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Expeditions to Cape York Peninsula North Queensland, Australia 1976 - 1989

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by

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FRONT COVER PHOTO: ***Dendrobium carronii***. Photographer Bill Lavarack
BACK COVER MAP: © Tyrone Thomas

Dr. Peter S. (Bill) Lavarack

Dr. Peter Lavarack, known to most as “Bill”, was born in Melbourne but moved to Queensland at the age of eight when his parent bought a pineapple farm at Nambour. On frequent trips into the nearby scrubs, he developed an interest in native orchids which was to last for a lifetime. He trained as a botanist at the University of Queensland, graduating with a Ph. D. degree on the classification of orchids. He then worked for more than 30 years for the National Parks and Wildlife Servic based mostly in North Queensland. His work involved the establishment of the large national parks on Cape York Peninsula, the development of management plans for national parks, development of legislation to protect threatened species and research on native orchids.

A continuing thread throughout his life has been his interest in native orchids. His work involved numerous trips to Cape York Peninsula and other parts of Australia, providing the opportunity to research rare and interesting species and he discovered several species new to science. During this time, he wrote five books on orchids and published over 100 papers on various botanical subjects. He has a long-standing interest in history, particularly the history of Tropical Queensland. He now lives in retirement in Buderim with his wife Beverley and is an active member of the Buderim Historical Society and the Native Orchid Society of Australasia.

Phillip Cribb and Bill Lavarack with *Dendrobium carronii* on Cape York Peninsula. This attractive miniature species was named in honour of William Carron by Dr. Lavarack and Dr. Cribb in 1983.


Australian Orchid Foundation

AUSTRALIAN ORCHID RESEARCH

VOLUME 6, 2011

Expeditions to Cape York Peninsula North Queensland, Australia 1976 – 1989

by P. S. (Bill) Lavarack

DEDICATION

This volume is dedicated to the memory of the **Rev. Ronald Dowse Collins**. Ron supported the Australian Orchid Foundation (AOF) expeditions by making his four wheel drive vehicle available at his own expense. A second vehicle provides an important safety factor in remote areas. Perhaps even more importantly Ron, ever the epitome of the old bushie with his battered hat, his campfire tales and never-failing good cheer, helped expedition members relax in sometimes uncomfortable situations.

Let me relate one Ron Collins story. Clambering up the ridge above the Chester Gorge one day we met a scrub bull in a small clearing. Now the McIlwraith Range scrub bulls have quite a reputation for an aggressive temperament, and this one was pawing the ground and looking upset. I started unslinging the expedition's Ruger .44, (with which I was no expert), while looking for the nearest climbable tree. But Ron, who was raised on a cattle property, took matters into his own hands. In simple terms - he charged the bull, yelling loudly! This proved too much for the bull which disappeared at high speed with his tail in the air and fertilising the nearby foliage as he went.

Ron was a true native orchid lover and a wonderful human being. He is sorely missed by all those involved with the expeditions and indeed by all who knew him. His spirit, I am sure, remains in the remote areas like the Leo Creek Falls or the top of Mount Tozer or singing with the orioles along the Claudie River.

PSL

INTRODUCTION

This publication brings together six reports on expeditions to Cape York Peninsula carried out between 1976 and 1989 and funded by the Australian Orchid Foundation. Data collected on numerous other trips to the area while working for the Queensland National Parks and Wildlife Service are also included, along with data on new discoveries in the following years by botanists including David Jones and Bruce Gray. All this information has been synthesised into a list of the orchids of the Peninsula which is presented later in this publication. As well as providing scientific data on the distribution of the orchids of the Peninsula, it is hoped that these reports will give a snapshot of the difficulties and rewards of working in a remote area of Australia in the 1970s and 1980s.

The original reports are preceded by a general account - *With the AOF on Cape York Peninsula* - which has been adapted from a paper prepared for the 8th Australian Orchid Conference (Lavarack 1983). The reports are followed by a summary of the results of the expeditions - *Origins and affinities of the orchids of Cape York Peninsula, revisited* - which is adapted from a paper presented to the Orchid Symposium which was a satellite function of the 13th International Botanical Congress (Lavarack 1981). Initially I had intended to reprint this paper with a few edits to bring it up to date, but ideas on the origins of many groups of orchids have progressed radically in the last quarter of a century and a complete rewrite has been necessary.

The areas visited were poorly known at the time and largely remain so even today. There is an interesting early history of European exploration and interaction with the indigenous people dating back to Cook in 1770, Bligh in 1788, the ill-fated Kennedy expedition of 1848 and the controversial and violent expedition of the Jardine brothers of 1864. In addition gold prospecting and mining were major activities in the latter years of the 19th century and the early years of the 20th century. Many parts of Cape York Peninsula saw more activity then than they have in the last 100 years. The reports all present some historical background on the early explorers and on the botanical exploration of the region.

Descriptions of the climate, topography and vegetation are presented in each report. Vegetation maps for the various study areas are presented, based on field observations made during the expeditions and on detailed study of aerial photography on return. While more comprehensive vegetation maps of the Peninsula have been published since, the maps in the reports still have their place as they often are more detailed and are more orientated to describing orchid habitats than the more recent maps.

Names

The accepted names of Australian orchids have undergone constant changes over the last thirty years. The various reports presented in this publication were written at a time when some of the names used were different to those commonly used today. To maintain the historical context of the reports and to avoid confusion and time-consuming editing, they are published here as they were originally published, using the names then in use. The names used in the original reports are all included in Appendix 1 (*List of Orchids of Cape York Peninsula*) along with a reference to the currently accepted name and any other recently-proposed names.

In addition to the normal flow of name changes there has been an exceptional increase in new names over the last twenty years, with many taxa previously considered as varieties, subspecies and forms being proposed for elevation to the status of species. A similar position is currently occurring at the level of the genus, particularly with respect to the genus *Dendrobium* where most of the sections have been proposed for generic status. In many cases these new names have not yet been generally adopted by the scientific and horticultural communities in Australia and more particularly overseas, and it would be fair to say that the names of Australian orchids are in a state of flux. These new names have not been used in the general text of this publication. The reasons for this are twofold – firstly the current lack of general acceptance and secondly (and more importantly), the more familiar names have been used for ease of reading and to avoid confusion. However to give this publication a level of consistency, the names used in Appendix 1 and in other general discussions (i.e. other than in the original reports), are those considered by the author to be the most appropriate. This has involved making decisions based on personal opinion, on current acceptance in Australia and overseas and on the names currently accepted by the Queensland Herbarium. In the current climate of almost daily changes to the nomenclature, the final choice of names has been influenced by a desire to maintain a readily understandable text for the average reader who is not up to date with the latest taxonomic research.

Some recent changes that have international acceptance by botanists are included although the names may not be familiar to many Australian orchid enthusiasts (e.g. some Australian species of *Eria* are now placed in *Bryobium*). Other new names which have not gained general acceptance have not been

used here. In particular the new generic names in *Dendrobium* are rejected. This includes the genera *Grastidium* and *Dockrillia*, both names which have gained some acceptance in horticultural circles in Australia. These names are given as alternatives in Appendix 1.

The only exception to this rule has been that, where in the original reports an unidentified or new species is mentioned, the name later applied to it is given in square brackets.

Not only orchid names have changed over the years. In Appendix 2 a table of 'old' versus 'new' names is presented for non-orchidaceous plants that are frequently mentioned in the text.

The only other changes to the original reports involve the bibliographies and the maps. The separate bibliographies in each report have been merged into one to conserve space. Each report included a map of Cape York Peninsula showing the study area. These have been combined into one map which is included in the chapter entitled *With the AOF on Cape York Peninsula* (see Map 1).

ACKNOWLEDGEMENTS

The expeditions described in these pages could not have occurred without the help of numerous people. Each separate report includes an *Acknowledgements* section which thanks many people for assistance of many different kinds.

One person deserves thanks of the highest order. The late Gerald McCraith AM (1909-2009) was instrumental in providing the financial support from the Australian Orchid Foundation that made the expeditions possible. Gerald was also able to be present on two of the expeditions and it would be hard to imagine a better companion in the field.

Dr Hugh Lavery gave whole hearted support of this research in his capacity as Director of Research and Planning Branch of QNPWS.

Rev. Ron Collins of Atherton made his 4WD vehicle available at considerable personal expense and also provided much appreciated help in the camp.

Other people came on the expeditions at their own expense, in particular Bruce Gray. Of course thanks are also due in no small measure to the 'regular' members of the expeditions – David Jones, and John Clarkson and occasional members Geoff Butler, Dave Wilson, Peter McLean, Hal Young, Merv Hodge, the late Len Lawler, Mike Lockyer, Ben Wallace, Peter Hind, Ken Hill and Phil Cribb.

Geoff Stocker, Bernie Hyland and Alick Dockrill of C.S.I.R.O. Forest Research Institute at Atherton, provided useful advice and the use of the Herbarium before and after expeditions.

The late Mair Swann, well known orchid artist from Atherton, generously provided the illustration of *Habenaria macraithii* on page 84.

QNPWS illustrators prepared several of the maps.

Enid Collins and Joy Gray provided accommodation and a cheerful atmosphere for expedition members in Atherton before and after expeditions.

Lastly I would like to thank my wife Beverley for her patience in looking after a growing young family while I was away chasing orchids in the romantic northern ranges for weeks at a time.

PSL

WITH THE AOF ON CAPE YORK PENINSULA

The Beginning

I first visited Cape York Peninsula in 1968 with Bruce Gray and the late Ron Collins. We hired a 4 wheel drive and met up with Mal Brown who was the local school teacher at Coen. Mal had already discovered several new orchid species in the McIlwraith Range which forms the backdrop to the small outback settlement of Coen. These plants were sent to Alick Dockrill who was just then in the process of making a name for himself as an orchid expert based in Cairns. On this trip we saw many interesting species including *Dendrobium malbrownii* (then recently named after its discoverer) and the climbing species *Dipodium pictum*. The plants, and perhaps even more, the wild unexplored atmosphere of the Peninsula, captured my imagination and I determined to return as often as possible.

Future opportunities to visit the Peninsula opened up for me when I joined the National Parks Branch of the Queensland Forestry Department (now the Queensland Parks and Wildlife Service within the Department of Environment and Resource Management). My first task with National Parks was to assist Peter Stanton with his work which involved defining areas suitable for reservation as national parks along the Queensland coast and on Cape York Peninsula. These surveys started on the Peninsula with visits to the Cape Melville area and to the Iron Range area in 1972. Over the next five years I visited the Peninsula five times, and these trips eventually resulted in the large national parks that now are such a feature of Cape York Peninsula. More Departmental trips followed to tidy up various details and to some extent I was also able to carry out research on the plants including the orchids. However there was always a requirement to do the Government's work and there were many areas I saw that I wanted to visit and explore further for orchids and other interesting plants. The National Parks and Wildlife Service as it was then, was happy for this research to proceed if outside funding could be obtained. It was for this reason that I approached the Australian Orchid Foundation through Gerald McCraith in 1976.

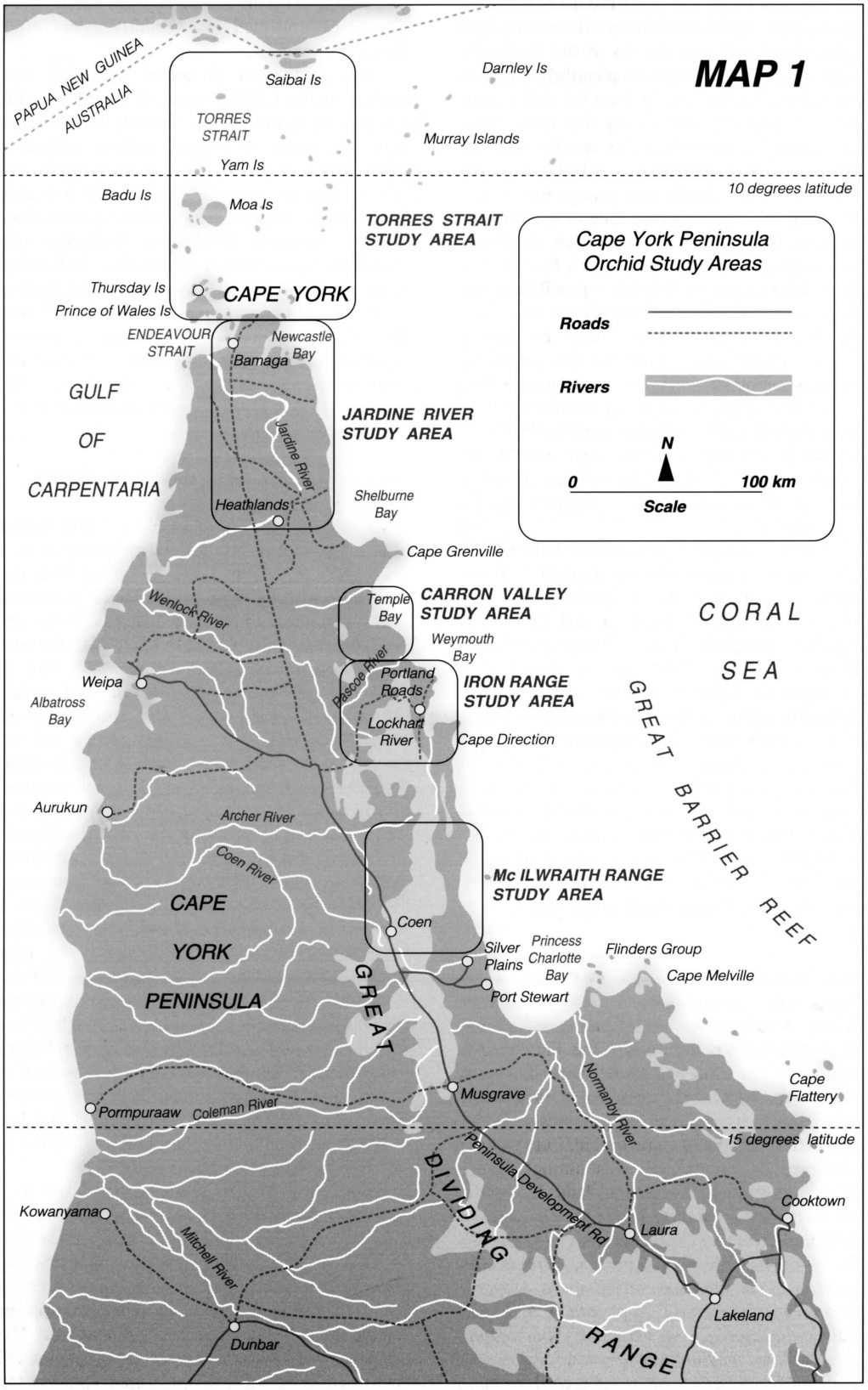
Cape York Peninsula – an overview

Before I discuss the AOF expeditions let me set the scene. The term 'Cape York Peninsula' as used in the following series of reports includes the area between about 10°S and 15°S, in simple terms between Cooktown and Saibai Island in Torres Strait (see map 1). It has been taken to include the islands of Torres Strait which are politically part of Queensland, but specifically excludes the Wet Tropics Region between Cooktown and Townsville. The Wet Tropics have a generally higher and more evenly distributed rainfall and higher mountains resulting in moist habitats supporting large areas of wet rainforests. In 1970 the orchids of the Wet Tropics were reasonably well known, while knowledge of the orchids of Cape York Peninsula was patchier. In contrast to the wet tropics, Cape York Peninsula is an area of generally low relief and a high, but extremely seasonal rainfall. This, allied with the poor soils, has resulted in large areas of open woodlands and forests and relatively small areas of rainforest and drier vine scrubs.

The McIlwraith Range, Macrossan Range, Iron Range, Tozer Range and Janet Range (all part of the Great Dividing Range) lie along central part of the east coast of the Peninsula. These ranges rarely reach above 500 metres but are well placed to intercept the prevailing south easterlies, resulting in some rain even in the driest months, as well as the heavy wet season rain. The rainforests are mostly restricted to these areas and along the major streams. Some rainforests of a different, less luxurious type exist amongst the heathlands and near the tip of the Peninsula where the rainfall is heavier. Extensive mangrove areas are present in the Escape River area, the Lockhart River area and along the west coast. Lower lying parts of the drier areas support huge areas of woodland dominated by the paper-bark *Melaleuca viridiflora*, while better drained sites are occupied by taller open eucalypt forests. In the north east on poor sandy soils there are extensive areas of heathland.

Thirty years ago, and to some extent to the present day, Cape York Peninsula was the last frontier for Australian orchid exploration. It was, and still is, sparsely settled and most is a vast untouched wilderness. While there are other wilderness areas in northern Australia, Cape York Peninsula differs as it has a moist climate and because it is adjacent to the rich flora and fauna of New Guinea. The areas of rainforest in the northern and eastern parts of the Peninsula are what makes it different to other tropical wilderness areas such as Arnhem Land (NT) or the Kimberleys (WA) – these areas lack well developed rainforest and the rich orchid flora that is usually a part of it. The rainforests and adjacent moist open forests are the most prolific habitats for orchids, but epiphytes are to be found in virtually all habitats on the Peninsula. Terrestrial orchids of varying types are also widespread particularly in the seasonally wet *Melaleuca* woodlands.

Cape York Peninsula has had a history of gold mining dating back 130 years, conflict with indigenous peoples and an up and down grazing industry. Forty years ago a large bauxite mine was


MAP 1
PAPUA NEW GUINEA
AUSTRALIA
Saibai Is
Darnley Is
TORRES STRAIT
Murray Islands
Yam Is
10 degrees latitude
Badu Is
Moa Is
TORRES STRAIT STUDY AREA
Thursday Is
Prince of Wales Is
CAPE YORK
ENDEAVOUR STRAIT
Newcastle Bay
Bamaga
GULF OF CARPENTARIA
JARDINE RIVER STUDY AREA
Jardine River
Heathlands
Shelburne Bay
Cape Grenville
Cape York Peninsula Orchid Study Areas
Roads
Rivers
N
0
100 km
Scale
Temple Bay
CARRON VALLEY STUDY AREA
Wenlock River
Weymouth Bay
CORAL SEA
Pascoe River
Portland Roads
IRON RANGE STUDY AREA
Weipa
Albatross Bay
Lockhart River
Cape Direction
GREAT BARRIER REEF
Aurukun
Archer River
Coen River
Mc ILWRAITH RANGE STUDY AREA
CAPE YORK PENINSULA
Coen
Silver Plains
Princess Charlotte Bay
Flinders Group
Cape Melville
Port Stewart
GREAT
Normanby River
Cape Flattery
Musgrave
Pormpuraaw
Coleman River
15 degrees latitude
DIVIDING
Peninsula Development Rd
Cooktown
Kowanyama
Laura
Mitchell River
Lakeland
Dunbar
RANGE

developed at Weipa and in the last decade tourism has become important with two wilderness lodges being developed near the tip of the Peninsula. Four-wheel-drive tourists are plentiful during the dry season, but few get far from the major roads and it is probably safe to say that many areas have fewer human visitors than was the case 100 years ago when prospectors poked into many remote corners. Roads have always been rough and only 4WD vehicles are able to handle most of them. However there have been significant improvements. In the 1970s it took four days to drive from Cairns to Bamaga – possible in two days today. However the wet season rains close the Peninsula Development Road for several months almost every year. For this reason air travel is important for communication with large ex-wartime strips at Iron Range and Bamaga and several smaller strips dotted around the Peninsula. Except for the visit to Torres Strait and the wet season expedition where there was no alternative, the cost of air travel made it impracticable for most AOF trips.

The western and central parts of the Peninsula experience a regular seasonal drought and only hardy orchids such as *Dendrobium johannis*, *D. canaliculatum*, *D. bigibbum* and *Cymbidium canaliculatum* flourish there. These species also occur in Arnhem Land with the exception of *D. bigibbum* which is replaced by the closely related *D. affine*. Other orchid species are shared also - mostly wet season terrestrials in genera such as *Calochilus*, *Habenaria* and *Nervilia*. However in the moister parts of the Peninsula there is a well developed orchid flora which shows affinities with New Guinea on the one hand and with the Wet Tropics of Queensland on the other. It is among this flora that new records and new species were found in the 1960s, 1970s and 1980s.

Orchid explorers on Cape York Peninsula

Apart from several isolated records such as Banks' collection of *Dendrobium canaliculatum* at Endeavour River in 1770, the first detailed botanical collecting on Cape York Peninsula was by the Archbold Expedition of 1948 which was ably led by Dr Len Brass. Interestingly this expedition collected several orchids but few were identified at the time, with most sitting in boxes in the corridor of the Queensland Herbarium for decades. These included *Dendrobium lobbii*, *D. bifalce*, *D. discolor*, *D. jonesii*, *D. rigidum*, *Cadetia wariana*, *Bromheadia pulchra*, *Dipodium pictum*, *Empusa* (*Liparis*) *habenarina*, *Nervilia plicata*, *Oberonia palmicola*, *Robiquetia wassellii*, *Spathoglottis plicata*, *Taeniophyllum muelleri* and *Schoenorchis sarcophylla*. The first published records of many of these species in Australia were made from specimens collected up to thirty years after Brass's collections.

The next spurt of orchid exploring was carried out by L.J.H. Wassell in the McIlwraith Range area in the 1950s. Wassell collected the type specimens of several orchids including *Dendrobium wassellii*, *Robiquetia wassellii* and *Vanda whiteana* (now *V. hindsii*). He was also the first to collect *Dendrobium antennatum*, *Thelasis carinata*, *Sarcochilus hirticalcar* and *Trachoma speciosum* in Australia. Following close on the heels of Wassell was Mal Brown who was a school teacher at Coen and was the first to collect several interesting species including *Dendrobium malbrownii*, *Trichoglottis australiensis*, *Flickingeria clementsii* (as *F. comata*) and *Taeniophyllum malianum* in the early to mid 1960s.

The Australian Orchid Foundation (AOF) expeditions

This then was the situation when I first visited the Peninsula. At least 13 new species or new Australian records had been recorded from the Iron Range – McIlwraith area in the preceding 15 years. My work with the National Parks and Wildlife Service took me to Cape Melville and Iron Range in 1972, the Jardine River area in 1973, the Olive River, Nesbit River and Archer River in 1974 and to the McIlwraith Range and Iron Range in 1975. Although it was not the major reason for these trips, I was able to spare some time to look for orchids and I became aware of several new or unknown species in the genera *Eulophia*, *Spathoglottis*, *Taeniophyllum*, *Crepidium*, *Cadetia*, *Bulbophyllum*, *Dendrobium* and *Oberonia*. In 1973 on the headwaters of Camisade Creek near the Jardine River I discovered a new *Bulbophyllum* for Australia. This turned out to be *B. blumei*. The next find was in 1974 on the western slopes of the Macrossan Range where the terrestrial species *Eulophia pulchra* was quite abundant. 1975 was the most prolific year for new discoveries. Severe unseasonable wet weather after I had arrived at Iron Range prevented a planned joint inspection with officers of the Lands Department and left me with some time to spare which I devoted to looking for orchids.

With me on that occasion, travelling in a private vehicle were Bruce Gray, Ron Collins and Peter McLain and the results of our searches were exciting. *Bulbophyllum gracillimum*, *Dendrobium tozerense* and *Oberonia carnosa* were all discovered, with the latter two species on the same day and in fact on the same tree! The discovery of these three interesting species led me to consider ways to spend more time in the

area looking for new orchids. Not long before this the Australian Orchid Foundation had been established and was looking for scientific projects to sponsor and I put a submission to them for a joint AOF - QNPWS expedition to Iron Range. The AOF generously provided funds for fuel and supplies and the expedition got underway on 3rd September 1976. I made a point of ensuring that the personnel of these expeditions were knowledgeable about native orchids and present on the 1976 Iron Range trip were Bruce Gray, Ron Collins, David Jones, John Wrigley (Canberra Botanic Gardens), Gerald McCraith (AOF), Len Lawler and Bruce Monroe (both from Sydney University).

The results were disappointing in that no 'new' orchids were found, however much information about the orchids of the Iron Range area was gained. The most interesting aspect of this expedition was the investigation of several 'rockpile' areas. These rockpiles comprised huge granite boulders with no soil and usually with deep and dangerous crevices between them. Access was difficult, slow and dangerous, but was well worth the effort as the rockpiles proved to be home to many interesting orchids such as huge clumps of *Vanda hindsii* along with large plants of *Dendrobium tozerense* and even *Pomatocalpa marsupiale*. The list of orchids seen included just about every species of epiphytic orchid from the Iron Range area, all growing as lithophytes, often in full sun. Other interesting species included collections of two unknown species of *Hoya* (now known to be *H. sussuela* and *H. anulata*), ant plants and ferns. Many other areas were investigated and several other valuable collections were made – notably of *Eulophia pulchra*, this being only the second record in Australia and 100 kilometres north of the original find. The same was also true for the record of *Pomatocalpa marsupiale*.

The trip was a most interesting experience for all involved, although marred by an accident to myself when I fell down a small waterfall on a tributary of the aptly named Capsize Creek. The injuries sustained were fortunately minor requiring a few stitches, but it occurred a day's walk from the vehicle and a few hours' drive from any assistance, bringing home to all involved that there is a risk involved in working in remote areas. Work of this nature requires an ultra careful approach with no risks allowable. A most pleasant part of this expedition was that Gerald McCraith, the chairman of the AOF was able to join the party for part of the trip.

The next AOF sponsored trips were held in 1978 and 1979 both to the McIlwraith Range. In 1978 the Chester River and Lankelly Creek areas were visited by a party consisting of myself, Rev Ron Collins, Merv Hodge, John Clarkson of the Queensland Herbarium and Geoff Butler of the Canberra Botanic Gardens. This group walked up the Chester Gorge and then walked overland on a compass bearing through thick rainforest to the top of the falls on Leo Creek. As on the previous expedition many interesting records were made, but no new species were found. The ranges of *Oberonia carnosa* and *Dendrobium tozerense* were extended and *Dendrobium antennatum* was found to be reasonably abundant in the right habitat.

In 1979 the party included myself, Ron Collins, John Clarkson, Ben Wallace and Ken Hill, the latter two from the Royal Botanic Gardens Sydney. Due to unfortunate circumstances the members of this expedition had very little time in the field. Only a day after forcing a road to a base camp at the mouth of the Massy Creek Gorge, Ron Collins became ill. At first this was presumed to be influenza, but later it became clear that it was more serious and a rushed evacuation to the flying doctor at Coen became necessary. The sickness was later diagnosed as Leptospirosis (Weal's disease) and Rev Collins spent several weeks in Cairns hospital. The party at base camp were left in no mood for further work and when I became ill soon after (this really was influenza as it turned out), we abandoned the trip. Ben Wallace and Ken Hill stayed on and proceeded to Leo Creek where both subsequently came down with Leptospirosis and also were later admitted to hospital in Cairns. All in all a disastrous expedition, but again emphasising the dangers of work in these remote areas where poorly understood diseases such as Weal's disease and scrub typhus occur. Indeed the first bit of equipment for anyone planning to enter these areas should be a good insect repellent as these diseases are spread by mites.

In 1980 a fourth AOF trip was organised – this time during the wet season to the Iron Range area. On this occasion the party comprised myself, Len Lawler, John Clarkson, Merv Hodge, and Gerald McCraith with help from Doug and Barb Holdsworth of Portland Roads. The aim was to look for wet season terrestrials and a good catalogue of these was obtained, but no definite new records were made. Non flowering specimens of a *Nervilia* species which appeared to be a new record were collected, but this could not be identified due to the lack of flowering material. This subsequently was identified as *N. crociformis* when plants grown in cultivation flowered.

1983 saw a new AOF – QNPWS expedition to the Carron Valley area which is situated north of the Iron Range area. On this occasion the expedition was joined by Dr Phillip Cribb of

the Royal Botanic Gardens Kew (UK). Other members were: myself, Bruce Gray, David Jones, Rev. Ron Collins, Dr Ben Wallace and Peter Hind (the latter two from the Royal Botanic Gardens, Sydney), Dave Wilson (a photographer from Townsville) and Neville Howcroft (an orchid expert from Papua New Guinea). The area proved a little disappointing and the orchids seen, by and large, proved to be a subset of those of the Iron Range area. However the return trip was made by a very rough road leading to Brown Creek in the Iron Range area. Near Brown Creek, Phillip Cribb found an interesting *Habenaria* species in flower. This proved to be a new species and was subsequently described as *Habenaria macraithii* in honour of Gerald McCraith. On a walk at Tozers Gap many interesting orchids were seen including *Bulbophyllum longiflorum* and *Liparis condylobulbon* both of which had previously been reported only in the McIlwraith Range, 150 kilometres to the south.

After the Carron Valley expedition the major remaining areas on the Peninsula were those to the north and immediate south of the Jardine River. I had already visited both areas in the course of other work, but as in the past I felt that the orchids of both areas were not thoroughly known, so an AOF – QNPWS expedition was organised in 1986 to tie together the results of previous expeditions and look for new records. On this occasion the area was reached by air, so that it was possible to visit in the wet season (February in this case). The party comprised of myself, Bruce Gray, David Jones and David Wilson. Accommodation was provided by the Top of Australia Wilderness Lodge (which was still under construction at the time) in a caravan. Interesting specimens were collected in the terrestrial genera *Calochilus* and *Arthrochilus* several of which have proved to be new species and have been subsequently described by David Jones.

With the report on the Bamaga area, Cape York Peninsula had been reasonably well covered. This left the islands of Torres Strait which lay half way between Australia and New Guinea, to complete the study. Another joint AOF – QNPWS trip was organised for February 1988 so that both epiphytic and wet season terrestrial species could be surveyed. Present on the expedition were myself, Bruce Gray, David Jones (Australian National Botanic Gardens) and John Clarkson. Several interesting orchids were found including terrestrials in the genera *Habenaria*, *Calochilus* and *Arthrochilus* which were possibly new species. *Dendrobium litorale* was discovered on Dauan Island, the only record from Australian territory, although it must be said that Dauan Island is geographically more part of New Guinea than of Australia. The results were interesting in providing a link between Australia and New Guinea. Their significance will be reviewed in the concluding chapter in this publication (*Origins and affinities of the orchids of Cape York Peninsula, revisited*).

Working on Cape York Peninsula

The work on Cape York Peninsula ranges from pleasant to unpleasant, from comfortable to dangerous and from simple to difficult. One thing is certain – it is rarely dull. In the next few paragraphs I will try to share some of the Cape York experiences with the reader.

The average trip starts out along the rough, but trafficable Peninsular Development Road which now is busy with traffic, but in the late 60s there were far fewer vehicles. A hurried overnight camp would be set up at the Stewart River or on one of the creeks near Coen. From here if the area to be visited is the McIlwraith Range, the road deteriorates to very rough and quite soon to a vague bush track scarcely detectable in the long grass and specialising in hair-raising washed out creek crossings which often involve winching. From this 'road' it is sometimes necessary to develop a new road to the site of the proposed base camp. These improvised roads require some careful planning with the aid of aerial photographs and a great deal of very hard work. It is slow going, tough on vehicles and frustrating for passengers and drivers who often go up several dead ends before finally finding a way through. One road of about eight kilometres took two days to put in. Great care is taken with the vehicles at all times and no risks are taken as the vehicle is the sole connection with the outside world. Most obstacles to the progress of the vehicle can be overcome if time and care are taken.

The site for base camp is decided on two criteria – the first being proximity to the proposed study area and the second comfort. The site chosen is usually on a high bank above a large creek. The site on a high bank ensures that the camp does not have unwelcome visits from estuarine crocodiles which are present in all the larger eastern streams. The first task is to burn off dry grass in the area to remove the risk from bushfires when the camp is unattended. Then a horizontal rope or pole is erected and a tarpaulin is hung from this for use as a bedroom. In winter and early spring rainfall is usually light and this is all that is required. Cooking is done on an open fire with camp oven, billy cans and a frying pan. Gas stoves are not often used except in very bad weather. A large ice box with two compartments is used to keep perishable food cold. One compartment has dry ice and small amounts of this are transferred to the larger food compartment every couple of days. In this way food can be kept frozen for

two to three weeks. This system has advantages over electric or gas refrigerators particularly if left unattended for two or three days. Nights on Cape York Peninsula can be cool and a sleeping bag is often needed. A mosquito net is essential particularly near the east coast, but less so in the centre of the Peninsula. For sleeping, different members of the group prefer a stretcher, blow up mattress or swag. The nearby creek supplies drinking, cooking and washing water. We never bothered boiling water as long as the water source was a fast flowing stream and I never had any problems with drinking the water all over the Peninsula over a period of 20 years. Care had to be taken with bathing or swimming if in crocodile territory. Shallow fast flowing creek sections are safe as long as they are a reasonable distance from any deep water capable of hiding a large crocodile.

From base camp the party usually packs rucksacks and heads off on hikes ranging from one to four days. These hikes are carefully planned in advance from maps and aerial photographs. Navigation is by following creeks where appropriate (creeks are usually the best orchid habitats in any case) or by compass lines and detailed use of aerial photographs which are more reliable than maps once one learns to interpret them. On these hikes living arrangements are much more primitive with luxuries restricted to what can be carried. Bed is usually a fairly flat bit of ground and the shelter is an ex-army hutchie slung between convenient branches. Dinner is dried food or, if very lucky, fresh jungle perch or black bream. Primitive as this may seem, it can feel like four star luxury after a hard day in the rainforest. These camps can have their compensations. I can recall being woken in the night by a loud noise, to see a large spotted cuscus perched on a branch only a few feet away. Then there are the less pleasant occasions such as being showered by the evil smelling liquid droppings of numerous flying foxes feeding on the *Melaleuca* blossoms above.

Other memories include the refreshing plunge in the cool water of a mountain rock pool, or standing at the top of Leo Creek Falls and surveying a panorama seen by very few living people, or the excitement of finding a bright yellow juvenile green tree python. Then there is the relief of stumbling back into base camp hot, tired and filthy and with a leg still throbbing from stinging tree encounters to taste an icy cold beer from the ice box or, best of all, the thrill of clambering over a boulder to be the first to see a new species of orchid.

The work consists of finding and collecting specimens of the orchids and other interesting plants seen. On most expeditions John Clarkson of the Queensland Herbarium was present and it was his job to make herbarium collections. Other institutions that sent staff over the years included the National Capital Botanic Gardens Canberra, the Royal Botanic Gardens Sydney, Royal Botanic Gardens Kew, and CSIRO Forest Research Institute Atherton and these people also made botanical collections and prepared reports of their activities on the expedition. These are presented as appendices to the AOF reports. Collections were made of live plants which were flowered in cultivation where necessary to identify plants not flowering at the time of collection. In addition notes were kept of known species and their habitats and abundance and numerous photographs were taken.

The work has its drawbacks such as worries about injury, getting lost, vehicle breakdowns, snakes, crocodiles, scrub bulls, feral pigs, stinging trees, tropical diseases, fires, getting bogged in creeks, early storms that can leave the vehicle bogged, and wondering if one is fit enough. But it rewards one with adventure and the satisfaction of a challenge met and conquered.

The Future

Only a fool would claim that all the orchids of Cape York Peninsula have been discovered. Undoubtedly more will be found, but it is probable that most epiphytes – particularly the larger ones – are now known, however new species in smaller epiphytic genera such as *Taeniophyllum* and *Bulbophyllum* could be found. The elusive terrestrial species that appear only in the wet season may well provide the material for future discoveries. More work in the McIlwraith Range and in the Mt. Carter area between Iron Range and the McIlwraith Range could yet yield more discoveries.

Large areas of the Peninsula are now reserved in national parks and other areas are designated as Aboriginal land. Hopefully this will provide some protection from land clearing and unscrupulous collectors, but attractive species such as *Phalaenopsis amabilis*, *Dendrobium bigibbum* and *Vanda hindsii* are possible targets for the illegal trade. Hopefully the laws controlling trade in threatened plants (the *Native Plants Protection Act 1992* and associated regulations) will help control this as they have largely removed the market for wild-collected plants. It is also to be hoped that local indigenous people who now have control of much of the orchid-rich land will not follow the example set by some of their white predecessors and will place a high priority on preserving the orchids and their natural habitat.

ORCHIDS OF THE IRON RANGE AREA
Expedition Report: Cape York Peninsula, 3 – 24 September 1976

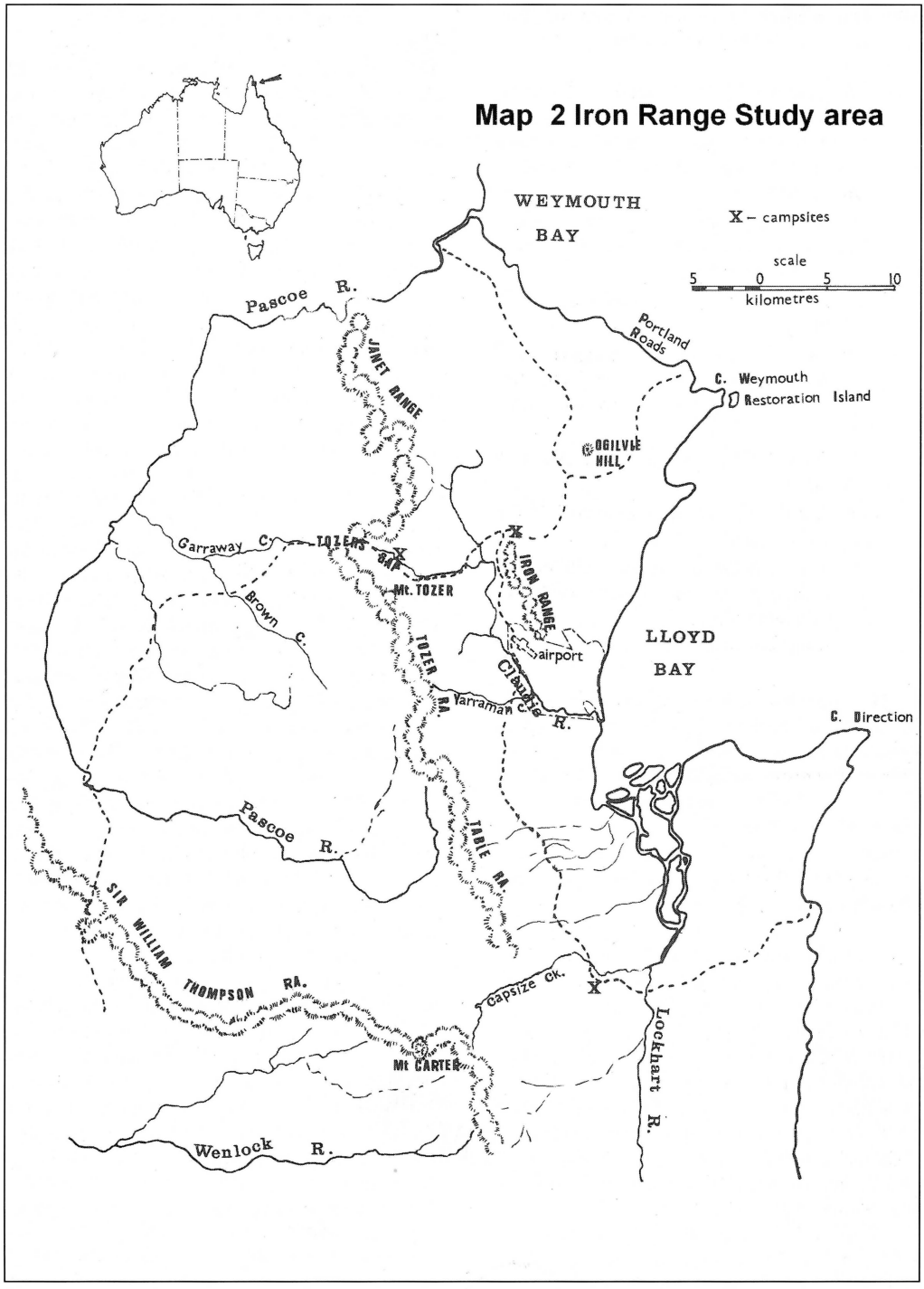
Contents

INTRODUCTION

The expedition described in the following pages was designed to examine the orchids occurring in the Iron Range area of Cape York Peninsula. Since the publication of *Australian Indigenous Orchids Volume 1* in 1969 by Alick Dockrill, about fifteen apparently new records for Australia have been discovered in the Iron Range-McIlwraith Range area in the following genera: *Bulbophyllum*, *Cadetia*, *Dendrobium*, *Dipodium*, *Eulophia*, *Liparis*, *Malaxis*, *Oberonia*, *Pomatocalpa*, *Schoenorchis*, *Taeniophyllum*, *Thelasis* and *Spathoglottis*. It seems more than likely that further previously unrecorded species of the Orchidaceae remain to be discovered in these inaccessible ranges. Thus one of the major aims of the expedition was to search for 'new' species of orchids. As well as this aim, it was also hoped to obtain further material of several of these new records as the available material in some cases was inadequate for further work. A third aim of the expedition was to gain some idea of the conservation status of the orchid flora of the area. To achieve this it was firstly important to establish which species were present, then secondly to estimate their relative abundance and thirdly to assess their exploitation both present and potential.

While the Iron Range - McIlwraith Range areas do in effect make up one vegetation region, it was considered that the area was too large to be examined on one expedition. For the first of a series of such expeditions it was considered that the relatively more accessible Iron Range area would be a useful starting point. Other possible expeditions may include two to the McIlwraith Range and a wet-season study of the Iron Range area.

The expedition was funded jointly by the Australian Orchid Foundation and the National


Map 2 Iron Range Study area
WEYMOUTH
BAY
X – campsites
scale
5 0 5 10
kilometres
Pascoe R.
JANET RANGE
Portland Roads
C. Weymouth
Restoration Island
OGILVIE HILL
Garraway C.
TOZERS BAY
Mt. TOZER
IRON RANGE
airport
Brown C.
TOZER RA.
CLAUDIE R.
Yarraman C.
LLOYD
BAY
C. Direction
Pascoe R.
TABLE RA.
SIR WILLIAM THOMPSON RA.
Capsize Ck.
Mt CARTER
Lockhart R.
Wenlock R.

Parks and Wildlife Service of Queensland. The personnel consisted of the following:

- Dr. Peter S. Lavarack, Botanist, the National Parks and Wildlife Service of Queensland and a member of the Research Committee of the Australian Orchid Foundation;
- Mr. John Wrigley, Curator of the Canberra Botanic Gardens and also a member of the Research Committee;
- Mr. Bruce Gray, native orchid expert of Atherton;
- Mr. David Jones, a botanist and horticulturist from Melbourne, who has published widely on orchids and other plants;
- Rev. Ron Collins, native orchid expert of Atherton;
- Mr. Gerald McCraith, a Director of the Australian Orchid Foundation;
- Mr. Len Lawler of Sydney University, an authority on the biochemistry of Australian Orchids;
- Mr. B. Munro, also of Sydney University.

The expenses of Mr. Wrigley were met by the Canberra Botanic Gardens and those of Messrs. Lawler and Munro were met in part by Sydney University, while Rev. Collins, Mr. Jones, Mr. Gray and Mr. McCraith were present at their own expense. Other expenses involved with the expedition were met jointly by the Australian Orchid Foundation and the National Parks and Wildlife Service of Queensland.

ACKNOWLEDGEMENTS

The financial support and enthusiasm of the Directors of the Australian Orchid Foundation and in particular of Mr. Gerald McCraith are most gratefully acknowledged as is the co-operation and enthusiasm of the people present on the expedition. A special debt of gratitude is owed to Rev. R. Collins of Atherton who made his four-wheel drive vehicle available to the expedition even though he was unable to be present for the entire trip himself.

Messrs. G. Stocker, B. P. M. Hyland and A. Dockrill of C.S.I.R.O. Forest Research Inst., Atherton, provided some useful advice based on a detailed local knowledge. Finally I wish to express the appreciation of the members of the expedition to the manager, staff and the citizens of the Lockhart River Aboriginal Community. The services provided enabled the expedition to function much more smoothly and efficiently than would otherwise have been possible.

THE IRON RANGE AREA

General

The area examined on this survey was, broadly speaking, bounded by the Pascoe River on the north and west and by Capsize Creek to the south (see map 2). Iron Range, which gives its name to the area, is a range of low hills, below 200 m in altitude. The major physical features of the region include the Tozer Range which reaches a maximum elevation of 550 metres at Mount Tozer. Much of the Tozer Range is at an elevation of about 400 to 500 metres. It is separated from the similar Janet Range to the north by Tozer's Gap. To the south the range decreases in altitude to be a little over 250 m due west of the mouth of the Lockhart River, where it is known as the Table Range. However, relatively high altitude is again reached further south at Mt. Carter (615 m). In many ways Mt. Carter represents both the northern end of the McIlwraith Range and the southern end of the Tozer Range. The western slopes of the study area are drained by the Wenlock River in the extreme south and over most of the western margin by the Pascoe River which describes a large semicircle as it rises just to the south of Mt. Tozer, runs west, then north and finally east to empty into Weymouth Bay. The Tozer's Gap area, the southern part of the Janet Range and the northern part of the Tozer Range are drained by the Claudie River which comprises a series of short fast-flowing jungle-clad streams. Other noteworthy streams in the study area include Brown and Garraway Creeks, both tributaries of the Pascoe River and the short, fast-flowing east coastal streams of Capsize and Yarraman Creeks. The Lockhart River rises outside the study area, but the extensive mangrove areas in its delta are within the area.

Thus the study area encompasses much mountainous country above 250 m altitude. In this it is quite unlike most of the Peninsula which is of low monotonous relief. These rugged ranges represent the northern part of an axis of igneous and metamorphic rocks which stretches from about the Mitchell River in the south to Cape Grenville in the north (Willmott *et al.* 1973). In this region the axis extends west to about the Pascoe River. Not all the study area is rugged. There is a coastal plain of varying width and varying geological origin extending the length of the coast. It is largely comprised of soils derived from granite with patches of quaternary sand. There are localised patches of rich alluvium along the streams.

Climate

When compared with Cape York Peninsula as a whole, the Iron Range-McIlwraith Range Region is unique in physiography, geology and climate. These three aspects are of course closely related in that the high granite ranges happen to be ideally situated in the path of the prevailing south-easterly winds causing significant winter rainfall. In other areas where the ranges are lower or non-existent the moist winds do not release any significant rainfall and, for nine months of the year, virtually no rain is recorded. Thus even in the driest month (September), Iron Range averages 13 mm compared to 5 mm for Moreton and 3 mm for Thursday Island. Even when it is not raining, there is often a cloud cover at Iron Range and, particularly on the mountains, a light misty rain. It is also highly likely that certain areas in the Tozer and Janet Ranges would average well above the yearly average for the Iron Range Airport (1980 mm). To the west of the ranges the rainfall decreases very sharply and it is likely that the area in the vicinity of the Kennedy Road crossing of the Pascoe River, although only about 20 km west of Mt. Tozer, would receive a rainfall no higher than that of the remainder of the Peninsula.

Temperatures in the study area, while consistently high as would be expected in a lowland tropical environment, show some moderating effect from the sea, the prevailing south-easterly winds and, to a minor degree, altitude. The hottest month is January with an average maximum of 31.3°C and an average minimum of 23.4°C, while July is the coldest with 26.7°C and 18.4°C. Humidity remains high throughout the year reaching a peak in the wet season of January to April. Tropical cyclones occur occasionally bringing floods and destructive winds.

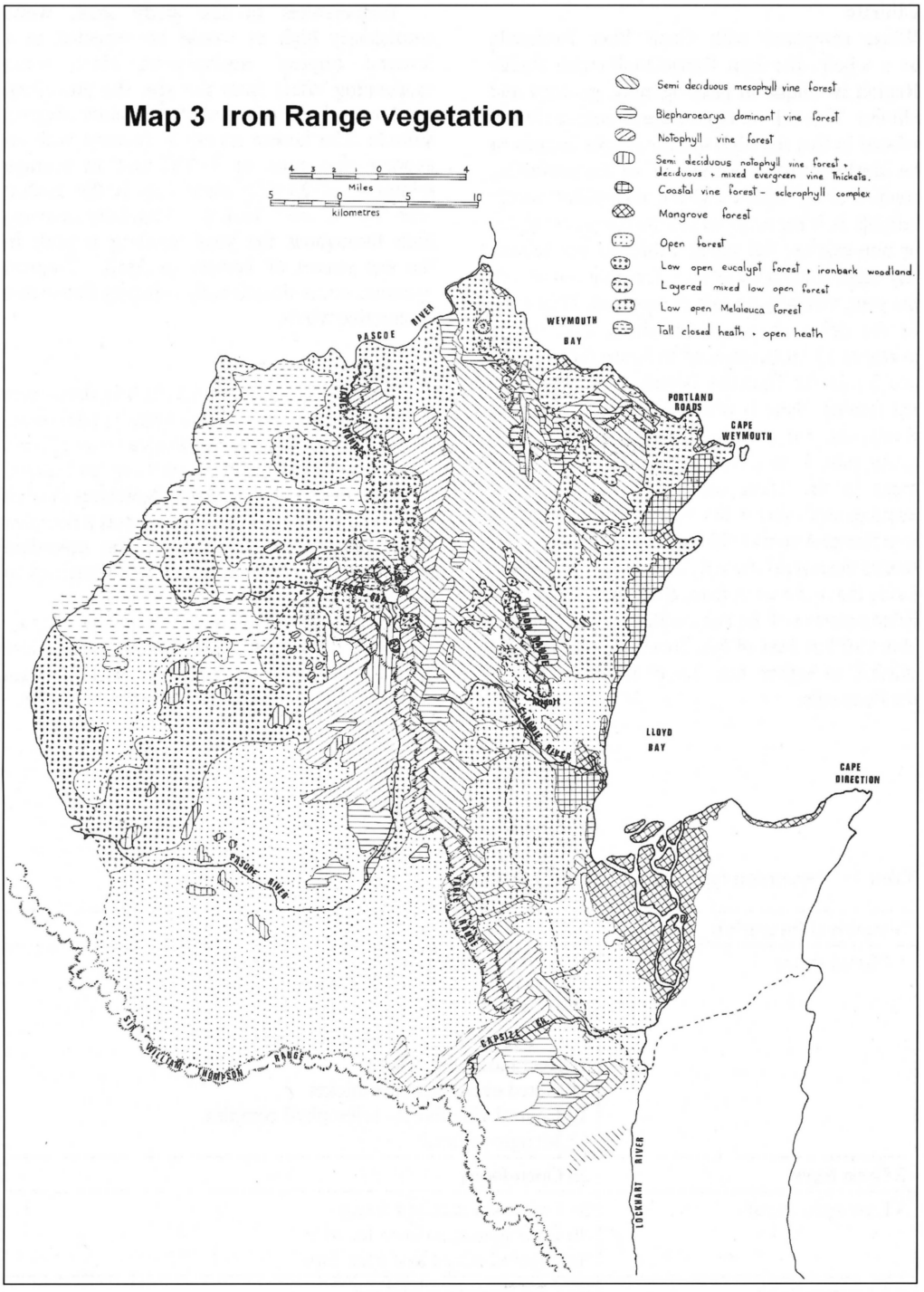
Vegetation

The study area includes within its boundaries part of one of the major areas of rainforest in Australia. As well as this there are extensive areas of open forest, woodland, heath, mangrove and strand communities. While rainforest dominates most of the uplands, the lowland areas support a complex mosaic of the types listed, varying according to the different environmental characteristics of the site.

The vegetation types noted during the study are set out in Table 1. Rainforest types are classified according to the scheme set out in Webb (1968), open forests and other types according to Specht (1970).

Table 1: Vegetation types noted in the study area.

Structural formation	Alliances
1 Closed forest	1a Semi deciduous mesophyll vine forest 1b *Blepharocarya* dominated vine forest 1c Notophyll vine forest 1d Semi deciduous notophyll vine forest 1e Deciduous vine thicket 1f Mixed evergreen vine thicket 1g Coastal vine forest - sclerophyll complex 1h Mangrove forest
2 Open forest	2a Open forest
3 Low open forest	3a Low open eucalypt forest 3b Low open melaleuca forest 3c Layered mixed low open forest
4 Low woodland	4a Low ironbark woodland
5 Closed heath	5a Tall closed heath
6 Open heath	6a Open heath
7 Grassland	7a Grassland


Map 3 Iron Range vegetation
Semi deciduous mesophyll vine forest
Blepharocarya dominant vine forest
Notophyll vine forest
Semi deciduous notophyll vine forest + deciduous + mixed evergreen vine thickets.
Coastal vine forest - sclerophyll complex
Mangrove forest
Open forest
Low open eucalypt forest + ironbark woodland.
Layered mixed low open forest
Low open Melaleuca forest
Tall closed heath + open heath
4 3 2 1 0 4
Miles
5 0 5 10
kilometres
PASCOE RIVER
WEYMOUTH BAY
PORTLAND ROADS
CAPE WEYMOUTH
IRON RANGE
Airport
LLOYD BAY
CAPE DIRECTION
PASCOE RIVER
LOCKHART RIVER

These types will now be described in more detail. It should be stressed, however, that the types here described are based on generalised impressions. It is felt they will be accurate as far as they go, but in several cases they represent an over-simplification. For example the category 2 (a) (open forest) encompasses several distinct plant alliances. Nevertheless it is anticipated that these categories and the accompanying map will be useful in describing the habitats of various plants in later chapters. See map 3.

1 (a) Semi-deciduous mesophyll vine forest

This is the predominant rainforest type on the lowlands of the Iron Range area. It is particularly well developed along the major streams such as the Claudie River and Capsize Creek where it occurs on a rich alluvium. There is a strong deciduous element with trees such as *Bombax ceiba* and *Brachychiton* species losing all their leaves and other species such as *Ficus albipila* and *Sarcocephalus coadunatus* which lose a large proportion. Palms of the genera *Caryota*, *Gulubia*, *Archontophoenix*, *Calamus*, *Ptychosperma*, *Licuala* and *Hydriastele* are a feature of these forests. Vines and epiphytes are not present in great abundance and the ground layer of vegetation is quite sparse, making these forests very easy of access. Orchids as a rule are present in fair quantity in the upper branches of the trees, although *Sarcochilus moorei* often grows low down.

Much of this vegetation type occurs on country of easy topography to the east of the mountain ranges. It forms the bulk of the Iron Range rainforest which, due to the extensive clearing of southern areas, is now the largest area of lowland rainforest on the continent.

1 (b) *Blepharocarya* dominated vine forest

This type is quite widespread usually in lowland situations and may represent a transition between open forest and semi-deciduous mesophyll vine forest. In several areas where it occurs there is evidence of fire having previously occurred. Frequently *Blepharocarya involucrigera* dominates the canopy almost to the exclusion of other species, although in some areas *Tristania longivalvis* and certain other sclerophyllous species such as *Acacia* species are common. The understorey is often that of a young rainforest. This is not a particularly productive orchid habitat.

1 (c) Notophyll vine forest

This type occurs predominately on the higher ridges. It has few deciduous species and, in some quite extensive areas, none at all. Under the classification proposed by Webb (1968) this type could be classified as either mixed notophyll vine forest or simple notophyll evergreen vine forest. It is closely related to the araucarian notophyll vine forests of the McIlwraith Range but lacks the emergent hoop pines (*Araucaria cunninghamii*). Epiphytes including orchids are not particularly common, but in certain positions such as exposed ridge tops, may be locally abundant. In general this type occurs in areas of presumably high year-round rainfall on well-drained soils. It often has a relatively low canopy, a well developed understorey and a moderate complement of vines.

1 (d) Semi-deciduous notophyll vine forest

This type in broad terms is closely related to notophyll vine forest, but with a strong deciduous element. It occurs on hills in the western parts of the study area such as between Brown Creek and the Pascoe River. *Brachychiton* species, *Bombax ceiba* and other deciduous trees are common. Stingers (*Dendrocnide* species) are a constant feature of the understorey and vines are prominent. This type is usually developed on very rocky hillsides which tend to deflect fire. In many areas it is a relatively good orchid habitat.

1 (e) Deciduous vine thickets

Areas of this type occur in several different situations throughout the study area. In certain situations on the frontal sand dunes immediately behind the mangroves, vine thickets of a strongly deciduous nature were encountered. The height of the canopy (if it can be so termed) is about 4 m and several very prickly vines (*Capparis* species and others) made their presence felt. There is a sparse ground layer of grasses. This particular type was rich in orchids. Types of a similar structure occur on the extreme western parts of the study area (e.g. near the Pascoe River crossing) and in dry gullies near Portland Roads. In most cases sclerophyll species are common, with *Tristania longivalvis* and *Melaleuca* sp. aff. *symphyocarpa* being common emergents. In areas other than those first mentioned, orchids are not a major feature of these communities.

1 (f) Mixed evergreen vine thicket

This type is relatively widespread on steep slopes (e.g. Mt. Tozer area). Sclerophyll emergents such as *Tristania longivalvis*, *T. suaveolens*, *Melaleuca* sp. aff. *symphyocarpa* and *Eucalyptus tetrodonta* are common as are vines such as the wiry *Smilax glyciphylla*. This type intergrades with heath vegetation. It often has a well developed understorey of sedges and ferns and is host to a relatively small number of orchids.

1 (g) Coastal vine forest - sclerophyll complex
This type is developed on sand dunes and is very variable. In some situations it intergrades with type 1(d) and in others it merges with open forest. Sclerophyll types such as *Melaleuca* sp. aff. *symphyocarpa*, *Leptospermum fabricia* and *Eucalyptus tessellaris* are common, as are evergreen rainforest species including *Eugenia bungadinnia* and *Syzygium rubiginosum* and semi-deciduous species such as *Terminalia* species. In effect several different plant alliances are involved here but detailed work is needed to separate them. In general this is a poor orchid habitat.

1 (h) Mangrove forest
Extensive areas of mangroves occur within the study area notably in the estuary of the Lockhart River. These forests have been little studied but appear not to be good orchid habitats.

2 (a) Open forest
This is the Type 2 (a) of Pedley and Isbell (1971). It ranges from relatively tall forest (20 m) to a more moderate height of about 14 m. The major tree species are *Eucalyptus tetrodonta* and *E. nesophila* with scattered *Erythrophleum chlorostachys*. Common in the lower layers are *Parinari nonda*, *Acacia* species, *Grevillea glauca*, *G. parallela* and *Livistona muelleri*. Ground cover is made up of tall thick grasses of which *Imperata cyclindrica* dominates. This vegetation type was seen to be well developed between the Yarraman Creek and Capsize Creek crossings on the old Lockhart River Mission road. Orchids are relatively uncommon.

3 (a) Low open eucalypt forest
This type in many ways is closely related to type 2 (a) (Open forest). It is encountered on poorer, well-drained soils in areas such as near Portland Roads road. Again *E. nesophila* and *E. tetrodonta* are the common species, but the average height is much lower at about 10m. Shrubs include *Coelospermum reticulatum*, *Parinari nonda*, *Casuarina littoralis*, *Acacia flavescens* and *Melaleuca* sp. aff. *symphyocarpa*. The ground cover is rather sparse, with grasses predominating. Again orchids are uncommon.

3 (b) Layered mixed low open forest
This is the Type 3 (b) of Pedley and Isbell (1971). It consists of, generally speaking, a mixture of open forest elements such as *Melaleuca viridiflora*, *Melaleuca* sp. aff. *symphyocarpa*, *Acacia* species, *Tristania suaveolens*, *Eucalyptus tetrodonta*, *Grevillea glauca* along with a few rainforest species such as *Deplanchea tetraphylla* also apparent. There is a prominent shrub layer with *Choriceras tricorne*, *Sinoga lysicephala* and *Banksia dentata* prominent. Creeks are usually lined with a dense gallery forest. This type is well developed in Tozer's Gap where it is a very good orchid habitat.

3 (c) Low open Melaleuca forest
This is Type 3 (c) of Pedley and Isbell (1971). The dominating tree species is *Melaleuca viridiflora* which forms almost pure stands. Other species include *Grevillea glauca* and *Acacia brassii*. The trees are well spaced, about 5 m tall. There is a moderately thick but low layer of grasses. *Utricularia* species are fairly common in damper areas. Orchids are represented by *Dendrobium johannis* and *D. canaliculatum* only.

4 (a) Low ironbark woodland
This is Type 5 (b) of Pedley and Isbell (1971). It is widespread in areas to the north and west of the study area, but was not investigated on this trip.

5 (a) Tall closed heath
This and the following type (6a) both are classified by Pedley and Isbell (1971) as Type 7 Heath. Tall closed heath forms a canopy at about 2 m. The canopy is here classified as 'closed' although it varies from quite open (50% cover) to closed (80%). At least part of this variation is related to recent fires. No one or two plants could be said to be dominant - common species include *Grevillea pteridiifolia*, *Leptospermum fabricia*, *Sinoga lysicephala*, *Banksia dentata*, *Melaleuca* sp. aff. *symphyocarpa*, *Boronia alulata*, *Casuarina littoralis*, *Acacia rothii*, Epacridaceae species and *Fenzlia obtusa*. The ground cover consists of sparse sedges. Occasional emergents such as *Grevillea glauca* and *Melaleuca viridiflora* are present. Areas of this vegetation type occur in Tozer's Gap, along the road to Portland Roads and in certain upland areas such as on the Janet Ranges and near Mt. Tozer. This is a rather barren orchid habitat at least for epiphytic species.

6 (a) Open heath
This low (0.5-1 m) type occurs in areas of impeded drainage on poorer soils within areas usually supporting tall closed heath on better drained sites. Sedges (such as *Schoenus sparteus*) and restiads are the major feature of this type. Also common is the pitcher plant (*Nepenthes mirabilis*) and smaller insectivorous plants such as *Drosera* and *Utricularia* species. *Sinoga lysicephala*, *Pandanus* species, *Melaleuca quinquenervia* and *Hakea pedunculata* are the most common emergents.

This type occurs in Tozer's Gap and other areas. It is well developed locally in areas of poor drainage. Orchids are represented by at least three terrestrial species.

7 (a) Grassland
Areas of naturally occurring treeless grassland occur in small pockets near Cassowary Creek and in larger areas near the Lockhart River. These were not investigated.

HISTORY OF THE IRON RANGE AREA

Early exploration
The first recorded European contact with the study area was made by Captain William Bligh, who in 1790, made landfall at Restoration Island after being cast adrift in a small boat by the *Bounty* mutineers. Bligh and his 18 companions spent three days on the island recovering their strength for the second part of their epic open boat voyage (Bligh 1792).

The first land based expedition did not reach the area until half a century later. In 1848 the ill-fated Kennedy expedition entered the Iron Range area (Carron 1849). Six members of the party died there. Little Roundback Hill in the north eastern part of the area was chosen as the base camp where Kennedy left eight men to await help as he pushed on to his fate. Of these only two, including William Carron the expedition botanist and second in charge, survived and they were nearly dead from starvation and under immediate threat of attack from hostile aborigines when rescued. Not surprisingly, the botanical results of this expedition were lost.

The next major expedition to pass through the area was led by Robert Logan Jack, the Government Geologist, in 1880. Jack, having studied the available information on the Kennedy expedition, carefully avoided the worst of the Iron Range jungles. Other than a general account Jack (1921) added little to knowledge of the botany of the area.

Botanical exploration
There is no record of botanists visiting the area for 100 years after Carron was there in 1848. Dr. L. J. Brass was the leader of the Archbold 1948 Cape York expedition (see Brass 1953). This expedition which included zoologists as well as botanists was financed by Richard Archbold through the American Museum of Natural History. It examined several areas of Cape York and spent the period 30 May 1948 to 18 July 1948 in the study area. Extensive collections were made at Portland Roads, Iron Range, Tozer's Gap, Mt. Tozer and Brown Creek. The list of orchids collected in the study area by Brass is given in Appendix 2. It is perhaps worth noting that Brass collected only fertile material and most of the orchids of the area would not have been in flower during the period he was there.

Subsequent expeditions have been made by Webb and Tracey of C.S.I.R.O., Division of Rainforest Ecology; Hyland and Stocker C.S.I.R.O., Forest Research Institute, Atherton; Queensland Forestry Department - E. Volk and later J. P. Stanton and P. S. Lavarack and by Queensland National Parks and Wildlife Service.

Until the present time, little attention has been focussed on the orchids of the area. All of the above mentioned expeditions have been mounted with other objectives in mind and any collection of orchids has been opportunistic. Because of difficulties in access no botanical expedition has visited the area during the wet season when terrestrial orchids could be expected to be in evidence.

METHODS

Preparation
This study relied heavily on the use of aerial photographs to locate different vegetation types. The photographs used were the Cape Weymouth Series (CAB 382) Runs 5, 6, 7, 8 flown in 1970 by Adastra at 25,000 feet and the Coen Series (CAB 136) Run 1 flown by Adastra in 1958 at 25,000 feet. From these photos and from previous ground experience it was possible to obtain a working knowledge of the geography of the area and to establish the locality of vegetation types likely to be good orchid habitats. It was also possible to locate particular areas such as rock faces and gorges likely to prove rewarding. From this a series of proposed trips was drawn up.

Field work
Base Camps were established at various localities predetermined from the aerial photos. From these camps (the localities of which are shown on map 2) various half-day, one day and overnight trips of two days or more were undertaken. Specimens were collected both as live plants and as herbarium material. These were shipped out via Bush Pilots Airways from Iron Range, plants being sent to Melbourne, Canberra and Brisbane. The regular use of air transport was a luxury which will not be available for future proposed expeditions elsewhere on Cape York.

An extensive collection of live plants was made for the Canberra Botanic Gardens and a smaller one for a research collection in Brisbane. In the case of several recently discovered species and one or two of doubtful identity it will be necessary to grow and flower plants before worthwhile fertile specimens can be obtained.

RESULTS

Diary of the expedition

Atherton – Pascoe River (3 - 4 September)

The party consisting of Dr. P. Lavarack and Messrs J. Wrigley, B. Gray, D. Jones, L. Lawler and B. Munro assembled at Atherton on 1 September. Stores were purchased and vehicles packed on 2nd and a start was made at 6.00 a.m. on 3 September. The vehicles used were: a long wheel base Toyota Landcruiser belonging to National Parks and Wildlife Service, a short wheel base Toyota, property of R. Collins of Atherton and a short wheel base Patrol, property of L. Lawler.

The first day was spent in travelling and few orchids were seen. Camp was made at Coen - a distance of 548 km. The Peninsula Development Road passes through dry open forest or woodland communities dominated in turn by *Eucalyptus* species and *Melaleuca viridiflora*. The topography is mostly flat with the monotony broken only by the Byerstown Range, the township of Laura and several fine streams such as the Palmer, Laura, Hann, Moorehead and Stewart Rivers. The vegetation, with a few notable exceptions such as Lakeland Downs, remains in a state close to its original condition.

Orchids in this area were typical of those found in the dry country throughout the Peninsula. *Dendrobium johannis* and *D. canaliculatum* var. *nigrescens* may often be locally abundant, usually growing on paper bark melaleuca species (*M. viridiflora* was the most common host). Both species may grow quite low down, but this is governed by the height to which fires reach. *D. johannis* often grows in the harshest of environments - in full sun and reflected glare and in areas that receive no rain for eight months of the year. While the plants were quite robust, the flowers, generally speaking, were smaller and less brightly coloured than those of plants from moister areas. *D. canaliculatum* was more common and was usually seen as plants of only a few pseudobulbs, but in September even the smaller plants were seen to have at least one inflorescence. All plants seen were the darker form known as 'var. *nigrescens*', but wide variations in colour, length of raceme and size were evident.

Also prominent in the drier areas was *Cymbidium canaliculatum*. This occurred largely in hollow limbs and crevices on ironbarks usually well above ground level. The plants were variable in flower colour. In several gullies which were protected from fire, vine forest tree species occurred and on these a careful search often revealed plants of *Dendrobium bigibbum* (the Cooktown Orchid). It is now rather rare near the road but still plentiful in suitable habitats in more remote areas. All plants from this area appear to be the variety *superbum*. *Dendrobium rigidum* was also found in similar circumstances along dry streams.

The party left Coen and drove to the Pascoe River crossing on 4 September. The country remained similar with the notable streams being the Archer and the Wenlock Rivers, two of the most important streams of the Peninsula. Several areas of possible interest were examined during the day. One isolated area of closed scrub a few kilometres to the south-west of the Archer crossing was located on the aerial photographs and investigated. It proved to be well developed semi-deciduous notophyll vine forest with a canopy at about 12 m supporting a very large colony of flying foxes; the only orchids seen were two plants of *Dendrobium bigibbum*.

Pascoe River area (5 September)

The road crossing of the Pascoe River lies immediately to the west of the relatively high Sir William Thompson Range. This area is separated from the ocean by about 40 km of elevated country and marks the probable western extremity of the relatively high rainfall country. Rainforest is reduced to rather small pockets of semi-deciduous vine forest grading into deciduous vine thicket.

One of the vine forest covered hills was climbed. On the lower western slopes fairly large numbers of small plants of *Dendrobium bigibbum* were seen, along with the very common *D. rigidum*. Farther up the slope on the crest of the ridge at about 300 m a moister environment was encountered. Orchids seen here were more typical of the high rainfall country to the east. *Pholidota pallida*, *Saccolabiopsis armitii*, *Dendrobium johannis*, *D. smillieae* (a white form), *D. discolor* and *Chilochista phyllorhiza* were seen growing epiphytically. Three species were seen growing terrestrially. These were *Cheirostylis ovata* which was very common in the leaf litter. One plant, presumably *Geodorum densiflorum* (*G. pictum*) was collected and a patch of large plants of *Vanda whiteana* was noted sprawling over rocks and on the forest floor.

At about 1.00 p.m. the party moved on to Tozer's Gap a distance of about 38 km where camp was established between two streams that flow from the nearby Mt. Tozer.

Tozer's Gap (6 - 12 September)

Four major full day trips and several of shorter duration were undertaken from this camp. A brief outline of the activities undertaken in this area follows, with the detailed results then presented in a consolidated form.

6 September - B. Gray and D. Jones went to 'Hornet Hill' a ridge which marks the western end of Tozer's Gap. P. Lavarack and J. Wrigley to Lockhart River to forward specimens.

7 September - whole party to a ridge to the north of Garraway Creek.

8 September - D. Jones and J. Wrigley to Lockhart, P. S. Lavarack and B. Gray to Claudie Forests;

9 September - whole party up 'Leratii Ridge' on north-east side of Mt. Tozer, reaching an elevation of about 450 m;

10 September - whole party to Lockhart River, on return P. Lavarack and B. Gray walked up West Claudie Gorge;

11 September - entire party (except J. Wrigley) to southern end of Hornet Hill;

12 September - preparation of specimens and local collecting.

Consolidated results for Tozer's Gap camp rockpiles. In several areas in the general vicinity of Tozer's Gap there are hillsides made up of piles of very large granite boulders. These 'rockpiles' are invariably surrounded by notophyll vine forest which encroaches on to the rocks where it can gain a foothold. Although very open and exposed to the sun, these rockpiles are also, in most instances, exposed to the rain-bearing winds and are excellent orchid habitats.

Orchids and other plants such as the ant plants (*Myrmecodia* sp. and *Hydnophytum formicarium*) which are normally epiphytic were, in these situations, lithophytic and often were present in large numbers. A few trees, notably *Ficus* species are present, but for the most part trees and shrubs are sparse. Vines such as *Hoya* (five species) and climbers such as *Scindapsus altissimus* are also common. On these rockpiles two as yet unidentified orchids *Dendrobium* sp. (which was later described as *D. tozerense*), and *Oberonia* sp. (later described as *O. carnosa*) were collected. These had both been collected previously on one occasion only and then from only one limited locality. This was in 1975 when Lavarack and Gray found these species near Tozer's Gap. These recent collections were from areas separated by several kilometres and provided material essential to establishing the identity of the species. Both were rather rare, occurring mostly on the scattered trees.

The *Dendrobium* sp. belongs to the section *Grastidium* and is superficially similar to *D. baileyi*, differing slightly in the leaf, but has a quite different labellum and perianth. The flowers are pure white and all examined have three fertile anthers, a most unusual condition among the orchids. The flowers are produced in pairs and there are several flowerings throughout spring and summer. There was a tendency for all plants in an area to bloom on the same day. The flowers are short lived, lasting only one day. It was occasionally found on rocks but more commonly on trees. The *Oberonia* is a dwarf species similar in size to *O. palmicola* but quite different in floral structure. The leaves are short and fleshy and the inflorescence is orange-red. It flowers in autumn and winter and occurred only on trees on the rockpiles.

Another feature of the rockpiles were some large patches of *Vanda whiteana*. This is an endemic species (possibly the only Australian species) and is restricted to the area between the Pascoe River and Coen. Generally regarded as a very rare orchid, the results of this survey showed it to be quite common. It was encountered in several different communities during this and preceding trips and certainly attains its best development on the rockpiles, where plants with more than twenty leads are not uncommon in some areas. It prefers sunny positions but was also seen in shaded positions. Flowering plants were collected but were quite rare.

On sheltered areas of the various rockpiles some large plants of *Thelasis carinata* were discovered. Previously this species had been recorded in Australia only from Leo Creek on the McIlwraith Range and this discovery represented a significant extension of range. Many of the plants seen were quite large having three or four growths and were more robust than previously examined Australian species.

Other plants encountered included the following: *Ephemerantha comata* - very large plants of this were quite common. The long branching pseudobulbs on some plants were as much as 1 m high. Again this species had been recorded from the McIlwraith Range, but not Iron Range previously; *Dendrobium luteocilium* was noted forming huge plants with canes up to 2 m long and in some cases probably producing 10 to 20 new leads. Probably the two most common species in the area were *Bulbophyllum baileyi* and *Pholidota pallida* which were abundant everywhere. Also present in smaller quantities were *Oberonia muelleriana*, *Bulbophyllum bowkettiae*, *Dendrobium discolor*, *D. smillieae*, *D. bifalce*, *D. teretifolium*, *Phreatia robusta*, *Robiquetia tierneyana* and *Eria inornata*.

The Notophyll vine forest on the ridges both near the rockpiles and in other areas provided some interesting discoveries. The eastern ridges near Mt. Tozer provided several plants of *Bulbophyllum leratii* an orchid as yet unrecorded in Australia and previously only known from New Caledonia. *B. leratii* is in the section *Cirrhopetalum* and vegetatively resembles *B. longiflorum* (= *B. clavigerum*).

The flowers however, are smaller, dark red-purple in colour and much more slender in their parts. *B. leratii* grows both on the exposed ridge tops and on the more sheltered slopes, usually in well-shaded positions and always epiphytically. It has been collected only once before in Australia by Lavarack and Gray in 1975. It was not encountered elsewhere on this or on other Cape York expeditions.

The top of the ridge which leads from Brass's 'Puffdelooney Peak' to the eastern shoulder of Mt. Tozer is a prolific orchid habitat. Very large plants of *Robiquetia tierneyana* were common, mostly growing in leaf litter and on rocks. Also common were *Dendrobium ruppianum* and *D. tetragonum*. The plants of the former which have been seen in flower appear to be a horticulturally rather inferior form, but those of the latter are the variety *giganteum* and are large and attractively marked. Some rather strange looking plants of an *Oberonia* (probably *O. palmicola*) were collected here and a solitary plant of *Habenaria papuana* was seen.

In the rocky creek leading up to Mt. Tozer and in other similar rocky gorge situations elsewhere the small *Cadetia wariana* was found to be abundant often forming mats over the rocks.

On ridge tops not exposed to the full force of the prevailing south-easterlies, some different orchids were evident. In one place *Phalaenopsis amabilis* and *Trichoglottis australiensis* were quite common growing both on trees and rocks. This represents an extension of range for the latter which previously had been recorded only from the Lankelly Creek area of the McIlwraith Range. Very large plants were seen here. *P. amabilis* is relatively widespread, extending from about Mt. Spec to Cooktown and again being present in the McIlwraith Range. It proved to be not uncommon in the Tozer's Gap ranges which, considering its depleted condition further south, is encouraging from a conservation aspect.

Occasional plants of *Vanda whiteana* were noted throughout these ridges as were plants of the climbing orchid *Dipodium pandanum*. This latter species crawls over the leaf litter until it strikes a boulder or tree which it then climbs up vigorously. The Australian distribution of this orchid is restricted to the McIlwraith Range and Iron Range areas.

One of the most important finds of the expedition was made in several of these areas. A terrestrial orchid previously collected only once (by the author in 1974) was found in relative abundance. This has now been identified as *Eulophia pulchra* a widespread species in south-eastern Asia but previously unrecorded for Australia. Sufficient material is now at hand to publish this record. Other plants noted on these ridges included *Robiquetia wassellii*, *Calanthe triplicata*, and *Dendrobium teretifolium*.

Layered mixed low open forest. This environment with its mixture of open forest types in well-drained areas and closed forests fringing creeks provided a rich and varied series of orchid habitats. Along the creeks and to a lesser extent in the more open areas the following species were noted: *Eria fitzalani*, *Diplocaulobium glabrum*, *Dendrobium smillieae*, *D. rigidum*, *Cymbidium madidum* (all common) and occasional plants of *Pholidota pallida* and *Acriopsis javanica* var. *nelsoniana*. All these plants were seen in flower. Plants of *D. smillieae* with white flowers, except for a green labellum, were common also.

In the open forest, as well as scattered plants of *Diplocaulobium glabrum*, plants were seen of *Dendrobium johannis* and *D. canaliculatum*. The particular form of *D. canaliculatum* which occurred here had petals and sepals which were light pink in the basal part tending to a dark purple at the apex. The labellum was bright yellow. If the 'variety *nigrescens*' is a valid variety then it is likely that this form is also deserving of varietal status at least. Previously this form has been collected only near the Jardine River. It was not encountered elsewhere in the study area. [This species has subsequently been described as *Dendrobium carronii*.] Both *D. canaliculatum* and *D. johannis* grow on paper-barks (almost exclusively on *Melaleuca viridiflora*). Some of this area and the adjacent heath may well contain terrestrials such as *Habenaria* which are evident only during the wet season.

Within this community some swampy areas were investigated. On several occasions these yielded plants of a species of *Spathoglottis*. This species is not *S. paulinae* but appears to be a much better horticultural subject, having a large flower which opens more widely. It is likely it will turn out to be a New Guinea species as it has been collected previously near the Jardine River. [This is now known to be *Spathoglottis plicata*.]

Areas of tall closed heath yielded no orchids except for occasional plants of *Dendrobium canaliculatum* on emergent paper barks. However, in swampy areas classified as low open heath two very interesting terrestrial orchids occurred. These were *Bromheadia venusta* and *Dendrobium lobbii*. It is interesting to note that both these orchids were collected in 1948 by Brass and while *Bromheadia venusta* was described by Hunt (1953), *Dendrobium lobbii* was overlooked until 1968 when Ian Walters of Townsville discovered a plant near Cardwell and established its identity (Walters 1968). *D. lobbii* always grows in wet, but open and sunny areas

usually amongst sedges about 30 cm in height, while *B. venusta* also is restricted to wet areas, apparently thriving in shaded positions and in thick vegetation to about 2 m. Both occurred in Tozer's Gap and in a hillside swamp near Brown Creek where they were abundant. Both are relatively common plants where there is a suitable habitat further north on the Peninsula.

Lowland rainforest. The orchids of the lowland forests classified earlier as semi-deciduous mesophyll vine forest were sampled at four major points during the expedition. These were on the road between Tozer's Gap and the Iron Range airport, in the vicinity of Iron Range itself, along Yarraman Creek and on the lower reaches of Capsize Creek. The forest and the orchids it supports were found not to vary significantly between areas.

Perhaps the most common orchid was *Sarcochilus moorei*. This species also occurs in New Guinea, but in Australia it appears to be restricted to the McIlwraith Range - Iron Range area. It was usually found in shade, often growing low down only a metre or two above the ground. The flowers are short lived, but the inflorescences which may be up to 40 cm long, flower in bursts of several centimetres at a time. One interesting feature of the flowering of this orchid is that all plants in the area were seen to open their blooms on the same morning. Plants of *S. moorei* can grow to a large size and when not in bloom may be mistaken for *Phalaenopsis* species. Other common epiphytes included *Pomatocalpa macphersonii*, *Robiquetia wassellii*, *Dendrobium bifalce* which often grew into very large plants, *D. discolor*, *D. luteocilium*, *D. smillieae*, *D. stuartii*, *Pholidota pallida* and *Micropera fasciculata*.

Perhaps the single most interesting find of the expedition was made in a Leichardt tree near the Claudie River. Several plants were collected by shooting branches down from the tall tree with a rifle. These turned out to be *Pomatocalpa marsupiale* which has been collected only once before in Australia at Lankelly Creek by B. Gray and R. Collins. This plant, of similar dimensions to a *Vanda*, but with smaller flowers borne on a branched spike, is apparently very rare in Australia. Later some more plants were collected a few kilometres away, again near one of the branches of the Claudie. The lowland forests also supported several terrestrial orchids. *Corymborkis veratrifolia*, *Apostasia wallichi*, *Zeuxine oblonga* and *Hetaeria oblongifolia* were all quite common.

Claudie River (13 - 15 September)

Camp was set up under some old mango trees near the site of an abandoned gold mine. This camp site was in the heart of an extensive area of lowland rainforest. From there trips were made locally and to the Yarraman Creek area. On 14 September Ron Collins and Gerald McCraith joined the party.

The lowland forests yielded several species of orchids as described in the previous section. A particularly good orchid habitat in this area occurred where lowland rainforest and open forest met. The margin of such areas proved very productive. On 15 September, P. Lavarack, B. Gray, D. Jones and J. Wrigley undertook a day trip to a long ridge near Yarraman Creek. This ridge which leads up to the main range proved unproductive.

Capsize Creek (16 - 21 September)

Camp was set up on the southern bank of Capsize Creek near the road crossing. The campsite was in an extensive belt of lowland rainforest which was found to be identical to the other areas investigated as far as orchids were concerned.

Melaleuca Woodland. On the way to Capsize Creek, extensive areas of *Melaleuca* woodland were examined. These areas varied considerably, but the most common trees (or in some cases shrubs) were *Melaleuca viridiflora* and *Petalostigma banksii*. *Dendrobium johannis* and *D. canaliculatum* were both abundant and one plant which was obviously a hybrid between these two species was collected. The form of *D. johannis* occurring there was seen to have a relatively large flower. It has been given the name 'variety *giganteum*' on occasions but this has not been formalised. The plants of *D. canaliculatum* are the variety '*nigrescens*'.

On 17 September, P. Lavarack, D. Jones, B. Gray and R. Collins walked up Capsize Creek on an overnight trip. Camp was set up on a tributary. A fall and an injury to P. Lavarack forced Lavarack and Collins to return early on the 18th while Gray and Jones returned at dark. A few orchids not previously seen on the trip were found. These were: *Dendrobium nindii*, *Thrixspermum platystachys* and *T. congestum*. Some very large plants of *Micropera fasciculata* and plants of *Vanda whiteana* and *Cadetia wariana* were also encountered.

The upper Capsize Creek area appears never to have been visited by botanists before and is likely to repay future explorations. A fern, new for Australia, was collected and several groves of the rare and beautiful palm *Gulubia costata* were noted. Several spectacular waterfalls were seen.

Mangroves and adjacent vine thickets. On 20 September, P. Lavarack, J. Wrigley, B. Gray and D. Jones walked to the Lockhart River mangroves. The mangroves themselves proved rather poor in orchids with only *Dendrobium*

rigidum and *D. discolor* being present in quantity. Also seen in small quantities were *D. luteocilium* and *Luisia teretifolia.*

However, a deciduous vine thicket on the edge of the mangroves proved to be an excellent orchid habitat. This low thicket was almost leafless and contained a large number of vines such as *Hoya* species and a prickly *Capparis* species. On the small trees and vines were the following orchids: *Dendrobium stuartii, D. rigidum, D. discolor, Robiquetia wassellii, Pomatocalpa macphersonii, Saccolabiopsis armitii, Chilochista phyllorhiza, Oberonia muelleriana, Pholidota pallida, Sarcochilus moorei, Taeniophyllum glandulosum* (synonym *T. wilkianum*) and *Taeniophyllum malianum.* This latter species has not yet been officially recorded for Australia. It is the largest *Taeniophyllum* occurring in Australia both in size of the vegetative parts and of the flowers which are bright yellow. Previously *T. malianum* had been collected only in the McIlwraith Range and this discovery represents a small extension of range.

Capsize Creek to Atherton (21 - 24 September) Camp was broken on 21 September. The return trip was without incident.

CONCLUSIONS

During the course of the expedition, 66 different species were noted occurring in the study area. No 'new' orchid was discovered although several of the collections made were most interesting and useful. The most important of these are listed below:

1. *Eulophia pulchra*
2. *Pomatocalpa marsupiale*
3. *Dendrobium tozerense*
4. *Oberonia carnosa*
5. *Bulbophyllum leratii*
6. *Taeniophyllum malianum*
7. *Thelasis carinata*
8. *Dendrobium canaliculatum* var. *nigrescens* x *D. johannis* (Natural hybrid)

A paper including new records has been accepted by the Queensland Herbarium for publication in their journal *Austrobaileya.* It is expected this will be published later in 1977. Other information of use to the National Parks and Wildlife Service of Queensland was gained concerning the conservation status of orchids and other plants of the Iron Range area. Plants such as *Vanda whiteana, Phalaenopsis amabilis, Thelasis carinata, Cadetia wariana* and *Trichoglottis australiensis* were found to be more widespread and common than had been thought. Other interesting plants including several rare ferns, two probably new species of *Hoya* and some useful specimens of species of *Melaleuca, Leptospermum, Utricularia, Leucopogon* and *Boronia* were collected. Over 300 collections of orchids and other plants were made by John Wrigley for the Canberra Botanic Gardens. Almost all of these have been successfully propagated and Mr. Wrigley in his report, which is included here as Appendix 3 describes these results as 'most successful'.

Of the orchids noted as occurring in the study area, a substantial proportion (27%) are, within Australia, restricted to the area between Coen and the Pascoe River. In many ways, the study area is closely related to New Guinea and of the 66 species recorded for the Iron Range area, 36 also occur in New Guinea. These facts reinforce the current proposal for the reservation of the area as a National Park.

Two orchids are possibly worthy of mention here because they were *not* found. They are *Dendrobium ophioglossum* and *D. johnsoniae.* Both are reputed to occur in Queensland and the former in particular has been said to be in the Iron Range area (Dockrill 1969). No trace of either was found and their existence within the area remains in doubt.

While there may be few new large epiphytes to be found in the area, it is likely that new terrestrials will be found. The dry season is an unsuitable time of year to search for terrestrial genera such as *Habenaria* or *Gastrodia* and a wet season expedition would undoubtedly be successful if the problems of access could be overcome. A further outcome of the expedition which may prove to be of value in years to come lies in the collections of both orchids and other plants for cultivation at the Canberra Botanic Gardens. The orchid collections will add to the Australian collection now nearing completion.

While no evidence of significant depletion by orchid collectors was observed this remains a very real threat in the future. Almost all the orchids from this area are sought after by hobbyists and some, such as *Vanda whiteana* and *Phalaenopsis amabilis* are worth a considerable sum. As the area becomes more accessible and a larger proportion of the population gains the use of 4-wheel drive vehicles, the protection of the orchid flora of the region will become a major problem. In the near future, the area will need to be patrolled almost continuously during the dry season to avoid serious depletions.

APPENDIX 1

List of the orchids of the Iron Range area

[Note: Many of the species listed below have new names. See *List of Orchids of Cape York Peninsula* for details.]

Capsize Creek (lower) lowland rainforest	L
Yarraman Creek lowland rainforest	Y
Lockhart River mangroves	M
Lockhart River vine thicket	V

This list includes all the orchids seen or collected during this expedition. For some of the plants listed no herbarium specimen was collected because they were infertile at the time. Most of these are in cultivation and herbarium specimens will be prepared as they flower. The species are listed alphabetically by genus. The areas from which they were recorded are shown in the first column using the following code:

Tozer's Gap ridges	T
Tozer's Gap rockpiles	R
Tozer's Gap mixed forest	F
Tozer's Gap and Brown Creek swamps	S
Claudie River lowland rainforest	C
Capsize Creek (upper)	U
Capsize Creek (lower) lowland rainforest	L
Yarraman Creek lowland rainforest	Y
Lockhart River mangroves	M
Lockhart River vine thicket	V
Road to Capsize Creek woodland	W
Road to Iron Range open forest	O
Pascoe River area	P

In the second column the particular vegetation types in which each species was seen are listed. The symbols are those shown in Table 1.

In the third column there is an indication of whether the species were fertile (+) or sterile (–).

NAME	LOCALITY	VEGETATION TYPE	FERTILE OR NOT
Acriopsis javanica Reinw. var. *nelsoniana* (F.M. Bail.) J.J. Sm.	TFU	1c, 3b	+
Aphyllorchis sp.	T	1c	–
Apostasia wallichi R. Br.	C Y L F	1a	+
Bromheadia venusta T. E. Hunt	S	6a	+
Bulbophyllum baileyi F. Muell.	TRCFULYP	1a, 1b, 1c, 1d	+
Bulbophyllum bowkettiae F. M. Bail.	T R	1c	+
Bulbophyllum leratii (Schltr.) J. J. Sm.	T	1c	+
Cadetia maideniana (Schltr.) Schltr.	C Y U L	1a	+
Cadetia taylori (F. Muell.) Schltr.	T	1c	+
Cadetia wariana Schltr.	T U	1c	+
Calanthe triplicata (Willem.) Ames	T	1c	–
Cheirostylis ovata (F. M. Bail.) Schltr.	T P	1c, 1d	+
Chilochista phyllorhiza (F. Muell.) Schltr.	T P V	1a, 1c, 1d, 1e	–
Corymborkis veratrifolia Thou. ex Bl.	C L	1a	–
Cymbidium canaliculatum R. Br.	O	4a	+
Cymbidium madidum Lindl.	F T U	1a, 1c, 3b	+
Dendrobium bifalce Lindl.	C Y L R	1a	–
Dendrobium bigibbum Lindl.	P	1d	–

NAME	LOCALITY	VEGETATION TYPE	FERTILE OR NOT
Dendrobium canaliculatum R.Br.	W	3b	+
Dendrobium canaliculatum var. *nigrescens* Nich.	F W	3c	+
Dendrobium discolor Lindl.	R C Y U L V P	la, 1c, 1d, 1e	+
Dendrobium johannis Reichb. f.	F P W	2b, 2c, 1d	+
Dendrobium lobbii T. & B.	S	6a	+
Dendrobium luteocilium Rupp	R C M	1a, 1c, 1n	–
Dendrobium nindii W. Hill	U	1a	–
Dendrobium rigidum R. Br.	CFULYMVOP	1a, 1b, 1c, 1d, 1e, 1g, 3b, 3c	+
Dendrobium ruppianum A. D. Hawkes	T	1c	–
Dendrobium smillieae F. Muell.	T R C U L Y F	1a, 1b, 1c, 1d, 3b	+
Dendrobium stuartii F. M. Bail.	C Y U L V	1a, 1e	–
Dendrobium teretifolium R. Br.	R T C U L Y	1a, 1b, 1c, 1d	+
Dendrobium tetragonum A. Cunn.	T	1c	+
Dendrobium sp. (*tozerense*)	R	1c	+
Diplocaulobium glabrum J. J. Sm.	F	3b	+
Dipodium pandanum F. M. Bail.	T	1c	–
Ephemerantha comata (Bl.) P. F. Hunt & Summerh.	R T	1c	–
Eria fitzalani F. Muell.	F	1c, 3b	+
Eria inornata T. E. Hunt	R	1c	+
Eulophia pulchra (Thou.) Lindl.	T	1c	–
Geodorum densiflorum (Lam.) Schltr.	P F	1d, 3b	–
Habenaria papuana Krzl.	T	1c	–
Hetaeria oblongifolia Bl.	C U L	1a	+
Luisia teretifolia Gaud.	M C	1h	–
Malaxis latifolia J. E. Sm.	C	1a, 3b	–
Micropera fasciculata (Lindl.) Garay	C L	1a	–
Oberonia muelleriana Schltr.	M V Y	1c, 1e, 1h	–
Oberonia palmicola F. Muell.	T	1c	–
Oberonia sp. (carnosa)	R	1c	–
Phalaenopsis amabilis Bl.	T	1c	–
Pholidota pallida Lindl.	RTMCULYF	1a, 1b, 1c, 1d, 3b	–

NAME	LOCALITY	VEGETATION TYPE	FERTILE OR NOT
Phreatia robusta Rog.	R T	1c	–
Pomatocalpa macphersonii (F. Muell) T. E. Hunt	C Y U L V	1a, 1c, 1e	+
Pomatocalpa marsupiale (Kraenzl.) J. J. Sm.	C	1a	–
Robiquetia tierneyana (Rupp) Dockr.	T R	1c	–
Robiquetia wassellii Dockr.	T V L C	1a, 1c, 1e	–
Saccolabiopsis armitii (F. Muell.) Dockr.	P V	1e, 1d	–
Saccolabium rhopalorrachis (Reichb. f.) J. J. Sm.	T R	1c	–
Sarcochilus moorei (Reichb. f.) Schltr.	C Y U L V	1a, 1c, 1e	+
Schoenorchis densiflora Schltr.	T	1c	–
Spathoglottis sp. (*plicata*)	F S	3b, 6a	–
Taeniophyllum glandulosum Bl.	Y V T	1c, 1e	+
Taeniophyllum malianum Schltr.	V	1e	+
Thelasis carinata Bl.	R T	1c	–
Thrixspermum congestum (F. M. Bail.) Dockr.	U	1a	–
Thrixspermum platystachys (.M. Bail.) Schltr.	U L	1a	–
Trichoglottis australiensis Dockr.	RT	1c	–
Vanda whiteana Herbert & S. T. Blake	RUT	1c	+
Zeuxine oblonga Rog. & C. T. White	C L	1a	+

APPENDIX 2

List of the orchids collected by L. J. Brass in the Iron Range area during the Archbold Expedition of 1948.

Number	Name
19646	*Bromheadia venusta* T.E. Hunt
19451	*Cadetia wariana* Schltr.
19511	*Dendrobium bifalce* Lindl.
19332	*Dendrobium discolor* Lindl.
19561	*Dendrobium lobbii* T. & B.
19275	*Dendrobium rigidum* R.Br.
19512	*Dendrobium ruppianum* A.D. Hawkes
19525	*Dendrobium tetragonum* A. Cunn.
18469	*Dipodium pandanum* F.M. Bail.
19132	*Liparis habenarina* (F. Muell.) Benth.
19220	*Nervilia discolor* (Bl.) Schltr.
19394	*Oberonia palmicola* F. Muell.
19526, 19251, 19442	*Robiquetia wassellii* Dockr.
19625, 19524, 19354	*Spathoglottis* sp.
19377	*Taeniophyllum glandulosum* Bl.

It is worth mentioning that Brass collected two species not seen in 1976. These are *Nervilia discolor* and *Liparis habenarina*, both small terrestrials that tend to drop their leaves in the dry season.

APPENDIX 3

Report on Field Trip to Iron Range, North Queensland.
1-27 September, 1976 (J.W. Wrigley: Curator, Canberra Botanic Gardens)

The expedition was funded jointly by the Australian Orchid Foundation, Federal Government and private persons. The object of the trip was to collect rare orchids and other plants of interest for propagation at Canberra Botanic Gardens and other institutions. The participants were Dr. P. Lavarack, Mr. D. Jones, Mr. B. Gray, Mr. J. Wrigley, Rev. R. Collins & Mr Gerald McCraith.

The Trip

Two vehicles were used; a Toyota Land cruiser owned by Queensland National Parks and Wildlife Service and funded by the Australian Orchid Foundation and a short wheel base Toyota owned by Rev. Collins. Thursday 2nd September was spent buying stores and packing the vehicles. The party departed from Atherton about 6.30am on 3rd September, 1976 and camp was made just north of Coen that evening.

Several collections were made the following day including the examination of an isolated patch of rainforest just south of the Archer River and about 3 km from the road. The long, hot walk was hardly worth the effort as little was found of interest apart from a large colony of fruit bats. The road became quite rough beyond the Wenlock River crossing, and progress was slow. An overnight camp was set up at the Pascoe River.

The next day, the party climbed a little known rainforest slope to the north of the river. Several interesting collections were made including *Vanda whiteana*, which although still restricted in its distribution was more common than at first thought.

That afternoon, the first base camp was established at Tozer's Gap, near a small running creek at the foot of Mt. Tozer. The camp was to last for 8 nights and proved to be a satisfactory point for examination of several rockpiles, the slopes of Mt. Tozer and the surrounding heath. Many interesting collections were made and are detailed in the summary of results.

The rockpiles are deserving of special mention as it was here that the greatest variety of orchids were seen. These strange structures consisted of enormous rounded boulders up to 7 or 8 m in diameter piled haphazardly on top of one another up the side of a mountain. They may extend more than 100 m up the slope and the same distance across the slope. Rainforest surrounded them on all sides but invasion of the pile by anything but lithophytes appeared slow as litter build-up was also slow. Gaping holes between the rocks swallowed up the litter and made collecting a hazardous operation as one's footing was rarely certain. Plants here, received high light, almost full sun and evaporation during the day must have been very high. The amount of material collected in these places was limited by the volume one could carry and consequently minimal amounts only were sent back to be reasonably sure of plant establishment. Several rare and unnamed orchids were collected in this area.

On 13th September, a three day camp was established near the junction of the Portland Roads road and the Iron Range airport road. This served as good access to several rainforest areas and a rich area of open *Melaleuca viridiflora* forest. The latter provided good collecting. Of particular interest was a different form of *Dendrobium canaliculatum* var. *nigrescens*. The spike was short and the flowers held very close together. *Dendrobium johannis* was also common and both were flowering. One plant of a natural hybrid was noted.

The party was joined at this time by Rev. R. Collins and G. McCraith, Chairman of the Australian Orchid Foundation who flew in for a few days. Camp was broken here on 16th September and a new base established on Capsize Creek, some 30 km south of the main Claudie River crossing. The site was in rainforest bordering the creek. From this camp, a two day trip was made to the headwaters of Capsize Creek as well as expeditions to the Lockhart River mangroves and local heath and open forest areas. Many valuable collections were made here, completing a comprehensive survey of the Iron Range area. The return trip was made with several overnight stops, returning to Canberra on 27th September.

General

The weather during the whole of the trip was dry, pleasantly warm with cool nights. Heavy dews were experienced and mosquitoes, leeches etc. were at a minimum, presumably due to the extreme dryness. The Iron Range airstrip was serviced by Bush Pilots on Tuesday, Wednesday and Thursday of each week and despite the bad roads maximum advantage was taken of these services to return material to Canberra. As a result, plant material arrived in excellent condition. Thanks are due to all airlines in expediting the packages.

Results

Results of propagation are so far beyond our wildest expectations. A few statistics to summarise:

352 Collections were made.

33 Collections being specimen only as no propagating material was available,

319 Collections of propagating material were made,

18 Are dead or doubtful or seed was immature, thus,

301 Successful or probably successful collections were made.

This figure may be reduced slightly as a result of unsuccessful germinations of seed just sown. Most of the collections made are of plants new to Canberra Botanic Gardens. Many have been brought into cultivation for the first time. Some species are extremely rare, several as yet undescribed scientifically and some may be new records for Australia.

In summary, the trip was most successful in terms of collection of plant material and from the point of view of Canberra Botanic Gardens a most economical one. The association with men who both knew the area and the plants and were able to provide vehicles made an opportunity not often repeated.

ORCHIDS OF THE McILWRAITH RANGE
Report of the AOF expeditions to Cape York Peninsula in 1978 and 1979, along with several other visits to the area

ACKNOWLEDGEMENTS

As with the Iron Range expedition of 1976, I would again like to thank the directors and members of the Australian Orchid Foundation for their financial help, which made the expeditions described in this report possible. The enthusiasm, hard work and pleasant company of all who took part in these expeditions made the whole program not only a success, but also a worthwhile experience. I owe a special debt of gratitude to John Clarkson and Ron Collins for their staunch support, which made the good times enjoyable and the bad times endurable.

Thanks are also due to Messrs. G. Stocker, B.P.M. Hyland, A. Dockrill and B. Gray of C.S.I.R.O., Atherton, for again providing useful advice and for help with a number of small items before and after each trip. Thanks are also due to the managers of Silver Plains Station, Mr. G. McKinnon and Mr. D. Taylor. Both were most hospitable to the expedition.

Finally, the members of the 1979 expedition would like to express their thanks and their admiration to the staff of the Australian Inland Mission Hospital at Coen to whom we turned in an emergency.

THE STUDY AREA

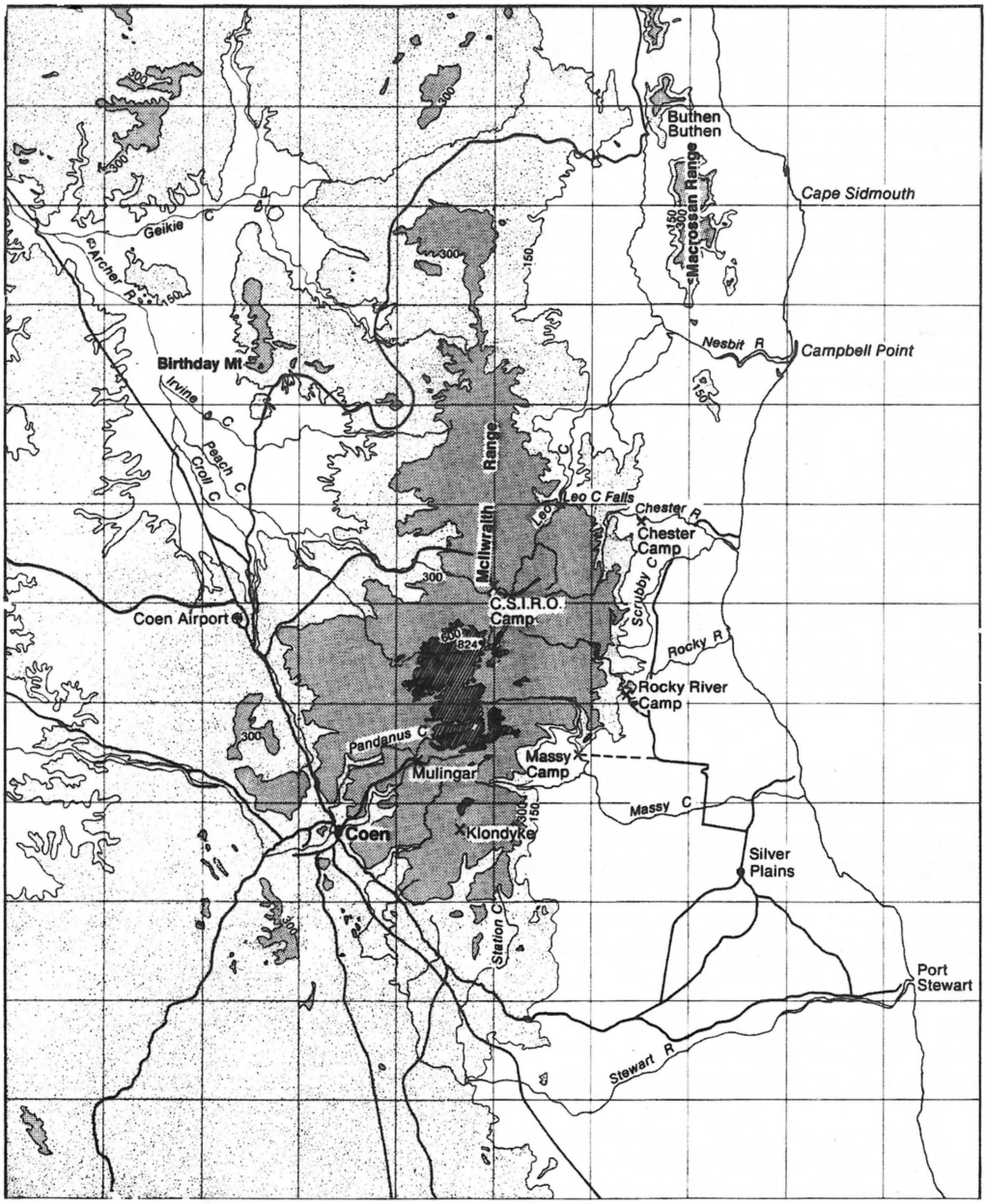
The McIlwraith Range is a rugged, vine forest-covered plateau of volcanic origin. It attains a maximum altitude of 824 m and extends from latitude 14° S to 13° 15' S, forming the southern part of a chain of low mountains, which lies close to the coast. For the purposes of the present study the area under consideration extends north to the Nesbit River - Lockhart River divide, south to the Stewart River, west to the Kennedy Road, and east to the Pacific Ocean (see maps 1 and 4). Much of this study area is at relatively high altitude with perhaps one-third of the area forming a broad plateau above 400 m and reaching a maximum altitude of 824 m. No other mountains on Cape York Peninsula or in equivalent latitudes in the Northern Territory reach this altitude.

The McIlwraith Range is the end of a chain of hills running from the low sandstone hills of the tip of the Peninsula through the moderate heights of the Tozer and Janet Ranges to the relatively high plateau of the study area. Thus there is no sharp line dividing the Iron Range area (studied in a previous report) from the present study area. However the southern end of the McIlwraith Range coincides with one of the north's most marked biological lines of demarcation. The low-lying, hot, seasonally dry plains of the Princess Charlotte Bay area have in the past formed a major obstacle in the spread of humid tropical biota. Certainly many life forms have crossed this area (possibly in times of more favourable climate as in evidenced by the wealth of orchids with a New Guinea background to be found on the Atherton Tableland) but many have not, reaching their southern limit in the McIlwraith Range. For these reasons - altitude and isolation from southern species and because of the inaccessibility of the ranges - the McIlwraith Range is today one of the most interesting sites for botanical exploration in Australia.

HISTORY

Although the McIlwraith Range must have been sighted by the early expeditions of the HMS *Fly*, HMS *Rattlesnake* and HMS *Bramble*, the journals of these voyages make no reference to it. Kennedy and his ill-fated party passed immediately to the east of the Range in October 1848. Had his journal survived there would doubtless be some mention - perhaps even a name - but unfortunately nothing remains today save the brief comment from Kennedy's botanist, Carron (1849) that the party 'passed between the hills', presumably meaning the valley of the Nesbit River between the McIlwraith Range and the Macrossan Range.

The first European contact with the McIlwraith Range was by prospectors. In 1876 a party of prospectors found payable gold in the vicinity of the present township of Coen. Various mines were operated spasmodically until 1916 (Willmott *et al.* 1973). A small amount of prospecting is still carried on in the ranges and as recently as 1973 a small-scale operation was carried out on the Rocky River. With the decline in the Palmer River goldfield about 1880, a lot of attention was focused on the McIlwraith Range because it is one of the few mineralised areas on the Peninsula. Gold was mined in several areas such as 'Klondyke' on the headwaters of Station Creek south-east of Coen around 1900, Rocky River (1893-1914), Blue Mountains from some time before 1934 up to about 1951, then in other smaller sites such as Bonanza Creek, Buthen-Buthen and Leo Creek. Numerous creeks in the Range carry small traces of alluvial gold and this was responsible for a series of prospecting trips extending up to about 1914.



Map 4 McIlwraith Range study area

The results of many of these trips were lost or never made public but one of these led by the Government Geologist Robert Logan Jack, provides the outstanding exception. Jack left a meticulous record of his travels in two trips (1879 and 1879-80) in his important book *Northmost Australia* (Jack 1921). Jack saw himself cast in the mould of an explorer rather than as a geologist and his account of the area is complete with useful detail. Even Jack was unable to penetrate the rainforests and found his way through the western foothills and open forest areas of the northern part of the range. Although he dutifully reported on the prospects for gold, it is apparent that geographical problems such as the real identities of the Coen and Batavia (now Wenlock) Rivers were of more interest to him. The expedition was forced to fire on the local aborigines on one or two occasions although major confrontations were avoided and little blood was shed. It is interesting to speculate that were Jack alive today he would find the ranges little changed from 1879. The aborigines have gone, cattle and pigs have arrived but these differences aside, the area remains the wilderness that Jack saw. A few lines from *Northmost Australia* describing white man's first contact with the Range sets the scene for this report -

'In a quarter of a mile more we reached the summit of the ridge and could see to the east for about 2 miles over scrubby mountains with a fringe of large hoop pines standing up against the sky. This range forming the divide of the Peninsula between the heads of the (south) Coen and the Peach on the one hand, and the east coast on the other, I named it the McIlwraith Range in honour of the present Premier. The banks of the river and all its tributaries were clothed with dense scrub, with palms and vines. The latter made travelling very toilsome and even painful'.

Hard on the heels of the prospectors came the sandalwood cutters whose tracks are mentioned in journals of explorers in the 1880s. A small port was established on the mouth of the Chester River to cater for the gold and sandalwood industries. Indeed in 1896, when gold was being mined on the Rocky River Goldfield, the Warden described a water-powered mill for crushing the ore, roads to Coen and to the mouth of the Chester River. None of this remains today and the mouth of the Chester River and the hills on the headwaters of the Rocky River today are in one of the least accessible parts of the State.

BOTANICAL HISTORY

Apart from a few passing comments on the vegetation by Jack, the first scientific report on the McIlwraith Range came from the Archbold Expedition of 1948 (Brass 1953). This expedition was led by Dr. L.J. Brass and financed by Richard Archbold for the American Museum of Natural History. Several zoologists accompanied Brass who acted as botanist as well as leader. Sites in the study area visited by the Archbold Expedition included the Coen area, Archer Crossing, headwaters of Peach and Leo Creeks. Unfortunately Brass suffered from a bout of influenza and his collecting was severely restricted, but he did give the only existing account (brief as it is) of the rainforests of the Range. He makes no mention of orchids although he must have encountered several on Leo Creek. Brass comments that the area near Leo Creek was then 'almost, if not quite, unknown for plants'. Although the specimens were not identified for more than 20 years, Brass on this expedition collected at least two orchids for the first time in Australia. These are *Dipodium pandanum* and *Schoenorchis sarcophylla*. Both were collected close to the old mine site on Leo Creek.

Other expeditions from various Government bodies (e.g. C.S.I.R.O., State Mines and Forestry Departments) have visited the Range since 1948 but have resulted in the addition of little botanical knowledge. In the period of 1950-1965 some interesting finds were made by two local amateurs – J.L.H. Wassell and M. Brown.

J.L.H. (Lea) Wassell lived in Coen from 1952 to 1955 and then from 1955 to 1965 lived on Silver Plains station. During these years he developed a passionate love for the rugged rainforest-clad ranges of the McIlwraith and undertook frequent, usually solitary, expeditions of several days in the jungle. Equipped only with a watch, shorts and collecting bag, he was the epitome of the skilled bushman. His major scientific interest was in insects but he also acquired a good local knowledge of the plants and in particular of the orchids of the area. He guided several botanical parties to the Range. Dr E.N. Marks in writing of his contributions to natural history (Marks 1968) says:

'In 1958 he undertook a commission for the Royal Botanic Gardens and National Herbarium, Melbourne. Mr. J.H. Willis writes "During 1958 he sent us 89 different orchid plants (and a few others) that he had collected in the Rocky River region of the McIlwraith Range, in June and July of that year. Most of these Cape York orchids have done well and several of them have flowered, thus enabling us to make identifications. Among them were some

apparently new records for Australia (including the New Guinean *Dendrobium d'albertisii*) and two genera that are quite new to Australia - viz. *Robiquetia* and *Thelasis*, represented by what are almost certainly undescribed species'. Together with an undescribed *Sarcochilus*, these were the highlights of his consignment. His habitat notes accompanying the various numbers are helpful. e.g. Found on fallen tree at edge of river, full sunlight. Also originally found on top of boulder in Massy Cr. in full sunlight many years ago." Lea also helped the C.S.I.R.O.'s Australian Photochemical Survey, supplying *Lunasia*, an understorey plant from inaccessible areas in the Coen district, which provided a link in the chemical study of the Rutaceae; helping in the work on finger cherry; and guiding botanical parties, one such, which included Dr L.J. Webb and Mr. L.S. Smith, being to the McIlwraith Range in 1962'.

Wassell is commemorated by the Australian endemic orchid species *Dendrobium wassellii* and *Robiquetia wassellii*, named by S.T. Blake and A.W. Dockrill, respectively, after the original collector. As well as these two species, Wassell was the original Australian collector of *Vanda whiteana*, *Thelasis carinata*, *Pteroceras hirticalcar*, *Saccolabium rhopalorrachis* and *Dendrobium antennatum* (= *D. d'albertisii*).

The other diligent collector of recent times has been Malcolm Brown. This is a name familiar to most people with an interest in Australian orchids through *Dendrobium malbrownii*, which was discovered by Brown and described by Dockrill. Other discoveries made by Brown include *Ephemerantha comata*, *Cadetia wariana*, *Trichoglottis australiensis*, *Taeniophyllum malianum* and an undescribed species of *Malaxis*. Brown, who spent some time as a school teacher at Coen, describes his work as follows:

'I arrived in Coen in 1962 and it was a few years before I became familiar enough with the country to go poking into corners. My brother-in-law Bill Huddy in Cairns to whom I had sent a few plants of *Dendrobium stuartii* and *Vanda whiteana*, introduced me to Alick Dockrill. Once we had made contact, our arrangements worked very well. I forwarded live plants where possible or preserved material, Alick identified or described the material and once every year or so we got together for a yarn about things. For the first five years, I used horses and an aboriginal horseboy to cover the hills - otherwise a weekend expedition was virtually useless. As time went on a road was pushed to the Nesbit, the Leo and Mulingar. This made it possible to walk from a base camp and I normally go up as far as possible before walking. Most times I go by myself - it is difficult to cover the ground you wish if you depend on someone else. Aerial photographs have helped enormously plus the occasional flight over the area. Back packing is the general method I use now, as the rainforest areas are impenetrable by any other method. The most difficult areas are the Klondyke - the southern end of the rainforest and head of Station Creek. I have been bushed in there for three days despite the presence of a stockman who should have known the country, a map, a compass and horses. I have been able to do more over the last ten years than previously although I'm not resident because going in on holidays seems to make more actual time available'.

Other notable first records for Australia have been made by various workers in recent years in the McIlwraith Range, the identify of some of these awaits official publication. Those that are known to the present author are listed in Table 1. In April 1969 John Walker of Cairns found a species of *Malaxis* near the Rocky River. This was subsequently described as *M. marsupichila* by Walter Upton in 1976.

Table 1: First Australian Collections from the Iron Range - McIlwraith Range Area Species.

SPECIES	COLLECTOR	LOCALITY	YEAR
Dipodium pandanum	L.J. Brass	Tozer's Gap; Leo Creek	1948
Robiquetia wassellii	L.J. Brass	Tozer's Gap	1948
Cadetia wariana	L.J. Brass	Tozer's Gap	1948
Bromheadia venusta	L.J. Brass	Brown Creek	1948
Dendrobium lobbii	L.J. Brass	Brown Creek	1948
Schoenorchis sarcophylla	L.J. Brass	Leo Creek	1948
Vanda whiteana	J.L.H. Wassell	McIlwraith Range	1950
Dendrobium antennatum	J.L.H. Wassell	McIlwraith Range	1955
Dendrobium wassellii	J.L.H. Wassell	Rocky River	< 1959
Thelasis carinata	J.L.H. Wassell	McIlwraith Range	1958
Pteroceras hirticalcar	M. Brown	Mulinger	1966
Saccolabium rhopalorrachis	M. Brown	Mulingar	1966
Dendrobium malbrownii	M. Brown	McIlwraith Range	1966
Trichoglottis australiensis	M. Brown	McIlwraith Range	1966
Ephemerantha comata	M. Brown	McIlwraith Range	1967
Sarcochilus moorei	M. Brown	McIlwraith Range	1977
Taeniophyllum malianum	Brown, Lavarack, Collins, Gray	Leo Creek	1968
Malaxis marsupichila	J. Walker	Rocky River	1969
Pomatocalpa marsupiale	B. Gray & R. Collins	Pandanus Creek	1973
Eulophia pulchra	P.S. Lavarack	Macrossan Range	1974
Dendrobium tozerense	Lavarack, Gray, Collins, Mclain	Tozer Range	1975
Oberonia carnosa	Lavarack, Gray, Collins, Mclain	Tozer Range	1975
Bulbophyllum leratii	Lavarack, Gray, Collins, Mclain	Tozer Range	1975
* *Nervilia aragoana*	M. Brown	McIlwraith Range	1967
* *Nervilia crociformis*	M. Brown	McIlwraith Range	1967
** *Liparis* sp. *'Rocky River'*	G. Stocker & A. Dockrill	Rocky River	1974
** *Malaxis* sp. *'Leo Creek'*	Brown, Lavarack, Collins, Gray	Leo Creek	1968
** *Spathoglottis* sp.	L.J. Brass	Brown Creek	1968
** *Cadetia* sp.	Gray, Collins, Jones	Rocky River	1973

* The existence of these two species has been reliably reported by Mal Brown, but specimens are lacking to confirm this.

** The identity of these four species remains uncertain but it is clear that they represent species either undescribed or unrecorded previously in Australia. [Now known to be *Liparis condylobulbon*, *Malaxis fimbriata*, *Spathoglottis plicata*, *Cadetia collinsii*]

In the early part of the 1970s Bruce Gray and Ron Collins found a previously uncollected species of *Cadetia* on a tributary of the Rocky River [now described as *Cadetia collinsii*]. This appears to be an undescribed species. About the same time they also found a species of *Pomatocalpa* new for Australia. This species has now been identified as *P. marsupiale*. (Gray 1979). About 1973 Geoff Stocker and Alick Dockrill of C.S.I.R.O., Atherton, found a species of *Liparis* near the Rocky River, The identity of this plant awaits confirmation [now known to be *Liparis condylobulbon*].

In the 1970s several expeditions led by Mr. G. Stocker and Mr. B.P. Hyland visited the range and made extensive collections. Many undescribed species have been found and a reasonably comprehensive plant list could now be compiled. As well as this, regular ecological measurements are now made of a site in the rainforest near the head of Peach Creek. The interest in orchids displayed by Stocker and the presence of Dockrill and, recently of Bruce Gray has resulted in some interesting records arising from these trips. Private trips by Gray, Collins and David Jones have also resulted in increased knowledge of the distribution of the orchids and ferns of the area and, on at least one occasion, in the discovery a new orchid record as mentioned previously.

Four trips on behalf of the Queensland National Parks and Wildlife Service have also visited the study area. The first which looked at the Macrossan Range and Nesbit River was led by Mr. J.P. Stanton and use was made of R.A.A.F. helicopters to visit this remote area. On this trip the first collection was made of *Eulophia pulchra* (Lavarack 1977a). Subsequent trips were led by the author culminating in the joint Australian Orchid Foundation National Parks and Wildlife Service expeditions described in this report.

McILWRAITH RANGE TODAY

Today McIlwraith Range remains one of the few real wilderness areas on the continent. The effect of man on the flora and fauna is, at present, less than it has been for thousands of years. The aborigines, who probably were never numerous, are gone, the prospectors are mostly gone, and the only visitors are people interested in the flora and fauna of the area. The only roads in the area are the Blue Mountains - Buthen Buthen road, Leo Creek road, Lankelly Creek road and the road from Silver Plains to Nesbit River. None of these roads is maintained and each successive year sees a further deterioration in condition. All of these roads require considerable effort to navigate in a well-equipped 4-wheel drive vehicle with an experienced driver. On one occasion on the 1979 trip it took almost 2 days to cover 40km and on another the 14km trip from Coen to Lankelly Creek took 2.5 hours. None of these roads could be found by someone without local knowledge. Many parts of the Range such as the eastern fall, the eastern gorges of the Massy, Rocky, Chester and Leo Creeks are quite inaccessible by vehicle and can only be reached after one or two days walking.

All trace of the settlement at the mouth of Chester River has vanished and the stretch of coastline north of the Stewart River is as isolated as any on the continent. With the decline in the beef industry, the large cattle leases centred on Rokeby to the west of the Range and Silver Plains to the east have severely limited their operations in more remote areas.

While small areas of mineral-bearing formations are well known in the area, there is apparently no firm plan for further mining operations in the near future. Thus this largely trackless wilderness retains many of its secrets even in this time of over-development of most other areas.

THE ENVIRONMENT

Physiography

The Range generally consists of a relatively flat plateau extending from about Coen to near the Wenlock River with a gradual decline in altitude from about 800m north-east of Coen to about 200m in the north. In the more elevated southern part, there is an extensive area above 400m and even a significant part above 600m. From these heights the descent to the north is gentle, but rugged dissected hills mark the western and southern edge of the tableland, while the eastern margin consists of a steep escarpment. Isolated mountains such as Birthday Mountain, Macrossan Range and Emberley Range are outliers of the major range.

The broad valleys of the Archer River and its tributaries the Peach, Irvine and Geike Creeks are relatively flat in their lower reaches. However these streams in their upper reaches have much in common with the fast-flowing waterfall-dotted streams of the south and east. Some of these streams, notably Leo Creek, Chester River, Rocky River and Massy Creek have cut deep gorges in the eastern escarpment, while Lankelly and Pandanus Creeks flow through only slightly less spectacular gorges on the western fall.

To the east of the Range lies a broad flat plain with fringing saline mud flats on the coast in the southern part. From about the Nesbit River north, the eastern plains become a deep broad valley flanked by the main range to the west and the Macrossan Range to the east. On this coastal

plain, the streams are slow moving and in places, swamps are prevalent. A large fresh-water lagoon lies between the Chester and Rocky Rivers forming one of the heads of the swampy, slow-moving Scrubby Creek.

Thus the general impression of the Range to the visitor is a broad, relatively flat tableland, well protected from the access points to the west, south and east by extremely rugged topography and dissected by numerous fast-flowing streams set in deep gorges.

Much of Cape York Peninsula is covered with sediments of Cainozoic and Mesozoic origin. The McIlwraith Range forms the higher part of the Peninsula Ridge, an axis of igneous and metamorphic rocks which penetrates these sediments, running from a little south of Musgrave to north of Pascoe River, The study area owes its rugged nature to underlying Precambrian and Palaeozic granites and metamorphic rocks. The soil is mostly poor with some exceptions in the deep alluvial soils along the major streams.

Climate

The study area lies between the 1200mm and 1500mm isohyets. However, it is unlikely that these figures are significant to most of the area as recording stations are infrequently spaced on the peninsula and none bears any real relationship to the study area. Coen is the nearest point but it lies in a rain shadow on the western extremity of the study area. It is certain that the eastern slopes and the tablelands of the Range would receive a high rainfall with a substantial winter component; possibly for such areas it would be about 2000mm.

Most of the Peninsula experiences a seasonal but reliable rainfall with most of the rain falling in the period December – April, the other seven months being dry except for insignificant light showers. The McIlwraith Range, however, with peaks in excess of 800m and lying close to the coast in the path of the prevailing south-easterlies experiences heavy falls at any time of the year. The author has encountered heavy persistent rain at Leo Creek, only to find on arrival later at Coen 20km away (in a direct line), that there had been no rain there. The winter rainfall can only be guessed at, but it is obviously enough to ensure the survival of moist closed forests on well-drained slopes; it is a seasonal rainfall with a most definite peak in January and February.

That the rainfall can be locally extremely heavy was demonstrated by a visit to the Chester River and Leo Creek during the 1978 expedition. The gorge of both these streams, but of Chester River in particular, showed the effects of a most violent flood. The bed of the gorge had been effectively cleared of all vegetation leaving white sand and boulders in places to a width of 150m. The stumps of trees 1m in diameter had been broken off cleanly at ground level and huge piles of tree trunks were often seen on the sides of the gorge. A study of aerial photographs taken in 1958 revealed no sign of this devastation, which apparently happened about 1972. Nor was there any sign of a similar flood in the Rocky River. This evidence suggests a localised and extremely heavy rainfall, and this is also borne out by the unstable nature of many of the slopes of the Chester Gorge which show signs of bad erosion.

The area is subject to cyclones but these appear to be somewhat less common than on the coast south of Cooktown. Nevertheless, both Carron and Jack mention areas of severe wind damage on the coastal plain. The mature rainforests of the ranges do not show much evidence of wind disturbance.

Temperatures in the study area again are hard to gauge and obviously vary much with altitude. Night temperatures at localities such as Lankelly Creek and Leo Creek in winter would seem to reach a minimum of about 12 to 14° C while day temperatures at that time of year infrequently rise above 30° C on the ranges. Summer temperatures would be considerably warmer but no doubt are moderated by the prevailing winds.

Vegetation

Just as the physiography of the study area is dominated by the broad plateau of McIlwraith Range, so is the pattern of the vegetation dominated by the closed forests that cover this plateau. Broadly speaking, closed forests cover all the eastern upland areas and the eastern river valleys. Smaller areas of forest with less complete canopy cover, but floristically related to the closed forests, occur on the western slopes and, in places, on sandy areas on the coastal plain. The closed forests of the ranges often are fringed with a mixed forest which varies in its composition according to its fire history, but often includes much *Acacia aulacocarpa*. On the plains and drier mountain slopes are areas of open forest dominated by various species of *Eucalyptus* and low woodlands dominated by *Melaleuca viridiflora*. North towards Nesbit River are substantial areas of grassland, while mangroves and saltpans line the coast.

In the following table (Table 2) the vegetation types noted in the area are set out. These types are also shown on Map 5. The types listed and shown are necessarily a compromise between those recognised on the ground and those recognised from aerial photography. The closed forest types are based largely on the classification of Webb (1968), while the open forests and other types are based on the scheme outlined by Specht (1970).

Table 2: Vegetation types noted in the study area.

Structural formation	Alliances
1. Closed forest	1a Notophyll vine forest 1b Semi-deciduous mesophyll vine forest 1c Swamp forest 1d Deciduous vine thicket and open forest 1e Marginal notophyll vine forest 1f Vine thicket on sand dunes 1g Mangrove forest
2. Open forest	2a Tall - medium open forest 2b Medium open forest 2c Mixed open forest 2d Layered open forest
3. Low Open Forest	3a Low open forest 3b Coastal sand dune complex
4. Grassland	4a Grassland
5. Saltpans	5a Saltpans

These types will now be discussed in more detail, including their suitability as orchid habitat. As in the Iron Range Report (Lavarack 1977c), it should be stressed that the vegetation types listed and the map which is based on these are the result of generalised impressions and not of an exhaustive survey; the map represents a generalised view of the vegetation of the study area, particularly in respect to the distribution of orchids in the various vegetation types.

1(a) Notophyll vine forest

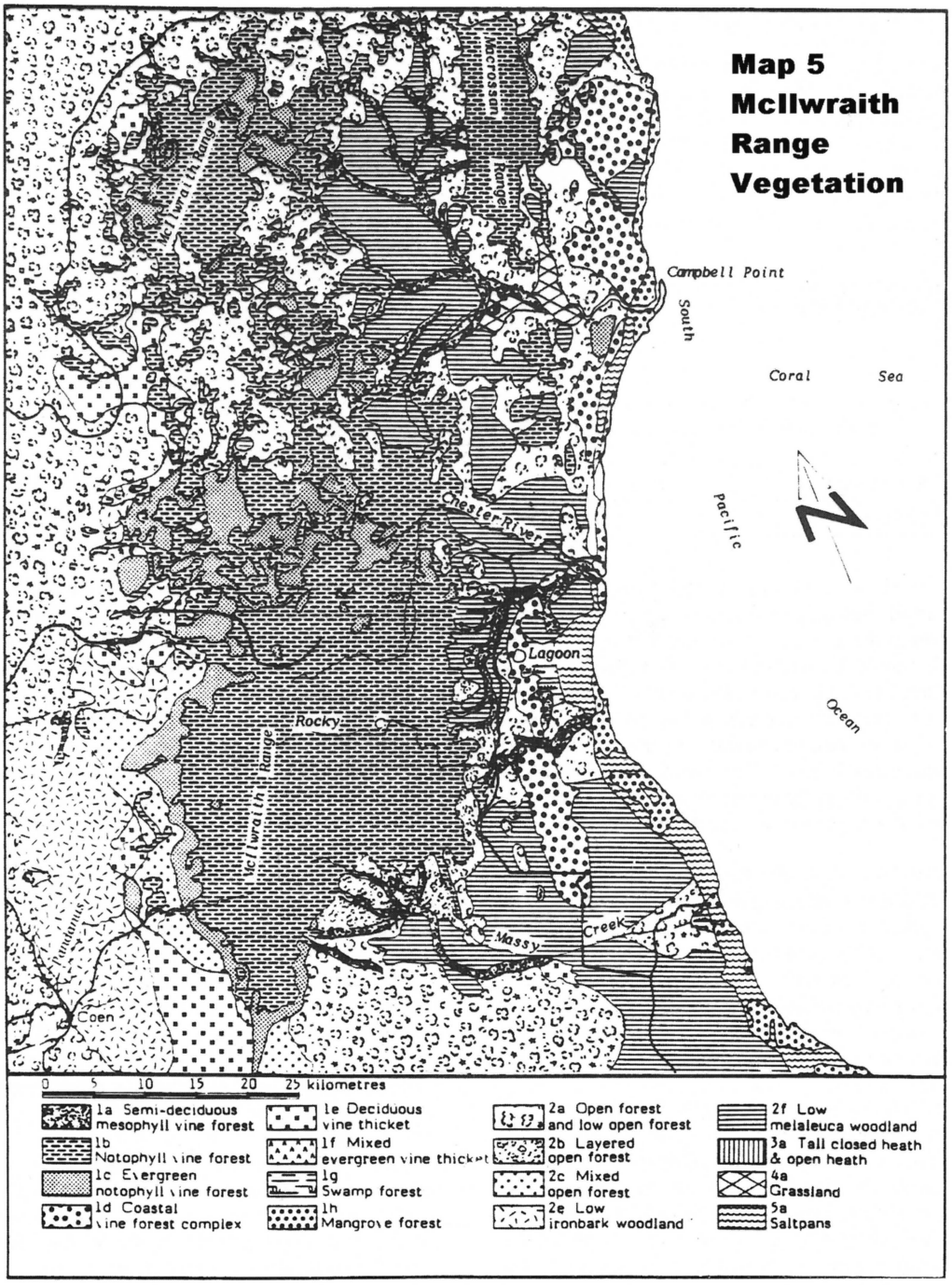
This is the predominant vegetation type on most upland areas in this region. Almost all the high areas of the McIlwraith and Macrossan Ranges are covered with this type. Webb and Tracey, describing the closed forests of this region in *Plant Communities of Cape York Peninsula* (Pedley and Isbell 1971) refer to this type as 'Araucarian notophyll vine forest'. Indeed the hoop pines (*Araucaria cunninghamii*) are a feature of the southern ridges of the McIlwraith Range where they are often obvious emergents, protruding well above the canopy of the forest. As it did not prove possible to separate Araucarian notophyll vine forest from areas of notophyll vine forest lacking hoop pines by use of aerial photographs, it was decided to record the whole area as one type.

The rainforests are consistent on the relatively flat plateau top. The canopy is low at about 15m and there appears not to be a large variety in tree species. Vines are moderately plentiful, while the understorey is relatively open. Higher ridge lines and deep creek gorges break the monotony of this upland forest. The ridges often support tangled thickets of small shrubs and vines, which are so dense as to seriously impede movement. The larger trees are often almost exclusively tall hoop pines. At the other extreme the deeper gorges are lined with the most luxuriant development of the notophyll vine forest. Palms and large figs and eugenias are common, while the creeks are usually lined with the distinctive white trunks of *Tristania exiliflora*. Hoop pines are often found near the creeks, particularly on the western slopes, but where they occur away from ridge tops, the hoop pines usually are confined to rocky areas. In general, the forest shows little sign of severe wind damage in the past, although some wind shearing is evident on the eastern escarpment.

Epiphytes are not abundant on the plateau itself but are present in large numbers in areas where light and wind movement are features of the environment. Hoop pine-dominated ridges, the edge of the eastern escarpment, broad creek valleys and the edge of open forest pockets are all rich in orchids and other epiphytes.

1(b) Semi-deciduous mesophyll vine forest

This is the dominant closed forest type on the alluvial plains of the eastern streams. Massy Creek, Rocky River, Chester River, Scrubby Creek, Leo Creek and Nesbit River all are lined by gallery forests comprising this type and varying in width from a few metres to two or three kilometres. It always occurs on deep alluvial soils near creeks and rivers. Deciduous and semi-deciduous species such as *Bombax ceiba*, *Sarcocephalus coadunatus* and *Ficus nodosa* are a feature of these forests. These and other species lose all or some of their leaves in the dry season. It would be wrong, however,


Map 5
McIlwraith
Range
Vegetation
Campbell Point
South
Coral
Sea
Pacific
Ocean
Chester River
Lagoon
Rocky
Massy
Creek
Coen
McIlwraith Range
Macrossan Ranges
Iron Range
0 5 10 15 20 25 kilometres
1a Semi-deciduous mesophyll vine forest
1b Notophyll vine forest
1c Evergreen notophyll vine forest
1d Coastal vine forest complex
1e Deciduous vine thicket
1f Mixed evergreen vine thicket
1g Swamp forest
1h Mangrove forest
2a Open forest and low open forest
2b Layered open forest
2c Mixed open forest
2e Low ironbark woodland
2f Low melaleuca woodland
3a Tall closed heath & open heath
4a Grassland
5a Saltpans

to imagine that the presence of these deciduous species results in a major reduction in the canopy cover. The deciduous species are decidedly in the minority and often are emergents. Most of the trees maintain a complete cover.

The occurrence of this type along the major streams means that it is subject to regular flooding, which in turn keeps the understorey to a minimum. Vines are uncommon and tend, where they do occur, to be robust. The trees are tall and the canopy high above the forest floor. Palms are common with genera such as *Caryota*, *Gulubia*, *Licuala*, *Archontophoenix*, *Ptychosperma* and *Calamus* being represented.

Generally speaking this is not a rich habitat for orchids and other epiphytes. In the eastern gorges where this type and type 1(a) merge, orchids may be evident, but in other areas only a few species occur. Where flooding is severe, the orchids are high up in the trees but in other areas some species, such as *Sarcochilus moorei*, occur low down.

1(c) Swamp forest

This type ranges from a close approximation to type 1(b) in drier areas, to a true swamp forest dominated by *Melaleuca leucadendron*, *Pandanus* species and *Dillenia alata* in wet areas. In other seasonally wet areas a lower forest with numerous vines and trees such as *Barringtonia* sp., *Carallia brachiata*, *Eugenia* sp., *Melaleuca dealbata* and *M. leucadendron* dominates. One such area is near the mouth of Massy Creek. Good examples of the wetter types of swamp forest occur on the margin of the large lagoon between the Rocky and Chester Rivers and on the eastern margin of the large sand dune mass north of Massy Creek.

The wet areas of swamp forest support a variety of epiphytes with most growing on *Pandanus* and *Dillenia* trees.

1(d) Deciduous vine thicket

This type occurs in a narrow band on the western slopes of the McIlwraith Range. The areas are usually too small to map, but as a compromise the broad areas in which these thickets occur are shown on the map. The thickets are interspersed with open forest most of which is probably best classified as a low-medium woodland dominated by *Eucalyptus cullenii* or by *E. tessellaris* and *E. nesophila*. Major occurrences are in a narrow band along the western slopes south from about Attack Creek to south of Coen. These thickets are, in the dry season, almost totally leafless with identification of the tree species difficult. *Cochlospermum gillivraei*, *Bombax ceiba* and *Brachychiton* sp. are immediately recognisable by their colourful flowers. Vines are numerous, with the unpleasant prickles of at least one species of *Capparis* being evident. The ground layer often includes sparse grasses and sedges, although because these thickets often grow on fire-free rocky areas this ground layer is sometimes absent.

This is a harsh habitat in the dry season and is unsuitable for most epiphytes, although occasional plants of *Cymbidium canaliculatum* may be seen on emergent eucalypts. *Dendrobium bigibbum* is occasionally locally abundant.

1(e) Marginal notophyll vine forest

This type has a more or less closed canopy and is in most respects a depauperate form of notophyll vine forest occurring on areas of poor or shallow soil or on steep slopes. *Acacia aulacocarpa* is often the most common species. There is usually a majority of rainforest species in the understorey with a few open forest species such as *Eucalyptus tessellaris*. In most of the areas inspected, there was evidence that fire is an important, if occasional, feature of this vegetation type. As this type occurs in wet areas which would, given more favourable soil and fire conditions, support notophyll vine forest, and because the more broken canopy allows better light penetration, this type can support a moderate to good selection of epiphytes. Mitigating against this is the occasional occurrence of fire and the unsuitability of *Acacia aulacocarpa* as a host plant, however, on the margins of these areas and on occasional larger rainforest trees within the area, orchids may be plentiful.

1(f) Vine thicket on sand dunes

Several large sand dunes occur on the eastern coastal plain, the best development being between Massy Creek and Rocky River. The vegetation of these dunes is variable, but the largest area is covered by a dense thicket with a nearly completely closed canopy at about 4 m. Vines are numerous, mostly being narrow and wiry. Common species of tree or shrub include *Melaleuca angustifolia*, *M.* sp. aff. *symphyocarpa*, *Leptospermum fabricia*, *Thryptomene oligandra*, *Acacia calyculata*, *Xanthostemom crenulatus* and *Eugenia suborbicularis*. These thickets are evergreen with no deciduous species. In low lying, poorly-drained parts of the dune system are areas of heath and swamp. All these areas are too small to distinguish on aerial photographs and have not been shown on the map. The heath is similar to other Cape York heaths with many of the species mentioned above and also *Banksia dentata*, *Sinoga lysicephala* and numerous sedges.

Epiphytes occur on the larger trees in the thickets. The orchids seen were a mixture of closed and open forest types with the latter predominating.

1(g) Mangrove forest
Moderately large areas of mangrove forest occur near the mouths of all the larger streams. These forests have a relatively low canopy at about 3 m. Little is known botanically about these areas, but they do not appear to be good habitat for epiphytes. A few of the open forest orchids occur there, but further investigations are necessary to provide a comprehensive list.

2(a) Medium - tall open forest
For the purposes of this report, it is not feasible to distinguish between tall and medium open forest. Nor has it proved possible (or necessary) to distinguish between two different floristic types of forest on the map. The following distinct types have therefore been treated under this category:

(i) *Eucalyptus tetrodonata – E. nesophila* open forest. Other tree species include *Grevillea glauca*, *Erythrophleum chlorostachys* and, in moister areas, *Tristania suaveolens*. A most interesting feature of much of this type on the eastern side of the range is large stands of the dwarf palm *Livistona muelleri*. The shrub layer includes *Alphitonia excelsa*, *Planchonia careya* and *Exocarpus latifolius*. The ground layer includes tall grasses. This type occurs on higher ground on well-drained sandy soil. It is developed in a moister phase on the eastern side of the Range where there is a full complement of understorey plants including the previously mentioned *Livistona muelleri*. Extensive areas also occur to the west of the Range, again on ridge tops, but in this position, many of the understorey plants are different. Orchids are not common in this forest.

(ii) *Eucalyptus leptophleba - E. papuana* open forest or woodland. The most common expression of this type is as a medium to tall woodland. The trees are widely spaced and the ground cover is almost exclusively grasses. *E. confertiflora* and, occasionally in southern parts of the study area, *E. alba* are dominant trees. A few isolated shrubs of *Melaleuca viridiflora*, *M. foliosa*, *M. nervosa*, *Hakea persiehana* and *Grevillea paralella* are scattered around. This type occurs on broad flat plains to the south of Silver Plains homestead and to the east of the Coen aerodrome. It is a poor habitat for orchids.

2(b) Medium open forest
This is a type of the rocky, well-drained exposed western slopes of the range and is dominated largely by the ironbark *Eucalyptus cullenii*. It is type 5(b) of Pedley and Isbell (1971). *E. dichromophloia* is also common. In some places this type attains the stature of an open forest, in others it is much lower and more open and is better described as a low woodland. Common shrubs include *Petalostigma banksii* and *Melaleuca viridiflora*. The ground cover consists of grasses. Few epiphytes occur in this type, although the Cooktown orchid (*Dendrobium bigibbum*) is often in gullies where a few trees of rainforest affinity may manage to survive.

2(c) Mixed open forest
In the context of this report, mixed open forest refers to areas at an altitude of about 400 to 500 m on the western margin of the rainforests, which support a moist type of open forest. A common species in many areas is *Eucalyptus brassiana*. Other trees and shrubs noted include *Casuarina torulosa*, *Melaleuca viridiflora*, *E. cullenii*, and *Tristania suaveolens*. The ground layer includes *Xanthorrhoea johnsonii*, sedges and grasses. Areas of this type have been encountered on the Lankelly Creek road and on the Leo Creek road. It is difficult to determine the full extent but it is likely to form a discontinuous band at moderate elevation between about Attack Creek and the upper part of Station Creek. It appears to occur on hard clay soil in areas of moderate rainfall which, but for the poor soil, would support some form of closed forest. It grades into type 2(b) to the west with decreasing rainfall and into type 1(e) or 1(d) with changes in soil type. Epiphytes are quite numerous, as would be expected with the high rainfall. A mixture of open forest and closed forest orchids were seen.

2(d) Layered open forest
In some areas of the coastal plain near the foot of the Range there occurs a forest type which is basically a medium height open forest of *Eucalyptus tessellaris*, an unidentified bloodwood, *Tristania suaveolens* and several species of *Melaleuca*. Beneath this is a scattered layer of vineforest species with an unidentified species of *Gardenia* prominent. A dense cover of grasses occurs in areas where the shrub layer is less dense. This type was encountered near the base camp on Massy Creek. It possibly represents a seral stage developed through an absence of fire for some years. The soil in the area examined appeared to be clayey with some impeded drainage evident. In areas of poor drainage *Dillenia* swamps were evident. Epiphytes were

relatively abundant, mostly growing on *Tristania suaveolens*.

3(a) Low open forest
This is type 3(c) of Pedley and Isbell. The dominating species is *Melaleuca viridiflora*, with *Acacia brassii* and, in some areas, *Petalostigma banksii* also quite abundant. The trees average about 5 to 6 m in height. In some areas, particularly to the west of the Range, the trees may be sparse and of lower height. These areas could be classified as low woodland, but for ease of mapping all areas dominated by *Melaleuca viridiflora* have been treated as one type. Those forests to the east of the Range, as well as being taller and denser, tend to have more diverse ground cover due no doubt to the higher rainfall. In a few areas, notably just to the south of the Chester River, are areas of low shrubland. Here the common species is *M. stenstachya*. The plants are well separated and only about 1 to 2 m in height. The ground is nearly bare, with a few thin grasses and sedges. These particular areas proved too small to map and are included in low open forest.

Another prominent feature of the *M. viridiflora* forest is the large 'magnetic' termite mounds which reach a height of over two metres and are long, narrow structures orientated north/south. The ground cover in these forests varies according to the seasons. During and immediately after the wet season large numbers of small plants such as *Stylidium* spp., *Drosera* spp., and *Utricularia* spp. become evident as they flower. By the height of the dry season few are to be seen. It is probable that terrestrial orchids are present and behave similarly. Epiphytes are quite abundant, particularly on the eastern side of the range. Ant plants and three species of *Dischidia* are common as are two or three species of orchid.

3(b) Coastal dune complex
This type occurs on sand ridges, often alternating with depressions in which are swamps or, near the river mouths, mangroves and saltpans. These ridges support a low woodland but with some areas of dense beach scrub. Common trees are *Eucalyptus tessellaris*, *Eugenia suborbicularis*, *Parinari nonda*, *Acacia aulacocarpa* and *Cochlospermum gillivraei*, There is a well-developed shrub layer in which *Fenzlia obtusa*, *Alyxia spicata*, *Exocarpus latifolius* and *Lomandra banksii* are prominent. The soil is coarse grey-white sand.

4(a) Grassland
Substantial areas of grassland, almost totally devoid of trees are a feature of the eastern plains and ridges from the Chester River north. The grass is predominantly blady grass (*Imperata cylindrica*) with some *Sorghum* sp. also present. In places, grasses reach a height of almost two metres. For a more detailed account of these grasslands and some interesting speculation their origin see Stanton (1976).

5(a) Saltpans
Extensive areas of saltpans and marine plains line the coast in a narrow strip.

METHODS

Preparation
Little has been published about the orchids of McIlwraith Range previously. It was known that several orchids occurred there and apparently nowhere else in Australia, but apart from this, information about botany in general and orchids in particular was almost negligible. The conviction that the orchid flora of this area would prove of interest established itself in the author's mind as a result of several previous field trips undertaken for the Queensland National Parks and Wildlife Service and it was on the knowledge gleaned from these trips that much of the planning for the AOF trips was based.

This previous knowledge was expanded by a careful study of aerial photographs which revealed promising localities such as the gorge of the Chester River and the Leo Creek Falls. The photographs used were the Coen Series. Habitats thought likely to contain a rich orchid flora were located and walking trips were planned from the few roads to these areas.

Field work
Base camps were established at various localities and planned trips were made from these base camps. These trips varied in duration from one-half day to five days. Specimens were collected both as live plants and when fertile, as herbarium specimens. Notes were taken listing the orchids of different areas and detailing features of the habitat. Photographs were taken of various species and of the different habitats.

Laboratory Work
Specimens brought back were studied in detail to confirm field identifications where possible. The live plants including some which were unidentified, were grown in the hope that they would produce flowers to enable identification or, in one or two cases, possible scientific description as new species. This latter stage, at the time of writing, remains to be completed.

THE EXPEDITIONS

The results presented in this Report are the end-product of two expeditions funded by the Australian Orchid Foundation and of various casual observations made by the author and by Messrs Brown, Gray, Stocker and Collins on other trips to the area.

1978 AOF EXPEDITION TO CHESTER RIVER:

Table 1 presented earlier shows that 24 orchid records new to Australia have been collected in the study area since 1948. Because several remote areas appeared not to have been thoroughly explored, it was considered that the possibility of further discoveries was substantial. Even should this not prove the case, it was considered that further valuable information on the distribution of some of the little-known species already found in the region would be of great value.

An approach was made to the Australian Orchid Foundation to help finance an expedition to the McIlwraith Range. The expedition was held between 16 July and 11 August 1978. It was financed largely by the Australian Orchid Foundation, but wages and expenses of three of the members were met by the Queensland National Parks and Wildlife Service, Queensland Department of Primary Industries (Botany Branch), and National Botanic Gardens, Canberra.

The personnel comprised the following:

- Dr. P.S. Lavarack, Queensland National Parks and Wildlife Service, Brisbane (Leader).
- Mr. J. Clarkson, Queensland Herbarium, Brisbane.
- Mr. M.W. Hodge, noted wildflower photographer, Brisbane.
- Mr. G. Butler, National Botanic Gardens.
- Rev. R.D. Collins, native orchid expert, Atherton.

Rev. Collins again made his vehicle available to the expedition. This second vehicle helped make the expedition a viable proposition. Without it, only three people could be included and the safety factor is greatly increased by having four or more people, as is the chance of a good find. Further, the second vehicle is often of great use in negotiating difficult creeks. Rev. Collins' knowledge of the area and his experience with orchids and bush cooking were also very valuable.

Mr. Merv Hodge was allocated the job of expedition photographer allowing the author valuable time to concentrate on other matters.

Mr. John Clarkson of Queensland Herbarium, as a trained botanist, ably assisted the author and provided a valuable spin-off in terms of a large collection of specimens from areas never before visited by botanists.

Mr. Geoff Butler, whose participation was funded by National Botanic Gardens, worked unceasingly to put together a valuable collection of live plants and herbarium material for Canberra.

DIARY

July 17 Dr Lavarack, Mr. Clarkson and Mr. Hodge spent the day in purchasing stores and making preparations in Townsville.

July 18 Drove from Townsville to Atherton.

July 19 Party was joined by Rev Collins and Mr. Butler. Loading of vehicles and further purchase of stores.

July 20 Travel, Atherton to Stewart River. Easy travelling along Peninsula Development Road (514 km).

July 21 Travel, Stewart River to Rocky River, This leg of the journey covered only 81 km, the first 60 km over well-used, if rough, roads. A stop was made at Silver Plains homestead where the manager Mr. Graham McKinnon was informed of the schedule of the expedition. From Silver Plains to Massy Creek travelling was relatively easy, but slow, over a rough but well-defined track. The crossing of Massy Creek was rough and one vehicle had to be winched. From Massy Creek, the road deteriorated, with the winch being required on at least two occasions. In places the 'road' disappeared in long grass and only a careful search on foot was able to locate it. This was particularly true where the road dropped down an eroded escarpment to the Rocky River and indeed camp was made on the Rocky River crossing only after a long search on foot. At the crossing the following orchids were seen in the gallery forest: *Dendrobium teretifolium*, *D. rigidum*, *D. discolor*, *Luisa teretifolia*.

July 22 Drove from Rocky River to Chester River. Although this leg took nearly a full day, only about 20 km was covered. The road was bad in places and vehicles were bogged in all three crossings of Scrubby Creek and its tributaries. The final part of the road into the site of the base camp proved extremely difficult to find. Camp was eventually established where a small creek in a deep gully joins Chester River about 2 km from the mouth of the gorge.

Base camp consisted of two tarpaulins strung up between trees on the high bank above the river. The river, at this point, is a shallow, fast-flowing stream only averaging about 20 cm deep,

about 10 m broad and spreading out over a bed of coarse sand. It is lined with tall rainforest in which *Ficus nodosa*, *Sarcocephalus coadunatus* (Leichardt tree) and *Syzygium rubiginosum* were prominent. This forest grows on sandy soil with a high content of leaf mould. It is obviously subject to frequent, heavy flooding and the understorey is sparse. Base camp was rapidly transformed into a tolerable living area spoiled only by the nightly hordes of mosquitoes.

During this day orchids were seen in two quite different environments. In the swamp forests along Scrubby Creek, dominated by *Dillenia alata*, the following orchids were noted: *Dendrobium smillieae*, *D. discolor*, *Cymbidium madidum*, *Acriopsis javanica* and *Bulbophyllum baileyi*. Just to the south of base camp and in several other areas along the road were large areas of low forest or woodland dominated by *Melaleuca viridiflora*, *Dendrobium canaliculatum* var. *nigrescens* and *D. johannis* were abundant while *D. rigidum* was less common.

July 23 After a moderately late start the entire party set out to head for Leo Creek Falls. The plan was to camp the first night at the top of a set of waterfalls on a side gorge then, on the following day, walk to Leo Creek Falls, spending one or two nights there. The walk on July 23 involved about a 5km hike up the bed of Chester River followed by about a 2 km climb up a long ridge to the headwaters of the side gorge.

Chester River inside the gorge presented an amazing sight. At some time since the aerial photographs were taken in 1958, a violent flood has devastated the gorge. The 1958 photographs show dense rainforest lining a relatively narrow creek and covering the entire floor of the gorge. However, the flood has been so complete in its devastation that on the river flat this forest has gone completely. The valley floor was white bleached sand and large boulders, sometimes stretching across 100 m or more of valley floor. Occasionally a tree stump was seen, some a metre or more in diameter, and all broken off cleanly at ground level. On the sides of the gorge were huge piles of twisted tree trunks, which in some places, made it impossible to leave the creek bed. No plant appeared to be recolonising this area except for a few annuals and a few hardy plants of *Callistemon viminalis*. Few orchids were seen during this first stage of the walk although one outstanding exception was a large plant of *Dendrobium tetragonum*, an unusual occurrence at this low altitude.

After a lunch which included freshly-caught jungle perch, the party set out up a ridge on the right-hand side of the gorge. This ridge proved steep and tiring for the party who were all carrying full packs. The ridge was named 'Green Ant Ridge' and was home to a few orchids: *Dendrobium bifalce*, *D. discolor*, *D. teretifolium*, *D. rigidum* and *Malaxis latifolia*. This ridge featured (as well as green ants) many cattle tracks. Only a few cattle were seen but tracks were evident everywhere. Where the ridge dropped into the creek at the top of the falls, Butler had a fortunate escape, falling down a small cliff and just stopping short of a steep fall. Camp was set up on the other side of the creek (named 'Antennatum Creek') in the midst of some good orchid country. In this area and just a little further upstream on the creek the following orchids were seen: *Dendrobium antennatum*, *D. luteocilium*, *D. discolor*. *D. teretifolium*, *D. smillieae*, *D. bifalce*, *D. stuartii*, *Bulbophyllum baileyi*, *Trichoglottis australiensis*, *Robiquetia wassellii*, *Sarcochilus moorei*. *Saccolabium rhopalorrachis* (pendant form), *Phreatia robusta*, *Schoenorchis densiflora*, *Eria fitzalani*, *Pholidota pallida* and *Pomatocalpa macphersonii*.

The most interesting of these was *D. antennatum*, previously thought to be scarce in Australia, but which was found to be abundant on trees overhanging the creek. These plants were in flower and proved to be identical to the previously collected Rocky River form - quite large flowered and clearly coloured. Three other orchids of some interest noted here were *Trichoglottis australiensis*, *Taeniophyllum malianum* and a *Cadetia* sp. *Trichoglottis australiensis* previously was known from Lankelly Creek and from a few plants at Iron Range, but proved to be abundant on the plateau top. *Taeniophyllum malianum*, only recently recorded for Australia (Lavarack 1977a), was also widespread in sheltered localities as was a *Cadetia* species which appears to be undescribed.

July 24 From the campsite on Antennatum Creek the party walked a compass line (300°). Trees were blazed to enable the return trip to be made more rapidly. The objective was the falls on Leo Creek and this was achieved after about five hours walking. The route passed through extensive areas of notophyll vine forest although many of the ridge tops supported a mixed open forest of *Acacia* spp., *Casuarina torulosa* and *Eucalyptus tessellaris* with a scrubby understorey of *Randia* sp. and grasses. The rainforest seen was uniformly of poor quality with few big trees and many vines. Only one creek with running water was encountered as the topography was relatively flat with no major hills. A few orchids were seen in this country including two terrestrial species - *Corymborkis veratrifolia* and *Hetaeria oblongifolia*. Epiphytes were not abundant but a few plants were noted of the following:

Trichoglottis australiensis, *Sarcochilus moorei*, *Robiquetia wassellii*, *Dendrobium smillieae*, *D. teretifolium*, *D. tetragonum* and *Taeniophyllum malianum*.

Just before reaching Leo Creek, during a lunch stop on a small tributary, a fine specimen of the juvenile phase of the green tree python (*Chondropython viridis*) was seen. This small snake is a vivid emerald green when adult and an equally vivid canary yellow when juvenile. A rather rocky campsite was selected on the only portion of almost level ground available and the remainder of the afternoon was spent in looking around the area of the falls. The falls themselves are in one of the most remote and least-visited areas in the State; few white people could have been there including perhaps a few of the early prospectors. The falls are a series of steep rapids and small waterfalls which drop in all about 250 m. The view from the top is magnificent looking down the broad valley of the creek towards the Macrossan Range. Leo Creek below the falls showed signs of a similar destructive flood to that which left its mark on the Chester River. The creek, although called a creek, is a far larger stream than Chester River. It runs through a broad, shallow gorge and the light, airy environment resulting from this is ideal for orchids and other epiphytes.

The orchids seen here were similar to those seen on Antennatum Creek at similar altitude (about 320 m): *Dendrobium antennatum*, *D. bifalce*, *D. teretifolium*, *D. luteocilium*, *D. discolor*, *D. rigidum*, *D. stuartii*, *D. tozerense*, *Phalaenopsis amabilis*, *Saccolabium rhopalorrachis* (erect form), *Vanda whiteana*, *Robiquetia wassellii*, *R. tierneyana*, *Trichoglottis australiensis*, *Phreatia robusta*, *Pholidota pallida*, *Oberonia muelleriana*, *Luisia teretifolia*, *Cadetia maideniana*, *Cadetia* sp., *Diplocaulobium glabrum*, *Bulbophyllum baileyi*. That night a spotted cuscus (*Phalanger maculatus*) was seen in the trees directly over the camp.

July 25 This day was spent exploring upstream and in the vicinity of the campsite at Leo Creek Falls. About 2-3 km upstream a stand of hoop pines were found on a high bank above the creek. These were investigated, but the only orchid not previously recorded on this trip which was seen here was *Dendrobium wassellii*. Several plants of *Phalaenopsis amabilis* were noted on a small tributary. No plant of *Dendrobium malbrownii* was seen. This orchid appears to be common only above 400 m altitude.

In summary, the orchids seen at Leo Creek Falls were disappointing. No new species was found but one most valuable record was discovered. This was a plant of *Dendrobium tozerense* which was found growing on a tree beside the campsite. Again the abundance of *D. antennatum* and *Trichoglottis australiensis* was striking, sure evidence that no orchid collector had been there previously.

July 26 The party returned from Leo Creek to base camp on the Chester River. This involved a long, hot walk heavily loaded with specimens.

July 27 This day was spent in camp, resting, preparing specimens and writing up notes.

July 28 This day was spent looking at areas near base camp. In particular the *Melaleuca viridiflora* forest nearby was surveyed. Although it was just too early for most of the orchid flowers, a few open flowers were seen on the numerous plants of *Dendrobium canaliculatum* present on the paperbarks. All appeared to be the variety *nigrescens*. *D. johannis* was also common and it, too, proved to be the familiar form. A few dried-up seedpods of a *Habenaria* sp. were seen in this area indicating that terrestrial orchids may be a feature of the area in the wet season. Some large plants of the carnivorous pitcher plant *Nepenthes mirabilis* were seen. The afternoon was spent in preparing for the trip planned for the next day.

July 29 The party set out on a cool day for Cape York - probably about 23° C - with light misty rain. After a long hard slog up the gorge a good campsite was found just below a major fork in the gorge. This campsite was on a sandy beach beside a large pool. The walk up the gorge revealed only a few orchids. *Sehoenorchis densiflora*, *Cymbidium madidum*, *Ephemerantha comata*, *Eria inornata* were observed for the first time on the trip. This part of the gorge is also the habitat of *Pomatocalpa marsupiale*. This species was first reported from a trip the previous year by Gray.

In the few remaining hours of daylight Lavarack, Collins and Clarkson investigated a large side gorge just upstream from the campsite. A big rock face was noted for further investigation and then the group ascended the creek about 2 km. Several waterfalls and rocky areas provided excellent orchid habitats although the orchids seen differed little from those listed for Leo Creek. The only new find for this trip was *Eria queenslandica* which was growing on a low tree overhanging a waterfall. Several plants of *Phalaenopsis amabilis* and the ever-present *Dendrobium antennatum* were seen.

July 30 The entire party spent the day walking up the main gorge for a distance of several kilometres. Much of the river's course above the

campsite is flat and the monotony is broken only by two sizeable sets of rapids, where the river drops several metres over rock bars. Although these areas were open and were the habitat of several orchids, nothing new for the trip was seen. Apart from these rocky areas the river is flat and is lined by *Tristania exiliflora* and other rainforest trees. The small branches of these were examined and *Schoenorchis densiflora* and *Taeniophyllum glandulosum* were found to be plentiful.

July 31 The party went to investigate the rock face noted earlier. It had previously been noted that much of the slopes of the Chester Gorge were unstable - possibly a legacy of the heavy rain which caused the flood a few years ago. The rock face proved a good example of this instability and members of the party had two near misses. Three of the party were climbing slowly up the right-hand side when a large boulder, perhaps a metre in diameter, dislodged and fell towards the group. Fortunately, it landed against a tree on a ledge a few metres above the party and did not fall further. A few minutes later a large tree fell within a metre or two of Collins, starting a small landslide. He subsequently reported that he could see no reason why it had fallen when it did. The members of the party were relieved to reach the top of this rock face. A few orchids were seen on the way but the only interesting record was *Oberonia carnosa* on a small tree at the top of the rock face. As with the earlier find of *Dendrobium tozerense*, this was the first record other than the type locality at Iron Range (other plants have been found subsequently on Massy Creek.) Farther up this creek above the rock face, *Acriopsis javanica* was seen for the first time on this expedition and *Dendrobium tetragonum* was also abundant. On the return journey near the foot of the rock face but in the forest - the party avoided the rock face this time - a few plants of *Thrixspermum congestum* were seen.

August 1 The party packed and walked back to base camp. The afternoon was spent in packing gear to move base camp next day.

August 2 The day was spent in travelling from Chester River to Massy Creek. The road seemed much easier on the return journey.

August 3 The party drove from Massy Creek to Coen, then on to a campsite on Lankelly Creek. The road from Coen to the campsite, although only 15 km long, took over two hours to negotiate. It was rough and in places difficult to find. The campsite was at an old set of yards known locally as Mulingar at an altitude of about 400 m in a mixed open forest in which *Eucalyptus brassiana* was prominent. The creek was lined with a gallery of vine forest and a few large patches of closed forest lay close to the camp site.

Lankelly Creek has been explored for orchids on several occasions in the past and several interesting finds have been made there. The gallery forest is the only confirmed locality for *Pteroceras hirticalcar*, while *Vanda whiteana*, *Robiquetia wassellii* and *Dendrobium wassellii* are also abundant in the vicinity. Other orchids seen in the closed forest included: *D. tetragonum*, *D. ruppianum*, *D. teretifolium*, *D. luteocilium*, *D. discolor*, *D. rigidum*, *D. stuartii*, *Pholidota pallida*, *Cymbidium madidum*, *Taeniophyllum glandulosum*, *Plectorrhiza brevilabris*, *Trichoglottis australiensis* and *Pomatocalpa marsupiale*.

The open forests near Mulingar have a scattering of *Melaleuca viridiflora* and *Tristania suaveolens* and these papery-barked trees are host to two most interesting orchids. These are the so-called 'pink form' of *Dendrobium canaliculatum* [now known as *D. carronii*] and the so called variety '*nigrescens*' of *D. johannis*. The 'pink' *D. canaliculatum* which was mentioned in the Iron Range Report as occurring at Tozer's Gap also occurs near the Rocky River, Massy Creek, Jardine River, upper Peach Creek and in New Guinea (J. Dodd pers. com.). The form of *D. johannis* which grows near Lankelly Creek is sometimes referred to as 'variety *nigrescens*' but has never been officially described as such. It has dark purple, almost black tips to the petals and sepals and usually a large yellow labellum. The stems and inflorescence are purple and the flowering period is autumn rather than spring. There is a chance that this is an undescribed species, and research aimed at clarifying this is presently under way. [This is now considered to be the type form of *D. johannis*, while the plants from lowland melaleuca woodlands are now thought to be *D. trilamellatum*.] Days were quite pleasantly warm and nights decidedly windy and cool in this area.

August 4 From base camp, the party walked over the ridge to nearby Pandanus Creek. This was then followed in a general north-easterly direction until the main stream swung to the east. This part was followed for about 3 km and camp was established near a rocky section of the creek. The route for the day was through mostly mixed open forest with a thin line of closed forest beside the creek. At the point where the creek changed direction it entered a closed forest, initially of *Acacia aulacocarpa* dominated forest, then notophyll vine forest.

The orchids of the mixed open forest and the creek bank forest were virtually identical to those noted previously for Lankelly Creek, and this included some plants of *Pteroceras hirticalcar*,

this being the first occasion this species had been seen away from Lankelly Creek, and several plants of *Bulbophyllum bowkettiae*. Once the rainforest was entered some interesting orchids were seen. *Dendrobium malbrownii* and *D. baileyi* were seen for the first time on this expedition, often growing quite low down on the palm *Archontophoenix alexandae*. Also seen for the first time were *Cadetia taylori* and *Eria irukandjiana* along with *Dendrobium luteocilium*, *D. tetragonum* (abundant), *D. ruppianum*, *Cadetia maideniana*, *Cymbidium madidum*, *Bulbophyllum bowkettiae*, *Plectorrhiza brevilabris* and *Pholidota pallida*. It was estimated that camp on Pandanus Creek was at about 700 m elevation.

August 5 On this day an attempt was made to reach one of the highest peaks in the range by following the creek east for about 2-3 km then striking north a similar distance. About midday several of the party reached a point which may well have been the summit of the range. In any case it would have been around the 800 m, close to the maximum altitude of the range. The top of the range featured a low closed forest in which the fan palm *Licuala ramsayi* was conspicuous. On the way to the summit, growing in a rocky creek bed were several large patches of a *Malaxis* species. This species, the existence of which is well known, was originally thought to be *M. xanthochila*, but is now thought to be an undescribed species or possibly a New Guinea species. It has purple inflorescence and flowers and grows into large clumps, usually creeping over the forest floor in low light positions. [This has since been described as *M. fimbriata*.] Several plants of *Hetaeria oblongifolia* were also seen in this area. After this trip to the summit, the main creek was followed farther until it became a small stream; no interesting new orchids were seen.

August 6 The party returned to base camp. This time the creek was not followed so closely and much better time was made. During the afternoon, the area near base camp was investigated more thoroughly.

August 7 After an early start, the party returned to Coen, then to Atherton arriving after dark.

August 8 Day spent in Atherton unpacking and cleaning vehicle.

August 9 Parted from Collins and Butler. Drove to Cairns, then to Townsville.

August 10 Day spent in Townsville preparing specimens etc. for shipping to Brisbane.

August 11 Townsville to Brisbane by air.

1979 AOF EXPEDITION TO MASSY CREEK:

Following on the success of the 1978 expedition it was considered that one major area remained to be investigated in the study area. This was the area of Massy Creek and the range to the south. Study of the aerial photographs indicated a steep escarpment of about 300 m with several fast-flowing streams, dominated by Massy Creek. The rainforest in some areas near the crest of the range appeared well developed, indicating a high rainfall. Added to this, it was in an area just to the north of Massy Creek that the previously mentioned unidentified *Liparis* sp. was discovered for the first and only time [now known to be *L. condylobulbon*].

Lavarack, Clarkson and Collins again participated, this time assisted by Mr. Mike Lockyer, a botany graduate from James Cook University. Mr. Ben Wallace of the Botany Department at the University of New England (who is currently pursuing a Ph D degree on epiphytes) and Mr. Ken Hill, Armidale, also attached themselves to the expedition, which consisted, then of three four-wheel drive vehicles and six people.

It was realised from the aerial photographs that it would be advantageous to set up base camp near the mouth of Massy Gorge. This involved the pushing of a road about 12 km to a suitable campsite. It was planned to follow an old dozed track then to push across some reasonably flat country to the creek.

DIARY OF TRIP

August 29 Fly to Cairns - purchase stores with Clarkson, to Atherton.

August 30 Packing vehicles.

August 31 Drive Atherton - Massy Creek, calling in at Silver Plains station to inform manager (Des Taylor) of plans. Massy Creek crossing in good condition. Drive on to where old dozed line leaves the 'main' road. The dozed line proved impossible to follow as it had regrown with dense wattles. An alternative route was selected through the adjacent *Melaleuca viridiflora* forest; this involved a lot of pushing of small trees and a winding track which followed the easiest country. Some large plants of *Dendrobium johannis* were noted with pseudobulbs up to about 50 cm long. These were growing low down in areas of clay pan which supported too sparse a covering of vegetation to carry a fire. Large plants of this species almost always seem to occur in these conditions and often grow on *Melaleuca* species other than *M. viridiflora*. Other areas of typical grassy *M. viridiflora* woodland carried small to medium-sized plants high in the branches

beyond the reach of the regular fires of the area. *D. canaliculatum* was also abundant and in one area numerous large plants of *D. rigidum* were encountered growing on the paper-barks. After the melaleuca woodland the road passed into a tall forest dominated by *Eucalyptus tetrodonta* and bloodwoods. Tall grass about 1-2 m and large logs made progress slow here. Minor repairs had to be carried out to one vehicle causing a delay of about two hours. After a great deal of hard work the party finally emerged from the eucalypt forest into a mixed forest where more rapid progress was made. The night was spent in a vine forest lining a dry creek. No orchids were seen here.

September 2 The road was pushed towards the creek through a mixed forest of *Eucalyptus tessellaris*, *Tristania suaveolens*, *Melaleuca viridiflora* and scattered vine forest species with *Dillenia alata* in the depressions. The ground here was flat but the dense vegetation made hard work for the party. About mid afternoon the creek was reached and camp was set up on the high bank near the junction of a tributary. Camp consisted of a tarpaulin strung between two trees in an open forest area. The creek was about 40 m away along a cattle pad. Massy Creek here is a stream about 20 m wide, fast-flowing and lined with a dense gallery forest in which large specimens of *Ficus nodosa* and *Bombax ceiba* are prominent.

September 3 This day was spent in organising the camp and preparing for the first of a series of hiking trips to various locations. In the afternoon the vicinity of the camp was examined in some detail and the following orchids were noted: In the tall gallery forest *Dendrobium bifalce*, *D. teretifolium*, *D. discolor* and *Pomatocalpa macphersonii*. In a patch of drier scrub on the west bank of the Massy: *Luisia teretifolia*, *Dendrobium rigidum*, *D. teretifolium* and *D. stuartii*.

September 4 On a cool cloudy day, the party set off to walk up the gorge. Collins was ill but insisted he was well enough to make what was planned to be a four to five day trip. Initially the party attempted to find easy travelling about 1 km to the east of the creek but found that numerous deep gullies made progress slow. (These gullies subsequently proved interesting for orchids and a full account will be given later.) Finally the least difficult track proved to be along the creek bank and this was followed to where the creek made a large U-shaped bend. This bend was avoided and the party pushed on up the creek, finally setting up camp about mid-afternoon. Collins during the latter part of the trip had been in obvious trouble and was causing the party some concern. After setting up the campsite members of the party spread out to search the surrounding area which was about 3 km inside the gorge and about 8 km from base camp. The gorge here was broad and relatively shallow with steep rainforest covered sides which in many places, consisted of rockpiles similar in many ways to those at Iron Range but more densely vegetated. Other areas showed evidence of instability. Dense rainforest grew right to the edge of the creek which was rocky and fast-flowing.

September 5 Rev. Collins was obviously ill and it was decided that he would have to be evacuated to the hospital at Coen. It was decided to allow him a day to rest and hopefully regain some of the strength which had been exhausted by the walk on the previous day, Leaving one of the party with him, the rest walked up the creek to attempt to gather what data they could as it appeared likely that the area would not be revisited. A few kilometres upstream a set of falls was encountered. Here there was a large bare rocky area though which the still-sizeable stream raced in a cascade of white water. Beyond this the stream settled down to a steady, but fast-flowing, pattern between huge boulders which made progress slow.

Orchids seen in the Massy Gorge

The gorge proved a most prolific habitat. Perhaps the most interesting find was of numerous large plants of *Dendrobium tozerense* which had previously been recorded from the Tozer Range to the north and from one isolated specimen seen in 1978 at Leo Creek. *D. tozerense* was abundant in trees overhanging the creek in exposed situations. More plants were seen here than had been seen at Iron Range. Also quite common in exposed situations was *Oberonia carnosa*, which previously was also not known to occur in this area. Another species of interest was *Vanda whiteana* which was abundant always growing in good light situations. No plant in flower was seen. *Dendrobium antennatum* was observed but plants were not as abundant as in some other areas visited in previous years. One plant of *Phalaenopsis amabilis* was seen, but this species is difficult to locate and was possibly more common than it appeared to be. Other orchids recorded included large numbers of *D. teretifolium* (all in full flower), *D. bifalce*, *D. tetragonum*, *D. stuartii*, *D. smillieae*, *D. rigidum*, *D. discolor*, *D. luteocilium*, *Bulbophyllum baileyi*, *Ephemerantha comata*, *Pholidota pallida*, *Eria fitzalani*, *E. queenslandica*, *E. inornata*, *Oberonia muelleriana*, *Cadetia maideniana*, *Phreatia robusta*, *Trichoglottis australiensis* (scarce), *Sarcochilus moorei*, *Pomatocalpa macphersonii*, *Robiquetia wassellii*, *Chiloschista phyllorhiza* and *Luisa teretifolia*.

This list of orchids is not much different from that recorded for Chester River, Leo Creek and Rocky River areas, although in each area there appeared to be a different emphasis, depending on the slightly varying local conditions. Generally speaking, most trees carried few epiphytes, but there was an occasional exception, usually a tree growing in an exposed position. It was unfortunately not possible to examine the sides of the gorge which looked quite promising, especially in some of the more rocky areas.

September 6 Because Collins appeared to be in slightly better condition, it was decided to break camp and return to base camp. Progress was slow but steady and base camp was reached about 1500 hours with no major problem.

September 7 Clarkson and Lavarack drove Collins to the Coen Hospital because his condition had deteriorated overnight. The trip out was necessarily slow as many trees which had been pushed over on the way in had to be removed to avoid the possibility of radiator damage. The trip out took six and a half hours and considerable relief was felt when the patient was delivered weak, but in good spirits, to the Coen Hospital. He was flown out the following day and much later was found to have leptospirosis.

September 8 The drive back proved faster although some time was spent doing further roadwork. As the exact nature of Collins' illness was at this stage uncertain (and it was felt possible it was hepatitis), it had been decided to bring the other members of the party out for injections.

September 9 This day was devoted to a detailed but hurried survey of a swamp near base camp and of some dry gullies also nearby. The orchids seen were as follows:

Swamp: This was a small area of impeded drainage about 1 km from camp dominated by *Dillenia alata*, *Xanthostemon crenulatus* and *Tristania suaveolens*. The canopy was not closed but was quite dense and the trees about 20 m tall. The ground was moist with a dense cover of sedges and shrubs in more open areas. The atmosphere in this community was quite humid while that in the surrounding open forest was dry. This area proved remarkably rich in orchids with *Xanthostemon* and *Tristania* being the principal host trees. The two species of major interest were *Dendrobium canalicalatum* and *D. johannis*. The form of *D. canalicalatum* occurring here was the so-called 'pink form' similar to plants previously seen at the Jardine River, Tozer's Gap and Lankelly Creek [i.e. *D. carronii*]. In common with plants seen at these other locations, the pink form was seen only in moister areas (similar to the swamp under present consideration). The plants were, without exception, small for the species and usually grew high in the trees. An illustration of this beautiful form can be found in the account of the AOF Iron Range Expedition (Lavarack, 1977d). The plants of *D. johannis* observed here showed all the vegetative characteristics of the so-called 'dark form' of *D. johannis*, which, like the 'pink form' of *D. canalicalatum*, has previously been recorded from only a few localities on Cape York including Jardine River, Iron Range, Lankelly Creek and Home Creek - all moister areas than those in which the supposedly 'type' form grows. This dark form flowers in autumn and the fact that no plant was seen in flower is further evidence that the plants seen here were of this form. Confirmation will have to wait until collected plants flower. Other orchids recorded in this swamp included *Luisia teretifolia*, *Pholidota pallida*, *Dendrobium rigidum*, *D. smillieae*, *Cymbidium madidum*. The pitcher plant *Nepenthes mirabilis* was also abundant.

Dry gullies: A number of deep narrow steep-sided gullies occurred between the base camp and the mouth of the gorge. These were for the most part covered with a rather sparse and deciduous vine scrub which proved to contain quite an interesting array or orchids. The most surprising discovery here was two plants of *Phalaenopsis amabilis* found growing in dry, harsh conditions. Both plants appeared to be almost deciduous, but to have been growing there for several years and had flowered. This species is usually considered to be restricted to shaded moist, humid localities. *Vanda whiteana* was also seen in one of these gullies. Other species seen were *Taeniophyllum malianum* which was abundant in one particular gully, *Pomatocalpa macphersonii*, *Robiquetia wassellii*, *Dendrobium stuartii*, *D. discolor*, *D. rigidum*, *D. teretifolium*, *D. bifalce* and *Chiloschista phyllorhiza*. In the extreme reaches of one dry gully, one plant of *Dendrobium bigibbum* was observed.

September 10 The party packed up and moved into Coen for the hepatitis injections which later proved not to be needed. As I was now experiencing a bout of sickness, the trip was abandoned and the journey back to Atherton commenced. In my case the sickness proved to be influenza.

September 11 Drove to Cooktown via Battle Camp.

September 12 Drove to Atherton via China Camp and C.R.E.B. road.

Other expeditions to the study area
As well as the two AOF sponsored trips described earlier the author has had the opportunity to study the orchids of the McIlwraith Range on a series of expeditions over the last six years. These are considered briefly.

Macrossan Range to Nesbit River
In September 1974 a trip was made via R.A.A.F. helicopter to the Macrossan Range. We were landed in a grassy area on a ridge leading up to the range top. A day was spent on top of the range which runs parallel to McIlwraith Range to the north of the mouth of Nesbit River. We then walked down a creek on the western side of the range to Nesbit River which was followed to its mouth. We were then picked up by helicopter just north of the mouth.

The following list of orchids was noted on the ridge top and on the plateau of the range: *Dendrobium stuartii*, *D. discolor*, *D. smillieae*, *D. bifalce*, *D. tetragonum*, *D. ruppianum*, *D. rigidum*, *D. teretifolium*, *Bulbophyllum baileyi*, *Corymborkis veratrifolia*, *Sarcochilus moorei*, *Robiquetia wassellii*, *Cymbidium madidum*, *Eria* sp., *Phreatia robusta*, *Hetaeria oblongifolia*. On the descent down the rocky creek, *Pholidota pallida* and *Saccolabium rhopalorrachis* were common, but the most noteworthy collection was that of *Eulophia pulchra*, this being the first occasion on which it had been collected in Australia. It was subsequently found at Iron Range but this remains the only record for the study area (Lavarack 1977a).

The orchids of Nesbit River gallery forest and of the *Melaleuca* woodlands nearby proved to be no different from those of similar habitats near the Chester River, Rocky River and Massy Creek.

Rocky River
In September 1975 the author visited the Rocky River area. The party walked some distance up the river, spending two nights there. Rocky River appears to be similar in many ways to Massy Creek. The only feature of note was that *Dendrobium antennatum* appeared to be rather more common here than on Massy Creek.

Upper Peach Creek - Leo Creek
This area of the McIlwraith Plateau is accessible from the road to the old Leo Creek mine site. This passes through the headwaters of Peach Creek at about 400 m altitude, then over a low divide to the catchment of Leo Creek. The C.S.I.R.O. has a rainforest study plot near here and this plateau rainforest contains several interesting orchids. The author visited this area on several occasions between 1967 and 1979 and the following are some notes on the orchids observed. At least four species appear to be restricted to this area within Australia.

Dendrobium malbrownii is perhaps the most interesting orchid from this area. It is apparently endemic to the McIlwraith Range at altitudes of 400 m and above in rainforest. When it occurs it is abundant in the upper branches of trees or lower down near creeks or on the margin of clearings. Another species which is, within Australia, restricted to this area is *Bulbophyllum longiflorum*. It has been collected in dense scrub near small tributaries of Leo Creek but is by no means abundant. It is widespread overseas. *Schoenorchis sarcophylla* occurs on the small twigs of *Tristania exiliflora* which overhang Leo Creek. Within Australia, this is the only locality from which this species has been recorded although it also occurs in New Guinea. *Malaxis* sp. 'Leo Creek' [subsequently described as *M. fimbriata*], an undescribed species occurs in moist locations near Leo Creek. The range of this species extends to the peaks north of the upper reaches of Pandanus Creek as described earlier.

Other orchids occurring in this area include *Phalaenopsis amabilis*, *Acriopsis javanica*, *Ephemerantha comata*, *Eria irukandjiana*, *Dendrobium baileyi*, *D. ruppianum*, *D. tetragonum*, *Galeola foliata*, *Phaius pictus*, *Malaxis latifolia*, *Dipodium pandanum*, *Aphyllorchis queenslandica*, *Habenaria papuana*, *Thelasis carinata*, *Phreatia robusta*, *Pholidota pallida*, *Plectorrhiza brevilabris*, *Taeniophyllum malianum* and *Diplocaulobium glabrum*.

Summit of the Range west to Horne Creek
In May 1979 the author, along with two other QNPWS staff, was dropped by helicopter on a bare rock in the middle of the rainforest. This rock was close to the highest point in the range (about 824 m). The party then walked back roughly west to the Coen airport about 25 km distant. Three-quarters of the distance travelled was at an altitude of 600 m or more although only about the first 6 km was through rainforest. The orchid flora was basically similar to that noted for the upper Peach and Leo Creeks areas but with two interesting additions. These were *Eria dischorensis* and *Corybas* sp. (possibly *C. abellianus*). Both these species are uncommon elsewhere in Australia, but were abundant in this area. *E. dischorensis* which also occurs in New Guinea, is an epiphyte of the taller trees, while *Corybas* sp. is a terrestrial orchid with an attractively-veined leaf which grows in leaf litter. A *Malaxis* sp. which appears to be undescribed also was collected here. The identity will not be known until the plants flower in cultivation.

Eria irukandjiana was also abundant along with an as yet unidentified *Bulbophyllum* (possibly *B. newportii*).

Some interesting areas of *Melaleuca* woodland at an altitude of about 650 m were encountered. These areas were usually on moist hillsides and supported a few plants of a most spectacular from of *Dendrobium johannis* with dark purple-brown flowers and a bright yellow labellum. The flowers were large and densely packed, making this a most attractive orchid. A large number of plants of *Cadetia wariana* were also encountered growing prolifically on rocks near a small waterfall on the western margin of the rainforest.

The rather open gallery forest along Home Creek was found to contain large numbers of Cooktown orchid (*Dendrobium bigibbum*) which were seen in full flower. Other plants of this species were encountered on exposed rocks near Horne Creek falls. Even in areas to the west of Horne Creek falls several orchids were seen in small tangles of vine scrub. In one such area *D. tetragonum*, *D. stuartii* and *Pholidota pallida* were common.

DISCUSSION

Comparison with Iron Range

Some 90 species of Orchidaceae have been recorded from the study area. The previous report on the Iron Range area (Lavarack 1977c) recorded 66 species, but most of these have also been found in the McIlwraith Range. It would appear rather artificial to separate the two areas as the following figures show:

Total number of species from McIlwraith Range and Iron Range combined	**96**
Number at Iron Range and not at McIlwraith Range	**5**
Number at McIlwraith Range and not at Iron Range	**24**

This figure of 24 species at McIlwraith Range but not at Iron Range probably is a distortion of reality. Several of the McIlwraith records were collected by Brown during the wet season (e.g. *Calochilus holtzei*, *Malaxis marsupichila*, *Nervilia aragoana*, *N. crociformis*, *N. uniflora*) and may well occur at Iron Range. Further detailed exploratory work will probably reduce the list substantially in the future.

The only real difference in the orchid floras lies in the difference in altitude and topography of the two areas. Iron Range reaches a maximum elevation of 550 m at Mt. Tozer but most of the area lies below 300 m. McIlwraith Range, on the other hand, has a maximum elevation of 824 m with a substantial plateau area above 400 m. This raises the question, is there a 'high' (or at least moderate) altitude orchid flora? Certain species are quite common at all elevations in the McIlwraith Range, but others appear to be regulated by altitude to some extent. In the sense of New Guinea or even of the Atherton Tableland, the McIlwraith Range does not attain anything like high altitude conditions. Yet it is apparent that there are some species which occur almost exclusively in the mountains, another group of species which is predominantly lowland and a third group which is to be found at all elevations. For the purposes of this discussion, high elevation has been defined as above 300 m. The altitudinal distribution of all the recorded species is shown in Appendix 1. The break down of the altitudinal distribution is shown in Table 3.

Table 3: Altitudinal Distribution of Orchids in the McIlwraith Range - Iron Range Area.

Predominantly Highland (above 300m)	Predominantly Lowland (below 300m)	Highland and Lowland	Uncertain
20	14	45	17

Highland Species

This is the most clearly defined group. *Dendrobium malbrownii* is the best example being an abundant species above about 400 m in the McIlwraith Range, but not found elsewhere. Other widespread and relatively common species also in the group include *Trichoglottis australiensis*, *Dendrobium ruppianum*, *D. tetragonum*, *D. wassellii*, *Ephemerantha comata*, *Cadetia taylori*, *Bulbophyllum bowkettiae*, *Eria irukandjiana* and *Plectorrhiza brevilabris*. As well as these there are several localised species e.g. *Eria dischorensis*, *Schoenorchis sarcophylla*, *Pteroceras hirticalcar*, *Malaxis* sp. ex Leo Creek, *Bulbophyllum longiflorum* and, at Iron Range, *B. leratii*. All of these have been recorded from restricted areas, all at 'high' altitude. Occasionally a 'high' altitude species will be found growing at low altitude especially in the eastern gorges of McIlwraith Range where cool air from higher altitudes often keeps the temperatures lower than other places of similar elevation. An example of this was a large plant of *Dendrobium tetragonum* found near the mouth of the Chester River Gorge. Despite examples such as these, there does appear to be an element of the orchid flora of the study area commonly occurring at relatively higher altitudes.

Lowland species

Many of the species listed as 'lowland' species are plants of vegetation types such as open forests and swamps which do not occur at higher altitude. In this category are *Cymbidium canaliculatum*, *Dendrobium lobbii*, *Bromheadia venusta* and *Calochilus holtzei*. A few rainforest species are predominantly lowland in distribution such as *Dendrobium bifalce*, *Eulophia pulchra* and *Sarcochilus moorei*, but most of the rainforest species occurring at low altitude also occur above 300 m.

In summary, there appears to be a group of about 15 species which occur only above 300 m and a much larger group which may grow at any elevation between sea level and about 700 m.

Other Environmental Factors

It is also useful to examine features of the environment other than altitude. The most prolific habitats, both in terms of numbers of individuals and numbers of species are the eastern gorges of Massy Creek, Rocky and Chester Rivers, and Leo Creek. These gorges are rich in orchids for most of their lengths, but the main populations occur where the streams fall over the edge of the range. These falls are always associated with broad, open, rocky areas where there is always good light, plenty of air movement and humidity. The trees on the margins of these areas are usually covered with epiphytes such as *Dendrobium tozerense*, *D. antennatum*, *D. discolor*, *D. luteocilium*, *D. ruppianum*, *D. rigidum*, *Luisia teretifolia*, *Vanda whiteana*, *Oberonia muelleriana*, *Bulbophyllum baileyi*, *Eria inornata*, *Cadetia maideniana* and *Saccolabium rhopalorrachis*.

Plants which more commonly occur in the rainforest include *Sarcochilus moorei*, *Trichoglottis australiensis*, *Pomatocalpa macphersonii*, *Robiquetia wassellii*, *Cadetia* sp., *Dendrobium bifalce*, *D. malbrownii*, *D. tetragonum*, *Dipodium pandanum*, *Eria irukandjiana*, *E. fitzalani*.

A substantial area of *Melaleuca* woodland with a heath understorey occurs above 600 m on the headwaters of Home Creek. It is interesting that this forest and other similar areas at slightly lower altitude (e.g. Lankelly Creek, about 450 m) contains plants of *Dendrobium canaliculatam* and *D. johannis* which are predominantly species of the lowlands. It is also worthy of note that the forms of both these species from these areas are different to those found at low elevation. It appears likely that the form of *D. canalicalatum* here represents an undescribed variety while the form of *D. johannis* may differ from what is normally regarded as the normal form by an even greater degree.

Phytogeographical considerations

[Some of the figures below are now a little dated, but the overall arguments remain valid.]

It has already been suggested that the Iron Range-McIlwraith Range area should be considered as an ecological entity at least as far as the orchids are concerned. It is, perhaps, advantageous to take this argument one step further and consider all of Cape York Peninsula north of about 14° S as one unit. Only three species of orchid have been recorded north of 14° S but outside the two study areas. These are *Arthrochilus dockrillii*, *Habenaria ocbroleuca* and *Bulbophyllum masdevalliaceum*, all of which have been recorded from the Bamaga area. There are then 99 species in Cape York Peninsula, and the McIlwraith Range area includes 90 of these as compared with 66 at Iron Range or 96 for the combined Iron Range-McIlwraith Range area. Ten species are endemic to Cape York Peninsula; these are *D. malbrownii*, *D. wassellii*, *D. tozerense*, *Malaxis marsupichila*, *Pteroceras hirticalcar*, *Robiquetia wassellii*, *Vanda whiteana*, *Trichoglottis australiensis*, *Oberonia carnosa*, *Bromheadia venusta*. Added to these are two other species - one a *Malaxis* and one a *Cadetia* which represent undescribed species (Lavarack, in press), giving a total of 13. Another

16 species occur outside Australia (mostly in New Guinea) but within Australia do not occur south of 14° S. These are:

Bulbophyllum leratii	*Eulophia pulchra*
B. masdevalliaceum	*Liparis* sp. Rocky River
B. longiflorum	*Pomatocalpa marsupiale*
Cadetia wariana	*Saccolabium rhopalorrachis*
Dendrobium antennatum	*Sarcochilus moorei*
D. bifalce (?)	*Schoenorchis sarcophylla*
Dipodium pandanum	*Taeniophyllum malianum*
Ephemerantha comata	*Thelasis carinata*

Thus 29% of the species of the area do not occur farther south and 13% are endemic to the region. These figures show a demarcation between the orchids of Cape York and those of the remainder of eastern Australia. The boundary in geographical terms is the dry, low-lying area of the Laura basin which does not support any habitats suitable for epiphytic orchids other than *Dendrobium bigibbum*, *D. canaliculatum*, *D. johannis* and *D. rigidum*, all plants of dry environments. These dry plains and sandstone hills between Cooktown and Stewart River represent one of the most sharply-defined phytogeographical boundaries in Australia, particularly with respect to rainforest species. The orchids illustrate this well.

In Table 4 the orchid floras of three areas on the Australian east coast are compared. Cape York can be seen to have the smallest percentage of endemic species, but the largest percentage of species shared with New Guinea. Thus it would appear that the links between this area and New Guinea are more recent than those of other areas. Possibly there has been a recent 'wave' of migration south from New Guinea which has not reached beyond the McIlwraith Range. Conversely, there has not been the time for a large proportion of endemic species to evolve in Cape York because the area has not been isolated as long as the more southern areas. Indeed it is quite possible that several of the 'endemic' species from Cape York may prove to be conspecific with New Guinea species. In this category are *Bromheadia venusta*, *Robiquetia wassellii*, *Dendrobium tozerense*, *D. stuartii*, *D. malbrownii*, *Vanda whiteana* and *Trichoglottis australiensis*, all of which have close relatives in New Guinea.

The orchid flora of Cape York shares 54% of its species with New Guinea and 65% with north Queensland south of Cooktown. These figures illustrate what is obvious in the field; that Cape York is a region of overlap of the Australian orchids represented by species such as *Dendrobium tetragonum* and *D. ruppianum*, with typically New Guinea species such as *Dendrobium bifalce* and *D. antennatum*. The endemic group is small but interesting, with much research needed to elaborate their real status.

In the above discussions the emphasis has been on the 'Indo-Malaysian' element of the orchid flora i.e. taxa which have their origins to the north and north-east of Australia. It is worth considering the Australian element, which in the truest sense is the Diurideae (Lavarack 1976). Only four species from the Tribe Diurideae have been recorded from Cape York. These are *Arthrochilus dockrillii*, *A. irritablis*, *Calochilus holtzei* and *Corybas* sp. The first of these has not yet been found in the McIlwraith Range area but, because it has been found to the north and south and because there are apparently suitable habitats in the area, it possibly does occur there. In the tropics, most members of the Diurideae seem able to survive only above about 700 m and are therefore absent from Cape York. *Calochilus holtzei* and the two *Arthrochilus* species are exceptions to this rule, while the unidentified species of *Corybas* grows at about 700 m elevation on the headwaters of Peach Creek. Thus the influence of the Australian tribe Diurideae is relatively weak on Cape York Peninsula.

Table 4: Comparisons of the orchid floras of areas on the east coast of Australia (species of Indo-Malaysian origin considered only).

	Percentage of species common to Australia and New Guinea	Percentage of species endemic to each region
Cape York Peninsula	**54**	**14**
Mackay to Cooktown	**35**	**36**
Port Macquarie (NSW) to Rockhampton (Qld)	**6**	**43**

FUTURE OF THE McILWRAITH RANGE ORCHIDS

Since the Iron Range Report was written a substantial National Park has been gazetted there. This no doubt will help preserve the orchids of that area against illegal collectors. National Park reservation is under consideration for the McIlwraith Range, but before considering the needs of protection of the orchids from collectors it is worth considering the habitat in which the orchids grow and the future of this.

It is wrong to regard the ecological system of an area like McIlwraith Range as a stable, static thing. In fact it is a dynamic system changing constantly in response to various factors such as changes in rainfall patterns. Observations made on the McIlwraith Range expedition appear to indicate some vegetation changes possibly induced by man. An example was noted near Massy Creek where some areas of open forest show indications of reverting to a vine thicket, possibly due to lack of recent fires. Some evidence of this can be detected on aerial photographs, taken 20 years ago which appear to show a more open forest community than that presently existing. It appears possible that a similar process is occurring on the western margin of the rainforest where acacia-dominated forests appear to be in the process of being replaced by a rainforest, which at this stage is evident as a tall understorey.

The explanation for these apparent changes appears to lie in a decreased frequency of fire resulting from the disappearance of the Aborigines from the area. Regular fires were an integral part of Aboriginal land management as described by the early explorers such as Kennedy and Jack. Since the Aborigines left in about 1930, the major influence has been European man who maintained a regular fire pattern for the grazing industry near the stations and along the roads. Many areas near the range or in the infertile and remote coastal country are not burned. Thus it appears likely that the vine forests of McIlwraith Range are spreading and, while dense moist rainforest may never develop in all sites on the drier coastal plains or rugged western ranges, a deciduous vine thicket or monsoon scrub may well eventuate. Thus it may well be that the vine forests of the McIlwraith Range are expanding, providing larger areas of suitable orchid habitats. If this is the situation, it must be almost unique in this age of rapidly contracting orchid habitats.

Illegal collecting is not a large problem in the McIlwraith Range at this juncture because the poor roads and the inhospitable and inaccessible nature of the country protect it adequately. Most of the good orchid habitats can be reached only after a day's drive on roads, which tend to simply disappear in long grass or end in apparently impossible creek crossings, followed by one or two day marches through trackless and rugged country.

It is a rich area for orchids with a varied array of species, some of which occur nowhere else in the world and many of which do not occur elsewhere in Australia. Even among the more widespread species, McIlwraith Range forms are often distinctive and therefore sought after. For these reasons, the orchids of the range are under a potential threat and it is to be hoped that a reservation can be made in the future to protect this most diverse orchid flora.

CONCLUSION

This study has shown the McIlwraith Range area to have a rich orchid flora with some 90 species recorded. The considerable increase in number of species over the previous study at Iron Range (90 compared to 66) reflects an increase in diversity of good orchid habitats due largely to the greater altitude range of the study area. As was pointed out previously, it is probably misleading to regard the McIlwraith Range study area as being a separate entity from the Iron Range Area. There are far more similarities than differences between the two areas, which together support a relatively distinct orchid flora. This flora has closer links with New Guinea than do those of the other areas in Australia.

The study resulted in some interesting records. At the time of writing it is not clear if any new species were discovered on the AOF sponsored expeditions, but the descriptions of two species new to science are now in press. These are being described from specimens collected in the McIlwraith Range on AOF and other expeditions and involve the genera *Cadetia* and *Malaxis*. Specimens collected on the AOF expedition of 1978 and 1979 have been used in a study of the species *Dendrobium johannis*, but this has proved complex and will require the study of types at present in European herbaria. Possible new species or records were collected in the genera *Malaxis*, *Taeniophyllum* and *Corybas*.

Of the better known species much useful information was gathered. *Dendrobium tozerense* and *Oberonia carnosa* were shown to be much more widely distributed than was previously suspected, the Massy Creek locality being about 150 km south of the type locality. The status of *Dendrobium antennatum* in Australia was clarified. It was recorded in the valleys of Massy Creek, Rocky and Chester Rivers, and Leo Creek, but nowhere else. It is abundant in small trees, usually in open, strong light

situations near waterfalls. *Pteroceras hirticalcar* was searched for in several areas but was found only in the gallery forest along Lankelly and Pandanus Creeks. Similarly, *Dendrobium malbrownii* was shown to be restricted to the area of the McIlwraith Range about 400 m in rainforest conditions. *Trichoglottis australiensis*, previously thought of as a rather uncommon species of the Lankelly Creek area, was found to be abundant in many of the eastern areas of the range above 300 m. *Phalaenopsis amabilis* was found to be widespread throughout the study area but generally uncommon. The two plants found in a dry vine scrub near Massy Creek were a surprising discovery because all other plants seen were in shady humid habitats.

The records of *Calochilus holtzei*, *Nervilia plicata*, *N. uniflora*, *N. aragoana*, *N. crociformis* and *Arthrochilus irritablis* reported by Mal Brown indicate that the terrestrial orchid flora of the drier habitats, which is evident only in the wet season, may be significant. This suggests a possible future expedition in about February. *Nervilia crociformis* is a new record for Australia, although because no specimen exists it cannot be regarded as confirmed at this stage. No plant of the *Liparis* species reported by Stocker was seen on the expeditions, but there is no doubt of its existence because there are well documented plants in collections and complete herbarium material. The official recording of the identity of this species awaits publication by Dockrill.

As with the Iron Range expedition, no plant of *Dendrobium johnsoniae* or *D. ophioglossum* was seen and the author remains extremely doubtful that these are Australian plants.

The information on the total flora, but with particular regard to the orchids, indicates that the McIlwraith Range area should be given a high priority for reservation. The orchid flora is more diverse than that of almost any other area of similar size in Australia. While many of the species both of orchids and of other families are shared with New Guinea, this is not an argument for failing to preserve the area when the flora is looked at from the community rather than the species viewpoint. No area with a complement of plant communities similar to those of the study area exists in New Guinea.

Other useful data has been gathered on the AOF sponsored expeditions. John Clarkson made detailed collections of all fertile plants on the two major expeditions. These collections have uncovered many interesting new records as related in Clarkson's report (Appendix 2). Many of the areas visited had never been visited by botanists previously. On the 1978 AOF expedition Butler collected both propagating material and herbarium specimens for the Canberra Botanic Gardens. These collections from previously unknown areas are likely to provide several 'new' plants of horticultural potential. Butler's report is given in Appendix 3.

APPENDIX 1

List of Orchids Recorded at the McIlwraith Range & Iron Range Area

It should be stated that many of these records are based on the author's recognition of species in the field. It is considered that these records will nevertheless prove accurate. Where uncertainty exists, the records have been given as a genus only (e.g. *Malaxis* sp. 'Leo Creek').

The following symbols have been used:

Column one - Source of Information (Info)

L - recorded by Dr. P.S. Lavarack

B - information supplied by Mr. Mal Brown

G - information supplied by Mr. Bruce Gray

S - information supplied by Mr. Geoff Stocker

A - information from collections by Dr. L.J. Brass

Column two – Area

M - McIlwraith Range study area

I - Iron Range study area

Column three – Habitat

The symbols used are those given in Table 2.

Column four – Altitude (Alt)

H - above 300m

L - below 300m

N - insufficient information

Column five – Abundance (Status)

A - abundant in the appropriate habitat

R – restricted

U - widespread but uncommon

N - insufficient information

(These categories are subjective and are intended as a very approximate guide only).

Note: *Nervilia crociformis* (Zoll. & Mor.) Seidenf. has not been officially recorded in Australia. It was reliably reported by M. Brown but no specimen exists so this record remains unconfirmed. This species is better known by the synonym *N. crispata* (Bl.) Schltr.

SPECIES	INFO	AREA	HABITAT	ALT	STATUS
Acriopsis javanica Reinw.	L	MI	1a	HL	U
Aphyllorchis queenslandica Dockr.	L	M	1a	N	R
Apostasia wallichii R. Br.	L	MI	1a 1e	LH	U
Arthrochilus irritabilis F. Muell.	B	M	N	N	N
Bromheadia venusta T.E. Hunt	L	MI	1c	L	R
Bulbophyllum baileyi F. Muell.	L	MI	1a 1b 1c 1f 1g	LH	A
Bulbophyllum bowkettiae F.M. Bail.	L	MI	1a	H	R
Bulbophyllum leratii (Schltr.) J.J.Sm.	L	I	1a	H	R
Bulbophyllum longiflorum Thouars.	L	M	1a	H	R
Bulbophyllum (?) *newportii* (F.M.Bail.) Rolfe	L	M	1a	H	R
Cadetia maideniana (Schltr.) Schltr.	L	MI	1a 1b	LH	H
Cadetia taylori (F.Muell.) Schltr.	L	MI	1a	H	U
Cadetia wariana Schltr.	L	MI	1a	HL	R
Cadetia sp.	L	MI	1a	HL	U
Calanthe triplicata (Willem) Ames	L	MI	1a	N	R
Calochilus holtzei F. Muell.	B	M	1d 2a	L	R
Cheirostylis ovata (F.M.Bail.) Schltr.	L	MI	1a	LH	U
Chiloschista phyllorhiza (F.Muell.) Schltr.	L	MI	1a 1b 1c 1g	L	U

SPECIES	INFO	AREA	HABITAT	ALT	STATUS
Corybas sp.	L	M	1a	H	R
Corymborkis veratrifolia Thouars ex Bl.	L	M	1a	LH	IJ
Cymbidium canaliculatum R.Br.	L	MI	2a 2b	L	A
Cymbidium madidum Lindl.	L	MI	1a 1b 1c	LH	A
Dendrobium antennatum Lindl.	L	MI	1a	LH	R
Dendrobium baileyi F.Muell.	L	M	1a	H	R
Dendrobium bifalce Lindl.	L	MI	1a 1b	L	A
Dendrobium bigibbum Lindl.	L	MI	1d	LH	R
Dendrobium canaliculatum R.Br.	L	MI	3a	LH	A
Dendrobium cancroides T.E.Hunt	L	M	1a	H	R
Dendrobium discolor Lindl.	L	MI	1a 1b 1c 1d 1f 1g	LH	A
Dendrobium johannis Reichb.f.	L	MI	3a	LH	A
Dendrobium lobbii T. & B.	L	I	N	L	R
Dendrobium luteocilium Rupp.	L	MI	1a	LH	A
Dendrobium malbrownii Dockr.	L	M	1a	H	R
Dendrobium nindii W. Hill	L	I	1a	L	R
Dendrobium rigidum R.Br.	L	MI	1a 1b 1c 1f 1g	LH	A
Dendrobium ruppianum A .D. Hawkes	L	MI	1a	H	A
Dendrobium smillieae F. Muell.	L	MI	1a 1b 1c	LH	A
Dendrobium stuartii F.M. Bail.	L	MI	1a 1b 1f	LH	U
Dendrobium teretifolium R.Br.	L	MI	1a 1b	LH	A
Dendrobium tetragonum A. Cunn.	L	MI	1a	H	A
Dendrobium tozerense P.S.Lavarack	L	MI	1a	LH	R
Dendrobium wassellii S.T. Blake	L	M	1a	H	R
Diplocaulobium glabrum J.J. Sm.	L	MI	2c 1a	LH	U
Dipodium pandanum F.M. Bail.	L	MI	1a	HL	U
Ephemerantha comata (Bl.) P.F.Hunt & Summerh.	L	MI	1a	H	U
Ephemerantha convexa (Bl.) P.F.Hunt & Summerh.	L	M	1a	N	R
Eria dischorensis Schltr.	L	M	1a	H	R
Eria fitzalani F. Muell.	L	MI	1a	LH	A
Eria inornata T.E. Hunt	L	MI	1a	LH	U
Eria irukandjiana St Cloud	L	M	1a	H	R

SPECIES	INFO	AREA	HABITAT	ALT	STATUS
Eria queenslandica T.E. Hunt	L	M	1a	LH	R
Eulophia pulchra (Thouars.) Lindl.	L	MI	1a	N	R
Galeola foliata (F. Muell.) F. Muell.	L	MI	1a	ML	R
Geodorum densiflorum Lam (Schltr.)	L	MI	1a 2c	N	U
Habenaria papuana Krzl.	A	MI	1a	LH	U
Hetaeria oblongifolia Bl.	S	MI	1a	N	A
Liparis habenarina (F.Muell.) Benth.	L	I	N	N	N
Liparis sp.	L	M	1a	LH	R
Luisia teretifolia Gaud.	B	MI	1a 1b 1c 1f 1g	LH	A
Malaxis latifolia J.E. Sm.	L	MI	1a	N	A
Malaxis marsupichila W. Upton	L	M	1a	H	R
Malaxis sp. 'Leo Creek'	B	M	1a	L	R
Micropera fasciculata (Lindl.) Garay	L	MI	1a 1b		U
Nervilia aragoana Gaud.	B	M	N	N	N
Nervilia crociformis (Zoll. & Mor.) Seidenf.	B	M	N	N	N
Nervilia plicata (Andr.) Schltr.	BA	MI	N	N	N
Nervilia uniflora (F. Muell.) Schltr.	B	M	N	N	N
Oberonia carnosa P.S. Lavarack	L	MI	1a	LH	R
Oberonia muelleriana Schltr.	L	MI	1a	LH	A
Oberonia palmicola F. Muell.	L	MI	1a	LH	U
Phaius pictus T.E. Hunt	L	M	1a	N	R
Phaius tancarvilliae (Banks) Bl.	G	?	N	N	N
Phalaenopsis amabilis Bl.	L	MI	1a 1d	LH	U
Pholidota pallida Ldl.	L	MI	1a 1b 1c 1g	LH	A
Phreatia robusta Rog.	L	MI	1a	LH	A
Plectorrhiza brevilabris (F. Muell.) Dockr.	L	M	1a 1f	H	U
Podochilus australiensis (F.M. Bail.) Schltr.	B	M	1a	N	R
Pomatocalpa macphersonii (F. Muell.) T. E. Hunt	L	MI	1a 1b 1f	LH	A
Pomatocalpa marsupiale (Krzl.) J.J.Sm.	L	MI	1a 1b	LH	R
Pteroceras hirticalcar (Dockr.) Garay	L	M	1a	H	R
Robiquetia tierneyana (Rupp) Dockr.	L	MI	1a 1b	L	U
Robiquetia wassellii Dockr.	L	MI	1a 1b	L	U

SPECIES	INFO	AREA	HABITAT	ALT	STATUS
Saccolabiopsis armitii (F.Muell.) Dockr.	L	MI	1d	L	R
Saccolabium rhopalorrachis (Reichenb.f.) J.J.Sm.	L	MI	1a	LH	U
Sarcochilus moorei (Reichb.f.) Schltr.	L	MI	1a 1b	L	A
Schoenorchis densiflora Schltr.	L	MI	1a	LH	U
Schoenorchis sarcophylla Schltr.	L	M	1a	H	R
Spathoglottis sp.	L	I	1c 2c	L	R
Taeniophyllum glandulosum Bl.	L	MI	1a 1e 1d	LH	A
Taeniophyllum malianum Schltr.	L	MI	1a 1b 1d	LH	A
Thelasis carinata Bl.	L	MI	1a	H	R
Thrixspermum congestum (F.M. Bail.) Dockr.	L	MI	1a	LH	R
Thrixspermum platystachys (F.M. Bail.) Schltr.	L	MI	1a	LH	R
Trichoglottis australiensis Dockr.	L	MI	1a	H	A
Vanda whiteana Herbert & S.T. Blake	L	MI	1a 1d	L	U
Zeuxine oblonga Rog. & C.T. White	L	MI	1a	LH	U

On a recent AOF trip during the wet season (February 1980), the following species not listed above were recorded at Iron Range:

Arthrochilus dockrillii P.S. Lavarack.

Habenaria ochroleuca R. Br.

Nervilia holochila (F. Muell.) Schltr.

[Note: Many of the species listed above have new names. See *List of Orchids of Cape York Peninsula north of 15° S* page 139 details.]

APPENDIX 2

Report On Field Trip to McIlwraith Range North Queensland: 15th July - 11th August 1978

John Clarkson

Introduction

This expedition was part of an ongoing study of the orchid flora of Cape York Peninsula being conducted by P.S. Lavarack of the Queensland National Parks and Wildlife Service. The results of a previous expedition to the more accessible Iron Range area were reported early in 1977 (*Project to Study Orchids of Cape York, Queensland, Orchids of the Iron Range Area,* P.S. Lavarack 1977). The study aims to improve the knowledge of the orchid flora of Cape York in terms of species present and their distribution and to gain some estimate of the conservation status of the orchid flora of the area. While the principal objectives of the expedition centered on the family Orchidaceae the opportunity was taken to collect any fertile material.

The party consisted of five persons:

- P.S. Lavarack, National Parks and Wildlife Service, Brisbane
- J.B. Clarkson, Queensland Herbarium, Brisbane
- G. Butler, Canberra Botanic Gardens, Canberra
- B. Collins, Atherton
- M. Hodge, Brisbane

Plant collecting was carried out mainly by Clarkson and Butler with the former concentrating on pressed and fluid preserved herbarium material, while the latter collected mainly propagating material for the Canberra Botanic Gardens. Two vehicles were used - a Toyota Landcruiser belonging to NPWS Townsville and a short-wheel base Toyota owned by R. Collins of Atherton.

Funding

The expedition was funded primarily by the Australian Orchid Foundation who provided airfares for three people Brisbane - Townsville and return and the running costs of the two vehicles used. Travelling allowances of Government officers were met by their own Departments while those of the two others were met privately.

The Trip

The party assembled in Atherton on the evening of July 18th, Lavarack, Clarkson and Hodge having flown to Townsville and driven the NPWS vehicle to Atherton. Owing to unforeseen circumstances the departure date was put back a day to the 20th July. The opportunity was taken to visit the new D.P.I. complex in Mareeba and to accompany an Entomology Branch officer to Cairns where Mr. B. Broadley of Plant Pathology Branch provided a tour of the Horticultural Research Station at Kamerunga.

The early problems having been overcome the party left Atherton early on the morning of the 20th July. Owing to the large distance to be covered (450 km) only brief stops were made and collecting restricted mainly to prominent shrub and tree species. An interesting find was *Vallisneria caulescens*, a submerged aquatic previously known only from the Gulf of Carpentaria area. Camp for the night was made in the sandy bed of the Stewart River.

The following day even with an early start, and driving non stop until dark, only 80 km were covered. Entry to the eastern fall of the McIlwraith Range is gained through Silver Plains Station and the contact made with the manager of the property will prove useful for future work in the area. Two fruit fly traps were set out at the lunch stop on the Massy River for officers of Entomology Branch. These were collected on the return journey.

The difficulties of vehicular traverse of this area were quickly brought home on the third day out of Atherton. It took nine hours to cover the 20 km from the Rocky River to the planned camp site on the Chester River.

Having set up a base camp on the Chester two four day trips were undertaken on foot. On the first, a major left bank tributary of the Chester was traced to its head and camp made for the night. From here a compass traverse was made to Leo Creek falls where the following two nights were spent. The falls area and the gorge above the falls were extensively explored. The return to base camp was made in one long day's walk. Due to the difficulties in handling and transporting material and the lack of fertile material only 58 specimens were collected over these four days, but a number of these proved very interesting. Two new *Cyperus* species were found in the bed of the Chester and good fruiting material of a recognised but as yet undescribed *Cadetia* was obtained. At Leo Creek falls material of the grass *Garnotia stricta* var. *longiseta* was collected. This is only the second collection of this New Guinea and Melesian grass from Australia. Excellent spirit material of the strange saprophytic plant *Balanophora fungosa* was collected.

On the second four day excursion the head of the Chester Gorge was extensively explored from a camp near the head of the gorge. Again collection was restricted for similar reasons and the need to stay near the creek where the orchids

were to be found. Notable collections include an undescribed *Asplenium* and what appears to be a new species of *Taeniophyllum*. Good flowering and fruiting material of the small epiphytic orchid *Oberonia carnosa* was obtained. This recently described species was previously known only from the type locality at Tozers Gap over 100 km to the north. A recognised but undescribed stinging tree was collected and photographed.

The Chester River base camp was left on the 2nd August and the following two days spent in retracing our tracks to Silver Plains and moving on, via Coen, to Lankelly Creek on the western fall of the McIlwraith Range where another base camp was established. From here a three day overland excursion to Pandanus Creek was undertaken. This creek rises in some of the highest country in the McIlwraith area. Some excellent specimens of filmy ferns were collected. The Lankelly basecamp was broken on 7th August and the party returned to Atherton that evening.

On the 8th August short visits were made and discussions had with officers at the D.P.I. offices and the C.S.I.R.O. Forestry Research Institute at Atherton. The NPWS vehicle was returned to Townsville on the 9th and on the 10th while P.S. Lavarack had discussions with NPWS staff at Cape Pallarenda, and a visit was made to the Douglas campus of James Cook University. The party returned to Brisbane on the 11th August.

Summary

Although the number of specimens collected was not high for the time spent in the field, due partly to the difficulty in both collecting and carrying material long distances over rather difficult terrain, the general lack of fertile material at this time of year and the necessity to stay in good orchid habitats, several valuable collections were made. In all five new species were found:

Cyperus sp. Clarkson 2392

Cyperus sp. aff. *C. bowmannii* Clarkson 2393

Asplenium sp. Clarkson 2426

Taeniophyllum sp. Clarkson 2436

Croton sp. Clarkson 2450

Additional material of two previously recorded but as yet undescribed species not well represented in the Brisbane collection were made:

Dendrocnide sp. Clarkson 2439 (cf. Smith 11782)

Cadetia sp. 2350 (no specimen BRI)

The range of several species was extended by a considerable distance. In addition the opportunities afforded to visit the new D.P.I. complex in Mareeba and the discussions had with D.P.I. and C.S.I.R.O. staff on the Tablelands and the university botany staff from Townsville were particularly rewarding. A complete list of the material collected is attached. Duplicate material of most collections were available for distribution.

J.R. Clarkson,
May 1979

Specimens collected on the McIlwraith Range Australian Orchid Foundation Expedition July-August 1978 (with collection numbers)

ACANTHACEAE
Graptophyllum spinigerum 2363
Hypoestes floribunda 2440
Pseuderanthemum variable 2425
ANNONACEAE
Polyalthia nitidissima 2361
ARALIACEAE
Kissodendron australianum 2443
ASCLEPIANDACEAE
Dischidia ovata 2372
ASTERACEAE
Blumea saxatilis 2413
Phacellothrix cladochaeta 2417
BALANOPHORACEAE
Balanophora fungosa 2370, 2432
BURSERACEAE
Canarium australianum 2469
CAMPANULACEAE
Wahlenbergia gracilis 2416
CYPERACEAE
Cyperus aquatilis 2353, 2422, 2445
C. brevifolius 2395
C. decompositus 2396
C. enervis 2427
C. haspan 2447
C. polystachyos 2364
Cyperus sp. aff. *C. bowmannii* 2393
Cyperus sp. nov. 2392
Fimbristylis acicularis 2407
F. dichotoma sens. at. 2394
F. pauciflora 2366, 2380
Gahnia aspera 2410
Hypolytrum nemorum 2354, 2448
Rhynchospora pterochaeta 2403
Scleria caricina 2424
S. levis 2382
S. polycarpa 2409, 2446
S. rugosa 2359
DROSERACEAE
Drosera indica 2341
ERIOCAULACEAE
Eriocaulon setaceum 244
EUPHORBIACEAE
Actephila lindleyi 2349
Croton insularis 2449
Croton sp. nov. 2450 (of Stoddard 1076 BRI 209382)
FABACEAE
Acacia crassicarpa 2339
A. holosericea 2340
A. leptocarpa 2402
A. leptostachya 2335
A. simsii 2337
A. umbellata 2336
Crotalaria acicularis 2400
Tephrosia purpurea 2368
HYDROCHARITACEAE
Vallisneria caulescens 2343
LILIACEAE
Schelhammera multiflora 2350B
Thysanotus tuberosus 2451
LOGANIACEAE
Mitrasacme stellata 2412
LORANTHACEAE
Amylotheca dictyophleba 2451
MALVACEAE
Macrostelia grandifolia subsp. *macilwraithensis* 2348
MELASTOMACEAE
Melastoma polyanthum 2443A
Osbeckia chinensis 2419
MORACEAE
Ficus virgata 2438
MUSACEAE
Musa acuminata 2433
MYRTACEAE
Eucalyptus cullenii 2333
E. miniata 2334
Eucalyptus sp. aff. *E. polycarpa* 2470
Melaleuca angustifolia 2452
M. foliolosa 2411
Tristania exiliflora 2385
Xanthostemon chrysanthus 2464
NYMPHAEACEAE
Nymphoides exiliflora 2342
ORCHIDACEAE
Bulbophyllum johnsonii 2455
Cadetia maideniana 2360, 2435
C. taylori 2456
Cadetia sp. a recognised but undescribed species 2350A
Dendrobium antennatum 2357
D. bifalce 2391
D. canaliculatum 2467
D. discolor 2390
D. malbrownii 2457
D. rigidum 2454
D. tetragonum var. *giganteum* 2458
Eria eriaeoides 2429
Oberonia carnosa 2434
O. muelleriana 2401
Robiquetia wassellii 2356
Schoenorchis densiflora 2471
Taeniophyllum glandulosum 2431, 2453
Taeniophyllum sp. nov. 2436
POACEAE
Dimeria ornithopoda 2367, 2376
Ectrosia leporina 2408
Garnotia stricta var. *longiseta* 2378
Oplismenus compositus 2387
Panicum trichoides 2375
Vetiveria filipes 2377

RESTIONACEAE
Leptocarpus elatior 2405
L. schultzii 2404
RUBIACEAE
Hedyotis galioides 2384
H. lapeyrousii 2423, 2437
Knoxia corymbosa 2398, 2345
Ophiorrhiza australiana 2430
Psychotria lonicernides 2365
Spermacoce brachystema sens. tat. 2421, 2381
RUTACEAE
Glycosmis pentaphylla 2373
SAPINDACEAE
Dodonaea polyandra 2362, 2468, 2406
SCROPHULARIACEAE
Adenosma cuerulea 2420
Buchnera linearis 241 4
Lindernia crustacea 2397
STYLIDIACEAE
Stylidium alsinoides 2418, 2444
S. fissilobium vel. aff. 2344
S. uliginosum 2369
URTICACEAE
Dendrocnide sp. (cf Smith 11782)
VITACEAE
Cissus repens 2399

FERNS
ASPLENIACEAE
Asplenium paleaceum 2347
Asplenium sp. nov. 2426
BLECHNACEAE
Doodia media var. *media* 2379
CYATHEACEAE
Cyathea rebeccae 2459
DAVALLIACEAE
Humata repens 2461
GRAMMITIDACEAE
Ctenopteris gordonii 2460
HYMENOPHYLLACEAE
Crepidomanes bipunctatum var. *bipunctatum* 2355
Crepidomanes bipunctatum var. *venulosum* 2465
Hymenophyllum polyanthus var. *contiguum* 2462
Microgonium bimarginatum 2466
Selenodesmium obscurum 2463
LYCOPODIACEAE
Lycopodium carinatum 2428
L. phlegmaria 2386, 2351
L. phlegmarioides 2374, 2402A
OPHIOGLOSSACEAE
Ophioglossum pendulum 2358
POLYPODIACEAE
Microsorum punctatum 2346
SCHIZAEACEAE
Lygodium flexuosum 2388
VITTARIACEAE
Antrophyum reticulatum 2352

APPENDIX 3

NATIONAL BOTANIC GARDENS CANBERRA, A.C.T.
McIlwraith Range Field Trip, North Queensland
18th July 1978 to 11th August 1978
Geoff Butler

This trip resulted from an invitation extended to the National Botanic Gardens (name changed from Canberra Botanic Gardens) from the Australian Orchid Foundation offering us the one spare seat available on the trip they planned to the McIlwraith Ranges in North Queensland.

The main purpose of the trip was to find rare or new species of orchids, to extend the distribution ranges of previously known species and to make collections of species for propagation and growing on at the National Botanic Gardens. Although the trip was primarily aimed at orchids the N.B.G. treated this as a general collection trip and as a result many species were sent back for our living and dried collections. The area covered is part of a large area of land proposed for a national park site in North Queensland.
Participants in the trip were:

- Dr. P. (Bill) Lavarack - Botanist, Queensland National Parks & Wildlife Service
- John Clarkson - Botanist, Queensland Herbarium
- Rev. Ron Collins - Orchidologist, Atherton, Queensland
- Merv Hodge - Official photographer for the trip, Brisbane, Queensland
- Geoff Butler - Horticulturalist, National Botanic Gardens

Two vehicles were used on the trip. These were a long wheel base Toyota Landcruiser owned by the Queensland National Parks and Wildlife Service and a short wheel base Toyota Landcruiser owned by Ron Collins. The trip was mainly funded by the AOF.

The weather for most of the trip was very warm sunny days and cool nights. On occasional nights some small amount of rain fell, though not enough to cause any inconvenience. Some difficulty was experienced in freighting propagation material back to Canberra mainly due to poor air service coverage. At one stage we were in the bush for 13 days before material was able to be freighted off. Generally most material did well once received in Canberra. Orchids and other epiphytes and lithophytes did extremely well.

18th July - I arrived at Cairns and took the local bus and carrying service to Atherton where I was given accommodation by Rev. Collins. Two other members of the trip had already arrived. The vehicles were also there awaiting packing the next day.

19th July - This day was spent packing and final shopping for perishable items was done. Final preparations took the full day and we stayed one more night in Atherton.

20th July - We left Atherton and picked up the fifth member of the trip at Mareeba. From there we went via Mt. Carbine towards the Stewart River. There was not much time to collect material as we had to travel reasonably fast to give us maximum time in the McIlwraith Ranges. Some plant species collected were *Themeda australis*, *Grevillea mimosoides*, *Cochlospermum gillivraei*, *Eucalyptus miniata*, *Acacia decora*, *Acacia multisiliqua*, *Acacia holosericea*, *Drosera indica*, *Drosera petiolaris* and *Acacia crassicarpa*. The country from Mareeba to the Stewart River was very arid and the weather extremely warm.

21st July - After a disturbed night owing to the noise of flying foxes we broke camp at the Stewart River and headed towards Silver Plains station. We stopped at the station and asked the manager about the state of the roads and crossings towards the McIlwraith. As he had not been up the track for some time he couldn't really help us so we headed off to the Massy River crossing and then on to Rocky River. Silver Plains station was to be our last sight of civilization for approximately two weeks. We reached Rocky River at 4:30 and made camp for the night in the river bed. The water in all the creeks and rivers was very clean and a pleasure to bathe in at the end of a dusty days driving.

22nd July - On Thursday (21st) night it was flying foxes and Friday night it was huge mosquitoes which sounded more like buzz bombs than mosquitoes. We broke camp fairly early and after a hearty breakfast started driving towards what was to be our base camp on the Chester River. On this leg of the journey there were some very rough creek crossings and considering the loads the vehicles were carrying they were performing exceptionally well. The 'road' we were using was at one stage a road but had obviously been long disused. On some of the creek crossings winches had to be used and the odd sheer pin was breaking, calling for on the spot repairs a number of times during the day. For very long stretches all that marked the road were cuts made into trees. At one 'intersection' where the road diverged two ways all that marked the intersection was a large tree with two arrows emblazed into it. The road was lost a number of times and we had to stop

and search for it before resuming the journey. We finally reached the Chester River camping area and set up a large base camp. We packed gear for the long walk to Leo Creek the next day. We also had our last good cooked meal for four days and went to bed.

23rd July - We left base camp for Leo Creek after rubbing on plenty of scrub tick and mite repellant. These particular pests are of great nuisance value in the McIlwraith area. We headed off up the Chester River, our guide being a compass and some aerial photographs taken in 1957. By lunchtime, we were at a point on the river where we had to leave it and walk up a ridge to the above plateau area, so we decided to stop for lunch by the river. The water was extremely clear and full of large numbers of fish for lunch. John baited up a line (with a small piece of orange peel of all things) and seconds after throwing it in was pulling out a jungle perch. These fish attack aggressively at just about anything and bite well almost ensuring a catch. After our fill of fish we went up the ridge to the top. The hills were covered with a poor type of rainforest which was extremely dry at this time of the year. Everywhere we walked lawyer vines or 'wait-a-whiles' (*Calamus* sp.) caught in our hair and clothing and produced many scratches on our bodies. After normally seeing orchids in 'captivity' growing on slabs of cork it seemed most strange to see them in their natural habitat. Some plant species found on the top of this ridge included *Callistemon viminalis*, *Xanthosternon chrysanthus*, *Ptychosnerma elegans*, *Licuala ramsayi*, *Doodia caudata* var. *caudata*, *Robiquetia* sp., *Saccolobium* sp., *Phreatia robusta*, *Dendrobium antennatum* and *D. stuartii*. We camped at a small creek at the top of the ridge and slept very well that night.

24th July - We broke camp early and resumed our trek through dense but dry rainforest scrub towards Leo Creek. From the camp site to Leo Creek is a cross country walk using a compass bearing. A trail was blazed onto trees as we went to enable us to find our way back a little easier.

Many orchids were seen as we walked through the rainforest including *Robiquetia wassellii* and *Dendrobium stuartii*. Our compass bearing brought us out practically right on the Leo Creek Falls. At the top of the falls were growing *Dendrobium discolor*, *D. rigidum*, *D. stuartii*. *Tristania exiliflora* and *Callistemon viminalis* lined the creeks. A lot of collections were made in this area including: *Casuarina torulosa*, *Apostasia wallichii*, *Doryopteris concolor*, *Crepidomanes bipunctatum* and *Lycopodium phlegmaria*.

25th July – Late on Monday night (24th) we were disturbed by a cuscus climbing through the trees above our heads. We were able to shine a torch on it for some time and observe it before it walked away. During the day we scouted around up Leo Creek and once again many more collections were made. Some of the collections were: *Pholidota pallida*, *Asplenium paleaceum*, *Boea* (new sp.), *Dendrobium antennatum* and *Malaxis latifolia*. The weather was still very warm but days short with the sun rising late and setting early due to the mountains around us.

26th July - We headed back to base camp on the Chester River, making it all the way back in one day. We collected as much as we could carry on the way back. Some plants collected were *Bulbophyllum baileyi*, *Vanda whiteana*, *Dendrobium bifalce*, *D. tozerense*, *D. luteocilium* and *Phalaenopsis amabilis* var. *rosenstomii*.

27th July – Today was a rest day which I spent pressing and packing specimens, packing plants, changing and drying blotters and newspapers, washing clothes, getting field notes up to date and preparing for the next trip away from base camp. A species collected near the camp site was *Eucalyptus leptophleba*.

28th July – The day was spent collecting in the area around the base camp then pressing and packing the specimens.

29th July – A small about of rain fell overnight and continued until lunchtime today as we walked up the Chester River towards the gorge. Wild pigs have done a tremendous about of damage even in this isolated country. Wild cattle are also prevalent. We set up camp on a small beach next to a large waterhole and did some collecting around the camp site area. Some species collected were *Pteris tremula*, *Doryopteris concolor*, *Schoenorchis densiflora*, *Robiquetia wassellii*, *Taeniophyllum malianum*, *Hoya macgillivrayi*.

30th July – We left for a walk up the Chester River gorge or approx. 8km over rocky creek beds and up waterfalls. The weather was still overcast which made it pleasant for working. A lot was collected today including; *Leptogium aureum*, *Lycopodium phlegmaria*, *Pteris ensiformis*, *Eria eriaeoides* and *Pholidota pallida*.

31st July – As I had so much pressing and packing to do from yesterday's collecting I decided to stay at camp and do it first thing in the morning while the others went on a walk up a tributary of the Chester. I said I would follow on later and meet them. I started off as soon as I had finished but while walking on to meet the others had very quickly collected so much I walked back to camp to process them. The others returned to camp just

on dark as I was finishing. Some species collected today were: *Pannania* cf. *fulvescens*, *Nephrolepis biserrata*, *Eustrephus latifolius*, *Mucuna gigantea*, *Christella dentate*, *Dendrobium stuartii* and *Oberonia carnosa*.

1st August – We set off back to the Chester River base camp and collected material all the way out. After processing this we started packing gear ready for the trip back to Coen township via Silver Plains Station.

2nd August – We were on the road by 8:30am and made excellent time heading back and were able to make the Massy River before dark and camped there. A small amount of collecting was done on the way back today including *Hibbertia banksii*, *Livistona muelleri*, *Melaleuca angustifolia*, *Leptospermum fabrica* and *Thryptomene oligandra*.

3rd August – As we arrived at Silver Plains a mail plane was just arriving. This, I am sure, was a lifesaver for most of the cutting material and plants I had collected, as a few more days in the heat would have killed much of it. We arrived at Coen at lunchtime and then took a very rough track out to a point on Lankelly Creek, 17km from Coen. There another base camp was set up. Few collections were able to be made on this day.

4th August – We walked some miles through thick rainforest scrub once again alive with lawyer vines (*Calamus* sp.) along the creek. We also collected numerous leeches. Some species collected today were: *Cteropteris gordonii*, *Humata repens*, *Bulbophyllum bowkettiae*, *Araptydria isidiophora*, *Dendrobium malbrownii*, *D. ruppianum* and *Microgonium bimarginatum*. At the end of the day, a small patch of rainforest by the creek was cleared for a two night stay.

5th August – We left camp and continued walking up the creek. Towards the source of the creek there were large rockpiles formed where soil had been eroded from around them. Bill, John and Ron continued further up a ridge and reached the highest peak of McIlwraith. The weather was still overcast with odd light showers which made it good walking weather.

6th August – We started walking back again towards the base camp at Lankelly Creek. The weather had cleared and was quite warm again. Upon reaching camp we did washing and pressed and packed specimens as we had decided to head back to Atherton the next day.

7th, 8th, 9th, 10th August – We broke camp and headed back to Atherton, completing the journey in one day. As the trip had been shortened by a few days, Ron and I decided to collect around the Atherton area. Some of the plants collected over this period were: *Melaleuca bracteata*, *Paraceterech muelleri*, *Sarcochilus roseus*, *Acacia umbellata*, *Acacia galiodes* var. *glabriflora*, *Eucalyptus shirleyae*, *Acacia calyculata*, *Dendrobium speciosum*, *Dipodium ensifolium*, *Thelymitra aristata* and *Bulbophyllum johnsonii*.

11th August - I left Cairns on return flight to Canberra.

I feel the trip was very successful and many thanks must go to the Australian Orchid Foundation for providing a seat for the National Botanic Gardens on the trip. Combined groups organising trips such as these have always proved of benefit to the gardens enabling us to collect species of plants that it would be unlikely to have collected any other way, and would urge that if the opportunity ever arise again it should be accepted.

WET SEASON ORCHIDS OF THE IRON RANGE AREA
Report of an expedition to Cape York Peninsula
21 February – 3 March 1980

ACKNOWLEDGEMENTS

The members of the party would like to thank Doug and Barb Holdsworth and Wally Betts for their hard work, hospitality and enjoyable company on this trip. Thanks are due also to Ross and Nita Pope of Portland Roads for their hospitality and for the use of their boat. The author is also indebted to the Directors of the Australian Orchid Foundation and to Gerald McCraith in particular, for the financial support of this study; Len Lawler for much of the organising; and Gerald, Len, John Clarkson & Merv Hodge for their enthusiasm and pleasant company on this trip.

INTRODUCTION

When compiling the first report on the orchids of the Iron Range area (Lavarack 1977c), it became obvious that one section of the orchid flora was being overlooked. This is the group of terrestrial orchids which flower and produce leaves after the onset of the wet season. The leaves of these species usually disappear and the plants survive the dry winter season as dormant bulbs or tubers. Therefore a field trip organised in July/August, the optimum months for access, will find no trace of these genera. However the wet season makes orchid hunting difficult and air travel is essential. Even then travel in the local area can be difficult due to flooded creeks and boggy roads.

Iron Range is one of the key orchid areas in Australia. Along with the closely related, but less accessible McIlwraith Range, it is a high rainfall area surrounded by relatively dry country. It shows evidence of close links to the orchid flora of New Guinea. The epiphytes and the evergreen terrestrials of the area are now well known. In the previous report the following terrestrial species were recorded - *Aphyllorchis* sp., *Apostasia wallichii*, *Bromheadia venusta*, *Calanthe triplicata*, *Cheirostylis ovata*, *Corymborkis veratrifolia*, *Dendrobium lobbii*, *Dipodium pandanum*, *Eulophia pulchra*, *Geodorum densiflorum*, *Habenaria papuana*, *Hetaeria oblongifolia*, *Malaxis latifolia*, *Spathoglottis* sp., and *Zeuxine oblonga*.

All these are species of rainforests or swamps and the only deciduous terrestrials recorded were the unpublished records (recorded in Lavarack 1977c, 1977d) of L.J. Brass (1948) who collected *Liparis habenarina* and *Nervilia plicata*. Terrestrial species in this category have been recorded elsewhere on Cape York Peninsula. There are recordings from the McIlwraith Range of *Habenaria papuana* (by Jones 1974), *Calochilus holtzei* (by Dockrill 1969), *Malaxis marsupichila* (by Upton 1976) and unconfirmed reports from the same area of *Nervilia crociformis* and *Arthrochilus irritabilis* (by M. Brown *pers. com.*). The present author has recorded *Habenaria orhroleuca*, *Malaxis marsupichila* from near Bamaga (Lavarack 1977b) and *Arthrochilus dockriilii* from the Jardine River area (Lavarack 1975).

Iron Range was chosen because it is poorly known with respect to the orchids under consideration and because access to the area is easy (if expensive) via regular flights to the Iron Range airport, which remains open in all but cyclonic weather.

THE HABITATS

The vegetation of the Iron Range area was described in detail in a previous report (Lavarack 1977c). In general terms about one-half of the area supports rainforest with the remaining half consisting of eucalypt-dominated forest, melaleuca-dominated forests and heath. The habitat types which were chosen for intensive investigation on the expedition were as follows:

(1) heath, in particular the wet heaths of Tozer's Gap,
(2) eucalypt forest on sand near the coast,
(3) eucalypt forest in moister areas,
(4) melaleuca woodlands and forests, and
(5) margins of rainforests.

All of these are habitats of at least some degree of seasonal water stress. Most of the area is in a relatively high rainfall belt, although there appears to be a significant rain shadow near Portland Roads on the coast. The average rainfall at Iron Range airport is 1980mm and, while heavy rain may occur at any time of the year, it is usual for the period between May and December to be dry.

PLANNING THE EXPEDITION

Searching for wet season terrestrials is always a gamble. The flowering of the plants appears to be related to the onset of the wet season but it is not known how much rain is required. Different species also appear to take longer to respond to the rain. *Nervilia* species would appear to respond quickly and the flowers are short lived. *Habenaria*, on the other hand, appears to take longer to respond and to last longer in

flower. Thus to sample an area exhaustively the collector would need to be in the area from about early November to April/May. This was clearly not possible. Factors other than the weather intervened to the planning of his expedition, until finally the period between 19 February and 3 March was chosen. As the wet season had been delayed, it was felt that these dates may have proved the best available, although it was realised that plants flowering early in the wet season would be overlooked.

For some years, the Queensland National Parks and Wildlife Service has had an ongoing project to survey the orchids of Cape York Peninsula. The funding of this project has been greatly aided by grants from the Australian Orchid Foundation and the trip described here was jointly organised by these two bodies. The personnel consisted of Dr P.S. Lavarack, Senior Botanist of the Queensland National Parks and Wildlife Service; Mr J. Clarkson, Botanist of the Queensland Herbarium; Mr L.J. Lawler of the University of Sydney; Mr M.W. Hodge of Brisbane; and M.G. McCraith, Director of the Australian Orchid Foundation.

The party was housed, fed and transported by Mr. and Mrs. D. Holdsworth of Portland Roads who provided a base for short trips to various areas. A period of four days was spent at Tozer's Gap.

RESULTS

All the vegetation types selected contained a few terrestrial orchids. Numbers of species and individuals were disappointingly low, possibly due to a poor wet season. The most prolific habitat appeared to be moist, grassy open forest near the margin of rainforest not far from Iron Range airport. Here *Liparis habenarina*, *Geodorurn densiflorum* and three or four species of *Nervilia* were found.

Some other species of plants which flower in the wet season were obvious. These included *Curcuma australasica* (Cape York lily), *Amorphophallus* sp., *Typhonium angustilobium* (black lily), *Drosera petiolaris* (sundew), *Tacca* sp., and *Eurycles amboinensis* (Cardwell lily). However, small herbs such as *Stylidium* and *Utricularia* were not abundant and the overall impression was of few plants flowering outside the rainforests. Whether this is the normal condition or is due to the poor wet season is uncertain.

A list of the terrestrial orchids recorded on this expedition along with some notes each is given below:

Habenaria ferdinandii - Three plants were collected at Tozer's Gap in heath country. All were in bud, but close to opening. This is a new record for the Iron Range area and also the first time this species has been collected on Cape York Peninsula.

Habenaria orhroleuca - One plant was collected at King Park station south of the Claudie River. It was growing on the margin of seasonally swampy ground dominated by *Melaleuca viridiflora*. This was a new record for the Iron Range area although it has been recorded both to the south and north of this region.

***Calochilus* sp.** - Plants of this species were found at Tozer's Gap and on King Park. All of the plants collected were in seed and the flowers were withered. It is likely the flowering period was about early December. Most plants had only 1-3 flowers. A careful study of the withered flowers in the laboratory indicated that these are probably *C. holtzei*, which has previously been reported at McIlwraith Range as well as other areas to the south and in Arnhem Land.

Arthrochilus irritabilis – Flowering plants of this species were collected in many localities in eucalypt and *Melaleuca* forest. The plants collected had as many as 20 flowers. In one or two specimens a rosette of leaves was present growing laterally from the base of the inflorescence, but usually the inflorescence was devoid of leaves. Rosettes of the same species were abundant and only a small proportion of flowering plants was observed. This species has not been collected north of about Cooktown previously although it does occur in Papua New Guinea.

Arthrochilus dockrillii - Flowering plants of this species were collected in eucalypt forest near Tozer's Gap and in mixed forest on old dunes near the beach where it was particularly abundant. Only a small proportion of the plants seen were in flower. The inflorescence is associated with a single leaf (or occasionally two leaves) which is up to 12cm long and about 1 cm broad. This species has previously been collected at Kurrimine, Bloomfield River, Jardine River and Papua New Guinea. The flowering time is of interest as other plants collected flowered in June to August. This is a new record for the Iron Range - McIlwraith Range area.

Nervilia holochiia – Non-flowering plants were seen in several localities all within a few kilometres of the coast, although no flowering material was collected, the identification of this species is certain. It always occurred in large colonies in eucalypt dominated forest. It is presumed that the flowering period is early in the wet season. This collection represents a new record for Iron Range.

Nervilia plicata - This species is better known in Australia as *N. discolor*. As with

N. holochila, no fertile material was seen but the leaf is distinctive for the species. It was seen in similar habitats to the other *Nervilia* species. A previous collection was made by Brass in 1948 at Iron Range.

***Nervilia* sp.** - Infertile specimens were collected of one, or possibly two, species of *Nervilia* near Iron Range airport. It is possible that either or both *N. uniflora* (F. Muell) Schltr. and *N. crociformis* (Zoll. & Mor.) Seidenf. may be represented among these specimens because there did appear to be two species present. Only flowering material will resolve this question. Whatever the identity, these leaves represent species previously unrecorded for Cape York Peninsula. [*N. crociformis* has subsequently been identified from this site.]

Liparis habenarina - Plants were seen in two or three localities, all a few kilometres from the coast. Only one fertile specimen was collected. This species was found growing in dense grass in eucalypt-dominated forest. The species was previously collected by Brass in 1948.

Malaxis marsupichila - Flowering plants of this species were abundant in a rather dry rainforest on a rocky slope to the west of Tozer's Gap. The plants were most common near the margin of the forest and grew in leaf litter. This species was previously recorded at Bamaga and the Rocky River. It is a new record for the Iron Range area.

Geodorum densiflorum - Flowering plants of this species were seen in a wide variety of habitats ranging from open melaleuca forest to dense rainforest. This species had previously been recorded at Iron Range (Lavarack 1977c) and the flowering material now available confirmed this identification.

***Spathoglottis* sp.** - Plants of this unknown species were seen at Tozer's Gap. No flowering material was seen. [This has subsequently been identified as *S. plicata*.]

Bromheadia venusta - Good flowering material of this species was obtained near Tozer's Gap. It was first collected in this area by Brass in 1948.

Dendrobium lobbii - This species was observed in flower at Tozer's Gap. It, like the previous species was first collected by Brass at Brown Creek in 1948.

[Note: Many of the species listed above have new names. See *List of Orchids of Cape York Peninsula* for details.]

DISCUSSION

Several new records for Iron Range and extensions of range of species to Cape York Peninsula were recorded on this expedition. No 'new' species were collected although further collections of the unknown *Nervilia* and the *Calochilus* species could prove interesting in this regard.

A more balanced record of the orchids of the area was obtained than was previously available. It is interesting that the wet season orchid flora appears not significantly different to that of the Darwin area. These orchids are part of the moister phase of the widespread tropical flora which extends from the Kimberleys to the top end of the Northern Territory and Cape York Peninsula. This flora would exclude plants of the rainforests and swamps such as *Bromheadia*, *Spathoglottis* and *Dendrobium lobbii*, which may be relatively recent arrivals from New Guinea.

There are equally strong relationships with the wet season orchid flora of the humid tropics between Ingham and Cooktown, although certain genera such as *Habenaria* are better developed there. Other genera such as *Didymoplexus* and *Prasophyllum*, which occur as wet season terrestrials in the south, have not been found at Iron Range although this could be because they are readily overlooked. The discovery of only two species of *Habenaria*, and then of only four individual flowering specimens, was a disappointment. There is a strong possibility that this paucity of plants may have been related to the late arrival of the wet season in this year. Although substantial rain had fallen in late December and January, the areas visited showed little evidence of this. While this poor wet season may have resulted in a decreased flowering, it did allow visits to several areas which otherwise would have been inaccessible.

The list of terrestrial orchids found on this expedition is a minimum and basic one for the region. It is probable that in better years, or perhaps in pockets overlooked on this occasion, other species will be found.

DIARY OF THE TRIP

21/2/80 Party met at Cairns Airport to fly to Iron Range via a Bush Pilots Airlines Trilander. Arrived Iron Range, drove to Portland Roads with Doug Holdsworth. Looked at some promising tea-tree country on the way but no orchids were seen. In the afternoon the party walked up the road for about 1km finding plants of *Nervilia holochila* and *Geodorum densiflorum*.

22/2/80 As the weather was dry it was decided to attempt to drive to Tozer's Gap. Arrived at Tozer's Gap about midday. In the afternoon the party all hunted for orchids in the wet heath at the Gap. Found three plants of *Habenaria ferdinandii*, one of *Calochilus* sp. and several of *Arthrochilus irritabilis* and *Dendrobium lobbii* in flower. A

heavy rainstorm in the late afternoon caused Doug to decide to return early next morning to avoid being stranded at the Gap.

23/2/80 Lavarack and Clarkson staying on, aiming to walk out on 25 February. They walked to Garaway Creek and then to a small patch of dry monsoon forest on a nearby hill. Some orchids were seen on the road, the most interesting being *Arthrochilus dockrilli* and *A. irritabilis*. In the monsoon forest *Malaxis marsupichila* was collected. Other orchids seen here included *Dendrobium discolor*, *D. teretifolium*, *D. rigidum*, *Saccolabium rhopallorachis*, *Pholidota pallida* and *Bulbophyllum baileyi*.

24/2/80 Lavarack and Clarkson walked up a small creek to the west shoulder of Mt. Tozer. Although a careful search was made, no orchid of great interest was noted. The epiphytic orchid flora was identical with that noted on the creek to the east in the first Iron Range Report (Lavarack 1977c).

25/2/80 Lavarack and Clarkson walked out to the Claudie River junction. This took four hours including an unsuccessful attempt to locate plants of *Eulophia pulchra* found on an earlier trip. On meeting the rest of the party they learned of a vehicle mishap on 23/2/80, fortunately with no serious injury. Len Lawler showed plants of *Nervilia discolor* and *Arthrochilus irritabilis* found near Portland Roads on the return journey.

26/2/80 The day was spent sorting specimens, writing notes and on a short local walk.

27/2/80 To Lockhart River where Billy Boyle and Michael Sandy joined the party, and showed Len Lawler some interesting native plant foods. Looked for orchids on road to Line Hill Holding near the airport and found several interesting orchids including *Nervilia* leaves which may be a new species for Australia [later found to be *N. crociformis*].

28/2/80 To Chili Creek road and then to the beach near the mouth of Chili Creek. This sandy country proved to be prolific habitat for *Arthrochilus dockrillii* and also *A. irritabilis*, both species in flower. In the beach scrub *Dendrobium rigidum*, *D. discolor*, *D. teretifolium*, *Chiloschista phyllorhiza* and *Pholidota pallida* were noted.

29/2/80 To Restoration Island with Ross Pope in his boat. The island is a rugged hill with a small sandy flat area on the sheltered side. The hill is covered with a dry stunted vine forest. The only orchid seen was *Dendrobium discolor*. The return trip was rough. Restoration Island has an interesting history as it was here that Captain Bligh and the crew members rested after being cast adrift by the *Bounty* mutineers in a small boat. Hence the name Restoration Island. Interestingly they found no coconuts here or on the nearby coast where they are now abundant.

1/3/80 Party travelled to the southern end of King Park, across the Claudie River. This is an area noted on a previous trip comprising open grassy woodland dominated by *Melaleuca viridiflora*. Some interesting discoveries were made including *Habenaria orcroleuca* (one plant only) *Calochilus* sp. (quite abundant) and the two species of *Arthrochilus*. Extremely heavy rain made the return journey on the slippery road rather unpleasant.

2/3/80 Heath areas on the Portland Roads road were examined in more detail. *Liparis habenarina* was found to be fairly common in forest areas while the rainforest gullies had plants of *Dendrobium johannis*, *D. smillieae*, *D. discolor* and *Diplocaulobium glabrum*.

3/3/80 Party drove to Iron Range airport and flew back to Cairns.

ORCHIDS OF THE CARRON VALLEY AREA
Report of an expedition to Cape York Peninsula
5 – 20 September 1983

Contents

ACKNOWLEDGEMENTS

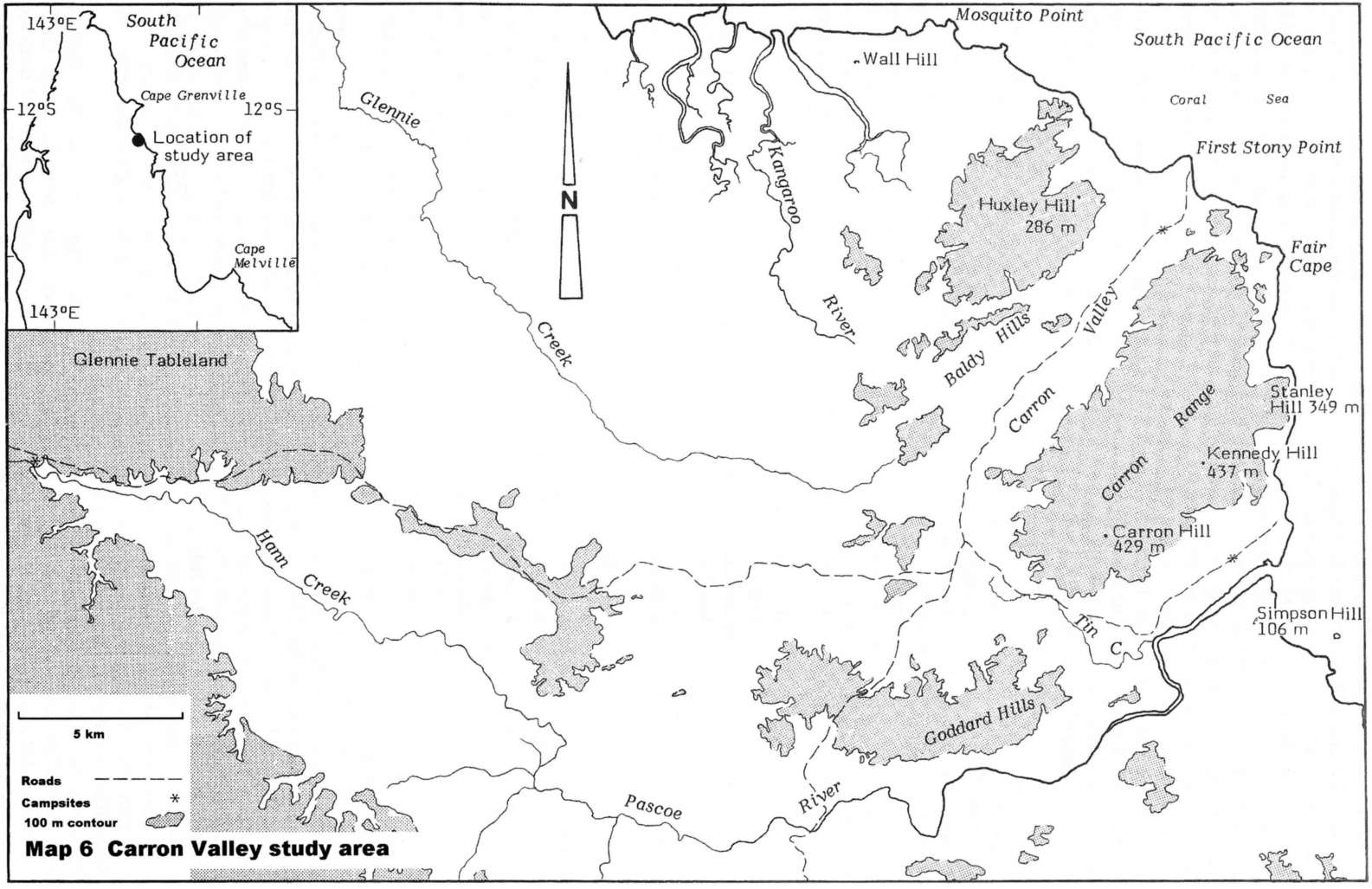
As with previous expeditions, I would again like to thank the Directors and Research Committee of the Australian Orchid Foundation for their support for this continuing orchid survey of Cape York Peninsula. Again thanks are due to the members of the expedition who helped make what was at times an arduous trip into a pleasant experience. Special thanks are due to Henry Wilson and his family whose accurate local knowledge and friendliness assisted the expedition.

INTRODUCTION

The study area

The Carron Range is a rugged range of low mountains lying to the north of the Pascoe River and to the south of Temple Bay on Cape York Peninsula. The study area included Carron Range, Carron Valley, the Valley of Hann Creek and part of Glennie Creek as shown on Map 6.

This area was selected for examination for two reasons. Firstly, it appeared on the aerial photographs to be a rugged area with small patches of rainforest interspersed between larger areas of heath, open forest and woodland. It included some areas of interest such as rockpiles north of the mouth of the Pascoe River and substantial



Map 6 Carron Valley study area

inland patches of rainforest on Hann Creek. Secondly the area had never been investigated before and it lies in a most strategic position. To the south is the Iron Range area which includes a wide diversity of orchids including several which are, in Australia, restricted to that area. To the north lies largely flat sandy country which carries far fewer species all of which are widespread. Clearly the boundary of the Iron Range orchid flora lies between the Pascoe River and the southern end of Temple Bay. One of the aims of the expedition described in the following pages was to determine where this boundary lay.

History

This study area, by and large, has not attracted a great deal of comment from early explorers. From the sea it offered little that was remarkable; it was an out of the way corner as far as the overland explorers were concerned; it had little to offer from a grazing point of view and, while scattered deposits of minerals such as tin occur, they have not been sufficient to provoke any major mining activity.

The first brief mention of the area is by Captain William Bligh while piloting the *Bounty's* launch after the mutiny. Bligh recorded that 'the coast we passed was high and woody. As I could see no land beyond Fair Cape, I concluded the coast inclined to the N.W. and W.N.W.' (Bligh, 1792).

Edmund Kennedy in 1848 was in the area, crossing the Pascoe somewhere near the mouth and skirting the western edge of the high country in the vicinity of Hann Creek. Robert Logan Jack (1921) was of the opinion that Carron and his party were left on the south eastern part of the Carron Range, but later evidence Beale (1962) shows that this was not the case and that Carron was in fact left at Little Roundback Hill south of the Pascoe River.

Jack himself led a Cape York exploring expedition through this area in 1880 and he also passed to the west of the main ranges. Jack named the sandstone ranges of the Glennie Tableland the Sir William Thompson Range and then, on February 15th, named the ranges north of the Pascoe the Carron Range. The names Carron Hill, Kennedy Hill, Stanley Hill, Huxley Hill and Wall Hill were all named during the marine surveys of HMS *Paluma* in 1880. All commemorate people associated with the Kennedy expedition. The Pascoe River was named in honour of Lieutenant Pascoe who was in charge of marines at Somerset on the tip of Cape York Peninsula.

According to Jack the first reference to mining activity in the area is in letters from John Dickie who found tin north of the Pascoe and reported that in 1887 a party of men were 'working tin six miles from the mouth of the Pascoe River'. Dickie also found tin and wolfram in a range of bald hills - possibly those now known as Baldy Hills - nearer the coast. According to Dickie there was 'payable tin from the roots downwards', but lack of water prevented working it. (Water was no more abundant in 1983 as the AOF party found to its disappointment.) Since those early days tin has been mined intermittently at Tin Creek (a tributary of the Pascoe) and near First Stony Point. The ore was originally transported along a pack track to the mouth of the Pascoe. Broken Hill Pty Ltd investigated these deposits in 1962 but considered them uneconomic. Some very small-scale mining continues to this day.

Botanical history

Unlike the previous study areas at Iron Range and the McIlwraith Range there is no recorded botanical history for this area. There are no records of plants being collected from the Carron Range, although, no doubt, some scattered collections have been made.

The study area today

The study area lies largely in two pastoral holdings - Bromley and Boynton with part of the southern catchment of Hann Creek being in Special Lease 35815. Bromley is a large holding with an area of 1590 sq km, but only relatively small areas are suitable for cattle. Boynton is smaller (90.6 sq km) and is entirely within the boundary of Bromley. Boynton has very little useful grazing country. There are two mining leases in the area and some tin is mined each year, but this is on a small scale. As well as this, a house is being built on a small lease near the mouth of the Pascoe and some grazing is being carried out centred on Wattle Hill on S.L. 35815 on the Pascoe. Thus the total population of the area is about 12 people widely scattered over very rough roads.

Access is by way of two roads. The most recently made runs east from Moreton to Carron Valley and the Pascoe River. It is a well used bush track in reasonable condition. The other road runs north from the Portland Roads, road branching off near Brown Creek. This is an extremely rough road with some very rough sections and some difficult creek crossings. Other local roads run to Stony Point and the mouth of the Pascoe. All roads are closed between about December and June.

By and large the area shows little signs of human activity away from the roads. Cattle and pigs are reasonably common and there are some local infestations of weeds on Baldy Hills. However, in common with most of Cape York

Peninsula, the study area is a wilderness still in a largely undisturbed state.

THE ENVIRONMENT

Physiography

The mountainous eastern part of the study area makes up the northern extension of the Janet Ranges mountain block (Willmott et al., 1973). This area is made up of rugged, dissected and well weathered low mountains. The parent rocks are acid volcanics and the resulting soil is very poor and, over much of the area, shallow. The highest peaks are Huxley Hill (286 m), Kennedy Hill (437 m), Carron Hill (429 m), Stanley Hill (349 m). There are two main blocks separated by the valley of the upper reaches of the Kangaroo River. This valley is known locally as Carron Valley.

To the west of the Janet Ranges mountain block lies a wide lowland area termed the Olive-Pascoe lowlands by Willmott and Powell (1977). This area has an average elevation between 50 and 100 m. West of this again lies the Glennie Tableland block, a northern extension of the Sir William Thompson Range. This is a sandstone plateau with an average altitude of about 200 m and a few peaks on the eastern escarpment of 300 m. The road follows the valley of Hann Creek where the average altitude is about 100 m. The sandstones provide a year round water-source for various permanent streams. As with most sandstone areas, the escarpment and creek valleys are deeply dissected and often provide small sheltered pockets.

The major watercourse is the Pascoe River which is a large perennial stream. Other substantial streams are Hann Creek, a major tributary of the Pascoe, Glennie Creek and the so-called Kangaroo River. Hann Creek is a major perennial stream which rises in the sandstones of the Glennie Tableland. The major heads of this creek are in large amphitheatres surrounded by steep sandstone cliffs. One such area visited was about one kilometre across and supported dense vine-choked rainforest.

In summary, the study area is a region of contrasts. The dissected, flat-topped sandstones of the Glennie Tableland contrast with the rounded bulk of the granites of the Carron Range, while the two areas are separated by the plains of the Olive-Pascoe lowlands.

Climate

Rainfall figures for most areas on Cape York Peninsula are sketchy. The study area lies between the 1200 and 1500mm isohyets. No recording stations are included in the study area but Moreton just to the west has an average of 1340 mm while Iron Range to the south averages 1980 mm and Bamaga to the north 1621 mm. Observations in the study area indicate that it is a considerably drier area than Iron Range, in fact it would appear to lie in the rain-shadow of the Tozer and Janet Ranges. This probably makes little difference to the wet season rainfall between January and April, but it may well serve to virtually eliminate the light, but important dry season showers which serve to maintain moisture and allow the development of rainforest. In this regard the region may well be more similar to inland parts of the Peninsula such as Moreton where the average rainfall for the period May to October totals only 61 mm. The average for the same six months at Iron Range is 268 mm.

Temperatures in the study area probably lie between those for Moreton and Iron Range which are given below.

Table 1: Average temperatures for Iron Range Airport and Moreton Telegraph Office (°C).

	January average maximum	January average minimum	July average maximum	July average minimum
Iron Range	**31.3**	**23.4**	**26.7**	**18.4**
Moreton	**33.0**	**23.2**	**29.4**	**17.1**

Vegetation

The study area is a mosaic of open forest, heath and small pockets of rainforest. Most of the area, with the possible exception of the southern slopes of the Carron Range, lies in a rain shadow and experiences a much more marked dry season than do the Iron Range and McIlwraith Range. When this is allied with poor soils, the result over much of the study area is a lack of closed forest communities.

Much of the mountainous area of the Carron Range has little soil at all being, in many places, almost bare rock and is subject to strong winds. A large area of rainforest occurs on the southern and eastern parts of the range, but on the evidence of those areas visited this area is not as species-rich as more southern areas such as the peaks of Tozer's Gap.

Other areas of closed forest occur on sand ridges near beaches and in sheltered gorges in the mountains. Further west, gullies in the sandstone of the Glennie Tableland support good rainforest, often with *Callitris* pines emergent. Gallery rainforests are also well-developed along major streams such as the Pascoe River and Hann Creek.

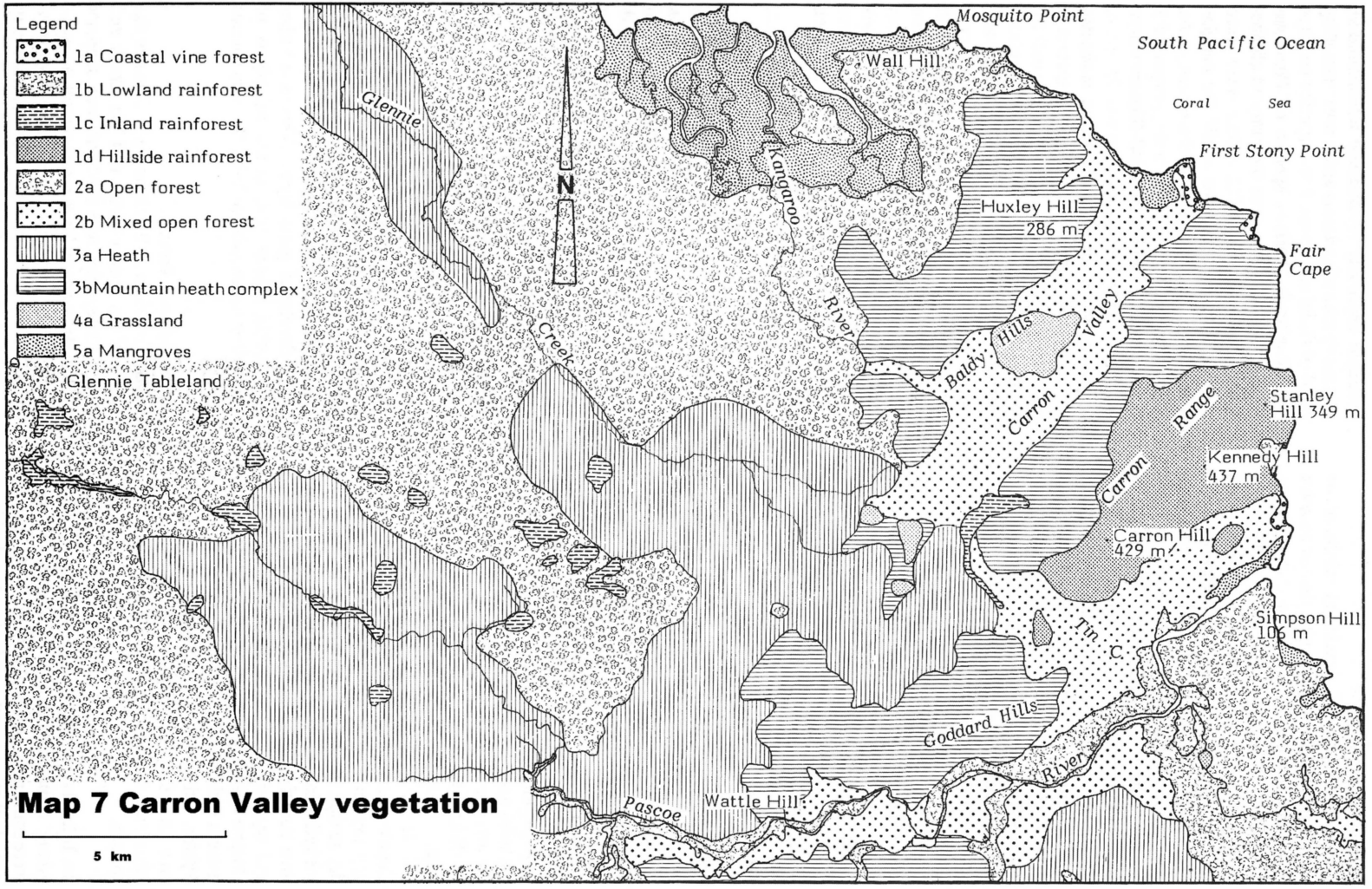
The lowland areas are dominated by mixtures of different kinds of open forest and heath with the heath occurring on the less well-drained soils. The open forests vary from quite simple forests dominated by *Eucalyptus tetrodonta* in the west to moister, more complex situations in the south near the mouth of the Pascoe River.

Mangroves occur in numerous small patches, but the largest concentration is at the mouth of the Kangaroo River.

The different forest types are shown on the accompanying map (Map 7) and are described briefly in the following notes. It should be noted that the map is based on rather sketchy data and should be used as a general guide to the disposition of the major types only. The types noted in the study area are listed below:

Table 2: Vegetation types noted in the study area.

Structural formation	Alliances
1. Closed forest	1a. Coastal vine forest 1b. Lowland rainforest 1c. Inland rainforest 1d. Hillside rainforest
2. Open forest	2a. *Eucalyptus tetrodonta* open forest 2b. Mixed open forest
3. Heath	3a. Tall heath 3b. Mountain heath - forest complex
4. Grassland	4a. Grassland
5. Mangroves	5a. Mangroves and saltpans


Legend
1a Coastal vine forest
1b Lowland rainforest
1c Inland rainforest
1d Hillside rainforest
2a Open forest
2b Mixed open forest
3a Heath
3bMountain heath complex
4a Grassland
5a Mangroves
N
Glennie Tableland
Glennie
Creek
Kangaroo
River
Mosquito Point
Wall Hill
South Pacific Ocean
Coral Sea
First Stony Point
Huxley Hill
286 m
Fair Cape
Baldy Hills
Carron Valley
Carron Range
Stanley Hill 349 m
Kennedy Hill
437 m
Carron
Carron Hill
429 m
Simpson Hill
106 m
Tin C
Goddard Hills
River
Pascoe
Wattle Hill
Map 7 Carron Valley vegetation
5 km

1a. Coastal vine forest
This varies from well developed rainforest on sand dunes to a rather open vine thicket on more rocky and exposed hillsides of the Carron Range. *Eucalyptus tessellaris* is a common emergent of these areas, along with scattered *Ficus* species and various rainforest trees. On open exposed areas *Cochlospermum gillivraei* and *Brachychiton* species are prominent with their bare seasonally deciduous branches and colourful flowers. Vines are abundant in both types. Understorey shrubs such as *Gardenia* and *Randia* are also obvious. By and large these habitats were poor in orchids with *Dendrobium discolor* and *Chiloschista phyllorhiza* being the only abundant species. Quite surprising was the lack of the Cooktown orchid (*D. bigibbum*). The habitats look suitable but no plants were seen despite quite extensive searches. The coast of Temple Bay to the north is well-known for the large numbers of Cooktown orchids but it would seem that perhaps the rainfall is too high in the study area although the vegetation did not seem to agree with this theory.

1b. Lowland rainforest occurs in several localities in the study area. The major occurrence is along the Pascoe River. Here it is a well developed semi-deciduous mesophyll vine forest in the terminology of Webb (1959). Large species of the fig *Ficus nodosa* occur. Black bean (*Castanospermum australe*) is another abundant species. These habitats were not examined in detail on this trip, but had been investigated on a previous trip and are not rich in orchids. A few large plants of *Dendrobium bifalce* occur high in the trees and *Sarcochilus moorei* occurs in areas not affected by regular flooding.

Some rockpile areas occur in the study area. These are composed entirely of granite boulders with little or no soil. They occur on slopes exposed to the south and east and receive any rain that is about. Nevertheless during the dry season these are harsh and hot habitats. The rockpiles in the study area appeared appreciably drier than those previously visited at Tozer's Gap and supported a reduced variety of lithophytes. Despite this there were several interesting orchids present including *Vanda hindsii* and *Dendrobium bifalce*. Other plants of interest in the rockpile area include *Schefflera versteegii*, *Scindapsis altissimus*, *Caryota rumphiana* and several *Hoya* species.

1c. Inland rainforest
Along Hann Creek on the Glennie Tableland were some good stands of gallery forest. This was notophyll vine forest and lacked the deciduous element of the Pascoe River forests. Palms were abundant especially *Hydriastete wendlandiana*, various species of *Calamus* and a most interesting stand of *Gulubia costata*, a rare species on Cape York Peninsula. Various species of *Pandanus* were also abundant as was the rampant climber *Freycinetia percostata*. The creeks were lined with *Tristaniopsis exiliflora*, while the margins were lined with *Welchiodendron longivalve* (previously known as *Tristania longivalvis*). Other common species included *Blepharocarya involucrigera* and *Syzygium fibrosum*. In one or two areas the large herb *Hanguana malayana* occurred. This common New Guinea species is rare in Australia and this is the most southern record. Vines were very abundant and in places this vegetation type was difficult to penetrate. Related patches of notophyll vine forest occurred away from Hann Creek, usually relatively small discrete areas less than a few hectares. These areas generally were similar to the gallery forests but lacked the palms. Cypress pine (*Callitris columellaris*) was a prominent emergent in these areas, not uncommonly occurring along the creek banks as well.

1d. Hillside rainforest
This type of rainforest which probably fits Webb's notophyll vine forest, consists of a low, fairly open forest dominated by *Welchiodendron longivalve*. This occurs on hillsides exposed to the south or east where there is a reasonable depth of soil. Ridges between the rockpile areas support this type which is often windswept. The orchids present were not very diverse. *Dendrobium johannis* was perhaps the most interesting find.

2a. *Eucalyptus tetrodonta* open forest
This relatively tall open forest type is abundant in many parts of the Peninsula. It occurs on well-drained sandy or lateritic soils and is dominated by *Eucalyptus tetrodonta* and *E. nesophila*. There are occasional trees of Cooktown ironwood (*Erythrophleum chlorostachys*) and *Grevillea glauca* and there is a sparse shrub layer and a well-developed grass layer. This is a rather poor orchid habitat with occasional plants of *Cymbidium canaliculatum* being the only species seen.

2b. Mixed open forest
Substantial areas of this forest type occur in the valley of the Pascoe River and Tin Creek and Carron Valley, although the latter area supports a much drier phase. This forest occurs on well-drained soils on gently undulating topography. There are several layers and the structure may be quite complex. Common tree species are *Eucalyptus tessellaris*, *Lophostemon suaveolens*,

Melaleuca viridiflora, *Melaleuca* sp. aff. *symphyocarpa*. Shrub species include a selection of those found in the heath country. Watercourses are often lined with *Dillenia alata* and a few other plants of rainforest affinity. The orchids of this habitat are interesting, but not great in variety. Most notable is *Dendrobium carronii* while *D. johannis* and *D. semifuscum* also occur.

3a. Tall heath

Tall closed heath featuring *Grevillea pteridiifolia*, *Melaleuca viridiflora*, *Sinoga lysicephela*, *Melaleuca* sp. aff. *symphyocarpa*, *Acacia calyculata*, *Fenzlia obtusa*, *Neofabricia myrtifolia*, *Jacksonia scoparia* is typical of much of northern Cape York Peninsula and occurs on well-drained sandy soil on flat or gently undulating country. In the southern part of the study area, heath also occurs on the flat tops of sandstone plateaus. In swamp areas *Nepenthes mirabilis* becomes a very abundant species, along with various sedges and occasionally two terrestrial orchids *Dendrobium lobbii* and *Bromheadia venusta*. Apart from these, this is not a rich orchid habitat.

3b. Mountain heath – forest complex

The drier parts of the Carron Ranges support a mosaic of vegetation types adapted to poor, shallow soil and seasonally dry, wind swept conditions. In sheltered sites with a reasonable depth of soil, an open forest of species including *Eucalyptus tessellaris*, *E. polycarpa*, *Lophostemon suaveolens*, *Acacia* spp., and occasional semi-rainforest species such as *Deplanchea tetraphylla* occurs. On the considerable areas of bare rock a low almost closed canopy of an undescribed species of *Leptospermum* dominates, while the tops of the ridges and plateaus are covered with heath which varies in height from about 2 m in more sheltered sites to a low prostrate cover only a few centimetres tall in exposed wind swept sites. The same set of species occurs in both the tall and prostrate communities. This includes *Grevilea pteridiifolia*, *Melaleuca* sp. aff. *symphyocarpa*, *M. viridiflora*, *Sinoga lysicephala*, *Neofabricea myrtifolia* and *Fenzlia obtusa*. In a few moister and well protected gullies some small patches of rainforest occur. These are usually dominated by *Welchiodendrom longivalve*. These areas are well developed on the southern slopes of the Goddard Hills. The mountain areas generally were poor in orchids - even the small patches of rainforest which appeared suitable were found to be host to very few orchids. *Dendrobium discolor* was a notable exception, being quite abundant on suitable rocky outcrops.

4a. Grassland

Some substantial areas of open grassland occur, on hills in the Carron Valley area. The major occurrence is on Baldy Hills which were recorded as being bald as far back as 1887, showing that these balds do not occur as a result of the activity of European man. Baldy Hills supports one small discrete patch of rainforest and it would appear likely that the grassland is fire-maintained, in fact probably fire-induced. The grass is largely blady grass (*Imperata cylindrica* var. *major*) with a lot of recently-introduced weeds. The area was not investigated for orchids.

5a. Mangroves and saltpans

Extensive mangrove and saltpan areas occur at the mouth of the Kangaroo River. It was not possible to reach these but smaller occurrences at First Stony Point and on the Pascoe River were looked at briefly. Few orchids were seen.

METHODS

Preparation

Nothing has been published about the orchids or indeed about the botany of the study area. A careful study of aerial photographs of Cape York Peninsula indicated that the area between the Pascoe River and Temple Bay appeared to contain some good orchid habitat. The photographs for the area were then studied in some detail and likely habitats selected. Potentially good sites such as Carron Valley, the mouth of the Olive River and rockpiles near the mouth of the Pascoe were selected. The photographs used were the Cape Weymouth series, taken in 1957. These, although old, were very clear, the only thing lacking being roads which have been put in since that date. Details of roads were obtained by writing to local residents and also from the recently published 1:100,000 map series. Maps used were: Cap Weymouth, Temple Bay, Moreton and Batavia Downs. From this information a plan to look at all the interesting areas was drawn up. As it happened this plan had to be modified in the light of field experience later.

Field work

Base camps were established at three localities and several day trips which radiated from these were undertaken. In the field specimens were collected as live plants and as herbarium specimens. Notes were taken listing the orchids seen in various areas and recording details of the habitats. Rare and interesting species were photographed.

Laboratory work

Specimens were studied in the laboratory to confirm identifications. One specimen in particular which appeared to be a new record was studied in detail to check on its identity. The importance of live collections was emphasised when a plant collected as *Bulbophyllum gracillimum* flowered the following January and proved to be *B. longiflorum*. The two species are vegetatively similar and the initial identification was based on previous locality records. Thus live collections are important, particularly where fertile material is unavailable at the time of collection.

DIARY OF THE EXPEDITION

September 5 Party met in Atherton after purchasing stores etc.

September 6 Travel on Peninsula Development Road to Coen River just outside Coen. Here the party was joined by Mr. D. Wilson and by the Sydney Botanical Gardens vehicle with Ben Wallace, Peter Hind and Neville Howcroft.

September 7. The party travelled north to the Wenlock River crossing. Shortly before the Wenlock, a stop was made to examine a patch of *Dendrobium semifuscum*, this being the first occasion Dr. Cribb had seen this species in the wild. The road from the Moreton Telegraph station to Carron Valley was then taken. This road proved rough but trafficable. In the sandstone plateau of the Sir William Thompson Range, some interesting areas likely to contain orchids were noted for further study. These were mostly in the vicinity of Hann Creek. One such area was examined very briefly but the only orchids seen were *Dendrobium rigidum* and *Geodorum densiflorum*. From here the party pushed on to Henry Wilson's place at Carron Valley. Here it was learned that the road to Bolt Head (south of the mouth of the Olive) had not been completed. Due to this and to a possible shortage of fuel it was decided to abandon ideas of visiting this area. Camp was set up on a small creek not far from First Stony Point.

September 8 The party drove a few kilometres to First Stony Point. This road lead across some damp salt-pans. A preliminary survey of the surroundings convinced the party that the region was a great deal drier than it had appeared on the aerial photographs. Mangroves were examined first. The only orchids seen here were *Dendrobium discolor* and *D. semifuscum*. This latter species was also abundant in melaleucas near the mangroves and some large specimens were seen. The vine forest behind the beach had appeared to be a suitable habitat for Cooktown orchids, but none was found. *Chiloschista phyllorhiza*, a leafless species, was extremely abundant. *D. discolor* was also quite common.

At the southern end of the beach a small creek was followed up into the hills. At an altitude of about 100m a series of springs arising from boggy ground provided one of the few sources of fresh water seen in Carron Valley. In this area several plants of a *Spathoglottis* were seen. This was not flowering, but it appeared to be *S. paulinae*. *Dendrobium lobbii* was also present in full flower. *Nepenthes mirabilis*, the pitcher plant, was also a feature of this area. From here the party worked their way around the hillside to the beach. The dry open forest came right down to the water's edge and no orchids were seen on a short walk down the beach. On the way back to Stony Point a very large *Dendrobium* was collected. It was at first thought that it may be a natural hybrid, but on flowering later it was found to be a large form of *D. semifuscum*.

On returning to base camp the party walked west to examine a larger stream. *D. canaliculatum* was found to be abundant in the mixed open forest. The stream was followed up to where it became fresh and the hills to the west (Huxley Hill) were noted for the next day's work.

September 9 This day the party visited Huxley Hill. The track lay west to the foot of the range. Then there was a very steep climb of about 200 m. This climb was up a rainforest gully. Few orchids were seen in this gully with *D. discolor*, *D. rigidum*, *D. semifuscum* and possibly *D. johannis* near the top of the range. Again, as in other places in Carron Valley, it was apparent that the area was too dry to support many orchids. Extensive spectacular views were obtained from the top of the ridge, but these served only to confirm the inhospitable nature of the area. The summit ridges were covered with a very low windswept heath comprising prostrate forms of the common heath plants of the area. On top the only orchids seen were a few small plants of *D. semifuscum*. The return trip followed another gully which again was lacking in orchids.

September 10 Due to the generally unproductive nature of the area it was decided to return to Hann Creek on the road from Moreton where some interesting country had been noted. On the return journey N. Howcroft collected a flowering specimen of the recently described *Dendrobium carronii*. Many large plants of *D. semifuscum* were also noted in mixed forest between Carron Valley and Hann Creek. After setting up base camp on a tributary of Hann Creek on the Glennie Tableland, the party spent the afternoon exploring in the vicinity of the camp. Quite extensive patches of rainforest were found both upstream

and downstream from the campsite. Orchids were abundant although the variety was not great. Species seen included *Dendrobium smillieae*, *D. discolor*, *D. rigidum*, *Bulbophyllum baileyi*, *Pholidota pallida*, *Eria fitzalani*, *Acriopsis javanica* var. *nelsoniana*, *Malaxis latifolia*, *Pomatocalpa macphersonii* and *Luisia teretifolia*. The creek was lined with ferns, palms and pitcher plants and also a patch of *Hanguana malayana* the most southerly record of this New Guinea species. Freycinetias, pandans and climbing palms were also abundant. The creek, which rises in the sandstone tableland provided a good, clear, fast flowing source of water.

The country surrounding the creek was open forest dominated by *Eucalyptus tetrodonta* along with a species of bloodwood and *Lophostemon suaveolens* in moister situations. Even the open-forest trees near the creek were covered with epiphytes such as *Dendrobium smillieae* and *Myrmecodia* species (ant plants). The area generally gave the impression of being much moister than Carron Valley, although this may be largely due to the presence of permanent water.

September 11 The party drove back along the road a few kilometres to a place where the main stream of Hann Creek was close to the road. The gallery rainforest was visited and the same species of orchids were recorded as on the previous day. A possible new species of *Pandanus* was collected here. The party then moved further down the road and walked to an isolated patch of rainforest which had been located by use of the aerial photographs. This patch was about one kilometre long and half a kilometre wide. It had a relatively low canopy with a large number of cypress pine (*Callitris columellaris*) emergents. In a few areas some eucalypts were also present in the rainforest, which had a fairly open lower storey with a moderate number of vines. This rainforest was rather poor in orchids but the following were recorded: *Dendrobium stuartii*, *D. smillieae*, *D. rigidum*, *Bulbophyllum baileyi*, *Cymbidium madidum*, *Chiloschista phyllorhiza* and *Pholidota pallida*. From here the party walked to Hann Creek through an extensive area of recently-burned heath. The gallery forest again was found to support many orchids, with *Diplocaulobium glabrum*, *Dendrobium carronii* and *D. johannis* being new records for the area. On a small tributary of Hann Creek a large plant of *D. bifalce* was seen. Three species of *Dischidia*, one or two of *Myrmecodia* and one of *Hydnophytum* were seen.

September 12 The party walked up the tributary of Hann Creek to a large area of rainforest in an amphitheatre of sandstone cliffs. This area, which was swampy underfoot, is one of the major heads of Hann Creek. The area of rainforest is about one kilometre in diameter and is very dense, being virtually impenetrable in places due to lawyer vine (*Calamus* spp.), *Freycinetia* spp. and other vines. A prominent feature was some fine specimens of *Gulubia costata*, a rare palm. In this swamp Dave Jones and Bruce Gray made some most interesting fern records, including a new tree fern for Australia and some specimens of the rare tree fern *Cyathea felina*. The small terrestrial *Zeuxine oblonga* was also seen in this area.

The edge of the sandstone cliffs proved a most prolific orchid habitat, although the variety was not high. Species seen were: *Dendrobium smillieae*, *Pholidota pallida*, *Bulbophyllum baileyii* and *Eria fitzalani*. The edge of this rainforest was ringed with trees of *Welchiodendrom longivalve* which, in this situation, was an excellent epiphyte host. As these trees were growing somewhat down the slope, the topmost branches were at eye level to observers on the cliff tops. Hence it was possible to see small plants of *D. carronii* which would otherwise have been inconspicuous. This species proved quite abundant, growing almost exclusively on these trees, and was in full flower.

On reaching camp about midday it was decided to move on to the mouth of the Pascoe River. Camp was struck and the party drove to the Pascoe River area. Several stops were made along the way and more plants of *D. carronii* were seen mostly growing on *Lophostemon suaveolens* in open forest. A new camp was eventually set up on a small creek near the mouth of the Pascoe River.

September 13 The party set out early for a rockpile area a little to the north of the mouth of the Pascoe River. The route taken skirted a melaleuca swamp, then across a low range of hills and on to the beach. A rocky area provided some problems to negotiate, then more beach was encountered. Along this second beach a 3 m crocodile was seen in the surf about 20 m offshore. The vegetation on the hills again was largely vine thicket apparently suitable for Cooktown orchids, but the only orchids seen were a few plants of *Dendrobium discolor*. A small creek was followed up to the foot of the rockpile then a forested ridge was followed for a short distance. The forest here was largely composed of *Welchiodendrorn longivalve* and plants of *Dendrobium johannis* were quite abundant. Other species seen here included *D. teretifolium*, *D. bifalce* and *Geodorum densiflorum*. The rockpile was soon encountered and proved very rugged going. It was apparent that these rockpiles were drier than those at Tozer's Gap and the variety of plants was lower. The following orchids were

seen: *D. bifalce* (very abundant), *D. teretifolium*, *D. discolor*, *Pholidota pallida*, *Bulbophyllum baileyi*, *Vanda hindsii* (only one large clump seen). Other plants seen included *Hoya macgillivrayi*, *Hoya* sp. aff. *poolei* [now known to be *Hoya anulata*], *Hoya* sp. aff. *rubida* [now known to be *H. sussuela*], *Hoya nicholsoniae*, *Schefflera versteegii*, *S. actinophylla*, *Scindapsis altissimus*, *Fagraea gracilipes*, and two unusual palms - *Caryota rumphiana* and *Arenga australasica*. Ferns were almost totally absent as were many orchid species. The party then returned after what proved the most strenuous day on the trip.

September 14 This day was spent exploring in the vicinity of the camp. The vegetation was quite moist open forest with patches of rainforest and swamp forest in depressions and along creeks. The hills which were the foothills of Kennedy Hill, were covered in a closed forest dominated by *Welchiodendron longivalve*. *Dendrobium carronii* was seen growing on *Lophostemon suaveolens* on the edge of a swamp. *D. johannis* was abundant occurring on *L. suaveolens* in open forest and on *Welchiodendron longivalve* in closed forest. *D. semifuscum* was also present in open forest localities, growing on melaleuca trees. A large patch of *Apostasia wallichii* was found in lowland rainforest just upstream from the campsite.

September 15 The party broke camp and headed for Brown Creek via Wattle Hills. Some light rain fell in the morning - the only rain seen during the trip. The road initially passed through quite moist country in which a few orchids were seen mostly in *Dillenia alata* and other scrubby trees along watercourses. Species seen included *Dendrobium smillieae*, *D. semifuscum* and *Eria fitzalani*. The road over the western end of Goddard Hills proved very rough and slow. The Pascoe River crossing was difficult and most vehicles had to use the winch. Beyond the Pascoe the road passed through heath and tea-tree woodland and featured some extensive views. Camp was finally set up on Brown Creek. At this point the Sydney Botanical Gardens vehicle departed taking Ben Wallace, Peter Hind and Neville Howcroft.

In the few hours of daylight remaining the party went to look at the well-known swamp near Brown Creek. On the way there a most exciting find was made by Phil Cribb. This was a new *Habenaria* species, related to *H. dryadum* from New Guinea. Subsequent research has shown this to be an undescribed species. [Subsequently named *H. macraithii* in honour of Gerald McCraith – see Appendix 2.] The plants stood 60 cm tall and had an inflorescent of about 20-30 greenish flowers each about 3 cm long. Several plants were seen, some in full flower, but most finished. The species appeared most closely related to *H. hymenophylla* among the Australian species. During the excitement of this discovery Dr. Cribb received a painful sting from a stinging tree and despite the application of a so-called cure, was in pain for several hours. Growing nearby in deep alluvial soil was *Apostosia wallichi*. The swamp had been investigated on a previous AOF trip but was looked at again. Numerous plants of *Dendrobium lobbii* and *Bromheadia venusta* were seen. Some plants of *Spathoglottis* were also seen on the margin of the swamp.

September 16 As Dave Jones wanted to look for a rare fern and as it looked like a good orchid habitat, it was decided to investigate a rain-forest gulley on one of the hills near Tozer's Gap. Phil Cribb and Dave Wilson departed and the remainder of the party set out. It was immediately apparent that this was a far more prolific orchid habitat than any other seen previously on the trip. The creek itself was moderately rich, but when the party left the creek and climbed the ridge, the variety increased markedly. The highlight of the day was the discovery of numerous plants of *Liparis condylobulbon* which had previously been recorded only once in Australia, 150 km south in the McIlwraith Range. This species was abundant on the sheltered side of the ridge just below the summit at an altitude of about 300 m. This was the first occasion any of the party had seen this species in the wild in Australia. Another highlight on the ridge top and nearby on the sheltered slopes was *Bulbophyllum longiflorum* growing on rocks and on small trees. Previously this species was only known from a small area near Leo Creek in the McIlwraith Range area.

Phalaenopsis amabilis was recorded, both in the creek valley and on the exposed slope. Tassel ferns were abundant with several plants of *Lycopodium carinatum* being observed. Previously this species was not known to occur north of the McIlwraith Range. Other orchids recorded were: *Dendrobium luteocilium*, *D. tetragonum*, *D. ruppianum*, *D. smillieae*, *D. bifalce*, *Pholidota pallida*, *Eria inornata*, *E. fitzalani*, *E. dischorensis*, *Flickingeria comata*, *Thelasis carinata*, *Rhynchophreatia micrantha*, *Cymbidium madidum*, *Oberonia palmicola*, *Cadetia maideniana*, *Robiquetia wassellii*, *Micropera fasciculata*, *Pomatocalpa macphersonii*, *Sarcochilus moorei*, *Bulbophyllum baileyi*, *Corymborkis veratrifolia*, *Cheirostylis ovata* and *Apostasia wallichii*. This gave a total of 26 species seen during this trip equal to twice the number of species seen at any other location previously on the trip. The trip back to camp was long and hard. Camp was made in Tozer's Gap.

September 17 On this day it was decided to take things easily and recover from several hard days. Several fine plants of *Dendrobium carronii* were located near the camp. The party then broke camp and drove to Portland Roads with many stops along the way. One area which previously supported a fine colony of *Bromheadia venusta* was investigated. Pigs had completely removed the plants. In other swamps along the way plants of *B. venusta* were seen along with *Spathoglottis plicata*, *Dendrobium smillieae*, *D. semifuscum*, *Eria fitzalani*, *D. teretifolium*, *Bulbophyllum baileyi*. Lunch was at Portland Roads after visiting the Popes and the Holdsworths, local residents who have assisted on previous expeditions. Camp was again made at Brown Creek.

September 18 The party set out for Coen. The trip back was uneventful. Camp was made on the Moorehead River.

September 19 Drive back on good road. Arrive at Atherton in the mid afternoon.

September 20 Return to Townsville.

Other expeditions

While the author has not previously visited the study area, he did visit areas to the north and to the south during previous expeditions. The orchids seen on these trips have some bearing on interpreting the results of the present trip.

In 1972 the author visited the Iron Range area as part of a survey of areas under consideration as National Park. During this trip a foot traverse was conducted of the northern end of the Janet Ranges. Some interesting orchids were seen on the first day which was on the southern part of Dorriwill Ridge. The orchids there are, in fact, similar to those of the high ridges of Tozer's Gap. Few, if any, of the rarer orchids were seen in the northern part of the area which was covered by areas of heath near Nelson Creek and lowland rainforest on Cassowary Creek.

Another NPWS expedition was mounted to the Olive River area to the north of the study area in 1974. The author was dropped by helicopter on the Olive and walked through to the mouth. On this trip the following were noted: *Dendrobium semjfuscum*, *D. discolor*, *D. bigibbum*, *D. rigidum*, *D.* x *superbiens*, *D. canaliculatum*. These, along with one or two others such as *Chiloschista phyllorhiza* and *Luisia teretifolia*, make up the basic lowland seasonal compliment of orchids for Cape York Peninsula.

The results of these expeditions show that somewhere between Tozer's Gap and Temple Bay is the northern boundary for the rich Iron Range-McIlwraith Range orchid flora, perhaps just south of the Pascoe River.

DISCUSSION

The significance of the study area

Only 25 species of orchid were recorded in the study area after several days of concentrated searching. When this is compared with the 26 species seen in the space of a few hours at Tozer's Gap, the relative paucity of the orchids of the area can be seen.

The Carron Range physiognomically represents a northern extension of the Iron Range area. However, judging by the vegetation, the area has a somewhat lower rainfall than much of the region to the south. The Carron Valley itself is quite clearly in a rain shadow and the flora reflects this. The hills near the mouth of the Pascoe and the rockpile area in particular, also appeared to be somewhat drier than equivalent areas at Tozer's Gap. It is not immediately obvious why this should be so, but the variety of species of orchid was considerably lower in the study area. The upper slopes of Carron Hill and Kennedy Hill were not investigated, and it is conceivable that moister communities with more orchids may occur there. However the lower slopes certainly showed no evidence of this. Of the set of species restricted to the Iron Range - McIlwraith Range area only one was seen in the study area. This was *Vanda hindsii*, but only one plant was seen. Clearly the Iron Range orchid flora could not be considered to occur to any extent in the study area, and the northern boundary should be considered to be the Pascoe River.

The most interesting area proved to be one which had been overlooked initially. This was the Hann Creek area. The sandstone cliffs provided a reservoir for year-round streams and associated gallery forest. However the vegetation appeared considerably moister than some other areas such as Carron Valley. Open forest trees near Hann Creek carried many epiphytes such as orchids and ant plants. Although only moderately rich in orchids, this area was found to be very interesting from other botanical viewpoints. The large area of rainforest at the head of Hann Creek was very moist underfoot, being a true swamp forest in all regards. Plants such as *Gulubia costata*, *Freycinetia percostata*, *Cyathea felina*, to name only a few, are species of wet areas and form an intriguing contrast with the hot and very dry surrounding sandstone country. According to the aerial photographs, there are many such areas tucked away in the low ranges of the Glennie Tableland.

These small patches of rainforest are significant in that they form part of an almost continuous corridor of moist rainforest environments stretching from Cape York to the lower end of the McIlwraith Range.

The orchids of Cape York Peninsula

The results of this expedition have reinforced ideas on the different 'sets' of orchids present on the Peninsula. There would appear to be three discrete 'sets'. These are:

1. Iron Range - McIlwraith Range set
2. Moister lowlands set
3. Drier lowlands set.

1. Iron Range - McIlwraith Range set

These occur in an area of relatively high rainfall with a small, but significant, winter component. They are plants of the rainforests and mountains. Within this set are some endemic species (e.g. *Dendrobium wassellii*, *Pteroceras hirticalcar*) some species which also occur in New Guinea (e.g. *D. antennatum*, *Vanda hindsii*), some which also occur to the south in Australia (e.g. *D. ruppianum*, *Plectorrhiza brevilabris*) and some from both northern and southern areas (e.g. *Phalaenopsis amabilis*, *D. nindii*). A total of 98 species has been recorded from the Iron Range – McIlwraith Range area, by far the richest orchid flora on the Peninsula, but of these only about 60 could be regarded as belonging to this set exclusively. The others are more widespread or belong to the other sets. The high rainfall and rough topography of this area combine to provide a variety of niches not equalled elsewhere on the Peninsula. This area would certainly have been a refuge in times of past harsh climate. These factors explain the variety of orchids present.

2. Moister lowlands set

These species are widespread on the east coast of the Peninsula and in the extreme north. They occur in small patches of rainforest on sand near the Jardine and Olive Rivers and in gallery forest along the Jardine, Wenlock, Archer and other streams. They are also in the Bamaga rainforests. By and large the habitats these orchids occupy are not as wet as those of the Iron Range and McIlwraith Range, nor is the variety of habitats as high. Some 25 species occur in this set, many being widespread species in areas outside Cape York Peninsula. Species typical of this set include: *Dendrobium stuartii*, *D. carronii*, *D. smillieae*, *D. bifalce*, *Eria fitzalani*. The orchids encountered along Hann Creek are typical of this set.

3. Drier lowlands set

A group of four or five species - *Dendrobium canaliculatum*, *D. semifuscum*, *D. bigibbum*, *Cymbidium canaliculatum* and perhaps *Luisia teretifolia*. These are plants of seasonally very dry areas often growing in open forests or woodlands in extreme heat - a very harsh habitat which covers the bulk of the Peninsula.

The study area then has elements of all three sets, although set 1 is poorly represented. Basically most of the orchids fall into set 2 with some of set 3 occurring in the drier lowland forests to the west of the ranges.

CONCLUSION

The results for the Carron Range area were somewhat disappointing. Some interesting records were achieved in the Hann Creek area, but the highlights of the trip were the new species of *Habenaria* at Brown Creek and the rediscovery of *Bulbophyllum longiflorum* and *Liparis condylobulbon* at Tozer's Gap, well north of previous sightings.

These results pointed out that perhaps there are still more orchids to be found at Iron Range and the McIlwraith Range in areas like the southern part of the Janet Range or at Mt. Carter. The likelihood of finding "new" orchids north of the Pascoe is not high with the possible exception of terrestrial species or tiny epiphytes such as *Taeniophyllum* species. However some knowledge of distribution is missing - particularly concerning the Cooktown orchid which is reputed to be abundant in the area north of Carron Range.

KEY for Appendix 1
Orchids of the Carron Range and Hann Creek Area

Locality

H Hann Creek

P Mouth of Pascoe River

R Rockpile

C Carron Valley

Habitat

1a Coastal vine forest

1b Lowland rainforest

1c Inland rainforest

1d Hillside rainforest

2a *Eucalyptus tetrodonta* open forest

2b Mixed open forest

3a Tall heath

3b Mountain heath - forest complex

4a Grassland

5a Mangroves

Abundance

A Abundant in the appropriate habitat

R Restricted

U Widespread, but uncommon

APPENDIX 1:
Orchids of the Carron Range and Hann Creek Area

NAME	LOCALITY	HABITAT	ABUNDANCE
Acriopsis javanica	H	1c	R
Apostasia wallichii	P	1b	U
Bulbophyllum baileyi	H, R	1b, 1c	A
Chiloschista phyllorhiza	C	1a, 1d	A
Cymbidium madidum	H	1c	R
Dendrobium bifalce	H, R	1b, 1c	A
D. canaliculatum	C	2b	A
D. carronii	H, P	1c, 2b	U
D. discolor	H, C, P, R	1a, 1b, 1c, 5a	A
D. johannis	C, P	1d, 2b	A
D. lobbii	C	3b	R
D. rigidum	H, C, P	1b, 1c, 1d, 5a	A
D. semifuscum	H, P	2b, 5a	A
D. smillieae	H, P	1b, 1c	A
D. stuartii	H	1c	R
D. teretifolium	R	1b	R
Diplocaulobium glabrum	H	1c	R
Eria fitzalani	H, P	1c, 2b	A
Geodorum densiflorum	H, P	1c, 1d	R
Luisia teretifolia	H	1c, 1d	R
Pholidota pallida	H, R	1c, 1c	U
Pomatocalpa macphersonii	H	1c	R
Spathoglottis plicata	C	3b	R
Vanda hindsii	R	1b	R
Zeuxine oblonga	H	1c	R

APPENDIX 2

Habenaria macraithii.

A new species from Cape York Peninsula
[Subsequently published in *The Orchadian* Vol 7(12):278-9, 1984]

Erect terrestrial herb, glabrous, 50-60 cm tall. Tubers approximately cylindrical 2-3 x 0.5 - 0.8 cm; roots thick and fleshy. Stem with 4-5 sheathing bracts at the base, 7-11 well-spaced leaves and 3 sheathing bracts above the leaves. Leaves lanceolate, sheathing, acuminate, thin in texture, up to 12 x 2.4 cm, with 3 prominent veins. Inflorescence many-flowered, dense, the rachis about 10 cm long, floral bracts 2.8 x 0.6 cm, attenuate-acuminate. Ovary 2-2.5 cm long, fusiform. Flowers green in all parts spreading, erect. Dorsal sepal 1.3 x 0.8 cm, cuculate, ovate, acute. Lateral sepals 1.3 x 0.4 cm ± deflexed, oblique, ovate-lanceolate, acute. Petals bipartite; posterior lobe erect 16 x 1.5 mm. linear, curved, with a small but distinct auricle at the base on the posterior margin; anterior lobe spreading, curved, filiform 20 x 0.5 mm. Labellum deeply tripartite; the lateral lobes 22 mm long, filiform; the mid lobe 18 mm long, narrow-linear, slightly thicker than the lateral lobes; spur about equal in length to the ovary, cylindrical, slightly dilated a little below the middle, about 22 x 1.5 mm. Anther about 2 mm high; anther cells not widely separated; anther canals about 2 mm long. Staminodes (auricles) large, approximately globular about 2 x 1 mm. Pollinia shorter than the caudicles; retinaculum large, almost globular. Stigmatophores slightly shorter than the anther canals, obtuse.

TYPUS: Cook District: Cape York Peninsula. Brown Creek near the crossing of the Portland Roads road. 12° 15' S; 1142°5' E, September 1983 AOF 58 (BRI, holotypus)

HABITAT: To date this species has been recorded only at the type locality given above, where it was growing in deep alluvial soil rich in organic matter on the upper levee bank of Brown Creek. The vegetation type at this locality is a tall closed gallery forest with a fairly open understorey and a deep leaf litter. It is an area which would be reached only by the higher floods. *Apostosia wallichii* was also growing in the same area.

NOTES: This species is quite closely related to two New Guinea species *H. dryadum* Schltr. (syn. *H. epiphylla* Schltr.) and *H. dracaenifolia* Schltr. Schlechter (1905) describes both these species as having a rosette, while *H. macraithii* has widely spaced leaves. There are also differences in the flowers, notably in the posterior lobe of the petal which has a prominent auricle in *H. macraithii* and in the stigmatophores which, in this species are shorter than the anther canals, while they are longer in *H. dryadum* and about the same in *H. dracaenifolia*. The staminodes in *H. macraithii* also appear to be considerably larger than in either of the other species. Given the differences which have been regarded diagnostic in this genus, this taxon would appear specifically different to its New Guinea relatives.

Among Australian species it is closest to *H. hymenophylla* Schltr., but may be readily distinguished by the larger size and by numerous floral characters, notably the petals which feature an anterior lobe slightly longer than the posterior in *H. macraithii* and an anterior lobe which is much shorter than the posterior in *H. hymenophylla.*

The flowering time for *H. macraithii* appears to be late autumn and winter. Plants collected in late September had almost finished flowering. This species has been named in honour of Gerald McCraith, Chairman of Directors of the Australian Orchid Foundation who has done much to facilitate the study of Australian Orchids.

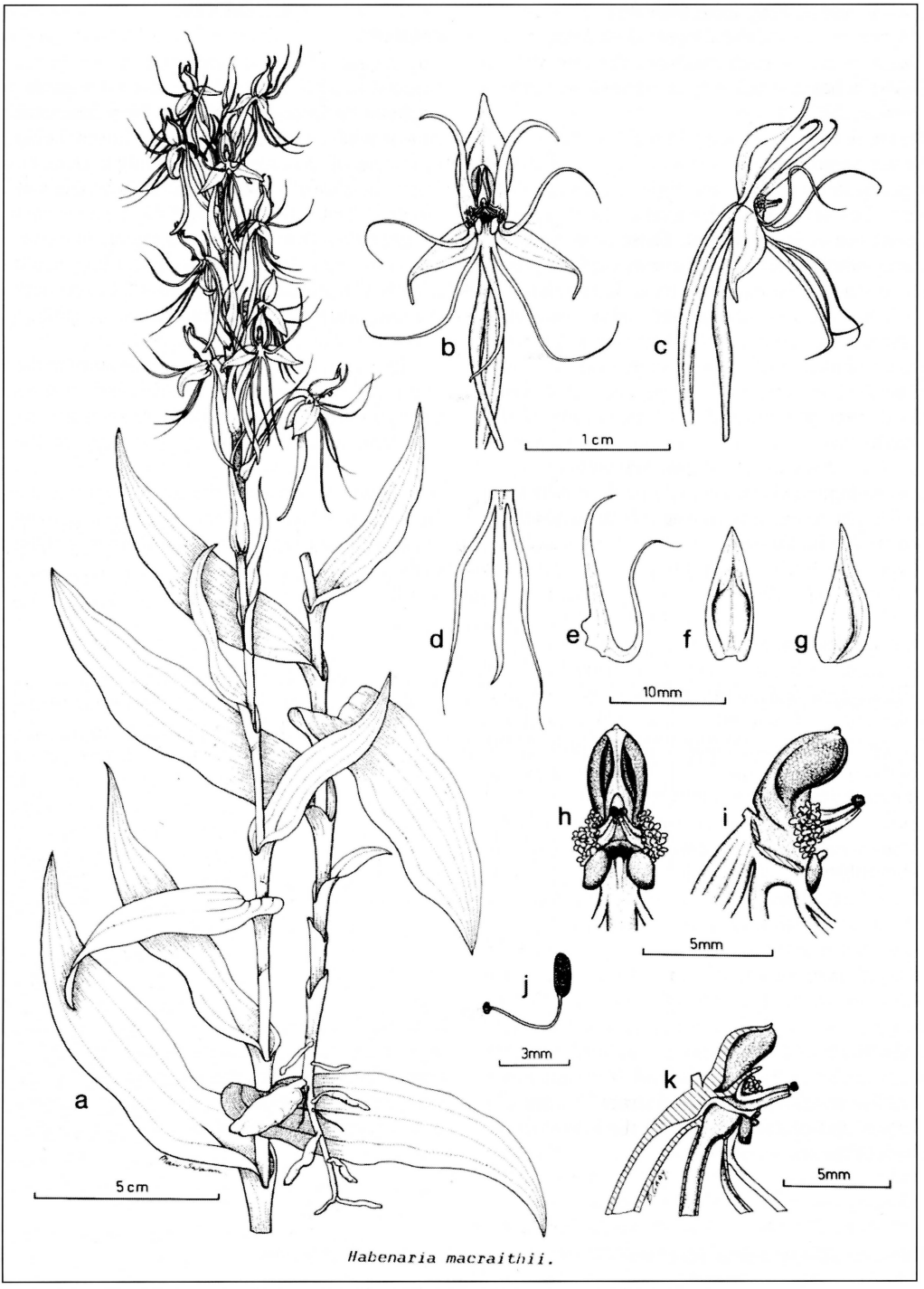


Fig 1: ***Habenaria macraithii***

APPENDIX 3

Report for The Royal Botanic Gardens, Kew on the AOF expedition to the Carron Valley and Pascoe River areas of Cape York, Australia
5-18 September, 1983

by Dr. P.J. Cribb

1. Aims

To study the orchid flora of the little known region of Cape York to the north of the Iron Range. Also to make general collections of other plant groups of interest, notably ferns and Lentibulariaceae. Dr. P.S. Lavarack, of the National Parks and Wildlife Service, was also looking at the area with a view to its possible inclusion in a national park.

2. Background

This expedition is the latest of several made to the Cape York Peninsula under the auspices of the Australian Orchid Foundation. The primary aims of these expeditions have been to gain a better understanding of the orchid flora of the region.

Cape York is of the greatest interest to botanists as its flora comprises elements of that of Australia to the south and that of New Guinea. However, the wild areas of the Cape are under a growing threat from logging, mining and agriculture use and, nowadays, increasingly from tourism. This is particularly true of the coastal rain forest areas which are often prime targets for tourist resort developments. It is therefore of vital importance to study the flora of the Cape before it is further disturbed. The usefulness of orchids as a conservation tool emphasises the need for surveys such as the AOF ones to be made. The current expedition to the Carron Valley and adjacent areas extends northwards the series of surveys begun by Dr. P.S. Lavarack and others in the McIlwraith Ranges in the early 1970s.

3. Personnel.

Dr. P.S. Lavarack - leader; Mr. Bruce Grey CSIRO, Atherton; Rev. R. Collins of Atherton; Dr. B. Wallace and Mr. P. Hind of the Royal Botanic Gardens, Sydney; Mr. N. Howcroft, Dept. of Forestry, Bulolo, Papua New Guinea; Mr. D. Jones of Gold Coast, Queensland; Mr. D. Wilson, photographer, Townsville; and Dr. P.J. Cribb, Royal Botanic Gardens, Kew, Surrey, England.

4. Itinerary

September 5	Townsville to Atherton
September 6	Atherton to Coen
September 7	Coen to Carron Valley
September 8 - 9	Carron Valley
September 10	Carron Valley to Hann Creek
September 11-12	Hann Creek
September 13	Kennedy Hill
September 14	Pascoe River
September 15	Pascoe River to Brown Creek, Iron Range
September 16	Tozer's Gap to Coen
September 17	Coen to Atherton
September 18	Atherton to Townsville

5. Results

For convenience, I will consider the expedition results in three parts: firstly, the Carron Valley and Pascoe River areas; secondly the Hann Creek area; and, finally, the Brown Creek/Tozer's Gap area.

(a) Carron Valley and Pascoe River.

The range of hills and the intersecting valleys to the north of the entrance of the Pascoe River formed the primary area of interest for the expedition. On the seaward faces of the hills, and particularly in the gulleys, the relatively high rainfall maintains rainforest. The valleys, ridges and hill tops are generally drier and support open woodland scrub or heath vegetation. The river banks towards the sea and the estuaries frequently support good stands of mangrove.

Overall, the area was much drier than had been suspected from the aerial reconnaissance photography. Thus, in the Carron Valley itself, the only orchids seen at all frequently were *Dendrobium semifuscum*, *D. canaliculatum* and *D. rigidum*. In the mangroves and on rocky outcrops by the sea, *Dendrobium discolor* was also found although not at all commonly. Surprisingly, the Cooktown orchid, *D. bigibbum*, a common species of drier parts of the Cape, was not seen at all.

Ascents of some of the forested rocky gullies running down the fringing hills yielded a few more species including *Chiloschista phyllorhiza*, *Luisia teretifolia* and larger clumps of *Dendrobium discolor* in full flower. A marshy area of one creek also yielded the terrestrial *Spathoglottis plicata* and *Dendrobium lobbii*.

The ascent of Kennedy Hill from the beach just north of the Pascoe River proved more productive. The forest was much wetter here and

was interspersed with large rock piles covered in lithophytes such as *Hoya* and *Peperomia* species. Several orchids, although epiphytic in habit, were predominantly found growing on the rocks here. Notable amongst these were *Dendrobium discolor*, including a spectacular floriferous purplish flowered form, *D. smillieae* (rare), *D. bifalce*, *Vanda hindsii* (one very large colony), *Pholidota pallida* and *Bulbophyllum baileyi*. The forest contained several epiphytes - *Dendrobium johannis*, *D. teretifolium*, *D. rigidum*, *Luisia teretifolia* and *Chiloschista phyllorhiza*. The only terrestrial noted was *Geodorum densiflorum*.

From the more general botanical interest, the forest in the valley at the base of the rock piles yielded *Caryota rumphiana*, while, on the rock piles, 5 species of *Hoya* and *Mucuna gigantea* were seen. The beach at the foot of Kennedy Hill was littered with *Nautilus* shells and also provided the major event of the day when a 3m long crocodile was spotted a few metres out from the beach lazily gliding in the surf. The following day a dugong or sea-cow was also spotted grazing in the surf near the entrance of the Pascoe River. This animal is now threatened by over-hunting by aboriginals.

(b) The headwaters of Hann Creek.

On our way into the Carron Valley the 'road' had passed through the southern end of the Sir William Thompson Range. Around the headwaters of Hann Creek areas of rainforest had been noted, in particular, several patches dominated by tall *Callitris* trees.

The galley forest along Hann Creek contained some fine rainforest trees and several palms and *Pandanus* species. The commonest orchids here were *Dendrobium smillieae*, *Eria fitzalani*, *Bulbophyllum baileyi* and *Pholidota pallida*. Other species also recorded thereabouts included *Dendrobium rigidum*, *D. bifalce*, *D. discolor*, *Acriopsis javanica* var. *nelsoniana*, *Pomatocalpa macphersonii* and *Malaxis latifolia*. The commonest host trees were *Pandanus*. A transect of one of the *Callitris* thickets yielded few orchids but a few plants of *D. stuartii* and a single *Cymbidium madidum* were added to the list.

By far the most interesting area proved to be a dense rattan palm dominated swamp, the source of several streams at the headwaters of Hann Creek. These streams issue as springs from the base of sandstone cliffs atop of which was a plateau of some extent. The dominant palms in the swamp were *Archontophoenix alexandrae*, *Calamus australis*, *Hydriastele wendlandiana* and *Gulubia* sp. Few orchids were found in the swamp, but *Zeuxine oblonga* was added to the list. Along the fringes *Dendrobium smillieae*, *Bulbophyllum baileyi* and *Pholidota pallida* were present in some numbers. The major finds in the swamp were two tree ferns - the rare *Cyathea felina* and a slender unidentified *Cyathea*, undoubtedly new to Australia.

The sandstone rocks above the swamp held good colonies of *Bulbophyllum baileyi* and *Dendrobium smillieae*, the latter in full flower. The more openly wooded drier slopes of the plateau carried good colonies of flowering *Dendrobium carronii* growing on the trunks of *Tristania suaveolens*. *D. johannis* was also not uncommon in the area and one particularly large clump bearing several fruits was collected. It seems that *D. carronii* and *D. johannis* commonly grow in association. Conversely, in somewhat drier areas, the closely related *D. canaliculatum* and *D. semifuscum* grow together.

(c) Brown Creek/Tozer's Gap.

In many ways our short stay at Brown Creek proved one of the highlights of the expedition. In the course of stumbling into a stinging plant, I found a colony of a *Habenaria*, some plants still in flower. This species does not appear to have been recorded from Australia and may be an undescribed species. It was growing in deep shade in deep loam in a rainforest patch near the stream. Above the stream a swamp drains into the creek and the area is therefore probably wet for much of the year. David Jones also found a species of the climbing fern, *Lygodium*, new to Australia in the same patch. The swamp above the creek also warrants mention. It is wet even at this time of year and is rich in *Utriculara* (at least 5 species), *Drosera* (4 species including one undescribed one), *Nepenthes mirabilis* and three orchids. These are *Spathoglottis plicata*, *Bromheadia venusta* and *Dendrobium lobbii*, the last being in full flower.

In all 59 collections mainly of orchids were made including herbarium, spirit and living materials. The collections were made under AOF numbers.

6. Conclusion

The information gathered during the visits to the Carron Valley. Pascoe River and Hann Creek areas filled in vital gaps in our knowledge of the distribution of orchids on Cape York. Not only that but the discovery of several ferns new to Australia emphasised how much is still to be discovered of the natural history of the Cape. The sightings of the dugong and a dead spotted cuscus are also useful records, the latter filling in a gap in the records.

To my mind the plateau and swamps at the

headwaters of Hann Creek are a particularly interesting and important site not least because of the new tree fern discovered there. Consideration might well be given to their being included in a National Park. The discovery of a *Habenaria* new to Australia at Brown Creek again emphasises the need for more thorough biological exploration of Cape York. Brown Creek is a well known locality and camping spot and the *Habenaria* which grows to 75cm tall is a prominent plant not easily overlooked (one would think!).

Phillip Cribb
Royal Botanic Gardens, Kew.

APPENDIX 4:

Species recorded by RBG Sydney contingent (Ben Wallace & Peter Hind) on AOF excursion to Carron Valley district, Cape York Peninsula, September 1983

* Living specimen collected. † Pressed or pickled specimen collected.

First Stony Point area:	
* *Chiloschista phyllorhiza* BJW83213	Rocky Point, growing on *Pouteria* in swale DVT; some very dense stands on bases of larger branches and trunks.
Dendrobium discolor	Occasional in same community as above. Also on rocks, Huxley Hill. BJW83214.
Spathoglottis plicata	In hillside watercourse soak in *Eucalyptus* woodland.
Dendrobium lobbii	With *Nepenthes mirabilis* and preceding species.
Dendrobium semifuscum	Occasional on *Melaleuca* sp. near inlet.
Dendrobium rigidum	As for preceding species.
Hann Creek headwaters:	
* *Malaxis latifolia* BJW83225/ BJW83 228	Low epiphyte on tree stump in gallery SENVF. Several in SENVF in gorge soaks.
* *Pomatocalpa macphersonii* BJW83224	Common in gallery SEVF.
Dendrobium stuartii	In scrubby gallery SENVF, in leaf and with several well-grown fruit; several plants in lower zones.
Chiloschista phyllorhiza	Common in gallery SEVF.
Dendrobium johannis	Scattered plants in gallery SENVF. One seen on laurel in margin of SENVF.
Dendrobium carronii	Several plants seen on margins of gallery SENVF, some in flower.
Dendrobium rigidum	Occasional in SENVF patch, downstream area.
Luisa teretifolia	Two rather small plants seen in canopy zone in same place as preceding species.
† *Eria fitzalani*	Frequent in same area; in flower.

Coastal gully rockpile (granite) to near north of Pascoe River Mouth	
Dendrobium johannis	Occasional within DVT on eastern side of rockpile.
Dendrobium teretifolium	Occasional on trees and on rocks in DVT.
† *Dendrobium bifalce*	Occasional in DVT, one large specimen in flower.
* *Dendrobium discolor*	Frequent, on trees but particularly on rocks and often in flower. One 'blue' form collected (BJW83249) with purple-brown petals and dense inflorescence.
Dendrobium rigidum	Occasional in DVT.
Pholidota pallida	A few plants, some large, on rocks, in fruit.
Bulbophyllum baileyi	Occasional on both tree trunks & rocks.
Geodorum densiflorum	Occasional on rocks in soil pockets in DVT.
Vanda hindsii	One very large stand located on exposed rocks. Photographs taken; one individual in flower, others in fruit.

ORCHIDS OF THE CAPE YORK AND JARDINE RIVER AREAS
Report of the AOF expedition to Cape York Peninsula 9 – 18 February 1986, along with data from other visits to the area

ACKNOWLEDGEMENTS

The expedition owes a great deal to the generosity and help of Air Queensland who provided accommodation and transport free of charge at Cape York. Special thanks in this regard are due to Paul Phelan and his staff at the 'Top of Australia Wilderness Lodge' without whose help the expedition would have been very difficult.

Ivan and Rae Vella of Bamaga were also most helpful to the party members, going to some trouble to help make the expedition a success. Members of the expedition would also like to thank the Directors of the Australian Orchid Foundation for their support.

INTRODUCTION

The study area

The study area encompasses that part of Cape York Peninsula north of about 11° 30". S. This includes the catchment of the Jardine River and the area to the north. The orchids described in these pages were recorded on several trips notably one in February 1986 to the Bamaga area and one in 1973 for the National Parks Branch of the Queensland Forestry Department. Data were also obtained from other visits and from personal communications.

The region discussed in the following pages can be divided by a line running east west through the Jardine River mouth. The northern part has been visited frequently by botanists, starting with Joseph Banks at Possession Island in 1770, while the southern part was unknown botanically up to the 1970s. This study of the northern part of Cape York Peninsula completes the survey of Cape York Peninsula. A few small areas remain to be visited, particularly west coast areas in the wet season, but it is unlikely that many new species remain to be discovered or new distributional records made.

History

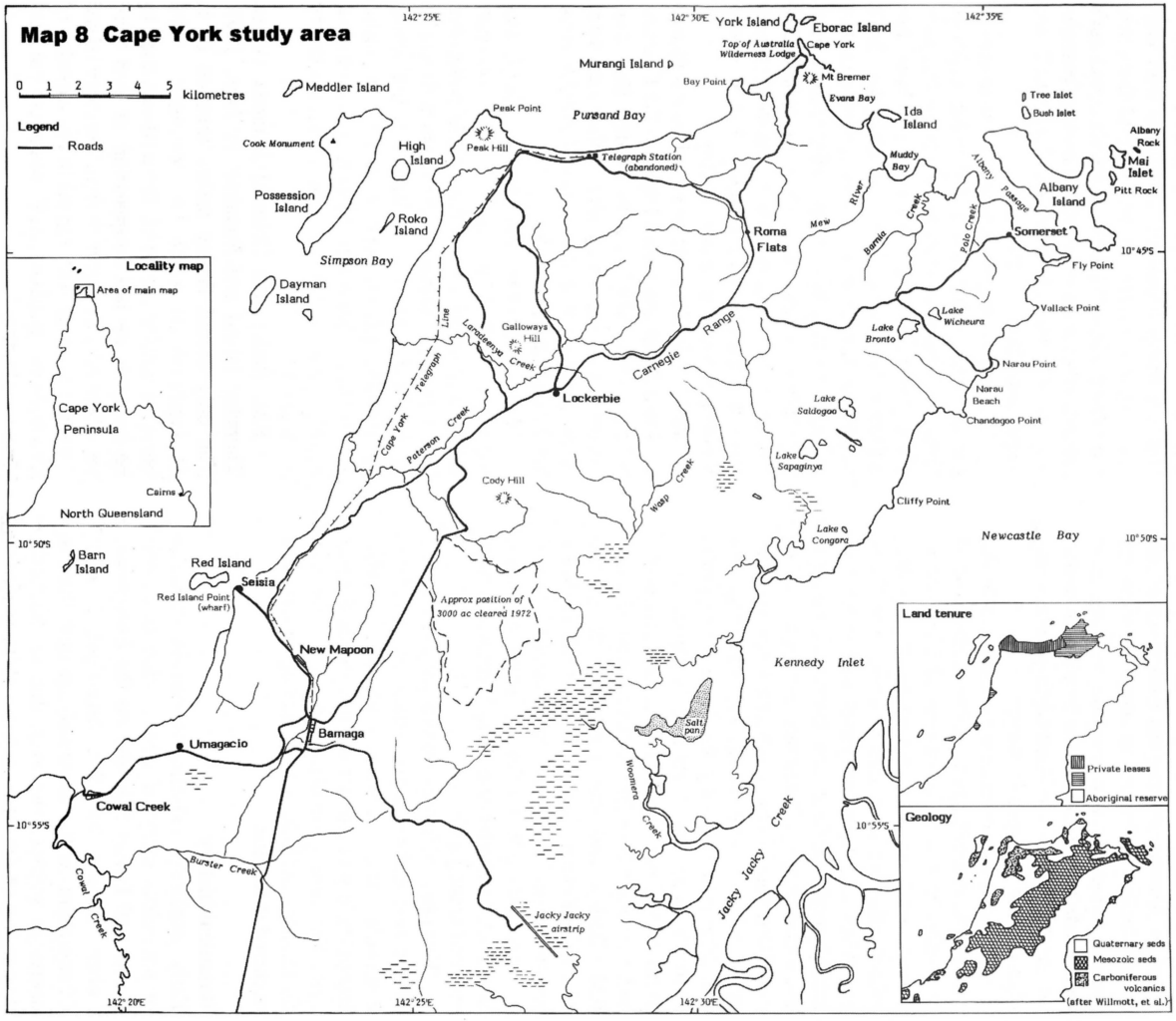
The area north of the Jardine is rich in European history. Some of the earliest European encounters with the Australian continent occurred in this area - probably more than are recorded in history books today. A good account of the early history of Cape York Peninsula is available in *Northmost Australia* (Jack 1920). Recorded history indicates that Willem Janz, Captain of the Dutch yacht *Duyfken* was the first to sight the Australian mainland sometime between January and April 1606. This land-fall occurred at the Pennefather River, a little to the south of the present study area. After a series of misadventures which included the loss of eight men to Aboriginal spears, Janz turned the *'Duyfken'* north sailing along the coast and probably landing on Prince of Wales Island.

Later in the same year Torres sailed through the strait which now bears his name and almost certainly saw the northern most coast of Australia. But was he the first through this strait? It now seems more than likely that the Portuguese and Spanish knew of the strait and presumably of the existence of the Australian continent before Torres. A Portuguese voyage under the command of Cristovao de Mendonca may have penetrated this area in about 1522 and could have mapped much of eastern Australia almost 250 years before Cook (McIntyre, 1977). We may never know the full story, but historians now say is possible, even probable, the Spanish and Portuguese were the first Europeans here. If that is true, it is conceivable landings were made in our study area in search of water in one of the sheltered anchorages such as Evans Bay or Albany Pass.

Successive Dutch expeditions from the *Duyfken* of 1606 to the *Rijder* in 1756 sailed the eastern coast of the Gulf of Carpentaria without rediscovering Torres Strait, the existence of which the Spanish and Portuguese had kept a secret. After Torres in 1606 the next European ship to sail through the strait was the *Endeavour* captained by James Cook. Cook probably knew of Torres' voyage and expected to find a strait between Australia and New Guinea. He landed on Possession Island and took possession of 'New South Wales' for England. Subsequent voyages through the straits included Bligh in the *Bounty* launch and a flotilla of four small boats carrying the survivors from the ill fated *Pandora* in 1791. One of these boats with Surgeon George Hamilton and Lt. Larkin on board landed for water in Orford Bay, the first record of white men on the mainland in the study area.

The next phase in the exploration of the area started with Matthew Flinders in the *Investigator* in 1802. Subsequent exploring trips were carried out by various naval surveyors in the *Mermaid*, *Bathurst*, *Beagle*, and *L'Astrolabe* but no landings appear to have been made on the mainland.

The *Fly* commanded by Captain Blackwood and the *Bramble* commanded by Lieutenant Yule surveyed Torres Strait in 1843-45 and were apparently the first to land and investigate the mainland in the study area. The account of


Map 8 Cape York study area
0 1 2 3 4 5 kilometres
Legend
Roads
Locality map
Area of main map
Cape York Peninsula
Cairns
North Queensland
142° 25'E
142° 30'E
142° 35'E
10° 45'S
10° 50'S
10° 55'S
142° 20'E
York Island
Eborac Island
Top of Australia Wilderness Lodge
Cape York
Mt Bremer
Evans Bay
Ida Island
Tree Islet
Bush Islet
Albany Rock
Mai Islet
Pitt Rock
Albany Island
Albany Passage
Somerset
Fly Point
Vallack Point
Narau Point
Narau Beach
Chandogoo Point
Cliffy Point
Newcastle Bay
Lake Wicheura
Lake Bronto
Lake Saldogoo
Lake Sapaginya
Lake Congora
Murangi Island
Bay Point
Punsand Bay
Peak Point
Peak Hill
Telegraph Station (abandoned)
Muddy Bay
Mew River
Bamus Creek
Pole Creek
Meddler Island
Cook Monument
High Island
Possession Island
Roko Island
Simpson Bay
Dayman Island
Roma Flats
Galloways Hill
Landsborough Creek
Telegraph Line
Carnegie Range
Lockerbie
Cape York Peninsula Development Road
Patterson Creek
Cody Hill
Wasp Creek
Barn Island
Red Island
Red Island Point (wharf)
Seisia
New Mapoon
Umagacio
Barmaga
Cowal Creek
Cowal Creek
Burster Creek
Approx position of 3000 ac cleared 1972
Kennedy Inlet
Salt pan
Woonerra Creek
Jacky Jacky Creek
Jacky Jacky airstrip
Land tenure
Private leases
Aboriginal reserve
Geology
Quaternary seds
Mesozoic seds
Carboniferous volcanics
(after Willmott, et al.)

this expedition has been given to us by J. Beete Jukes, the naturalist on board the *Fly*. Jukes recommended a settlement be established at Cape York.

The phase of land explorations began with the Kennedy expedition of 1848. By the time Kennedy reached the vicinity of the Jardine River in late November his expedition was reduced to two people. On about 5 December, Kennedy was killed by Aboriginals near the Escape River and Jackey-Jackey struggled on alone to meet the *Ariel* at Albany Pass. Subsequent investigations were made by the crew of the brig *Freak* during which they recovered Kennedy's journals and charts, much damaged by water.

An event of far reaching importance to the future of the tip of Cape York Peninsula occurred in 1863 with the establishment of a settlement at Somerset by the Government Resident John Jardine. In 1865 Jardine's two sons Frank and Alick arrived at Somerset with a herd of cattle brought overland from Bowen after an epic and violent journey. Frank Jardine was to exert an iron-fisted control over northmost Cape York for the next 50 years and his memory is still regarded with fear and anger by the local Aboriginals. Jardine's hopes for a second Singapore never came to fruition but he remained at Somerset and provided a base for various scientists such as F.M. Bailey and the noted flower painter Mrs Ellis Rowan. Descendants of the Jardine's remained at Somerset and nearby 'Piara' homestead up to World War II, but since then the Somerset, Lockerbie and Piara homesteads have reverted to the jungle.

This phase of history was abruptly terminated by the war and for a few years the tip of the Peninsula saw constant military activity. Higginsfield was a major air base. Since the war there has been spasmodic small scale gold and tin mining, but little serious mining activity has occurred in the area.

Botanical history

Early exploring expeditions carried botanists or naturalists many of whom, such as Joseph Banks and Daniel Solander on the *Endeavour*; Robert Brown on the *Investigator*; Alan Cunningham on the *Mermaid*, are now famous names in science. However, due to the fierce disposition of the natives, these ships preferred to avoid the mainland, landing mostly on islands. J. Beete Jukes appears to have been the first to land on the mainland when the *Fly* anchored in Evans Bay in June, 1845 for a few days. Jukes (1847) gives a brief description of the flora and also made the first of a long line of comments on the biogeography of the Peninsula saying, 'It is evident that in crossing Torres Strait we were passing from the Australian centre of life, so to speak, into that of the Indian Archipelago.' Jukes was followed by John MacGillivray on the *Rattlesnake* in the period 1847-49 when two lengthy stays were made at Evans Bay.

Following on these expeditions came the establishment of the settlement of Somerset. During the 1880s and later, Somerset became a base for many prominent biologists who were encouraged by Frank Jardine. One of these was the colourful Italian Luigi D'Albertis whose main preoccupation was collection of birds of paradise in New Guinea. *Dendrobium d'albertisii* was named after him.

Very early in the history of Somerset it appears likely that the noted plant collector John G. Veitch was at Somerset or the near vicinity as he collected plants of a *Dendrobium* subsequently named *D. johannis* by H.G. Reichenbach (Bateman, 1865). Veitch travelled to Australia in 1864 and probably called in at Somerset or Evans Bay where *D. johannis* is abundant. The type locality of this species may never be known with certainty but it seems probable it was Somerset or nearby.

In 1875 William Macleay led an expedition to Torres Strait and New Guinea in the *Chevert*. Several days were spent at Muddy Bay near Somerset and apparently plant collections were made, however it is not known if orchids were included (Fletcher, 1929).

Mrs. Ellis Rowan, well known for her flower paintings, visited Somerset in 1891 (Rowan, 1898). She made one notable orchid collection. This was a *Bromheadia* subsequently shown to be *B. pulchra*, the first collection of this genus in Australia (Ewart, 1907). A truly beautiful legacy of her visit is the painting of *Dendrobium bigibbum* and *D. bifalce* in the National Gallery at Canberra.

F.M. Bailey, the Colonial Botanist visited Thursday Island and Somerset in June, 1897. The only orchid Bailey makes mention of is *D. bigibbum* on which he comments, 'The beautiful orchids for which these islands used to be favoured are fast disappearing, at least from anywhere easy of approach from Thursday Island - such is the case with regard to the varieties of *Dendrobium bigibbum* Lindl. which are the kind most sought after.'

The next event of botanical significance was the Archbold Expedition of 1948 led by Dr. L.J. Brass. The expedition camped at Lockerbie from April 20th to May 5th and again from May 14th to 17th; at Newcastle Bay May 6th to 13th and near Sanamere Lagoon from May 18th to 21st. This expedition completed the first general

survey of the biology of the area, collecting many specimens and providing a good general account (Brass, 1953). Brass collected fertile material only and consequently not many orchids appear in his collections. He did collect *Dendrobium johannis* and *D. bigibbum*, both autumn flowerers.

Since the 1948 Archbold Expedition, the area has been visited on several occasions by botanists from institutions such as CSIRO Division of Forest Research, National Parks and Wildlife Service and James Cook University, although very little has been published on the vegetation. Lavarack (1977b) provided a list of orchids at Bamaga.

The area south of the Jardine area supports a vast mosaic of heath, rainforest, open forest and swamps. This was a most inhospitable environment to the early explorers and was referred to by Logan Jack as a 'wet desert', because of the complete lack of food for his horses. It was the country which put the final nail in the coffin of the Kennedy expedition and which caused grave problems to other explorers such as Logan Jack, Bradford and the Jardine Brothers. This country remained a wilderness until quite recently with only spasmodic cattle raising taking place up the early 1970s when 'Heathlands' was established.

Many hectares of heath country on sand were cleared in an attempt to grow pastures. In 1973 a QNPWS expedition lead by Peter Stanton and Bill Lavarack looked at the area in detail and made some of the first plant collections in the area. These included *Bulbophyllum masdevalliaceum*, the first record to this species in Australia (Lavarack 1977a). Extensive areas of rainforest were discovered and the vegetation was mapped in detail (Lavarack and Stanton, 1977). Before this expedition the existence of this large area of rainforest (60,000 ha in total) was not well known and a vegetation map of Cape York Peninsula (Pedley and Isbell, 1971) had omitted it.

The study area today

Today the two major land tenures are national park and Aboriginal reserve. Communities of Aboriginals and Islanders have been established in the vicinity of Bamaga. These are Bamaga, New Mapoon, Umaqico, Seisia and Cowal Creek (see Map 8). An area of about 1,300 hectares off rainforest was cleared a little north of Bamaga in 1972. This area now features soil erosion and weeds and it is to be hoped the experiment is not repeated. Apart from this some logging is occurring in both rainforest and open forest areas, but this is at a low level. No mines were operating when the area was visited in 1986.

A few leasehold areas remain notably in the area between Cape York and Peak Hill. The Cape York lease is being operated as a tourist resort by Air Queensland while a camping and tourist area is also operating at Punsand Bay to the west.

Tourism is now a thriving industry and regular flights service Jackey Jackey airstrip. The relics of Somerset attract a steady stream of visitors, but years of neglect and vandalism have left little to see of the Jardine era.

South of the Jardine the large Jardine River National Park which was gazetted in 1977 dominates the headwaters of the Jardine. This park has a great potential for tourism as well as being an important area for conservation. To the north east of the Jardine River National Park an area of about 275 square kilometres which was formerly a special bauxite mining lease has been declared a Departmental Area. This allows for possible future mining but in the meantime the area is managed as if part of the national park.

Tourism continues to increase with upwards of 4,000 4-wheel drive vehicles making the trip to the top of the Peninsula in 1985, but in other ways some areas are reverting to wilderness. Small scale mining ventures have almost disappeared and cattle properties in some areas are retreating. 'Heathlands' has closed down and may be added to the national park in the near future. Two large well equipped ferries now operate to move vehicles across the river which once formed an impassable barrier for much of the year.

THE ENVIRONMENT

Physiography

Much of the following information is extracted from the Explanatory Notes for the 1:250,000 Geological Series for Torres Strait-Boigu-Daru (Willmott and Powell, 1977). North of the Jardine River much of the area is taken up by the Carnegie Tableland, a low, relatively flat plateau of ferruginized Mesozoic sandstone. The maximum elevation is 145 m at Peak Hill, but average heights are around 40-80 m. The relatively small Newcastle Bay Dunefield lies to the east of the Carnegie Tableland and a large area of mangrove-clothed mud fills the estuary of Jackey Jackey Creek and the Escape River. This is known as the Kennedy Swamp.

The lower part of the Jardine River flows through an extensive lowland area known as the Jardine Swamp. South from Bamaga runs a low lying corridor of sandstone country termed the Bamaga Lowlands. To the east of this along the coast is the Orford Bay Dunefield. The Jardine River rises in the McHenry Uplands, a low tableland of weathered sandstone.

The drainage of the southern part of the study area is dominated by the Jardine River System. This is one of Queensland's greatest rivers, rising in the dunefields and sandstones of the McHenry

Uplands and flowing north, then west to the Gulf of Carpentaria. On the figures of streamflow it appears that, of Queensland's rivers, only the Burdekin has a larger annual flow. At the road crossing, the Jardine is about 120 m wide, one m deep and very fast flowing in the dry season. In the wet season the river is much larger and quite impassable by vehicle for eight months of the year. The river owes its character to the sands and sandstones of its catchment. These hold the wet season rainfall and release it evenly over the year, also providing clear water even in flood times.

These same sandstones also support numerous smaller streams particularly on the east coast and most of these are also perennial. North of the Jardine there are few large creeks and most run dry for part of the year. Cowal Creek and Laradeenya Creek are the largest. In summary the study area consists of low, monotonous hills with no high features. The only really significant topographical features are the coastal dunefields and the Jardine River.

CLIMATE

Rainfall

The study area lies in an area of quite heavy, but seasonal rainfall. It is reliable rainfall with the emphasis on December to April. Very little rain falls in winter and spring with the lowest being an average of 15 mm or less from July to October. Storm rains usually commence in November and continue through December with heavier rain usually falling during January to March. In winter light rain may fall with the prevailing south easterlies, but usually this is too light to register in a rain gauge, although it may serve to maintain humidity in closed forest communities.

The major rainfall stations of relevance to the area are at Thursday Island, Bamaga and Moreton and figures from these are given for comparison.

Moreton, at the southern boundary of the study area, is typical of the central Peninsula climate which extends to the southern part of the Jardine River National Park, while Bamaga and Thursday Island represent the northern part of the study area.

Table 1: Rainfall.

Location	J	F	M	A	M	J	J	A	S	O	N	D	Year
Thursday Is.	400	342	343	210	46	27	10	8	3	10	35	218	1652
Bamaga	448	374	389	206	53	24	11	6	8	14	36	195	1764
Moreton	318	323	273	110	22	11	8	4	5	16	71	201	1362

Temperatures

The study area is in an area of consistently high temperatures. The extreme northern part of the Peninsula has an island climate and probably is very similar to Thursday Island. Temperatures recorded at Moreton are considerably higher in summer and cooler in winter as the moderating effect of the sea is lessened.

John Jardine (1866) wrote: 'Of the agreeableness and salubrity of the climate at Somerset, I cannot speak too favourably.' The experience of the members of the 1986 AOF expedition would back this up. Even in February the nights were cool and the days not excessively hot, although humidity levels were always high.

Table 2: Temperatures (degrees° C): Average Maximum and Minimum.

Location	January max.	January min.	July max.	July min.
Thursday Is.	29.7	24.7	27.4	22.2
Moreton	33.0	23.2	29.4	17.1

VEGETATION

Some Interesting Species

A feature of the vegetation is the seasonality of many of the communities. While the main rainforest area retains most of its canopy cover throughout the year, this is not true of many pockets of monsoon forest on rainforest margins and on steep rocky slopes. In such areas many of the larger species are deciduous and a closed forest of February can become an open forest by September. It is not only in the canopy that these changes occur. Almost all of the prolific herbaceous cover of the wet season is absent in September, having retreated to an underground tuber or rhizome. Plants in this category include the extremely abundant Cape York Lily (*Curcuma australasica*), *Tacca leontopetaloides*, *Eurycles amboinensis*, *Amorphophallus galbra* and several species of *Typhonium*. The only dry season indication of the presence of these attractive and interesting plants is usually a few dried leaves. *Malaxis marsupichila* has the same growth habit losing its leaves in the dry season, when the small pseudobulbs are covered by fallen leaves and the plants become virtually unfindable. This contrasts with the wet season situation of abundant large patches of this species on the forest floor.

The Cape York Lily, *Curcuma australasica*, is worthy of special mention as it virtually dominates so much of the ground layer in all areas except those on sandy soils. The spectacular pink and yellow inflorescences are a real feature of the area occurring equally in open forests and rainforests.

Another species of interest is *Zingiber zerumbet* an abundant ginger which is prominent on rainforest margins during the wet. This is related to the commercial ginger and it has been suggested that this population is the result of an escape from Jardine's gardens at Somerset and Lockerbie.

The open forests also feature a large number of seasonal species such as yams (*Dioscorea* spp.), *Curcuma*, and the attractive *Abelmoschus moschatus*, a close relative of *Hibiscus*.

In the sandy country to the east and south in the study area, the species do not exhibit the same degree of seasonality, possibly due to the water retaining capacity and generally low-lying nature of much of the country.

Nevertheless interesting species abound, none more so than the pitcher plant *Nepenthes mirabilis*. This species occurs south to near Innisfail, but the plants from the Jardine Catchment north to Cape York exhibit more variations than those from other areas. Much of this variation is environmentally induced, while some is due to different growth stages of the plant. This led F.M. Bailey to erroneously propose some twelve different species all from this area. Later research has shown all to be conspecific. Some particularly large forms occur here, one from Naru Point being measured at 25 cm. The form, described by Bailey as *N. rowanae* occurs here and is most attractive with its squat, red pitchers. Other insectivorous plants occur such as *Utricularia* species, particularly the yellow *U. chrysantha*, and sundews including *Drosera spatulata*, *D. burmannii*, *D. indica*, *D. petiolaris* and *D. banksii*. *Byblis liniflora* the rainbow plant, is also evident with its long stickly leaves ready to catch unwary insects.

The rocky ridges near Cape York and Peak Hill support an interesting open forest in which the outstanding tree is *Weichiodendron longivalve*. This small tree is an outstanding host for epiphytes, but is also most attractive when in flower as it has large yellow flowers. Many other fine flowering trees were noted including *Gmelina schlechteri*, *Erythrina verspitilio*, *Cerbera manghas* and *Melaleuca leucadendra*.

The Vegetation Map

The vegetation of the Jardine River National Park was mapped by Lavarack and Stanton in 1977 and is quite well known. A simple map showing rainforest areas north of about Bamaga was presented in 'Focus on Cape York' published by the Entomological Society of Queensland in 1974. Lavarack and Godwin (1984) provided some notes on rainforest in the study area. The vegetation map presented here was compiled from these sources and from a study of the aerial photographs of the area.

The study area may be divided by a raw east-west between the latitudes of Bamaga and the Jardine River. North of this rainforests predominant (see Map 9) while to the south heaths, open forests and rainforests are equally abundant. Mangroves are abundant in several estuaries notably the Escape River - Jackey Jackey Creek area, one of the largest mangrove areas on the continent.

The study area supports numerous vegetation types, however it was not possible to map all the types recognised because (a) different types are sometimes difficult to distinguish on high flying aerial photography, and (b) some types occur in tiny areas in intricately interwoven mosaics. To avoid this problem the vegetation has been mapped as a series of complexes, each of which is discussed in detail (see Table 3).

Table 3: Vegetation types noted in the study area.

Complex	Community or subcomplex
1. Rainforests	1a. Semi deciduous mesophyll vine 1b. Notophyll vine forest 1c. Araucarian vine forest 1d. Mesophyll palm forest
2. Dune vegetation	2a. Eastern dune complex 2b. Western dune complex
3. Heath	3a. Low open heath 3b. Tall closed heath 3c. Closed epacrid scrub
4. Open Forest	4a. *Melaleuca brassii* forest 4b. *Eucalyptus tetrodonta* forest 4c. *E. nesophila* forest 4d. Mixed forest 4e. Paperbark forest
5. Mangroves	5. Mangroves
6. Cleared	Grassland or regrowth

1. Closed forest complex
Closed forests or rainforests form a significant proportion of the areas mapped. In the area north of Bamaga (Map 9) there is approximately 10,500 ha of rainforest. It is not homogeneous, the following communities being recognisable at least at ground level.

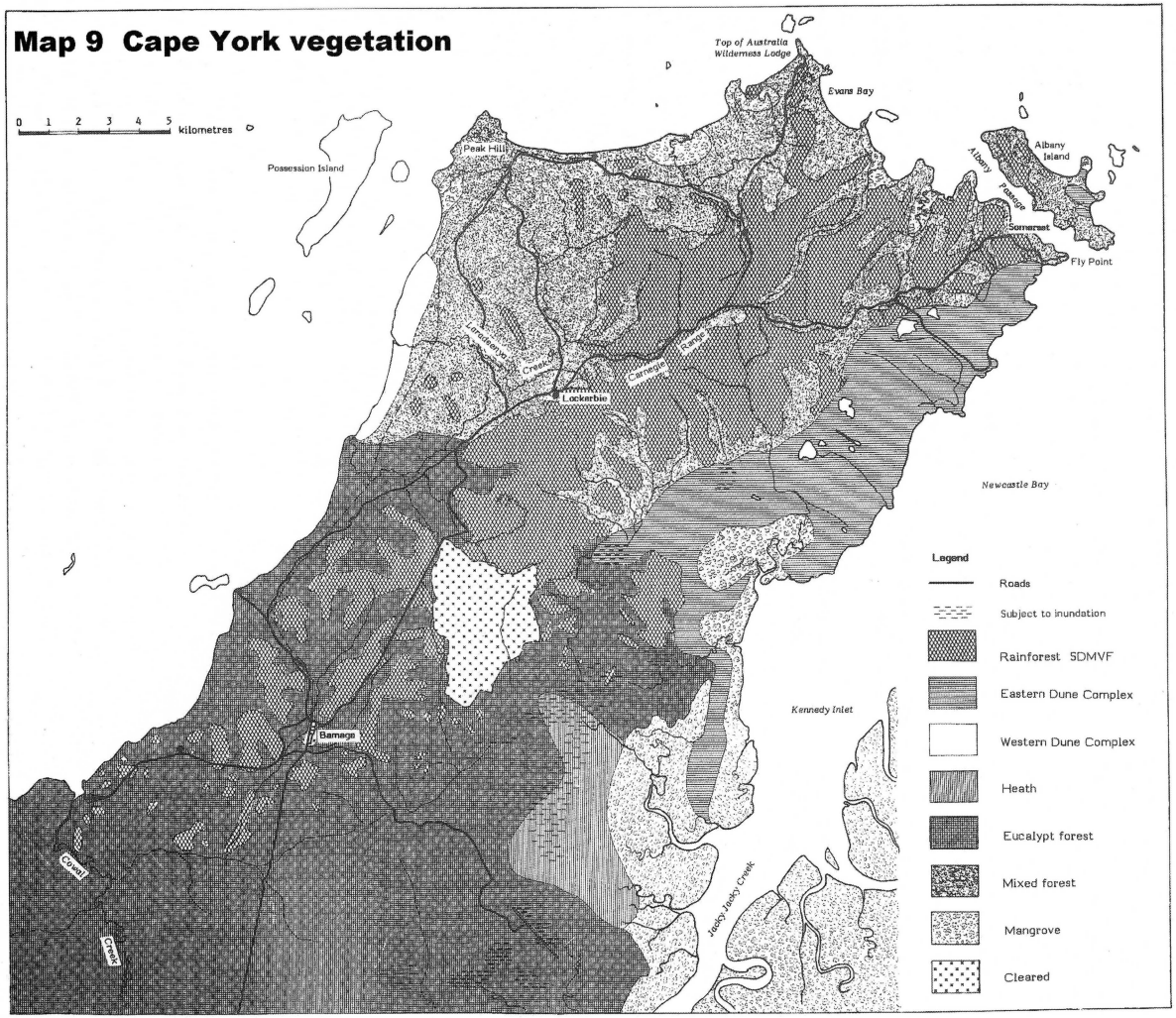
1a. Semi deciduous mesophyll vine forest
Common canopy trees in this type are *Bombax ceiba*, *Ficus albipila*, *Syyzygium fibrosun*, *Terminalia sericocarpa*, *Acmenospermum claviflorum* and *Alstonia scholaris*. In moister low lying areas *Syzygium bamagense* is abundant with the palms *Gulubia costata*, *Caryota rumphiana*, *Ptychosperma elegans*, *P. macarthurii* and *Hydriastele wendlandiana*. This community makes up most of the rainforest north of Bamaga and appears not to occur between the Jardine River and Carron Valley.

In many ways this forest is related to the lowland rainforest at Iron Range. On margins and in larger trees orchids and other epiphytes are abundant, although not as diverse as those at Iron Range. Abundant orchids include *Dendrobium bifalce*, *D. smillieae*, *Bulboplyllum baileyi*, *Eria fitzalani* and, among the terrestrials, *Malaxis marsupichila*.

1b. Simple notophyll vine forest
This type is best developed on the eastern part of the Jardine River catchment south of Bamaga. Palms are a feature with two species of *Calamus*, *Licuala ramsayi*, and *Ptychosperma macarthurii* prominent. Other tree species noted include *Syzygium rubiginosum*, *S. fibrosum*, *Weichiodendron longivalve*, *Podocarpus neriifolius*, *Endiandra glauca*, *Deplanchea tetraphylla* and *Ficus* spp. Deciduous species are absent. The understorey is often dense with *Randia sessilis*, *Alyxia spicata*, and *Choriceras tricorne*. Epiphytes are not numerous but the following orchids were noted: *Dendrobium bifalce*, *Pholidota pallida*, *Bulbophyllum baileyi*, *B. masdevalliaceum* and *Eria fitzalani*.

1c. Araucarian vine forest
This type is basically similar to Notophyll vine forest with the addition of hoop pines (*Araucaria cunninghamii*). It occurs at the extreme southern end of the study area just south of Captain Billy Creek. The only orchids seen here were *Dendrobium discolor* and *D. rigidum*. The area is too small to be shown on the maps.

1d. Mesophyll palm forest
This forest occurs often along streams where it forms a dense gallery forest of *Xanthostemon* sp., *Ilex arnhemicus*, *Euodia elleryana*, *Dillenia alata* and *Melaleuca leucadendra*. The palm *Ptychosperma macarthurii* is very abundant, forming dense clumps. *Schefflera actinophylla* is also abundant. In moister situations the tall growing terrestrial orchid *Bromheadia pulchra* often forms dense stands up to 2m high. The pitcher plant *Nepenthes mirabilis* is also abundant. Another form of this forest occurs along the lower Jardine where it forms a narrow band of gallery forest. Common species include *M. leucadendra*, *Ceodes umbellifera*, *Carallia*


Map 9 Cape York vegetation
0 1 2 3 4 5 kilometres
Top of Australia Wilderness Lodge
Evans Bay
Peak Hill
Possession Island
Albany Island
Albany Passage
Somerset
Fly Point
Lockerbie
Newcastle Bay
Kennedy Inlet
Jacky Jacky Creek
Legend
Roads
Subject to inundation
Rainforest 5DMVF
Eastern Dune Complex
Western Dune Complex
Heath
Eucalypt forest
Mixed forest
Mangrove
Cleared

brachiata, *Barrinqtonia gracilis* and *Syzygium rubiginosum*. Palms including *Livistona benthami* and *Licuala ramsayi* are also abundant, but orchids are not evident.

2. Dune complex

2a. Eastern dune complex

The vegetation of the extensive eastern sand dunes north and south of the Jardine River includes many species common to other parts of the Peninsula but not always comprising similar vegetation types. The predominant type present on crests is closed epacrid scrub (see 3c). The valleys between the dunes may be narrow or wide, containing creeks, swamps or lakes or occasionally dry. Interdune areas, in the absence of swamps or lakes, often support the same vegetation as the slopes modified to form a depauperate vine forest if moister or more open with large quantities of *Dodonaea viscosa*, if drier.

Interdune lakes are all shallow and fringed with *Melaleuca arcana*, *Baeckea frutescens* and *M. quinquenervia*. Open heath swamps (3a) are developed in broader, moister interdune systems. The area behind the frontal dunes includes bare sand areas and some low vine forest. The lake systems near Usher Point and Orford Ness are spectacular although not as extensive as those south of the study area at Cape Grenville. Orchids are not particularly abundant in this complex. Some golden orchids occur and rainforest species such as *D. bifalce* may be found in the vine forests.

2b. Western dune complex

A narrow band of parallel sand dunes up to about 1km wide lines much of the west coast of the study area. These dunes occur behind mangroves and usually feature open areas alternating with low closed forest or shrubland. Prominent tree species include *Ficus platypoda*, *Mimusops elengi* and *Pongamia pinnata* and *Manilkara kauki*. The interdune areas comprise saltwater couch meadows, saltpans, or mangroves.

The forests on these dunes are excellent epiphyte habitats with the Cooktown orchid (*Dendrobium bigibbum*) and the golden orchid (*D. discolor*) predominating. Other species include *Dendrobium rigidum*, *D.* X. *superbiens* and *Chiloschista phyllorrhiza*.

3. Heath

3a. Low open heath

This community reaches a height of 0.5-1.0m and is composed of 50% shrubs and 50% sedges. Shrubs include *Sinoga lysicephala*, *Thryptomene oligandra*, *Melaleuca quinquenervia* and *Banksia dentata*. The ground cover is largely sedges with the pitcher plant (*Nepenthes mirabilis*) being abundant along with small carnivorous plants such as *Drosera* and *Utricularia* species. The largest occurrences of this type are close to the Jardine, but it is a prominent feature of many landscapes in the study area. Two terrestrial orchids are quite abundant - *Bromheadia pulchra* preferring shaded sites and *Dendrobium lobbii* preferring open very moist sites.

3b. Tall closed heath

This extensive type occurs on sandy soil south of the Jardine River. The height is 0.5- 2.0m and the degree of openness of the canopy is determined largely by fire history. Common species include *Grevillea pteridiifolia*, *G. glauca*, *Allocasuarina littoralis*, *Jacksonia thesioides*, *Acacia calyculata*, *Choriceras tricorne*, *Neofabricea myrtifolia* and *Hibbertia banksii*. No species dominates and this type is remarkably consistent.

Few orchids occur, although an occasional *Dendrobium carronli* or *D. johannis* may be found on paperbarks.

3c. Closed Epacrid scrub

This type is a component of the eastern dune complex where it occurs on flat sandy ridge tops. The predominant shrubs are members of the Epacridaceae, two undescribed species, probably *Leucopogon*, being present and forming an interlocking canopy at 3-7m. Other shrubs present include *Acacia* spp., *Neofabricea myrtifolia*, *Randia sessilis* while *Callitirs neotropica* is a common emergent. The ground is usually covered to a depth of up to 20cm by dense compact leaf litter. Very few herbs grow and the area will not carry a fire due to this lack of a ground layer. Consequently this can be an excellent orchid habitat with up to 14 species having been recorded frequently growing in the leaf litter.

Common species include *Bulbophyllum baileyi*, *Dendrobium smillieae*, *D. johannis*, *D. rigidum*, *Eria fitzalani*, *Schoenorchis densiflora*, *Pholidota pallida* and *Arthrochilus* sp.

4. Open forest

4a. *Melaleuca brassii* forest.

This species along with *Neofabricea myrtifolia* dominates large areas south of the Jardine River. Other species include *Allocasuarina littoralis*, *Acacia rothii*, *Grevillea glauca*, *Eucalyptus* sp. aff. *polycarpa*, *E. leptophleba*. In many areas *Melaleuca* and *Neofabricea* dominate, but in other areas a vine forest understorey with *Weichiodendron longivalve* may be prominent. *Callitris intratropica* is occasionally present. The

most common understorey is a dense layer 1-2m high of *Choriceras tricorne*, *Hibbertia banksii*, *Lomandra banksii* and *Xanthorrhoea johnsonii*. The ground layer is sparse grasses and sedges. Orchids are not abundant although *Dendrobium johannis* and *D. carronii* occasionally occur.

4b. *Eucalyptus tetrodonta* forest

In this community the canopy height varies from 15 to 19m and comprises almost entirely *Eucalyptus tetrodonta*. Another layer occurs just below this including *Grevillea glauca*, scattered *Acacia crassicarpa*, *Neofabricia myrtifolia* and *Allocasuarina littoralis*. Below this is a second shrub layer of *Choriceras tricorne*, *Acacia simsii* and *Grevillea pteridiifolia*. The ground cover is largely sedges and a few sparse grasses. Epiphytic orchids are virtually absent from this forest, although an occasional *Cymbidium canaliculatum* may occur. A few terrestrials including *Geodorum densiflorum* and *Habenaria ferdinandli* appear in the wet season.

4c. *Eucalyptus nesophila* forest

This community reaches a height of about 25m. *E. nesophila* predominates with occasional *E. tetrodonta*. A rather sparse layer of shrubs occurs to 6m, including *Erythrophleum chiorostachys* and *Grevillea glauca*. The ground layer is well developed with dense grasses and *Pandanus*. Again as in 4b., orchids are not common. Various other mixtures of *E. tetrodonta* and *E. nesophila* occur throughout the study area.

4d. Mixed forests

These forests occur in the high rainfall area between Bamaga and Somerset. This type has a relatively low canopy at about 10-15m. Trees include *Eucalyptus polycarpa*, *E. tessellaris*, *Parinari nonda*, *Acacia rothil*, *Lophostemon suaveolens*, *Melaleuca viridiflora*, *M. quinquenervia*, *Erythrophleum chlorostachys*, *Parinari nonda*. The lower layer includes *Gmelina schlechteri*, *Welchiodendron longivalve*, *Melaleuca viridiflora* and *Livistona muelleri*. The ground layer is *Imperata* and *Themeda*. Rocky areas with patches of vine forest occur dominated by *Welchiodendron longivalve*. Larger creeks are lined with vine forest.

This type is rich in orchids in localised areas. Various terrestrials occur in the wet season, notably *Calochilus caeruleus*, *Calochilus* sp., *Arthrochilus* sp. aff. *irritabilis*, *Habenaria ferdinandii*, *Nervilia holochila* and *Nervilia* sp. Epiphytes occur notably on *Welchiodendron longivalve* trees on rocky outcrops where *Diplocaulobium glabrum* is locally abundant along with *Dendrobium johannis* and *D. bigibbum*.

4e. Paperbark forest

This type often approaches a woodland and is dominated by *Melaleuca viridiflora*. A widespread community further south, this type is not so abundant in the study area. The height reached is about 3m and *M. viridiflora* is dominant. Other species include *M. symphyocarpa* and *Thryptomene oligandra*. The ground layer is usually sparse grasses and sedges and the soil is poorly drained. Orchids include the terrestrial *Habenaria ferdinandii* and the epiphytes *Dendrobium semifuscum*, *D. canaliculatum* and *D. rigidum*.

5. Mangroves

The Escape River estuary includes one of the largest mangrove areas on the Australian continent. This area ranges from saltpans, through shrubland to tall forest. A brief inspection revealed few orchids with only *Dendrobium discolor* being prominent. Other mangrove areas occasionally support healthy epiphyte populations on their margins where *Heritiera littoralis* is a common host tree.

6. Cleared areas

Areas near Bamaga and near 'Heathlands' were cleared in the 1970's for pasture. Both areas are now regrowing with pioneer species and weeds.

METHODS

The Expeditions

The results presented here represent a fusion of data gathered on three separate expeditions. A detailed account is given of the AOF expedition of 1986 along with a summary of the results of the other trips.

Expedition 1: August 1973 to Captain Billy Creek and the Jardine River area for national park proposal work. Present - P. Lavarack, P. Stanton, J. Winter, R. Collins.

Expedition 2: December 1976 to Bamaga for 'Exploration North' television series. Present - P. Lavarack and various QNPWS staff.

Expedition 3: February 1986 to Bamaga area. AOF Orchid trip. Present - P. Lavarack, B. Gray, D. Jones, D. Wilson.

Preparation for 1986 expedition

Personnel

- Dr P.S. Lavarack (QNPWS Townsville)
- Mr B. Gray (CSIRO Atherton)
- Mr D. Jones (National Botanic Gardens, Canberra)
- Mr D. Wilson (photographer, Townsville)

Bruce Gray and David Jones as on past expeditions provided experienced manpower

to search for orchids. They also made several valuable collections of other plants such as ferns and *Typhonium* species. David Jones proved invaluable to the expedition as he was, at the time, involved in detailed work on Northern Territory orchids and was able to make some interesting comparisons. Two or three undescribed species common to both the Northern Territory and to Cape York were collected. As was the case with other parts of the Peninsula, little was published on the orchids of the extreme north before this expedition. Orchids were mentioned here and there in the literature but precise knowledge was negligible apart from some data collected on previous trips by the author.

The study area was carefully surveyed with the aid of aerial photographs, and maps and all published reports were studied. From this, and from past experience of the author and Bruce Gray, some tentative plans were drawn up of areas to be examined. The logistics of this trip were simplified by the co-operation of Air Queensland who made accommodation available at their 'Top of Australia Wilderness Lodge' and also helped with transport. The Lodge is situated in the heart of interesting orchid country and as it is adjacent to a large variety of vegetation types all in easy walking distance. Aerial photographs used were old, being published in 1957, and were at a scale of 1:50,000. Despite this they were of good quality and very useful. Maps used were the 1:100,000 series for Thursday Island, Cape York, Orford Bay and Vrilya Point.

Field work

A base camp was established at Air Queensland's 'Top of Australia Wilderness Lodge' and collecting trips carried out from there. Some herbarium material was collected, but spirit collections were more commonly used. Some live plants were also collected. Notes were made and photographs taken of all interesting discoveries and of their habitat.

Laboratory Work

Specimens brought back were studied. In the case of some, such as *Nervilia*, plants were grown, hopefully to produce flowers in the next wet season. Some taxonomic work remains to be completed.

DIARY OF THE 1986 AOF EXPEDITION

February 9 The party met in Atherton. On the way from Townsville to Atherton, Bill Lavarack and Dave Wilson inspected rainforests in the Mission Beach area which had been hit by Cyclone Winifred only a week previously. The damage was quite startling with few trees retaining any leaves at all. On a section of about 50m of beach, twelve large plants of *Dendrobium discolor* were counted washed up on the high tide mark. However, a surprising number of epiphytes were seen to have weathered the effects of the winds.

February 10 The party flew via an Air Queensland DC-3 from Cairns to Bamaga. During a refuelling stop at Iron Range, Bruce Gray led a brief excursion to an area near the airport fence where a known population of an interesting peltate-leaved *Nervilia* was growing. Leaves, but no flowers, were seen. The flight which takes about 4 hours followed by a bumpy drive to the Lodge of one and a half hours left little time for any substantial field work on the first day.

February 11 The weather was hot and humid after a surprisingly cool night. Isolated heavy showers were around but basically the weather remained fine. The party set out on a local walk along the road south of the Lodge. It was planned to head west towards Punsand Bay, but mangroves and time prevented this.

The country covered was mostly mixed forest with some swampy ground and some rocky outcrops covered with *Weichiodendron longivalve*. Walking proved tiring due to boggy ground and wet conditions. Initial reactions to the orchids encountered were of disappointment. Although much country apparently well suited to terrestrials was inspected only a few species were seen. The only *Habenaria* seen was *H. ferdinandii* which occurred scattered in several different habitats. A species of *Nervilia* with peltate leaves was found to be abundant although no flowers were seen. It appears likely that this is an undescribed species also occurring in the Northern Territory. Live plants were collected in the hope that they can be induced to flower in cultivation.

Several specimens of a small *Calochilus* were found on a swampy flat beside a creek. From the remains of the flowers it appeared that this species which produces only 1-4 flowers is conspecific with an undescribed species from the Northern Territory. Other species seen were: *Nervilia holochila* (leaves only), *Calochilus caeruleus* (spent flowers and capsules only), *Geodorum densiflorum*, *Arthrochilus* sp. possibly *A. irritabilis*.

On rocky knolls where *Welchiodendron longivavle* is the predominant tree several orchids were seen. *Diplocaulobium glabrum* was particularly common along with *Dendrobium discolor*, *D. bigibbum*, *D. johannis*, *D. smilliea* ', *D. rigidum*, *Eria fitzalani*, *Bulbophyllum baileyi* and *Luisia teretifolia*.

After return'ng to camp several large flowering colonie. of *Malaxis marsupichila* were found growing in leaf litter in scrub near the beach.

February 12 On this day the party walked west from Cape York along the beach to Crocodile Creek. It was hoped to cross this creek to reach Bay Point but high tides and the almost certain presence of estuarine crocodiles prevented this. The beach showed evidence of continuing erosion. Near the mouth of Crocodile Creek a system of vegetated parallel dunes alternating with mangroves occurs. This proved productive orchid country. The dunes carried patches of vine forest alternating with shrubland. The Cooktown orchid (*Dendrobium bigibbum* var. *bigibbum*) was abundant along with *D. discolor*, *D. rigidum* and *D. semifuscum*. Common shrubs in this area included *Melaleuca acacioides*, *Leucopogon* sp., *Melaleuca symphyocarpa*.

On the way back a detour inland was made and *Geodorum densiflorum* in flower was collected along with rosettes of an *Arthrochilus* in sandy forest country. In moister areas *Habenaria ferdinandii* was abundant. Next some flowering plants of the small *Calochilus* were located confirming that these are in fact the same as the Northern Territory species and distinct from *C. caeruleus*. [This has subsequently been described as *C. metallicus* by D.L. Jones.] This species produces only a few flowers and these last only a day or two so the collector has to be on the right spot at the right time. The leaves appear to come up after the flowers. *C. caeruleus* produces the leaves before the flowers. On the return trip close to camp a very large colony of *Habenaria ferdinandii* was discovered.

A fishing trip in the evening to Evans Bay resulted in some magnificent views of sunsets and rainbows (much to the annoyance of the photographer who had come without his camera) but alas no fish!

February 13 'Lockerbie Scrub' area. On this day the party was driven to a point near the old Lockerbie homestead and worked through the rainforest area. This was the one day on which heavy rain caused some problems.

A major aim of this day was to look for specimens of a *Taeniophyllum* collected on a previous trip by Bruce Gray and which appears to be either a new species or a new record for Australia. Many branches were pulled down from trees on the edge of the rainforest and a few specimens, including one large plant, were collected. Other species seen included *Dendrobium bifalce* which was abundant and the following: *D. smillieae*, *D. johannis*, *Chiloschista phyllorrhiza*, *Pholidota pallida*, *Bulbophyllum baileyi*. In the nearby woodland *Habenaria ferdinandii* was again present along with *Nervilia holochila*.

After returning to camp and donning dry clothes the party climbed Mt Brewer, a hill about 120m high just to the east of the Lodge. Much of this hill is covered with a very dense low vine forest, featuring *Eucalyptus tessellaris*, and many shrubs and vines. On open rocky areas orchids were abundant, in particular *Dendrobium bigibbum*. Other orchids noted included *D. canaliculatum*, *D. discolor* and *Chiloschista phyllorrhiza*.

February 14 On Valentine's Day the party attempted what proved an overly ambitious walk from the road near the Lake Bronto turnoff to Muddy Bay, the Mew River and then to Evans Bay and Cape York. However the swamps on Barnia Creek proved impenetrable and resulted in a long weary march back along the road.

On the way to the drop off point some plants of *Pomatocalpa macphersoni* were collected on a fallen tree while it was being removed from the road. On the walk some plants of *Malaxis latifolia* and *M. marsupichila* were collected along with a flowering *Arthrochilus* which may turn out to be a new species or possibly a form of *A. irritabilis*. *Geodorum* was also seen.

A point of interest in the closed forests was the presence of nesting white tailed kingfishers. These attractive birds nest in small ant hills on the forest floor. Many of these ant hills had a nest in them and if one listened carefully the chirping of the chicks could be heard.

On sand ridges behind the mangroves, *Dendrobium bigibbum*, *D. rigidum* and *Chiloschista* were common but few other orchids were seen.

Palms were also a feature of this walk with some magnificent forests of *Gulubia costata* being encountered. *Caryota rumphiana* was also present. The swamps were often ringed with very dense stands of *Melaleuca quinquenervia*.

The group returned to camp very footsore with several painful blisters due to the continually wet conditions of the past three days.

February 15 Air Queensland provided a vehicle to travel to the Jardine River area. After calling at Bamaga hospital for treatment for various

rashes and blisters, the group proceeded to a creek locally known as the 'The Cyprus Hole'. The road passed through an extensive heath swamp in which pitcher plants were common along with *Habenaria ferdinandii*. In shrubland on the margin of this swamp, leaves of an *Arthrochilus* were found and, after a long hunt, a flowering specimen. This was at first thought to be *A. dockrillii*, but subsequent investigations by David Jones have showed it to be an undescribed species.

Nearby was an extensive area of epacrid scrub and in this the following orchids were noted: *Dendrobium johannis*, *D. smillieae*, *D. rigidum*, *Bulbophyllum baileyi* and *Pholidota pallida*.

Next the group moved on to some wet heaths near the Jardine River and Lake Sanamere. Large plants of *Bromheadia pulchra* in bud were seen along with *Dendrobium lobbii* growing in boggy soil. Pitcher plants were numerous. Several stops were made in open forest areas, but the only orchid seen was *Habenaria ferdinandii*.

February 16 On this day, thanks to the generosity of a local family, Mr Ivan Vella and his wife Rae, an extensive tour was undertaken of the northern part of the Cape.

Firstly the party travelled to Lake Wicheura, an isolated freshwater lake. Despite being a good two kilometres inland with no connecting stream, this lake is a known habitat of estuarine crocodiles, one of which was seen in the middle of the lake. Orchids, however, were more scarce here. Following this Narau Point was visited. Again orchids were absent although the scenery made up for this. From here the party drove to Somerset and inspected the ruins of the Jardine homestead. A short side trip was made to Fly Point for a spot of fishing, it being assumed that this area would be unproductive for orchids. The unpredictability of orchid hunting was demonstrated when a large colony of the rare *Habenaria elongata* was discovered on the grassy headland. This was a most valuable find as good material of this species is not common. (No fish were caught by the way). After lunch at Somerset, the group headed for Laradeenya Creek. On the bottom crossing road in the open forest more colonies of *H. elonqata* were located along with the ubiquitous *H. ferdinandii*. *H. elongata* appears to favour rocky well grassed country. A side track was taken to 'Ginger Dick's Mine' - a mine site previously worked by a late Peninsula identity Dick Holland. Set on a ridge at about 100m elevation, this proved an excellent orchid area. The scattered *Weichiodendron longivalve* trees to the west of a small creek were covered in orchids including *Dendrobium johannis*, *D. rigidum*, *D. smillieae*, *Diplocaulobium glabrum* and *Luisia teretifolia*. Across the creek a small patch of rather open vine forest on a rocky slope proved rewarding. Many epiphytes were present including *Myrmecodia* and *Hydnophytum* species. Orchids were: *Dendrobium teretifolium*, *Taeniophyllum* sp. c.f. *glandulosum*, *Pholidota pallida*, *Bulbophyllum baileyi*, *Chiloschista phyllorrhiza*. The ground layer in this forest included much *Eurycles* and *Cucurma* and some large plants of *Nervilia pilcata*. This most productive day was followed by dinner at Vella's place at Bamaga.

February 17 On this day Bill Lavarack and Dave Wilson did a short walk to Evans Bay and return around the back of Mt Brewer. This led through some interesting rocky country which featured some very large plants of *Dendrobium johannis* again growing on *Weichiodendron longivalve* trees. In the afternoon, after identifying local trees for Air Queensland, the party drove to some nearby rainforest areas for a final look there. The only orchid not previously recorded was *Dendrobium stuartii*.

February 18 The group packed up and travelled to Bamaga airport and then to Cairns.

OTHER EXPEDITIONS

Captain Billy Creek expedition

This was mounted by QNPWS in August 1973 for park proposal work and resulted in 1977 in the gazettal of the Jardine River National Park. The author was able to look for orchids during the course of his other duties on this expedition and was also fortunate in having Rev. Ron Collins of Atherton with him to help in this regard.

A full report on the vegetation of this area is to be found in Lavarack and Stanton (1977). This expedition was notable for the first discovery in Australia of *Bulbophyllum masdevalliaceum* which was found separately on the same day by Bill Lavarack and Ron Collins.

Another species which was found to be relatively abundant between Captain Billy Creek and the Jardine River was *Dendrobium carronii*. It was a result of the examination of specimens collected on this trip that this species was recognised as separate to *D. canaliculatum*. *D. johannis* was also found to be an abundant species around the margins of the rainforest and again it was on this expedition that the first ideas were formulated that this might be a separate species. Material of a then unidentified *Spathoglottis* was collected these collections subsequently were used in determining this as *S. plicata*.

The following orchids were recorded in the rainforests behind Captain Billy Creek:

Dendrobium johannis, *D. bifalce*, *D. smillieae*, *D. discolor*, *D. rigidum*, *Diplocaulobium glabrum*, *Bulbophyllum baileyi*, *B. masdevalliaceum*, *Robiquetia tierneyana*, *Eria fitzalani*, *Taeniophyllum* sp., *Phreatia crassiuscula*, *Pholidota pallida*, *Chiloschista phyllorihiza*. *Spathoglottis plicata* occurred in densely vegetated creeks running out of the eastern escarpment.

The extensive epacrid scrubs supported most of the species listed previously with the addition of some large plants of *Schoenorchis densiflora*. Drier inland paperbark woodlands supported *Dendrobium canaliculatum* and *D. semifuscum*.

In summary this expedition was an important one on which many useful collections were made. However it was held during the driest part of the year and records of terrestrial orchids consequently were incomplete.

Bamaga expeditions

In December 1976, Bill Lavarack travelled to Bamaga with QNPWS. Many of the species recorded in the previous pages were seen. Full records are given in Lavarack (1977b). Bruce Gray also was present on several other expeditions to the Bamaga area on behalf of CSIRO. On one of these the first collections of the previously mentioned undescribed *Taeniophyllum* were made. No serious wet season orchid hunting was possible on any of these expeditions, but Bruce did visit the western sand dunes near the mouth of Laradeenya Creek where he reported that *Dendrobium bigibbum* is present in abundance. Plants of the natural hybrid *D.* X *superbiens* were also recorded.

DISCUSSION

The Significance of the Study Area

In Appendix 1, 42 species are recorded in the study area of which 36 occur north of the Jardine River and 27 south. The lesser number to the south is probably due, at least in part; to the fact that wet season surveys have not been carried out there.

Thus in comparison with other parts of Cape York Peninsula, these areas are somewhat richer than the Carron Valley area (25 species), but considerably behind the McIlwraith Range (90+) and the Iron Range area (70+). (See reports by Lavarack 1984b, 1980b, 1977c).

In the Carron Valley report (Lavarack 1984b) it was proposed that there are three sets of orchid species on Cape York Peninsula. These were postulated as follows:

1. Iron Range - McIlwraith Range set

These occur in an area of relatively high rainfall with a small, but significant winter component. They are plants of the rainforests and mountains. Within this set are some endemic species (eg. *Dendrobium wassellii*, *Pteroceras hirticalcar*), some species which also occur in New Guinea (eg. *Dendrobium antennatum*, *Vanda hindsii*), some which also occur to the south in Australia (eg. *Dendrobium ruppianum*, *Plectorrhiza brevilabris*) and some from both northern and southern areas (eg. *Phalaenopsis amabilis*, *Dendrobium nindii*). A total of 98 species has been recorded from this area, by far the richest orchid flora on the Peninsula, but of these only about 60 could be regarded as belonging to this set exclusively. The others are more widespread or belong to other sets. The high rainfall and rough topography of this area combine to provide a variety of niches not equalled elsewhere on the Peninsula. This area would certainly have been a refuge in times of past harsh climate. These factors explain the variety of orchids present.

2. Moister lowlands set

These species are widespread on the east coast of the Peninsula and in the extreme north. They occur in small patches of rainforest on sand near the Jardine and Olive Rivers and in gallery forest along the Jardine, Wenlock, Archer and other streams. They are also in the Bamaga rainforests. By and large the habitats these orchids occupy are not as wet as those of the Iron Range and McIlwraith Range, nor is the variety of habitats as high. Some 25 species occur in this set, many being widespread species in areas outside Cape York Peninsula. Species typical of this set include: *Dendrobium stuartii*, *D. carronii*, *D. smillieae*, *D. bifalce*, *Eria fitzalani*.

3. Drier lowlands set

A group of four or five species – *Dendrobium canaliculatum*, *D. semifuscum*, *D. bigibbum*, *Cymbidium canaliculatum* and perhaps *Luisia teretifolia*.

These are plants of seasonally very dry areas often growing in open forests or woodlands in extreme heat - a very harsh habitat which covers the bulk of the Peninsula.

The results presented here do not disagree with this hypothesis. It is perhaps a little surprising that *Dendrobium carronii* is not common north of the Jardine River and conversely it was surprising just how abundant *D. bigibbum* was in habitats that would, in some parts of the Peninsula seem too moist, but results in general are predictable.

The Bamaga area does not show any evidence of links to New Guinea stronger than those for other areas such as Iron Range. Any species of

supposed New Guinea origin which have reached Bamaga have also reached Iron Range and often further south.

There is little doubt that the seasonal climate reduces the number of niches available to various orchids. It is tempting, when visiting the area in the wet season, to imagine that conditions are as moist as this all year, however a glance at Table 1 will show this to be false. Many of the most shaded environments of February, become dry and dusty with no leaf cover in September. Thus species such as *Vanda hindsii*, *Phalaenopsis amabilis* and *Dendrobium antennatum* are missing from the Bamaga area although relatively common in New Guinea and at Iron Range.

There are considerable links to the west with the Top End of the Northern Territory. Some of these links remain to be fully clarified and the current work by David Jones should do this. Species such as the unidentified *Nervilia* and the unidentified *Calochilus* are significant in this regard.

No orchid species appear to be endemic to the study area. Within Australia only *Bulbophyllum masdevalliaceum* is restricted to part of the study area, but it also occurs on the Torres Strait Islands and in New Guinea.

CONSERVATION

Almost all of the catchment of the Jardine River is now part of the Jardine River National Park and is well conserved. This includes virtually all the Australian mainland occurrence of *Bulbophyllum masdevalliaceum*. There is however very little security for orchids and their habitats north of the Jardine River. Most of this area is Aboriginal and Islander Reserve and could conceivably be cleared if the local inhabitants so desired. Previous attempts at clearing and pasture growing have proved unsuccessful with regrowth of weeds being the end result. The benefits likely to accrue from clearing for grazing are small compared to the potential benefits from tourism if the area is left substantially intact.

Already two private concerns are exploiting the tourism market at Cape York and at Punsand Bay. There is no reason why people from Bamaga should not become involved in this industry but to do so it is important that the rainforests remain intact. Some form of agreement with the local Aboriginal and Islanders Council and with the Department of Community Services to preserve these rainforests is urgently required.

As well as this steps may need to be taken to prevent the removal of plants, in particular Cooktown orchids, from the bush. There orchids have been heavily collected for about 100 years and are now depleted on many of the islands. Good populations still remain on the mainland in several areas, but increased accessibility due to the increased ownership of four wheel drive vehicles is now resulting in steady collecting pressure on these plants.

If a way can be found to allow access to tourists while ensuring that plants are not removed, they could become a great tourist attraction. Strict control on the sale of these plants will help prevent commercial collecting, but removal of small numbers of for private use is now a significant problem. Perhaps Aboriginal Rangers could be used to police this. Certainly a publicity campaign is required to attempt to control private collecting.

CONCLUSION

The epiphytic orchids of the study area could perhaps be described as 'predictable'. In the light of experience of other parts of the Peninsula they are what would be expected. The terrestrials however offered some surprises. Some extremely valuable collections of *Calochilus*, *Nervilia* and *Arthrochilus* species were made. It would appear that undescribed species of all these genera occur here along with at least one undescribed *Taeniophyllum*.

The area is rich in fine forms of *Dendrobium bigibbum* and the natural hybrid *D.* X *superbiens*. Provided collecting of these fine horticultural specimens can be limited, these plants will prove a great tourist attraction between April and June each year. Other orchids are less spectacular but often make up for a lack of size by occurring in large numbers.

APPENDIX 1

Orchids of the Northern Peninsula area

KEY

Locality

C Cape York (i.e. north of the Jardine)

H Heathlands area (south of the Jardine)

Habitat (as per Table 3)

Abundance

A Abundant

R Restricted

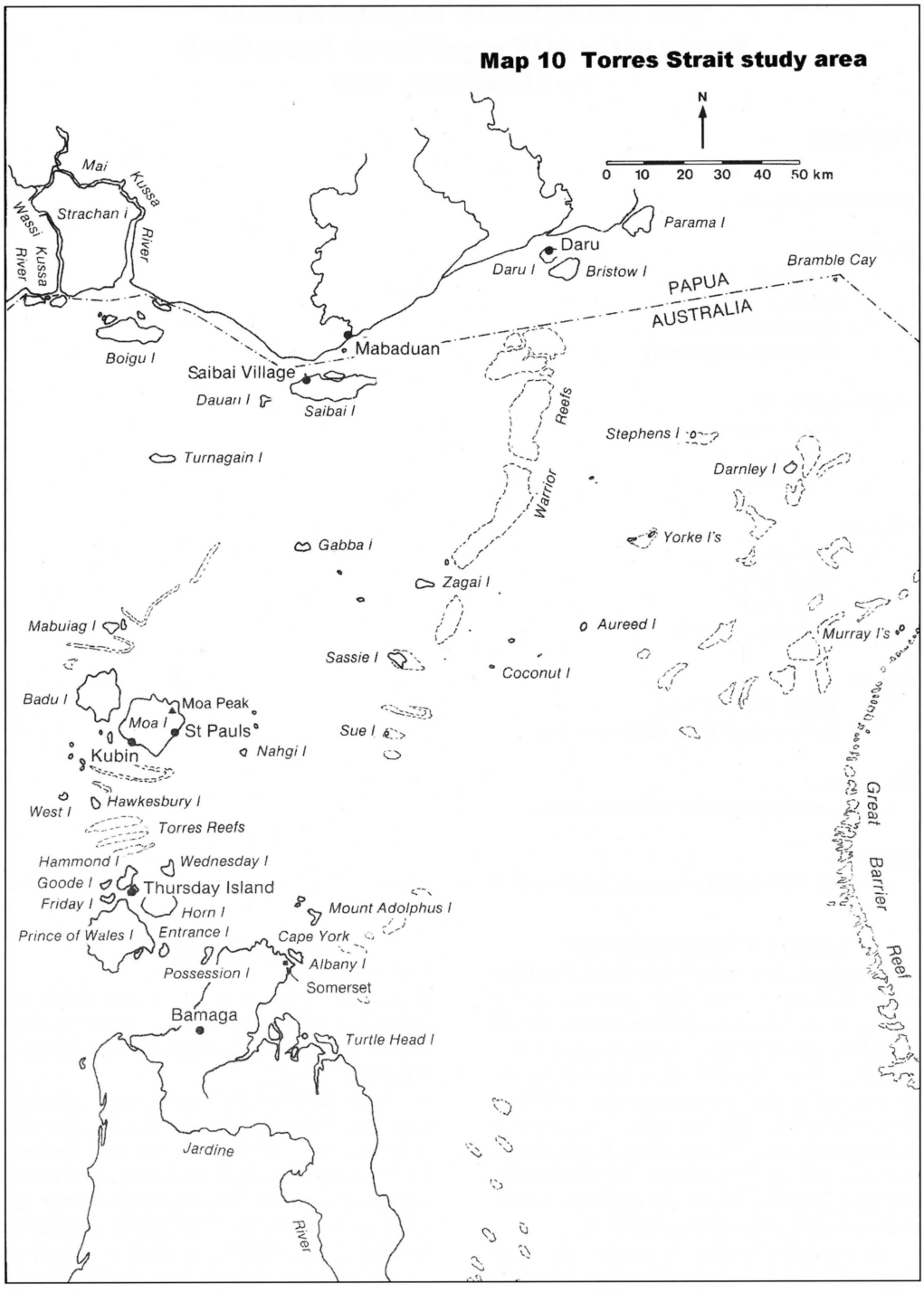
U Widespread, but uncommon

Orchids of the Northern Peninsula area

NAME	LOCALITY	HABITAT	ABUNDANCE
Arthrochilus irritabilis	CH	3a,3b,4a,4e	A
Arthrochilus sp. aff. *dockrillii*	CH	3b,3c	R
Bromheadia pulchra	CH	3a	U
Bulbophyllum baileyi	CH	la, 1b, ld,3c	A
Bulbophyllum masdevalliaceum	H	1b, 3c	R
Calochilus caeruleus	C	4d	R
Calochilus sp.	C	4d	R
Chiloschista phyllorrhiza	CH	la, lb,4d,5	A
Dendrobium bifalce	CH	la, lb	A
Dendrobium bigibbum	CH	2b, 4d	A
Dendrobium canaliculatum	CH	4d, 4e	U
Dendrobium carronii	H	4a	R
Dendrobium discolor	CH	1 a, lb, 1c, 2a, 2b,4d	A
Dendrobium johannis	CH	la,3c,4a,4d	A
Dendrobium lobbii	CH	3a	R
Dendrobium rigidum	CH	la, lb, lc,2a, 2b,3c,4d	A
Dendrobium semifuscum	CH	4e	A
Dendrobium smillieae	CH	la, lb,3c,4d	A
Dendrobium stuartii	C	la	R
Dendrobium X. *superbiens*	C	2b	R
Dendrobium teretifolium	C	lb	R
Diplocaulobium glabrum	CH	4d	A
Eria fitzalani	CH	la, lb,3c,4a,4d	A
Geodorum densiflorum	CH	4b, 4c, 4d	A
Habenaria elongata	C	4d	U
Habenaria ferdinandii	C	4b, 4c, 4d	A

NAME	LOCALITY	HABITAT	ABUNDANCE
Habenaria ochroleuca	C	4b	R
Liparis habenarina	C	4b	R
Luisia teretifolia	CH	la, lb,2a,2b, 3c,5	A
Malaxis latifolia	CH	la, lb	U
Malaxis marsupichila	C	la, lb	A
Nervilia holochila	C	4d	A
Nervilia plicata	C	lb	R
Nervilia sp.	C	4d	A
Pholidota pallida	CH	la, lb,3c	A
Phreatia crassiuscula	H	3c	R
Pomatocalpa macphersonii	C	la	R
Robiquetia tierneyana	H	lb	R
Schoenorchis densiflora	H	3c	R
Spathoglottis plicata	H	1b	R
Taeniophyllum sp. aff. *glandulosum*	C	1b	R
Taeniophyllum sp.	CH	1a	R

[Note – some of the names listed above have changed. See the list in Appendix 1 on page 139 for new names.]


Map 10 Torres Strait study area
N
0 10 20 30 40 50 km
Mai
Kussa
River
Strachan I
Wassi Kussa River
Parama I
Daru
Daru I
Bristow I
Bramble Cay
PAPUA
AUSTRALIA
Boigu I
Mabaduan
Saibai Village
Dauan I
Saibai I
Turnagain I
Warrior Reefs
Stephens I
Darnley I
Yorke I's
Gabba I
Zagai I
Aureed I
Murray I's
Mabuiag I
Sassie I
Coconut I
Badu I
Moa Peak
Moa I
St Pauls
Kubin
Sue I
Nahgi I
Great Barrier Reef
West I
Hawkesbury I
Torres Reefs
Hammond I
Wednesday I
Goode I
Thursday Island
Friday I
Horn I
Mount Adolphus I
Prince of Wales I
Entrance I
Cape York
Albany I
Possession I
Somerset
Bamaga
Turtle Head I
Jardine
River

THE ORCHIDS OF TORRES STRAIT
Report of the AOF expedition to Torres Strait
7 – 21 February 1989

Contents

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The members of the 1989 Torres Strait expedition would like to express their gratitude to the Directors and members of the Australian Orchid Foundation for their support of this expedition.

Many others helped to make this expedition a success and particular thanks are due to Andrew Christie and Pedro Stephen of the Department of Primary Industries, Thursday Island. Mr. Dragan Rastoka of the Department of Community Services, Thursday Island was also most helpful in the planning stage of the expedition.

In particular, special thanks are due to the people of St Pauls, Kubin, Saibai and Dauan who made us welcome and were always willing to help. We would also like to thank the owners of the Grand Hotel, Norm and Noel Shadbolt for their cooperation in making the expedition comfortable while at Thursday Island and to the staff of Sunbird Airlines who cheerfully accepted our numerous schedule changes and always arrived on time.

INTRODUCTION

The study area

This report is the latest in a series which has considered the orchid flora of Northern Cape York Peninsula from the McIlwraith Range north to the Bamaga area.

Torres Strait is a shallow waterway separating Cape York from New Guinea. It is 150 km wide at its narrowest and is notorious with seafarers for its treacherous island and reef studded waters and strong currents. The numerous islands fall into three major types - high islands or volcanic islands (e.g. Moa Island); coral islands (e.g. Yam Island) and mud islands (e.g. Saibai Island). Situated between Australia and New Guinea, the islands of Torres Strait lie at one of the major crossroads of the world plant geography and possibly represent part of the pathway by which part of the Australian flora (including many orchids) came to this continent over the past 15 million years.

It was not possible to visit all the numerous islands of the Strait in a short time, so this report concentrates on a selection of islands which the expedition visited and on records of collections and observations on other islands.

History

The history of Torres Strait is one of the intermixing - not always peacefully - of different peoples. It is clearly an area of overlap between the Melanesians of New Guinea and the Australian Aborigines, although there is no clear line of demarcation. It has been suggested that people have lived in the islands for only about 2,000 years (Wilby 1988), although this seems at odds with a 40,000 year history in Northern Australia and a similarly long history in New Guinea, especially given that as recently as 8,000 years ago the two land masses were joined (Doutch 1972). In any case it seems that before European contact these islands were populated by a vigorous and very mobile people who had close trading ties with New Guinea to the north and Australia to the south (Singe 1979). There was a considerable amount of mixing of the races in the southern part of the Strait. e.g. the language spoken on Mabuiag was basically an Aboriginal one, while physically the people resembled Melanesians. The people of the islands travelled widely and it is now difficult to know which plant species were originally native to the islands and which have been introduced.

Recorded European contact began in 1606 with the voyages of Torres and Janszoon, although it seems probable that earlier Portuguese navigators passed through the Strait. There are also legends of shipwrecked Spanish sailors living on Murray Island before this. Torres is recorded as shooting two men and abducting three young women probably on Long Island (Hilder 1980), while Janszoon sailed near Prince of Wales Island as far as is known without landing (Sigmond and Zuiderbaan 1974).

James Cook in August 1770 landed on Possession Island, but both Cook and Banks found little of interest there. Perhaps the most important voyage was that of Bligh in 1792 in the *Providence* and *Assistant* (Lee 1920). Bligh entered the Strait near Darnley Island, possibly the first European contact with the natives of these eastern islands. This first contact was far from friendly with canoes being fired on near Darnley and again at Warrior Island and one sailor being killed by an arrow on the *Assistant*. Bligh first attempted to travel north-west but was blocked by reefs. At this point he named Mt. Cornwallis, now known as Dauan Island and Banks (Moa), Mulgrave (Badu) and Jarvis (Mabuiag) islands. He also named Mt. Augustus on Moa Island. A party landed on North Possession Island, a small island off the coast of Moa. Bligh sailed through the passage between Badu and Mabuiag - with some difficulty - and then westward.

The following year Bampton and Alt in the *Hormuzeer* and the *Chesterfield* entered the Strait near Darnley and after a bloody stay near that island, proceeded north west close to Dauan and Boigu Islands along the coast of New Guinea to the west. The extreme problems of reefs and sandbanks encountered by these expeditions encouraged others to give the area a clear berth for many years, the most common route being to enter near Darnley and then sail south west to the Prince of Wales group and then west to Timor. There are few records of contact with Moa or Badu and none with Saibai for over half a century with the exception of a clash between warriors from Badu and some of the crew of the *Thomas Lord* in 1846. However there were numerous visits to the Prince of Wales Group - notably by Flinders in the *Investigator* in 1802. Flinders explored the area near Hammond and Good Islands and a party including the botanist Robert Brown landed on Good Island.

Several expeditions visited the Northern tip of Cape York Peninsula and the nearby islands, but it is from the writers on the *Rattlesnake* in 1847 that most can be learned. On this expedition Barbara Thompson, who had lived with the natives on Prince of Wales for five years, was rescued. She provided a unique insight into the way of life of the islanders which is the basis of much of our present understanding of the ethnology of the area (Moore 1979). The settlement at Somerset was moved to Thursday Island in 1876 and, with the subsequent development of the pearling industry, Thursday Island soon became a thriving port. Today it remains the largest town in the region.

The history of the local peoples is one of persistent pressures on a resilient population. Firstly the European pressures, then followed by pressures from ex-patriat south sea islanders who settled in large numbers on Mabuiag and at St. Pauls on Moa Island as well as many other localities. Somewhere around 1860 it appears that virtually the entire population of Moa was wiped out in a battle with people from Badu. The vacuum so created was filled by south sea islanders and by people from Prince of Wales Island. People from Saibai and Boigu show close affinities with peoples from the adjacent New Guinea mainland, but clearly consider themselves a separate group. Perhaps the major influences on the peoples were the advent of the pearl shell industry in the 1870s and the arrival of the missionaries soon after. After the initial violent

and warlike confrontations of the early part of the 19th century, the people of the Strait now have a reputation for friendliness which members of the AOF expedition found to be justified.

In 1879 Queensland moved to annex the islands of Torres Strait and by an Act of Parliament established a border very close to the Papuan mainland. As there was no government in Papua at the time, this boundary came to be recognised and exists largely unchanged today.

Botanical history

In 1770 Cook landed on Possession Island. While there was little time for botany, Joseph Banks was unimpressed by what he saw, stating: 'The hill we were upon was by far the most barren we had been upon'. Later Banks landed on Booby Island and reported some plants of interest which he had not seen before. In November 1802 Robert Brown collected quite extensively on Good Island.

Jukes, the naturalist on the *Fly* in 1844, describes several islands, but in general makes little mention of plants, other than some interesting comments on coconuts which he reports on all rocky islands 30 miles or more from the Australian coast. He notes that he has never seen them on the Australian mainland (Jukes 1847). MacGillivray on the *Rattlesnake* in 1849 gave descriptions of Cape York but has little to say concerning the islands, with the exception of Mt. Ernest Island (Nahgi Island) where he reported large areas of bamboo, and Darnley Island where he collected a cuscus (MacGillivray 1852). The bamboo and the cuscus are indications of the problem facing a present day biologist in Torres Strait. Certainly the cuscus and almost certainly the bamboo, were brought from New Guinea by the natives, along possibly with yams and taro and other useful plants. During the expedition we also became aware that spectacular orchids such as *Dendrobium* X *superbiens* were also moved from island to island by the local people. The natural vegetation of much of the islands was modified by man long before white man came, particularly in the heavily cultivated eastern islands.

F.M. Bailey the colonial Botanist visited Thursday Island and adjacent islands in June 1897. He was apparently a little disappointed in the flora, writing (Bailey 1898): 'On the islands in the Straits I certainly expected to meet with a more diversified flora than I saw there, and probably on the larger islands, could the time have been spared to make a careful botanical examination, many new plants would have been brought to our knowledge. The prevailing high winds are detrimental to the growth of tall, handsome trees, thus no trees of any considerable size are met with except in the deep gullies between the hills'. He mentions few orchids, recording *Sarcochilus phyllorrhizus* (now regarded as *Chiloschista phyllorrhiza*) in his list of the species of Thursday Island. He makes an interesting comment on the Cooktown orchid saying: 'The beautiful orchids for which these islands used to be favoured are fast disappearing, at least from anywhere easy of approach from Thursday Island - such is the case with regard to the varieties of *Dendrobium bigibbum* Lindl., which are the kinds most sought after. On the trees of Hammond Island I saw large masses of that pitcher-forming asclepiad, *Dischidia rafflesiana* Wall., as well as other species of this genus, which in Queensland are known as button orchids.'

Members of the AOF expedition found Cooktown orchids (*Dendrobium bigibbum*) still to be in reasonable supply on Horn Island and recent reports indicate they are still present on Hammond, Prince of Wales and other islands including Thursday Island, although less abundant than in the early 19th century.

In more recent times extensive collections have been made, in particular by John Clarkson of D.P.I., Mareeba, while a list of plants from Badu has been published (Garnett and Jakes 1983). The only general account of the vegetation is that of Stocker (1982). Therefore it is still fair to say that the botany of the islands is poorly known.

The study area today

Today the Torres Strait islands are home to about 7,000 people of whom some 3,800 live on Thursday Island. There are 15 Island Councils scattered around the 100 or so islands. [In 2011 administration is now centralised in Thursday Island.] While there are problems with unemployment, the communities are well organised and well kept. Many islands have airstrips and regular barge services bringing food and other goods. Most inhabited islands now have telephone contact. Travel is largely by small boat as the islanders have lost none of their traditional seafaring skills and think nothing of taking on the 100 km crossing from Saibai Island to Thursday Island.

Quarantine is a major issue today as the islands provide an accessible pathway between New Guinea and Australia. Quarantine laws are strict in Torres Strait to attempt to prevent the introduction of animal diseases such as rabies and screw worm and numerous plant diseases. The plants collected on this expedition could be brought to mainland Australia only after inspection and dipping.

Another related aspect of life in Torres Strait which can cause the visitor some surprise is the

positioning of the international boundary. The Torres Strait islands have been part of Australia since they were annexed by Queensland in 1879 extending the border virtually to the Papuan mainland. This was done to protect fishing areas and sea lanes and has been the subject of much debate over the years. In recent years there has been a strong local movement to retain the old border and any changes are now most unlikely. Various provisions of a treaty allow for traditional visits and fishing rights.

Entry to the island communities is allowed only by permission of the Councils, although this is readily granted for legitimate purposes.

Horn Island is the site of a large active goldmine which employs a large workforce of islanders. This and an infant tourism industry probably point the way to the future.

THE ENVIRONMENT

Physiography

The Torres Straits consist of a shallow waterway up to 150 km wide studded with about 140 islands and numerous reefs and mud banks. The strait has existed for about 6,000 - 8,000 years, before that a land bridge existed between New Guinea and Australia at various times. The islands fall into four groups:

1. Western and southern continental islands
2. Eastern volcanic islands
3. Central coral islands
4. Northern mud islands

1. Western and southern continental islands

These include the group centred on Thursday Island and Prince of Wales Island; Badu, Moa and Mabuiag in the centre of the Strait and Dauan Island near the New Guinea mainland. This chain of islands is termed the Cape York Oriomo Ridge (Willmott et al 1973) and comprises upper carboniferous granite which has intruded the Torres Strait volcanics. Most of these islands are over 100 metres high while Moa (400 m) and Dauan (220 m) are the highest. Mabaduan on the New Guinea mainland is the northern extension of this ridge. Some of these islands are large - in particular Prince of Wales (19,610 ha), Horn (5,268 ha), Moa (17,000 ha) and Badu (10,103 ha), while Dauan is 325 ha and several others are much smaller such as Tuesday Islets (18 ha, 10 ha, 1 ha). The altitude of the higher points is not great, but most of the islands are rugged. There are extensive sand covered plains on Moa and Horn Islands. Few, if any, streams are perennial.

2. Eastern volcanic islands

This group comprises Darnley Island, Stephen Island and three islands in the Murray Group. These islands are smaller and are more recent than the western islands, being Pleistocene basalt in origin. Murray Island is 436 ha in area, Darnley is 563 ha.

3. Central coral islands

These islands are sand and coral of very low relief and with extensive fringing reefs. Typical examples are Sue (Warraber) Island (63 ha), Long (Sassie) Island (912 ha) and Coconut Island (30 ha).

4. Northern mud islands

These islands are formed from the outwash of the large southern rivers of New Guinea in particular the Fly. While politically belonging to Australia, they are geographically part of the southern Papuan lowlands. Only a metre or two above sea level, these islands are made of mud perched on coral and comprise large areas of salt and brackish swamp. The only inhabited islands are Saibai (9,625 ha) and Boigu (7,150 ha). They are subject to partial inundation on spring tides. Both islands lie within a few kilometres of the New Guinea coast.

CLIMATE

Rainfall

Torres Strait lies in an area of high, reliable and very seasonal rainfall. Only two recording stations have any relevance to the Straits - Thursday Island and Daru situated at opposite ends of the Straits.

The figures for Thursday Island indicate a dry season with little rain falling between June and October and heavy rain peaking during the north-west monsoon from December to April. This is the common pattern over most of northern Australia. The Daru rainfall figures indicate a trend towards a higher average rainfall and a more even distribution over the year in northern parts of Torres Strait. The usual pattern over most of Torres Strait is storms starting in November and heavy monsoon rain from January to April. During the remainder of the year scattered showers fall during the persistent south easterly winds.

Table 1: Rainfall (mm) – comparison between Thursday Island and Daru.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
Thursday Is.	423	364	357	222	48	19	9	8	3	11	36	241	1741
Daru	280	258	325	321	223	108	93	52	42	55	111	204	2063

Winds

Torres Strait has a reputation for windy conditions with the winter south easterlies often reaching 30 knots and persisting for long periods. During summer and autumn the north west monsoons are milder, rarely exceeding 20 knots and often much lighter. The Strait lies north of the area which receives regular cyclone activity, although occasional cyclones have been recorded in the region.

Temperatures

Torres Strait lies between 9° and 11° S latitude and consequently experiences a tropical climate. However the high temperatures are moderated by the influence of the sea with lower maxima and higher minima than inland areas. During the 1989 expedition, members found daytime conditions hot and humid with occasional heavy rain, while nights generally were not oppressively hot.

Table 2: Temperatures (averages in °C).

Location	Jan. av. max.	Jan. av. min.	July av. max.	July av. min.
Thursday Island	29.8	24.7	27.6	22.4

VEGETATION

1. Moa Island

Notophyll vine forest

This forest occurs on the granite hills of the ranges of the north east corner of Moa Island. The forest is low to moderate in height and, due to the steep nature of the ranges is often wind-pruned. Even in sheltered gullies it seldom exceeds 15 metres in height. Common species are *Welchiodendron longivalve*, *Syzygium branderhorstii*, *Ficus* spp., *Bambusa forbesii*, *Schefflera versteegii*, and the palms *Arenga australasica* and *Liculala ramsayi*. Vines were not a prominent feature and epiphytes showed prominent zonation, being very abundant above about 150 metres altitude.

Mixed closed forest and grassland

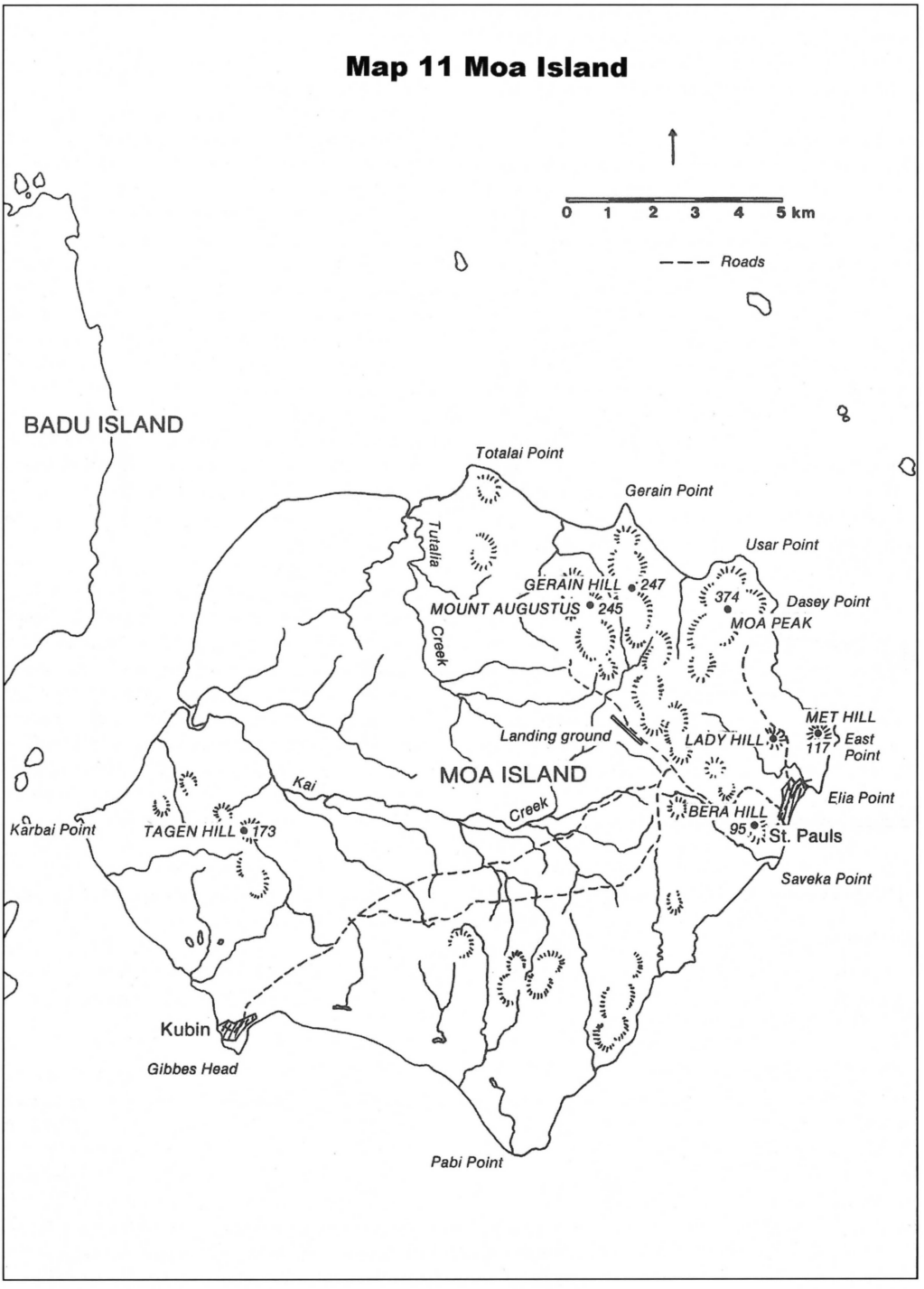
This type occurred mostly on the margins of the notophyll vine forest (type one) and is clearly a fire disclimax. Most of this area would support closed forest if not for the regular man- started fires which sweep up the ridges and force the closed forest back. This leaves small enclosures of typical notophyll vine forest in gullies or on rocky areas or, in some cases, for no obvious reason, these probably being all that remains of larger patches. These are interspersed with closed grassland often up to two metres tall. A common emergent tree in there grasslands is *Barringtonia calyptrata* which must be tolerant of hot fires.

Tagen Hill in the south west of the island, appears to represent an area of notophyll vine forest which has been severely damaged by fire and now features much *Acacia auriculiformis*, *A. polystachya*, *Eucalyptus tessellaris* and odd mango trees with patches of grassland and undisturbed vine forest.

Grasslands occur largely on the eastern coast near St Pauls village and are almost certainly the result of regular firing by the inhabitants. The remaining trees vary from patches of closed forest along the streams to a mixed open forest of eucalypts, acacias and introduced species such as bamboo and mangos. Closed forest species are abundant in the understorey where fires are not too prevalent. The grass forms a dense continuous cover up to two metres tall and is continuous with mixed closed forest at the base of the hills. Some pockets of *Welchiodendron longivalve* have survived the fires, possibly because they occur on poor rocky sites which do not carry a fire well.

Closed forests on rocky knolls

Among the open forests which dominate much of Moa Island are small patches of closed forest on rocky outcrops. These are no doubt due to the protection from fire offered by the rocky


Map 11 Moa Island
0 1 2 3 4 5 km
Roads
BADU ISLAND
Totalai Point
Gerain Point
Usar Point
Tutalia Creek
GERAIN HILL 247
MOUNT AUGUSTUS 245
374
Dasey Point
MOA PEAK
MET HILL
117
East Point
Landing ground
LADY HILL
MOA ISLAND
Kai Creek
BERA HILL
95
St. Pauls
Elia Point
Saveka Point
Karbai Point
TAGEN HILL 173
Kubin
Gibbes Head
Pabi Point

ground. Usually *Welchiodendron longivalve* dominates the canopy almost to the exclusion of other species, while *Curcuma australasica* is prominent in the ground layer in the wet season.

Open forest on volcanics
This type occurs on the Torres Strait volcanics of the southern part of the island, an area of comparatively rugged topography on a minor scale. The ridges and slopes are well drained and support a moderate height forest to about 15 metres of bloodwoods (*Eucalyptus nesophila*, *E. novaguinensis*, *E. hylandii*), *Planchonia careya*, *Acacia crassicarpa* and occasional trees of *Welchiodendron longivalve*. The ground layer is usually tall grasses to about one metre, with some areas in which *Cycas media* dominates.

Open forest on granites
This type occurs in the outwash from the granite ranges of the north east country of easier topography. As there was no chance to visit this area, no details on the species present are available.

Melaleuca forests of the interior
This area was not visited, but is known to be of low flat topography and sandy soil. Better drained low ridges support open forest with eucalypts, while low lying areas are dominated by melaleucas, in particular *M. symphyocarpa*.

Melaleuca woodlands of the coasts
This type occurs on the low lying poorly drained country near the coast, particularly in the vicinity of Kubin Village. Common species are *Melaleuca viridiflora*, *M. leucadendra*, *M. acacioides*, *M. stenostachya* with a ground cover of sedges and, in the wet season, small herbaceous annuals. During the wet season the ground is covered with about six centimetres of warm water.

Mangroves and salt flats
There are extensive areas of mangrove forest in many locations around the coast. There are backed by salt flats in a few areas.

2. Saibai Island
Saibai is a large low-lying island comprising a muddy soil on top of coral. No point is more than a metre or two above sea level and much of the island is inundated by spring tides. The interior of the island consists of a patch work of brackish water swamps, mangrove forests and pandanus savanna. The margin of the island is fringed with mangrove forests in all areas except the Saibai Village area on the north-west coast. The area in which all the terrestrial orchids occurred was the savanna and this will be described in more detail below.

Pandanus savanna
This occurs on the higher ground on poorly drained mud soils. In the wet season, almost the whole area is covered n a few centimetres of hot brackish water. The grasses were commonly about one metre tall and comprised blady grass (*Imperata cylindrica*) and *Themeda* sp. The cover is thick and even, changing to low swards of saltwater couch (*Sporobolus virginicus*) on the lagoon margins. Scattered throughout the grasslands are clumps and isolated plants of *Pandanus* sp. Occasional groves of *Lophostemon suaveolens* or *Melaleuca viridiflora* occur on slightly better drained sites. The shallow lagoons contain large areas of the sedges *Scirpus littoralis* in more salty areas and *Elaeocharis dulcis* in areas with a greater freshwater influence.

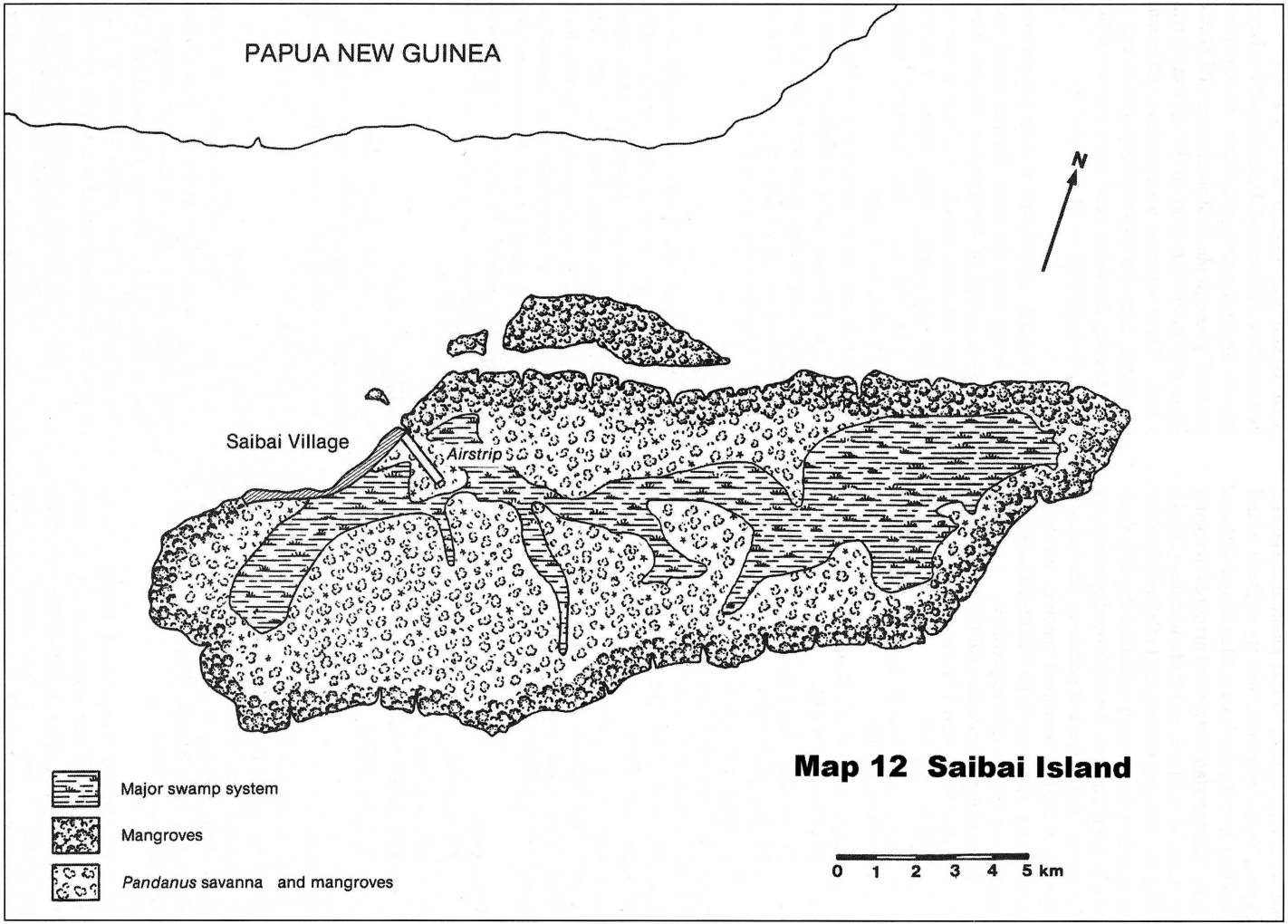
3. Dauan Island
No aerial photographs were available. From observations, Dauan is composed largely of large granite boulders. The very narrow flat sandy country behind the beaches has been cleared and planted to gardens and grasslands. The rugged hills are covered in mesophyll vine forest where the rocks allow plants a foot hold. Several species of *Ficus* are present along with *Schefflera actinophylla* and *S. versteegii*. The rocks are covered with orchids, ferns, and vines with the climbing *Scindapsus altissimus* prominent.

METHODS

The bulk of the results presented here were gathered on the AOF expedition of February 1989. To these data have been added various bits of information gleaned from personal communications and from published accounts.

Planning
As a first stage aerial photographs maps and published accounts were studied and information was obtained from people with firsthand experience. From this the areas most likely to provide chances of finding new or interesting orchids were selected, given that a maximum period of two weeks was available. The islands selected were: Moa, Saibai and Dauan. It was not planned to survey the southern islands centred on Thursday Island in detail on this expedition, although some time was to be spent on Horn and Thursday Islands.

The only practical method of carrying out this survey was by chartering a light plane. Because of this and because the group were to rely on local people for accommodation, numbers in the party



Map 12 Saibai Island

had to be kept to four. It was planned to spend a day on Thursday Island, then fly to Badu Island for three days then by boat to Moa Island for three days. (Circumstances resulted in more time being spent on Moa Island, and Badu was not visited.) From here the party would fly to Saibai Island for three or four days which includes a day or two on nearby Dauan Island. It was planned to undertake the survey during the wet season to increase the chances of finding terrestrial species. As far as possible supplies were to be purchased locally to keep the party as mobile as possible.

The aerial photographs used were:

- Torres Strait Run 1 North nos. 34, 36, 38 (1971) CAB 388
- Torres Strait Run 2 North nos. 69, 71, 73 (1971) CAB 388
- Torres Strait Run 1 South nos. 51, 53, 55, 57 (1971) CAB 415
- Torres Strait Run 2 South nos. 31, 33, 35, 37 (1971) CAB 415

The major maps used were the 1:100,000 series for Thursday Island and Moa Island, the 1:250,000 series for Torres Strait and 1:1,000,000 series for Torres Strait. No maps or photographs of Saibai and Dauan (other than 1:1,000,000 scale maps) were located and this made planning of this phase difficult. The map of Saibai Island (Map 12) is taken from the publication 'Saibai Island of Torres Strait' (Teske 1988).

Personnel:

- P.S. Lavarack (QNPWS)
- J.R. Clarkson (Queensland Herbarium)
- D.L. Jones (National Botanic Gardens)
- B. Gray (CSIRO, Atherton)

Study areas

The areas chosen for closer investigation were: Thursday Island, Horn Island, Moa Island, Saibai Island and Dauan Island. As well as these islands, brief visits were made to Murray, Yorke, Yam, Boigu and Badu Islands. The rationale for these selections is as follows:

Thursday Island, Horn Island Thursday Island was the base for the expedition for logistical reasons. While there, a few hours were spent in orchid hunting. As Horn Island is readily accessible from Thursday Island it was also searched. The major aims of this part of the expedition were (1) to organise the expedition and (2) to asses these more accessible islands and to determine if they would be worth a more detailed examination at a later date.

Moa Island was chosen as it lies half way between New Guinea and Australia and is a large island with diverse array of habitats. Examination of aerial photographs indicated more and better developed rainforests than on the adjacent Badu Island. There was also a convenient settlement (St. Pauls) near the major rainforest area and a road passing through a good cross section of the island. (This proved to be untrafficable).

Saibai Island was chosen as it is a large mud island lying near the New Guinea coast and there is a record of *Dendrobium insigne* from there (Stocker pers. com.). It is also a base to investigate the nearby rocky island of Dauan which John Clarkson had reported looked excellent habitat for orchids.

Other islands were not investigated because of time, logistics and cost and because reports to hand indicated that they were heavily cultivated and not likely to support any significant numbers of orchids, or they were of small size.

Field work

Base camps were established at Thursday Island (Feb. 7 to 10 and Feb. 18 to 20), St Pauls on Moa Island (Feb. 10 to 14), Kubin on Moa Island (Feb. 14 to 16) and Saibai (Feb. 16 to 18). From these bases day trips were made to various local features which had previously been located on maps and aerial photography. Collections were made of live material and herbarium specimens. Notes were made on habitats and relevant photographs taken.

Laboratory work

Specimens brought back were studied or cultivated to produce flowers as appropriate. Taxonomic studies on terrestrial species are still progressing.

Diary of expedition

February 7 The party assembled at Cairns Airport and was farewelled by Rev. Ron Collins. The flight lasted three hours and stopped at Weipa. On arrival at Thursday Island about 5.30, the party was met by Andrew Christie and Pedro Stephens of DPI and settled in at the Grand Hotel. The Grand was to prove an excellent base and much writing and preparation of specimens was carried out on the spacious verandas overlooking a splendid 180 degree vista of the Thursday Island harbour.

February 8 By arrangement with Andrew Christie, David Jones and Bruce Gray were able to travel to several islands on a DPI quarantine flight. The islands visited were Murray, Yorke,

Yam, Saibai, Boigu and Badu. The only orchids seen was a large colony of *Nervilia holochila* on Yorke Island. Murray Island looked too altered by cultivation to have any remaining habitats with large numbers of orchids, while too little time was available on other islands for good searches.

Meanwhile John Clarkson and Bill Lavarack spent the morning organising food and other matters. A major problem was found to exist with the importation of live plants from Torres Strait to mainland Australia. Detailed negotiations had to be set in train to organise this and the outcome was not finalised until much later in the expedition - placing a limit on the amount of live material which was collected. Another problem was caused by conflicting reports on the availability of supplies on the islands.

During the afternoon Bill Lavarack and John Clarkson had a look at Green Hill. This hill just behind the town is covered by grasslands and disturbed rainforest. Much of the area was used for emplacements during the war. Three orchid species were seen - *Dendrobium johannis*, *Chiloschista phyllorhiza* and *Nervilia holochila*. The plants of the latter were by far the largest that anyone had seen for this species and some doubt was expressed about the identification. They were growing on the rainforest margin under trees of *Barringtonia calyptrata*. Although not seen on this expedition, other orchids reported from Thursday Island include *D. bigibbum* (Cooktown orchid), *D. canaliculatum* and *Luisia teretifolia* (Smythe 1970).

That evening the party were entertained by one of the local attractions of Thursday Island - The Mills Sisters.

February 9 Three of the party spent the day on Horn Island while John Clarkson continued with the problems involved with quarantine of orchids. Most of Horn Island is a mosaic of open forest with bloodwoods on the ridges and swampy paper bark forests on the flats. On some rocky ridges are closed forests of *Welchiodendron longivalve*. The paper bark forests were found to have the following orchid species: *Dendrobium canaliculatam*, *D. johannis* and probably two species of *Arthrochilus* similar to *A. irritabilis*. One of these was found in flower in white sand country, very similar to the epacrid scrubs of Cape York. *Habenaria propinquior* was abundant in low lying country. The forests of *Welchiodendron* were found to include large numbers of *D. johannis* along with *D. smillieae*, *Nervilia holochila* and *Geodorum densiflorum*.

February 10 The party boarded a charter flight at 8.30 a.m. for Kubin Village on Moa Island. The flight was only 20 minutes but was very spectacular passing over four major reef systems. Visibility near Moa Island was poor due to low cloud, but a large patch of closed forest was seen just inland from Kubin. The aircraft landed in heavy rain. While waiting for transport at the airstrip (endless hours were spent waiting on this expedition), two *Habenaria* species were found close by. These were *H. propinquior* and *H. elongata*, both growing in paperbark woodland. The party then proceeded to wait on the beach for boat transport to St Pauls Village on the eastern side of the island - the road being out due to rain. Finally the party and all its equipment was picked up in a dingy sent from St Pauls and enjoyed an exciting ride through reefs and rain squalls to St Pauls. St Pauls is a beautiful small community of about 100 people built on a low sandy flat behind a beach which has an extensive reef. The party was accommodated in very comfortable quarters in a building named 'The Arc' and owned by the local Anglican Church.

After settling in, the group set off to explore the hills behind the village. These hills are covered in a patchwork of grasslands and closed forest which shows evidence of frequent firing, pushing closed forest margins back. The grass in February was shoulder high and difficult to move through. Generally the number of orchids seen was disappointing. Those seen were: *Chiloschista phyllorhiza*, *Dendrobium discolor*, *D. smillieae*, *D. calamiforme* (i.e. *D. teretifolium* sens. lat), *D. johannis*, *Luisia teretifolia* and in one damp gully, *Pholidota imbricata*. On the return trip *Habenaria elongata* and *H. propinquior* were collected in paperbark forest.

February 11 The party was dropped off on the reef flat near the foot of Moa Peak (also known as Banks Peak) by a local dingy. The drop off point was near Daisy Point adjacent to a prominent dyke of white quartz. After a steep climb up the rocks, the party entered some low windswept scrub and followed the ridge toward the summit (374 m). This low scrub proved to be rather poor in orchids with *Luisia teretifolia*, *Pholidota imbricata*, *Dendrobium discolor* and *Geodorum densiflorum* being noted. However at about 150 m altitude this changed markedly to a much moister habitat under quite well developed, but low, rainforest obviously heavily influenced by the moist south easterlies during winter. The feature of this zone is an obvious abundance of epiphytes, such that anyone entering the area would be immediately struck by their overwhelming numbers. Species seen were: *Dendrobium discolor*, *D. bifalce*, *D. calamiforme*, *D. smillieae*, *D. luteocilium*, *Bulbophyllum masdevalliaceum*,

B. baileyi, *Cadetia wariana*, *C. maideniana*, *Diplocaulobium glabrum*, *Pholidota imbricata*, *Robiquetia tierneyana* and the terrestrial *Malaxis marsupichila*. [A specimen collected here was later described as *Cadetia clausa* by D.L. Jones.] The suddenness of the change from a poor orchid habitat to a rich one was startling. The two species of greatest interest were *Cadetia wariana* and *Bulbophyllum masdevalliaceum* both of which were very abundant. Another plant of interest here was a mangosteen (*Garcinnia* sp.) with large yellow fruit which had a delicious taste. At the time of writing this had not been identified, but appears not to be an Australian species. Near the summit a *Hoya* species new to Australia was discovered. This species has small globular flowers somewhat similar to *H. littoralis* [now known to be *H. revoluta*]. Other notable plants included the fan palm *Licuala ramaysii*, the rare palm *Arenga australasica*, *Bambusa forbesii* and *Syzygium branderhorstii* with its attractive red and white fruit. No sign was seen of a rumoured occurrence of a species of *Coelogyne* or *Dendrochilum* and members agreed this sighting was probably a small plant of *Pholidota*.

The trip down was very steep and slippery in a creek bed. On arriving at the bottom a large clump of bamboo was seen (not *B. forbesii*). This had the appearance of being planted and was used by locals for building etc. On the return journey *Nervilia holochila* and the two *Habenaria* species were collected.

February 12 This day the party set out at about 8.00 am to walk to an old mine site on the slopes of Mt Augustus (246 m). The route initially lead along the road to Kubin, branching off on a side road a few kilometres from St Pauls. This road passed through mostly grassland under scattered patches of *Welchiodendron longivalve* forest and cycads. *D. johannis* was abundant in the trees and in the grass were *Habenaria elongata*, *H. propinquior* and *Nervilia* sp, - a species with peltate leaves previously known only from Cape York [Since described as *N. peltata*.] In gallery forest along a large creek *Pholidota imbricata*, *Dendrobium smillieae*, *D. bifalce*, *Bulbophyllum baileyi* and *Eria fitzalani* were seen, and in rainforest on the lower slopes *Diplocaulobium glabrum* and *E. fitzalani* were present. On a rocky slope a large colony of *Nervilia plicata* and a few plants of *Geodorum densiflorum* and some plants of an unidentified *Malaxis* were seen.

At about 200 m (i.e. just below the summit of the ridge) a sudden transition was made to habitat very rich in orchids and other epiphytes. This was similar in many ways to the upper parts of Moa Peak but, due to the easier topography, the forest was taller, consisting mostly of *Welchiodendron longivalve*. The understorey was quite open, giving the habitat a most beautiful appearance. Orchids seen here were: *Bulbophyllum masdevalliaceum* (very abundant), *B. baileyi*, *Pholidota imbricata*, *Eria fitzalani*, *Dendrobium luteocilium*, *D. calamiforme*, *D. bifalce* and *Zeuxine* sp.

February 13 Most members of the group were sore after four days hard walking in hot and humid conditions and the morning was spent resting and preparing specimens. In the afternoon a walk was done around Met Hill. Some mangrove areas were inspected and large plants of *Dendrobium discolor* and *Chiloschista phyllorhiza* were noted, but the general poverty of orchids in lowland areas was obvious. In the evening the Chairlady of St Pauls, Grace Ware, called in.

February 14 Party left for Kubin in a leaky, overloaded boat. Fortunately the weather was calm and all went well. Accommodation was a problem at Kubin, but finally the group was put up in the new medical aid post. After an early lunch the party set out to walk along the road towards St Pauls as this was known to pass through some promising country for terrestrials. The road initially traversed low lying paper bark woodland which supported large colonies of *Habenaria elongata* and *H. propinquior*. Other terrestrials noted included possibly *H. xanthantha* (only one plant seen and this may have been a malformed *H. propinquior*), *Calochilus* sp. (similar to one from Darwin) and *Liparis habenarina*. The paper barks included *Melaleuca viridiflora* and *M. stenostachya*, all with plants of *Dendrobium canaliculatum*.

The road then ascended a small hill which was covered with open forest of bloodwoods and *Cycas* sp. with tall grass. The main trees were *Eucalyptus nesophila*, *E. novoguinensis* and *E. hylandii* with *Planchonia careya* and occasional *Welchiodendron longivalve*. Plants of *Dendrobium johannis* were abundant on the latter. A side road lead to a patch of closed forest on a heavily disturbed rocky area which was later identified as a wolfram mine site from 40 years previously. Further on in rocky soil plants of *Nervilia plicata* and *N. holochila* were seen along with *D. smillieae*, *D. calamiforme*, *D. discolor* in trees and on larger rocks.

February 15 Very heavy rain fell up to about 10:00 am. The party then set off to walk to Tagen Hill (173 m) north of Kubin. In the paperbark woodlands south of the hill some interesting terrestrials were found. In addition to those noted

on February 14th the following were seen: two - possibly three - species of *Arthrochilus*. Two of these had a single leaf similar to one previously collected at Cape York. Good flowering material of the *Calochilus* was collected and spent specimens of a second species were also collected. A tall growing *Habenaria*, not previously seen on this trip was collected, but unfortunately the flowers were virtually finished. In gallery forest near a major creek were plants of *Luisia* (possibly a second species separate from *L. teretifolia*), *Dendrobium johannis* and *D. smillieae*. Further on another small *Arthrochilus* was collected - making a total of possibly four species. Tagen Hill proved to be disturbed by fires and not high enough to support the good epiphytic habitats seen on Moa Peak and Mt Augustus. The range of orchids seen was small with no surprises. On the return journey plants of the peltate - leaved *Nervilia* from Cape York were seen.

February 16 The party left for Saibai via a Sunbird Charter Flight. Saibai Island is basically a mangrove and brackish water swamp with some dry ground just above the water table. The village is perched on a beach ridge on the north coast. Much of the interior of the island is a pandanus savanna. Accommodation was provided in a rather run down house at the extreme western end of the village.

The party then set out to walk into the interior of the island. The conditions were hot and almost unbearably humid with ankle deep water on most of the road. The few trees encountered were examined, but no epiphytes were seen. Some interesting terrestrials were discovered in the grassland. *Habenaria rumphii* and *H. propinquior* were quite common along with odd plants of *Didymoplexis pallens*, *Liparis habenarina* and *Nervilia crociformis*. Footprints of rusa deer were evident. Saibai has a large deer population which originated on the adjacent New Guinea mainland.

February 17 The party left at 9.00 am to travel by dingy to Dauan Island some 8 km distant. Dauan, in contrast to low lying Saibai, is a high island reaching 296 m and composed of a large tumble of rainforest-covered granite boulders with a narrow sandy coastal strip. Cultivation extends a very short way up the hills. Progress on the mountain was very slow, difficult and dangerous due to the boulders which had deep crevices between them. Where there was sufficient soil, dense rainforest with numerous vines was present. On the western side of the hill large numbers of a new *Dendrobium* were found. This was a pendulous, branching species with small yellow flowers and subsequently proved to be *D. litorale*, a species not previously recorded from Australia, but quite abundant on the New Guinea coast. Other species seen were: *D. bifalce*, *D. discolor*, *Pholidota imbricata*, *Bulbophyllum baileyi*. Three species of *Hoya* were collected - only one of which, *H. nicholsonae*, occurs in Australia. Of the others, one had previously been collected on Moa and the other was quite unknown. A new *Dischidia* species was also collected. The view from the top of the ridge was spectacular, emphasising how close Saibai Island is to mainland New Guinea (only 4 kilometres).

February 18 A Sunbird charter flight picked the group up in the morning and returned to Horn Island, where the group had to wait for three hours for transport to Thursday Island. They then moved into the Grand Hotel for a few hours rest and preparation of specimens.

February 19 This day (Sunday) was spent at Thursday Island preparing specimens and recovering from what had been a very strenuous expedition. The party went on a short walk to Green Hill where plants of *Nervilia holochila* were collected and the historic fort was visited.

February 20 The party was due to fly to Cairns, but a pilots' strike resulted in an extra day on Thursday Island. David Jones and Bruce Gray travelled to Horn Island primarily to look for more material of a probably new species of *Arthrochilus*. They discovered a good population of Cooktown orchids (*Dendrobium bigibbum*) growing in *Leucopogon* shrubs in a white sand area. During the morning Bill Lavarack and John Clarkson completed arrangements for export of plants collected during the expedition. This was permitted by DPI officers after inspection for disease and dipping in malathion and white oil mixture.

February 21 After a delay of several hours due to aircraft trouble the party finally departed Thursday Island for Cairns.

Information from other sources

Very little has been published on the flora of Torres Strait and even less mentions orchids. A few of the most important are considered below.

(1) Garnett and Jackes (1983) provided a list of plants from Badu Island which included five Orchids. Three of these are expected: *Dendrobium discolor*, *D. smillieae* and *Diplocaulobium glabrum*. Two others are worthy of mention:

a. *Eria dischorensis*. This is a most unlikely record as this species in Australia occurs in very moist rainforest - often at an altitude of 500 m or more. It seems probable that this was in fact a small plant of *E. fitzalani*.

b. *Dendrobium linearis*. It is not known what this species is. Perhaps it is a misprint for *D. lineale* but this seems a most unlikely record or perhaps it is *D. teretifolium* (*D. calamiforme*) which has linear leaves and is abundant on the adjacent Moa Island. Or it may be a reference to *D. litorale*.

(2) Captain R.S. Davis of the US Army (Davis 1945) wrote a short article on *Dendrobium bigibbum* on Horn Island. He reports:

'While walking along the beach where the cliffs extended to the shoreline, I observed the lovely flowers of *Dendrobium bigibbum*, which appeared in abundance along the face of the cliff. The plants at this location were in three-quarters sun, being exposed to direct light the entire morning and for two or three hours in the afternoon, as well as to the moist air and wind off the tropical ocean. Plants growing here were somewhat smaller than those in most collections in Queensland, but appeared very vigorous. The flowers likewise were smaller, but the colour developed from exposure to the sun was more intense, and of a deeper shade than those of the usual collection. The plants themselves developed and thrived in the humus produced from fallen twigs and leaves of the undergrowth which had lodged and collected in the crevices between the rubble. This arrangement provides the ideal situation of an adequate porous growing material with good drainage and a yearly replenishment of humus.

A further abundance of plants, with ten to fifteen blooms on a raceme, were encountered in the more shaded location of the gully, where a greater number of trees grew. The plants which grew in this area were very large, with well developed pseudobulbs and leaves. Flowers were also large, in many cases more than two inches across, but because of the under-exposed position were of paler hue than those which developed in the sunlight. However, the paler blooms possessed a very beautiful opalescence, which considerably added on their natural beauty. The plants invariably grow quite close to the ground on the trunks of a type of tea-tree, which possesses porous bark. In many cases the roots of the dendrobe extend down into a loose accumulation of decomposed bark, mixed with the coarse sand prevalent in the area. The plants are large, producing many back-bulbs, and a considerable number of new growth each year.'

(3) Dr H.E. Young (1947) seems less reliable as he reports *Dendrobium speciosum* (probably *D. bifalce*) and *D. pugioniforme* (probably *D. rigidum*) at Cape York. On the islands he comments:

'Prince of Wales Island is passed to the east and here can be found the Cooktown orchid again and also the golden orchid and an occasional plant of their hybrid offspring, *Dendrobium superbiens*, most of which, however, have been removed. Then we go on up the narrow half mile passage separating Thursday and Horn Islands.

Horn Island, with its airfield, was found to possess a peculiar type of *Dendrobium canaliculatum* in which the flowers had sepals tipped with chocolate, instead of the usual mauve, and the plants appeared more robust than the normal mainland form. It was noted here, and elsewhere, that this orchid preferred the narrow leafed ti-tree to the broad-leafed species, both species occurring in a mixed association in those parts. Cooktown and golden orchids also occur on Horn Island, but in small quantities as most have been as most have been collected.

On Warrior Island I was fortunate enough to gain two plants of *Dendrobium bigibbum*, both having white flowers, but with purple blotches in the throat of the labellum'.

(4) R. Smythe (1970) reported the following orchids from Thursday Island: *Dendrobium canaliculatum*, *D. bigibbum*, *D. johannis*, *Luisia teretifolia*, *Chiloschista phyllorhiza*. On Hammond Island he reported *D. bigibbum*, *C. phyllorhiza* and *D. superbiens* on Prince of Wales Island.

(5) Various other comments suggest good population of Cooktown orchids and occasional plants of *Dendrobium* X *superbiens* on some islands north and south of Thursday Island and on Prince of Wales Island, but there seem to be few reports from the Moa - Badu area.

(6) G. Stocker (pers. com.) reported two interesting species from Saibai Island. There are *Dendrobium insigne* and *D. antennatum*, both growing in mangroves just to the east of the Saibai airstrip. The former report is the only Australian record of this species.

Table 3: Orchids of Torres Strait.

SPECIES	Horn Island	Thurs. Island	St Pauls Moa Is.	Kubin Moa Is.	Saibai Island	Dauan Island	Yorke Island
Arthrochilus sp. 1	X			X			
Arthrochilus sp. 2				X			
Arthrochilus sp. 3				X			
Bulbophyllum baileyi			X				
Bulbo. masdevalliaceum			X				
Cadetia maideniana			X				
Cadetia wariana			X				
Calochilus sp. 1				X			
Calochilus sp. 2				X			
Chiloschista phyllorhiza		X	X	X		X	
Dendrobium antennatum					X*		
Dendrobium bifalce			X			X	
Dendrobium bigibbum	X	X*					
Dendrobium calamiforme			X				
Dendrobium canaliculatum	X	X*	X	X			
Dendrobium discolor			X	X		X	
Dendrobium insigne					X*		
Dendrobium johannis	X	X	X	X			
Dendrobium litorale						X	
Dendrobium luteocilium			X				
Dendrobium smillieae	X		X	X		X	
Dendrobium X *superbiens*		X**					
Didymoplexis pallens					X		
Diplocaulobium glabrum			X				
Eria fitzalani			X			X	
Geodorum densiflorum	X		X	X			
Habenaria elongata			X	X			
Habenaria propinquior	X		X	X	X		
Habenaria rumphii					X		
Habenaria sp.				X			
Liparis habenarina				X	X		
Luisia sp.				X		X	

SPECIES	Horn Island	Thurs. Island	St Pauls Moa Is.	Kubin Moa Is.	Saibai Island	Dauan Island	Yorke Island
Luisia teretifolia		X*	X	X			
Malaxis marsupichila			X	X			
Nervilia crociformis					X		
Nervilia holochila	X	X	X	X			X
Nervilia plicata			X	X			
Nervilia sp. peltate leaf***			X	X			
Pholidota imbricata			X			X	
Robiquetia gracilistipes			X				
Zeuxine oblonga			X				

Legend

* Records from sources other than AOF Expedition.

** Actually recorded from other islands near Thursday Island.

*** *Nervilia* sp 'peltate leaf' has been described as *Nervilia peltata* B. Gray & D.L. Jones

DISCUSSION

Comparison with adjacent areas

Torres Strait, lying as it does between the major land masses of Australia and New Guinea, might be expected to represent an important line of demarcation between the two biotas. This was in fact the subject of 'Bridge and Barrier: The Natural and Cultural History of Torres Strait' a symposium held in 1972. (Walker 1972). The evidence gained on the 1989 AOF expedition will now be examined to determine what it can tell us about the distributions and relationships of and the orchids in particular and the flora in general across Torres Strait. To do this we first need to examine what is known of the flora on both sides of Torres Strait.

Unfortunately knowledge of the orchid flora of south western Papua is sketchy. Much of the area is low lying, of sedimentary origin with mangroves on the coast and extensive freshwater swamps inland. Open forests and grasslands tend to dominate with well developed closed forests along the streams. The climate appears to be considerably moister than that of Cape York Peninsula, but still retains a marked dry season in May to October. Information from G. Stocker (pers. com.) and R. Smythe (1970) indicates an orchid flora of south east Papua New Guinea very similar to that in Torres Strait. Stocker reports seeing only two species which were not present on the islands, these being *Coelogyne* c.f. *fragrans* and *Dendrobium purpureum*.

Two species which are virtually restricted to New Guinea were recorded on islands close to the New Guinea coast. These are *Dendrobium insigne* on Saibai (4km from the New Guinea coast) and *D. litorale* on Dauan (10 km from the coast). Neither species has been found further south, but both are widespread lowland species in New Guinea.

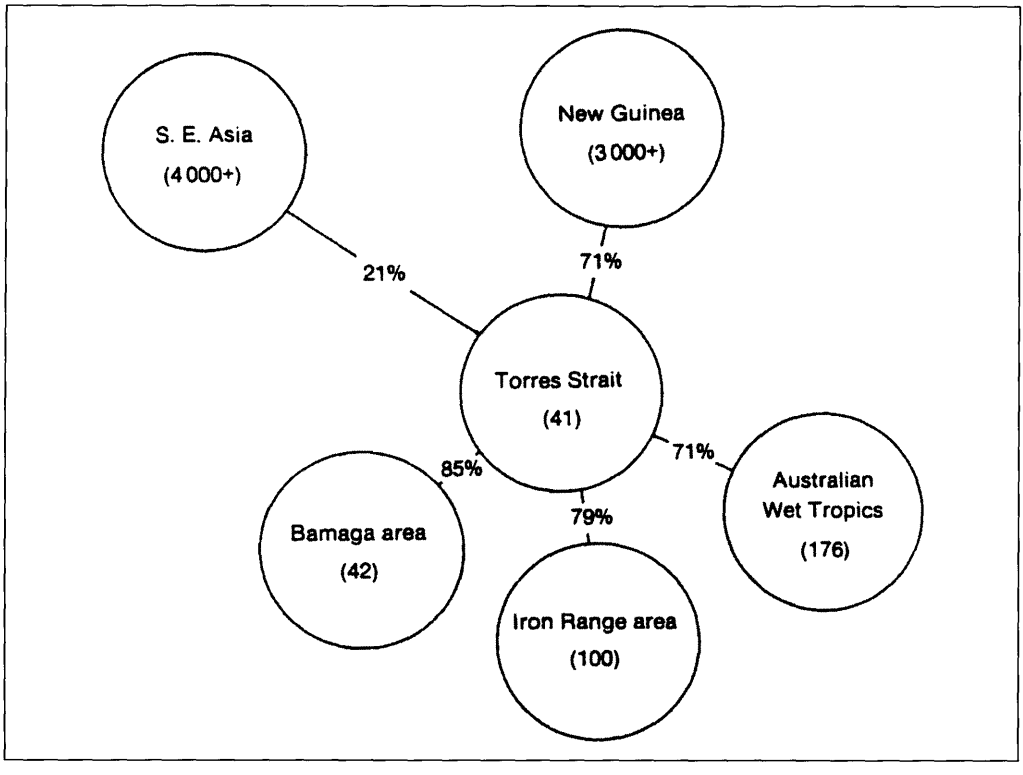


Fig 2: Relationships of the orchids of Torres Strait in terms of the percentage of shared species. (The numbers in brackets represent the total orchid flora of each area.)

Stocker (1982) suggests that the flora of mainland New Guinea is basically part of the same system as Torres Strait and northern Cape York Peninsula saying: 'Real intermingling of Australian and New Guinean flora takes place still further north along the freshwater reaches of the streams that flow across the Oriomo Plateau of south west Papua.'

Relationships of the Torres Strait and Cape York orchid floras is easier to determine as there are good lists for Cape York (Lavarack 1977c, 1980b, 1984b, 1986). Of the 41 species listed for Torres Strait only seven are not on Cape York Peninsula. Two of these are mentioned previously (*Dendrobium litorale* and *D. insigne*), while the remainder are all unidentified terrestrials (*Habenaria*, *Arthrochilus* and *Calochilus*), which may well prove to be present on Cape York when identifications of collections from both areas are available.

Some of the Torres Strait species are widely distributed in New Guinea e.g. *Dendrobium bifalce*, *D. smillieae*, *D. discolor*, *D. luteocilium*, *Pholidota imbricata*. However others have a limited distribution in New Guinea occurring only in the seasonally dry parts of southern Papua, e.g. *D. canaliculatum*, *D. johannis*, *D. bigibbum*. A comparison of the orchid flora of Torres Strait with those of surrounding areas (see Fig.2) indicates that Torres Strait is most closely related to the Bamaga - tip of Cape York Peninsula area with some 85% of its species shared with that area. It is also closely linked to the Iron Range, Australian Wet Tropics and New Guinea floras. The link to New Guinea, given as 71% in Fig.2 may well be closer than this as so little data is available for that area.

The overall picture, then, is of an orchid flora covering Northern Australia, Torres Strait and southern New Guinea. It is, in effect, a transitional flora between New Guinea and Australia with few, if any, endemic species, but with an 'overflow' of species from the north (*Dendrobium litorale*, *D. insigne*) and from the south (*D. johannis*, *Habenaria propinquior*).

APPENDIX 1

Report by D.L. Jones to the Australian National Botanic Gardens
Field Trip Report - Torres Strait Islands
5-22 February 1989

Background:

The Australian Orchid Foundation has sponsored a number of expeditions to various parts of Cape York Peninsula over the last 12 years. All have been led by Bill Lavarack and the basic aim has been to gain better knowledge of the Australian tropical orchids. These expeditions have been very successful, resulting in the discovery of many new species, extensions of range of others and a significant increase in the basic knowledge of orchids of the region. David Jones has participated in three of these earlier trips and as well as collecting orchids has made a number of significant fern discoveries.

All of the earlier AOF expeditions have concentrated on Cape York Peninsula. The Torres Strait Islands extend as a chain from Cape York to the mainland of New Guinea. Basically these are one of three types, coral cays, granite ridges which are extensions of Cape York, and basalt cones. Politically and geographically these islands are Australian but they have been largely neglected by botanists. Previous orchid collecting has mostly been fragmentary with the collectors concentrating on horticulturally desirable species such as *Dendrobium bigibbum* and the natural hybrid *D.* X *superbiens*. Many of the earlier orchid collections lack habitat details and often basic localities are missing. The knowledge of terrestrial species of the region is extremely poor since these orchids are deciduous and only grow and flower during the wet season when few visits are made. Additionally the hot, steamy climate at this time of the year is not conducive to collectors. Two strains of malaria are present in the region.

Participants:

- Bill Lavarack, NPWS, Townsville
- Bruce Gray, CSIRO, Atherton
- John Clarkson, DPI, Mareeba
- David Jones, ANBG, Canberra

Aims:

The main aim of this expedition was to survey the orchids of five Torres Strait Islands - Thursday, Horn, Moa, Saibai and Dauan. The trip was made during the middle of the wet season to coincide with the growth and flowering of terrestrial species.

As well as general collecting, David Jones had the following requirements:

a) to collect material of the terrestrial genera *Arthrochilus*, *Calochilus* and *Habenaria* for revisions and flora treatments.
b) to collect live orchids for the ANBG collection.
c) to collect ferns, in particular *Cheilanthes* as part of an on-going study of this genus in tropical Australia.

Transportation on and between islands was either by light plane, dingy or shank's pony. This imposed limitations on the number of personnel which could be involved and the amount of material which could be collected.

As drying of specimens was impossible in

the humid climate all herbarium specimens were treated by the alcohol method. A day's collection, each between sheets of newspapers, was tied tightly in bundles, placed in thick plastic bags, doused with 2 cups of alcohol and the bags sealed with tape. Treated this way, specimens will keep for many months and can then be dried and processed normally. This method is strongly recommended for work in the tropics.

Itinerary

5/2/1989	Canberra to Cairns; met with Len Lawler and collected in Palmerston area
6/2/1989	Atherton Tableland with Len Lawler
7/2/1989	Cairns to Thursday Island
8/2/1989	Bruce Gray and David Jones accompanied DPI officer on routine fruit fly trap inspection to the islands of Badu, Boigu, Saibai, Yam, Yorke and Murray
9/2/1989	Collected on Horn Island
10/2/1989	Horn to Moa Island, taken from Kubin to St Pauls by boat
10-13/2/1989	Collected around St Pauls
14/2/1989	St Pauls to Kubin by boat
14-15/2/1989	Collected around Kubin
16/2/1989	Moa to Saibai
17/2/1989	Saibai to Dauan to Saibai
18/2/1989	Saibai to Thursday Island
19/2/1989	Thursday Island and Horn Island
21/2/1989	Horn Island to Cairns
22/2/1989	Cairns to Canberra

SUMMARY OF RESULTS

Badu Island

Short stop only. Island dotted with small, rocky hills and some swamps. Soil sandy. No orchids seen in the single swamp visited.

Boigu Island

Short stop only. Low flat mangrove mudflat. Little chance of orchids except perhaps in mangroves.

Saibai Island

Short stop only. Low flat mud island dominated by mangroves with inundated pandanus grassland at centre.

Yam Island

Short stop only. Small hilly inland, hills covered in rocks and depauperate rainforest. No orchids seen on hill near airstrip.

Yorke Island

Short stop only. Low coral cay covered with depauperate littoral rainforest. *Nervilia holochila* present in colonies of thousands. Interesting trees in fruit including *Diospyros ferrea*, a species of Pittosporaceae and the fern *Phymatosorus grossus*.

Murray Island

Large volcanic island with deep red soil. Most of the vegetation has been cleared and an extensive cropping system is employed by the islanders. Airstrip is located at the top of a steep hill which makes for interesting landings and departures. No orchids collected but collections made of *Uvaria rufa* in flower and the fern *Adiantum philippense* and fern ally *Selaginella ciliaris*.

Horn Island

Spent about one and a half days collecting on this island mainly between the jetty, airport and gold mine. Topography generally flat with a few rocky hills. Vegetation mostly stunted woodland dominated by bloodwoods (*Eucalyptus brassiana*, *E. hylandii*), melaleucas (*Melaleuca viridiflora*, *M. symphiocarpa* and acacias (particularly *Acacia crassicarpa*). Seven species of orchid were collected on the island. Of these the most significant was an undescribed species of *Arthrochilus* found in abundance under sparse epacrid scrub in white sand. An intensive collection gathered will probably be used as the type. Plants of *Dendrobium bigibbum* were also located in drier patches of this type of vegetation. This was the only locality where this normally common orchid was found on this trip.

Moa Island

Previously known as Banks Island, Moa is a large island with numerous hills, the highest being Moa Peak which is about 300 metres elevation. The peaks are covered in rainforest which in some areas is quite dense. Dominant species include *Welchiodendron longivalve*, *Acacia aulacocarpa* and *Canarium australianum*. Fire has destroyed much of the rainforest between the hills, this being replaced by dense grassland reaching to about 1.5 metres tall. Melaleuca wetland dominates the lower part of the island. Much of this is covered by warm surface water about 15 centimetres deep. In all 27 species of the orchid were collected on this island. Of the five days spent on Moa Island, three were devoted to collecting on the rainforest clad hills around the village of St. Pauls. Epiphytes were found to be abundant above 150 metres altitude.

The most noteworthy find was *Bulbophyllum blumei* (*Bulbophyllum masdevalliaceum*) in absolute profusion. Previously in Australia this

species was known only from a small area on northern Cape York Peninsula. While traversing the grassland on one trip a small colony of an undescribed *Nervilia* was located. This species is well known on Cape York Peninsula and northern parts of the Northern Territory.

Much of the two days around the village of Kubin was spent collecting in melaleuca wetland were some very interesting terrestrials were discovered. *Habenaria elongata* and *H. propinquior* were abundant and I managed to observe the pollination of the latter species and catch the vector, a small bee. Two species of *Calochilus* were collected both probably undescribed, one in flower and the other finished. A third species of *Habenaria* was common in one locality. All plants had finished flowering but from the relatively large leaves and apparent small flowers this species would appear to be a new record for Australia.

Saibai Island

A sign on the airstrip welcomes visitors to this the northern gateway of Australia. Although large, this island is very low and it is beyond my ken as to why people would wish to live there. Much of the island is underwater at high tide and these areas are dominated by mangroves. The parts high enough to escape inundation by salt water are covered during the wet season by 10-20 centimetres of water which becomes amazingly hot. The soil is black mud. Apart from a few patches of *Melaleuca viridiflora* and *Tristaniopsis suaveolens*, the vegetation in the higher parts is dominated by tall grass and scattered *Pandanus*.

Although *Dendrobium insigne* has been collected from Saibai we did not find any epiphytes. Five species of terrestrials were collected however including *Habenaria rumphii*, *Nervilia crociformis* and the brittle saprophyte *Didymoplexis pallens*. An interesting species of *Cheilanthes* was also collected.

Dauan Island

Only a short trip from Saibai but an order of magnitude in interest and attraction is Dauan Island. This island is dominated by Mt. Cornwallis which is covered with rockpile vegetation - gigantic granite boulders interspersed with rainforest trees particularly *Ficus* spp. Traversing such rockpiles is botanically rewarding but dangerous since loose mats of vegetation often hide deep cavities between boulders. Although we only had sufficient time for one transect of the mountain this proved to be extremely worthwhile and future visits to this island would be warranted. A species of *Dendrobium*, new for Australia, was located in a large *Ficus* growing on the southern slope of the mountain. Collected plants have since flowered at ANBG and have been identified as *Dendrobium litorale* Schltr. Plants of two other interesting *Dendrobium* sp. were also collected but they have not flowered. The recently described fern *Asplenium capitisyork* D. Jones was found in abundance among the boulders.

Three climbing species of Cucurbitaceae proved to be of interest to Ian Telford.

1. First record of *Muellerargia timorensis* this century - listed as extinct in Briggs and Leigh (1989)
2. Third collection of *Zehncria mucronata* for Queensland
3. *Neocalsomitra capricornica* - probably a new genus.

In addition two species of *Hoya* new for Australia and a *Dischidia* were found to be quite common. Cuttings of these are growing at the ANBG.

Thursday Island

This is the most heavily populated island in Torres Strait and much of the remaining vegetation was disturbed by wartime activities. Four species of orchid were located on the island the most interesting being a large variant of *Nervilia holochila*. This grows in very dense colonies and has leaves about twice as large as normal. Live plants were collected for ANBG.

Summary

In retrospect this trip was excellent and the results obtained fully justified the outlay by the AOF. The hot steamy conditions and long walks were very arduous but conductive to a good night's sleep in surroundings that were sometimes less than primitive. In all some 37 species of orchids were recorded, 20 of which were terrestrials and the remainder epiphytes. *Dendrobium litorale* is a notable new record for Australia and the range of others such as *Bulbophyllum blumei* has been extended considerably. Good material collected of two undescribed terrestrials (*Arthrochilus*, *Calochilus*), will be probably be used for type specimens when they are described shortly. Two others (*Calochilus* sp., *Habenaria* sp.) will require further collections. Two epiphytic species which are tremendously abundant on northern Cape York Peninsula, were surprisingly absent or rare on the islands we visited. Only one patch of *Dendrobium bigibbum* was located and plants of *D. rigidum* were completely absent. Useful fern collections were made including species of *Cheilanthes* and *Ophioglossum*.

Future collectors to this area should note that the Torres Strait Islands are a declared quarantine zone and live plants cannot be removed from the area without permission and until they have been treated by a quarantine officer.

David L. Jones
5 May 1989

List of Orchids and Ferns collected or noted on various islands

ORCHIDS	FERNS
Horn Island	
Arthrochilus sp. nov.	*Cheilanthes caudata*
Dendrobium bigibbum	*C. pumilio*
D. canaliculatum	*C. tenuifolia*
D. johannis	*Drynaria quercifolia*
Geodorum densiflorum	*Lygodium japonicum*
Habenaria propinquior	
Nervilia holochila	
Moa Island	
Arthrochilus spp. (4)	*Antrophyum* sp.
Bulbophyllum baileyi	*Asplenium laserpitifolium*
B. blumei	*A. nidus*
Cadetia maideniana	*Cheilanthes caudata*
C. wariana	*C. prenticei*
Calochilus spp. (2)	*C. pumilio*
Chiloschista phyllorhiza	*C. tenuifolia*
Dendrobium bifalce	*C. tenuissima*
D. calamiforme	*Davallia denticulata*
D. canaliculatum	*D. solida*
D. discolor	*Drynaria quercifolia*
D. johannis	*Gonocormus saxifragoides*
D. luteocilium	*Lecanopteris sinuosa*
D. smillieae	*Lindsaea* sp.
Eria fitzalani	*Lygodium flexuosum*
Geodorum densiflorum	*Microsorum punctatum*
Habenaria elongata	*Nephrolepis biserrata*
H. propinquior	*Ophioglossum pendulum*
H. sp.	*O.* spp. (4)
Liparis aff. *habenarina*	*Pyrrosia lanceolata*
Luisia teretifolia	*P. longifolia*
L. aff. *teretifolia*	*Tectaria brachiata*
Malaxis marsupichila	*Vittaria ensiformis*
Nervilia holochila	
N. sp. nov.	
Robiquetia gracilistipes	
Zeuxine oblonga	
Saibai Island	
Didymoplexis pallens	*Cheilanthes* sp.
Habenaria propinquior	*Ophioglossum* sp.
H. rumphii	
Liparis aff. *habenarina*	

Nervilia crociformis

ORCHIDS	FERNS
Dauan Island	
Bulbophyllum baileyi	*Asplenium capitisyork*
Dendrobium bifalce	*A. nidus*
D. discolor	*Cheilanthes* spp. (2)
D. litorale	*Davallia denticulata*
D. smillieae	*Drynaria quercifolia*
Luisia aff. *teretifolia*	*Microsorum punctatum*
	Nephrolepis biserrata
	N. hirsutula
	Pyrrosia lanceolata
	P. longifolia
Thursday Island	
Chiloschista phyllorhiza	*Cheilanthes tenuifolia*
Dendrobium canaliculatum	*C.* spp. (2)
D. johannis	*Drynaria quercifolia*
Nervilia holochila	*Lygodium japonicum*
Yam Island	
	Drynaria quercifolia
Yorke Island	
Nervilia holochila	*Drynaria quercifolia*
	Phymatosorus grossus
Murray Island	
	Adiantum philippense
	Selaginella ciliaris

ORIGINS AND AFFINITIES OF THE ORCHIDS OF CAPE YORK PENINSULA, REVISITED

Background

In 1981 I wrote a paper entitled *Origins and affinities of the orchid flora of Cape York Peninsula* (Lavarack 1981). The following discussion is based on that, but with some major changes which have come about due to increasing knowledge, particularly with respect to the tribe *Dendrobieae*. The AOF expeditions described previously provided the data on which the theories presented below are based.

The orchids of Cape York Peninsula are now reasonably well known. The AOF reports in the previous pages along with other discoveries and descriptions of new species by Bruce Gray, David Jones and others over the last decade or two have led to this position. Other tropical areas such as the Wet Tropics of Queensland, the Top End of the Northern Territory and the Kimberleys are also in a similar position with regard to orchids, meaning that we are now in a position to speculate about the affinities and origins of the Peninsula orchids. The one drawback is that the southern part of the island of New Guinea adjacent to Cape York Peninsula remains relatively unknown so some guesswork and extrapolation will be required there.

The past half a century has seen some refining of ideas on the biogeographical past of the Australian region both in the long and short term. Influencing these new ideas have been some more detailed information on the ways in which plate tectonics has operated in the areas to the north and west of present day Australia; the study of pollen from cores taken from the craters on the Atherton Tableland (Kershaw 1975, 1980) and with respect to the orchids, the results of molecular studies of the tribe *Dendrobieae* which has been summarised by Wood (2001, 2006). Information of this kind has made it possible to take a fresh look at the origins and relationships of the Australian flora and in particular the orchids.

Changing theories

It is now generally accepted that the large land mass that included Australia, New Guinea, New Zealand and New Caledonia, separated from the ancient supercontinent of Gondwana about 60 million years ago and drifted north. It seems likely that it originally supported an ancient Gondwana flora adapted to cool moist environments such as presently exist in Tasmania, New Zealand and in the mountains of New Guinea.

In 1981 I proposed what then seemed to be the simplest explanation for the present day distribution of orchids in Australia. This postulated that the tribe *Diurideae* represented the native or original orchid flora of Australia and that the rainforests of north east Australia were largely devoid of orchids, in particular epiphytes, prior to the collision of the Australian tectonic plate with the Asian plate some 15 million years ago. This collision allowed the rich Asian orchid flora to invade Australia and the then rapidly emerging land mass of New Guinea. Cape York Peninsula was seen as important as it was regarded as a point of entry of the postulated Indomalayan invasion of rainforest elements into Australia (e.g. see Burbidge 1960). This comfortable and simple theory has been questioned by recent molecular research on the tribe *Dendrobieae* (e.g. Yukawa et al 1996, Clements 2003, Wood 2006). This research carried out by independently by separate workers clearly shows two major natural divisions in the group. The likely origin of these groups is that, while both originally came from ancient Gondwana, one developed on the Australian plate and the other on the Indian plate. The Australian (or 'southern') group including the ancestors of *Dendrobium* species such as *D. jonesii* and *D. discolor* (and presumably other genera), survived in moist areas such as mountain tops and gorges as the plate moved north through increasingly drier climates until it collided with the Asian plate about 15 million years ago. This collision caused the elevation of the land mass of New Guinea with mountains that are still increasing in height to this day. These mountains provided moist climates with numerous different habitat niches which facilitated the rapid evolution of the southern orchids into part of the incredibly rich orchid flora of present day New Guinea. This theory accommodates the unique orchid flora of New Caledonia more satisfactorily than my original proposal.

The other group (the 'northern' group) moved north more rapidly on the Indian plate to its ultimate collision with the Asian plate which caused the uplift of the Himalayas and a rapid burst of evolution of the plate's orchid passengers. Some of these, including the ancestors of species such as *Dendrobium smillieae, D. macrostachyum* and *D. lobbii*, subsequently found their way to New Guinea where they diversified further, mixing with the 'southern' element already there. New Guinea now had an extremely rich and diversified orchid flora and elements of this then moved back into northern Australia via Cape York Peninsula, blending with the original flora from the Australian plate.

[Note added in proof: This question is far from settled and looking at the situation a year after writing the above, I still give my original theory, or a version of it, some credence. The plate tectonic history is much more complex than at first thought and I am sure there will be more twists and turns before this story is completed.]

Cape York Peninsula – the study area.

Today conditions suitable for rainforest occur in eastern Australia in a narrow, interrupted band along the length of the coast, nowhere more than a hundred or so kilometres wide (see Fig 3). This band usually corresponds with the summit and eastern slopes of the Great Dividing Range and the coastal plain. The height of the range, its alignment to the prevailing south easterly winds and its distance from the coast vary, giving rise to wet areas and rain shadows which are variously known as 'dry corridors' or 'barriers to the spread of rainforest' (see Webb and Tracey 1981). The most important barriers to rainforest spread along the Australian east coast are between the Stewart River and Cooktown (the Laura Basin); between Townsville and Bowen and between Sarina and Gladstone.

The area covered by the expeditions described in the preceding pages is bounded by the Laura Basin to the south, under present climate conditions a formidable barrier to the spread of rainforest plants. To the north is Torres Strait, also an efficient barrier under current high sea levels.

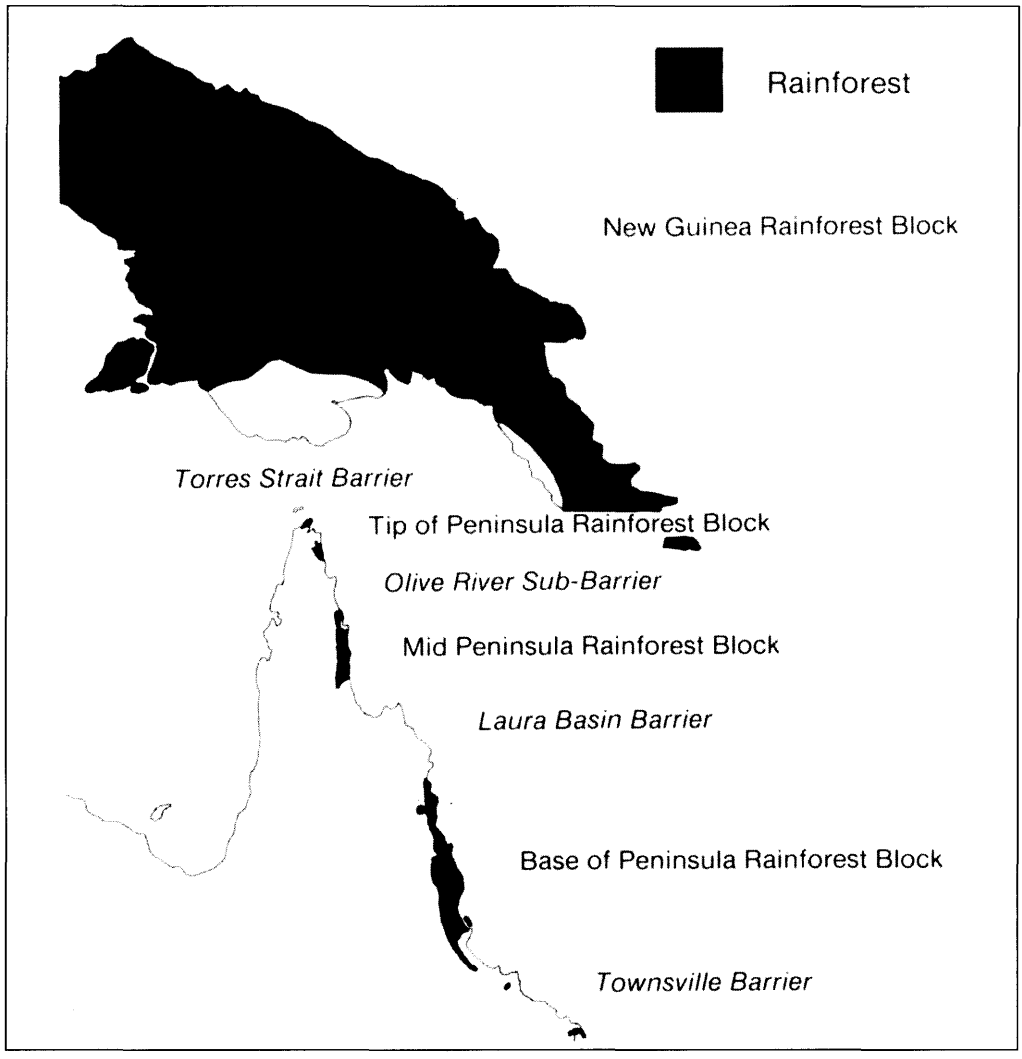


Fig 3: Distribution of rainforest in north east Australia and New Guinea.

In the following discussion the term 'Cape York Peninsula' is used in a narrow sense based on vegetation distributions, rather than on strict geography. It includes the area between 10° south and 15° south. The extensive rainforests of the Wet Tropics area from about Cooktown (15° 30" S) south are excluded from the present study as they have a distinct climate and support their own orchid flora.

In the Cape York Peninsula area the ranges lie close to east coast but generally lack height. Only in the area of the McIlwraith and Iron Ranges does the altitude reach 300 metres, but in all areas the ranges are close to the coast and lie in the direct path of the rain-bearing south easterly winds. Rainfall therefore is high in most eastern parts. The only recording station in this area at Iron Range airport has an annual average of almost 2000 mm. Rainfall in the adjacent Tozer Range and in the higher parts of the McIlwraith Range is likely to be rather higher than this but in other eastern areas to the north it would be lower. Even in eastern areas of lower elevation, the constant south easterlies produce light rainfall or mist along the ranges allowing rainforest to survive in the dry season. These rainforests in areas such as the upper Jardine River and the Olive River are less diverse than those of the Iron Range-McIlwraith Range area, but provide a habitat suitable for some epiphytic orchids. Further north on the lateritic soils of the Bamaga - Lockerbie area the rainforests are better developed than those of the upper Jardine, but less diverse than those of the Iron Range - McIlwraith Range area. These areas all support epiphytic and terrestrial orchid species, the numbers being related to the diversity of the forests.

In central and western parts of the Peninsula, west of the dividing range, rainfall is more seasonal with an extended dry season during which little rain falls from May to November and rainforests are mostly restricted to the banks of the major streams. Away from these the landscape is dominated by Melaleuca woodlands on poorly drained sites and eucalypt forest in better drained places. The seasonal drought experienced in these areas has resulted in only a handful of tough, drought-resistant species such as *Dendrobium canaliculatum*, *D. johannis* and *Cymbidium canaliculatum* in most areas and *Dendrobium bigibbum* in the deciduous vine scrubs and the gallery forests along the major streams.

The origins of the Cape York orchids

A list of orchids recorded from Cape York Peninsula north of 15° S is given elsewhere in this publication (see Appendix 1 *List of orchids of Cape York Peninsula north of 15° S*). A total of 130 species in 58 genera has been recorded. To put this into perspective it is interesting to compare it with those for two other eastern Australian regions which are centres for distribution of the family. The region from Cooktown to Townsville (the Wet Tropics) has 73 genera and about 220 species, while further to the south the region which includes south eastern Queensland and north eastern New South Wales ('subtropical') has about 48 genera and 190 species. To the north New Guinea has one of the richest orchid floras in the world with some 132 genera and at least 2500 species (Schuiteman & de Vogel, 2001). The Cape York Peninsula orchids have a number of different apparent origins. Some groups that shed light on these origins are considered below.

The tribe *Diurideae*

The vast majority of orchid genera occurring on Cape York Peninsula are epiphytes or terrestrials of northern affinity (e.g. *Habenaria*, *Calanthe*). However a few species belong to the tribe *Diurideae* a group whose distribution is centred in southern Australia. It is now generally agreed that the *Diurideae* are a southern group originating on the ancient continent of Gondwana. On Cape York Peninsula there are five genera (*Arthrochilus*, *Calochilus*, *Corybas*, *Caladenia* and *Thelymitra*) and eleven species in the *Diurideae*.

The percentage of *Diurideae* in the orchid floras of different areas tends to decrease from south to north along the eastern Australian coast (see Table 1), with the exception of New Guinea where the genus *Corybas*, with about 45 species, has proliferated in the cool moist uplands. The low percentage on Cape York reflects the southern origins of this group which has typically evolved in moist temperate climates. The climate of Australia has been progressively drying over the millennia as the continent drifts north. This has resulted in the *Diurideae* successfully adapting to temperate seasonal climates, but to date they have been less successful in hot tropical lowland climates whether they be seasonal, as on most of Cape York Peninsula, or moist year round as in lowland New Guinea. It would seem valid to conclude that the Cape York *Diurideae* represent the evolving edge of the Australian plants that are struggling to gain a toehold in the inhospitable climate of seasonal lowland Cape York Peninsula. The genus *Arthrochilus* with four or five closely related, very similar species on the Peninsula provides additional evidence of recent speciation.

Table 1: Percentage of *Diurideae* in orchid flora.

REGION	Percentage of *Diurideae* in orchid flora
New Guinea	4
Cape York Peninsula	8
Wet Tropics	17
Subtropics	50
Tasmania	96
Australia as a whole	65

Subtribe *Dendrobiinae*

The subtribe *Dendrobiinae* includes the well known genus *Dendrobium* along with related genera including *Cadetia*, *Diplocaulobium* and *Flickingeria*. Two separate origins are suggested for the *Dendrobiinae* as discussed previously – a southern group representing the original Australian plate flora and a northern group originating from the Asian plate. Cape York Peninsula, along with New Guinea, represents a mixing ground for these two elements. On the Peninsula, species such as *Dendrobium bigibbum*, *D. tetragonum* and *D. discolor* are of southern origin and *D. macrostachyum*, *D. smillieae* and *D. lobbii* are of northern origin.

Relationships with New Guinea

A few species such as *Dendrobium antennatum*, *D. bifalce*, *Cadetia wariana*, *Bulbophyllum longiflorum*, *B. blumei* and *Pomatocalpa marsupiale* are distributed along the east coast of the Peninsula and more or less attenuate towards the south. This could be seen as suggesting a relatively recent "invasion" from New Guinea and that is the view I proposed in 1981. However there are other ways of interpreting these distributions. They can be seen as relicts of a once widely distributed flora surviving in suitable enclaves in a drying climate, or simply as the outer edge of the distribution of these species. Perhaps the last mentioned of these may be the most logical interpretation.

Endemic and shared species

Like any other area of substantial size, Cape York Peninsula has endemic plant and animal species. Among the 130 species of orchid on the Peninsula there are 24 species that are restricted to the area. Ten of these are wet season terrestrial species which are poorly known as they flower in the wet season when it is difficult to visit their habitat. These are species in the genera *Habenaria*, *Arthrochilus* and *Calochilus* and it is quite possible that these species might be found in southern New Guinea where the habitat is similar, or in the Wet Tropics area or even in the Northern Territory. A few of the other species might also be in New Guinea where the orchids are not perfectly known e.g. *Dendrobium malbrownii*, *Trichoglottis australiensis* (which is very close to *T. papuana*), *Crepidium fimbriatum*, *C. marsupichilum* and *Appendicula australiensis*, but a handful appear to be true endemics that have evolved in the area and appear not to have any very close relatives outside. The list of these "true" endemics at present is: *Cadetia collinsii*, *C. clausa*, *Dendrobium wassellii*, *Dendrobium tozerense*, *Liparis collinsii*, *Oberonia carnosa*, *Robiquetia wassellii*, *Sarcochilus hirticalcar*, *Trachoma stellatum* and *Trichoglottis australiensis*. This list could change as more information about the orchids of New Guinea becomes available.

About 19% of the orchids of Cape York Peninsula are endemic based on current data. This compares to about 32% for the Wet Tropics and 38% for the eastern Australian sub-tropics. The percentage of endemics in the New Guinea orchid flora has not been calculated, but must be upwards of 75%. The relatively low figure for Cape York probably represents the lower number of habitats due to the lack of significant mountains and the relatively monotonous nature of most of the landscape away from the coast. About 70 species or 55% of the orchids of the Peninsula are shared with New Guinea. This compares

with about 30% of the Wet Tropics shared with New Guinea and 5% from the eastern Australian subtropical area. On the other hand Cape York Peninsula shares about 60% of its orchids with the Wet Tropics region to the south. These figures suggest that, placed as it is between the rich orchid floras of New Guinea and the Australian Wet Tropics, contemporary Cape York Peninsula may best be considered as a transition area.

Recent climate changes

In attempting to understand the origins of the present orchid flora of this region it is important to know something of occurrences not only in terms of plate tectonics millions of years ago, but also in the recent past. There is now good evidence that the climate of Cape York Peninsula has altered significantly in recent times. A reconstruction of paleoclimates by Nix and Kalma (1972) suggests major changes in the last 15,000 years. Fifteen thousand years ago (see Fig. 4a) sea levels were very low and all of Torres Strait, the Arafura Sea and the Timor Sea, as well as some areas east of the present coastline of north east Australia were low lying dry land, resulting in a low rainfall over the Peninsula. Rainforest would have been reduced to small refuge areas in places such as the eastern gorges of the McIlwraith Range and along major streams.

Eight thousand years ago (Fig. 4b) sea levels were rising and while a land connection still existed across Torres Strait, the areas that previously were low lying land were now shallow water, which heats rapidly and provides ideal conditions for evaporation and consequent rainfall. Under these conditions, rainforest expanded, probably forming an almost continuous strip along the east coast of the Peninsula, virtually linking the rainforests of New Guinea and the Wet Tropics. Sea levels have continued to rise to the present day, the shallow water areas becoming deeper and evaporation less, although still considerably above the levels 15,000 years ago. So today (Fig. 4c) rainforest has retreated a little compared with 8,000 years ago, but is still at relatively high levels. This pattern is likely to have occurred several times over the last million years or more.

Analysis of pollen in cores taken from the crater lakes on the Atherton Tableland has provided some direct evidence to support this theory and has extended our understanding back in time to about 80,000 years ago (Kershaw 1975, 1980). In summary these results indicate that on the Atherton Tableland rainforest was the dominant vegetation type from 80,000 to 70,000 years ago, followed by a mix of rainforest and open forest to about 40,000 years ago when open forest became dominant almost to the exclusion of rainforest types. This situation persisted to about 8000 years ago when rainforests again asserted themselves, but started to decline slightly in the last 3000 years.

Kershaw (1980) suggests that the rainforest species must have survived the more arid phases in small refuge areas having a present annual rainfall of 2500 mm or more, or along the banks of larger streams. These refuge areas were considered in more detail by Webb and Tracey (1981) who consider the Iron Range and McIlwraith Range area as a refuge area. If the 2500 mm limit is accurate few, if any, other areas on the Peninsula would qualify. Even in the McIlwraith and Iron Ranges the refuges would have been small areas and elsewhere not many of the rainforest orchids would have survived. Possibly a few plants in select areas along the Jardine River might have survived.

The contraction to refuge areas was probably hastened by the advent of humans possibly about 40 to 50 thousand years ago. Fire is an integral part of Aboriginal land management and would have been instrumental in pushing back the margins of rainforest. It has been suggested (Stocker and Mott 1981) that monsoon forests, a drier form of rainforests, might have been a dominant vegetation type before the advent of humans. There is some evidence (Lavarack 1980) that the rainforests and monsoon scrubs of the McIlwraith Range are spreading, possibly due to the absence of fires started by humans in remote areas where Aboriginal firing has not been replaced by fires started by graziers.

In summary it seems probable that the rainforest orchids of Cape York Peninsula have been reduced almost to the point of extinction several times in the past, the most recent being only 15,000 years ago. The present day orchids must have originated from the refuge areas or from New Guinea or from the Wet Tropics to the south. Restricted endemic species such as *Dendrobium wassellii* and *Sarcochilus hirticalcar* probably are examples of species that have survived in refuge areas over several dry periods. On the other hand species such as *Dendrobium antennatum* and *Vanda hindsii* could have survived in the same refuge areas or could have arrived relatively recently from the north. The extremely high New Guinea mountains with their reliably wet climate, would have provided the best supply for re-colonisation of the Peninsula, but the Wet Tropics to the south would also have been a source for species such as *Dendrobium jonesii*. Some 33 species from the Wet Tropics are in this category as their range extends to Cape York Peninsula.

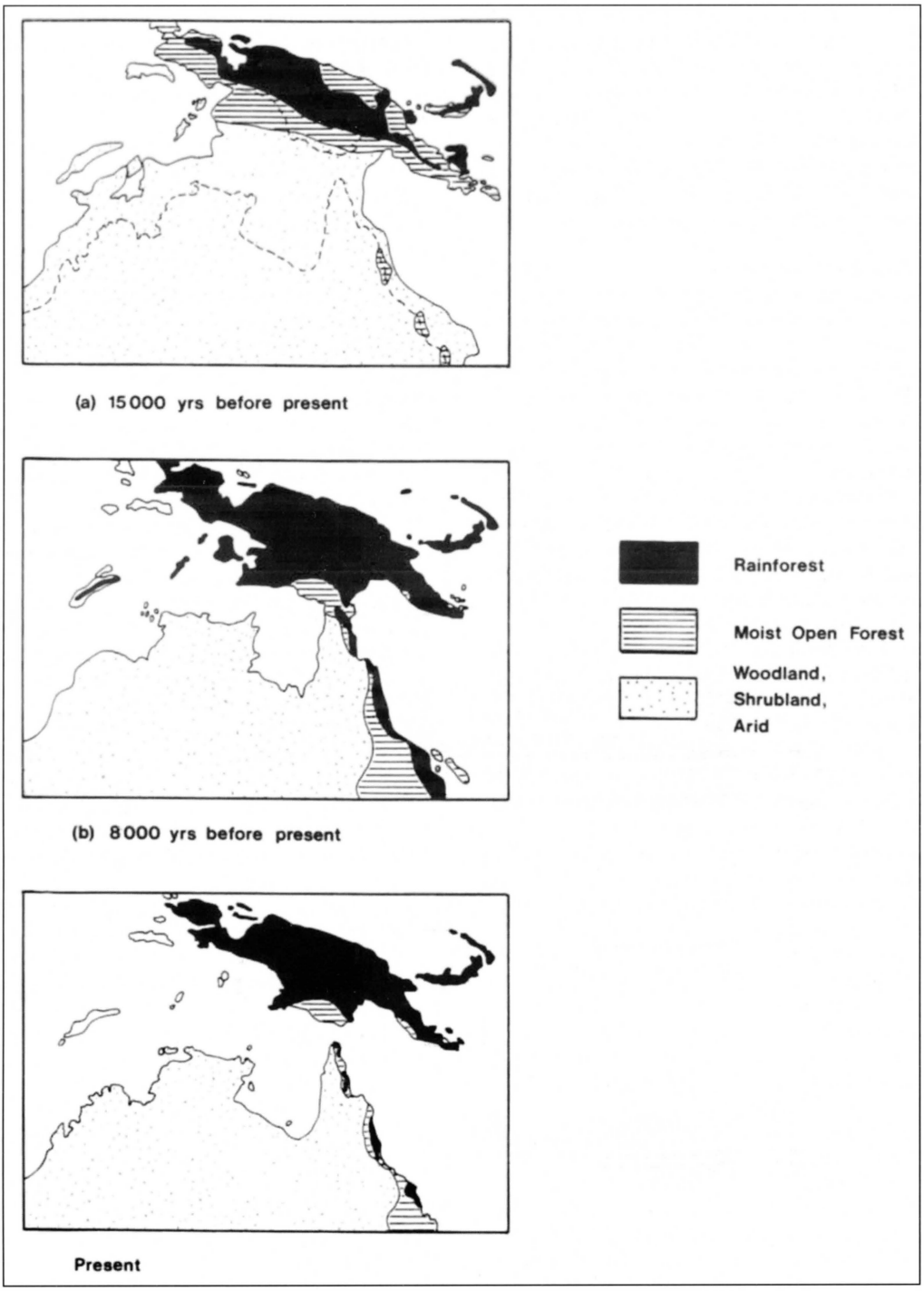


Fig 4: Suggested distribution of rainforest over the last 15 000 years (Modified from Nix and Kalma 1972)

A study of what is missing in the orchid flora also supports this theory of periodic reduction to refuge areas. The genus *Bulbophyllum* is an interesting example. In most orchid habitats from India to Australia, *Bulbophyllum* species are numerous. New Guinea has at least 600 species, perhaps 20% of the total orchid flora. The Wet Tropics has 18 species about 8% of the total. Cape York Peninsula has five species (or 4% of the total) and four of these are very localised with only *Bulbophyllum baileyi* being widespread. Even in the McIlwraith uplands where the conditions are apparently ideal, *Bulbophyllum* species are not abundant. This would suggest that the moist habitats of the McIlwraith uplands have not been a long term, consistent feature of the area.

Summary

Looking back in geological time, based on the preceding discussions, the Peninsula orchid flora represents an original southern flora comprising the *Diurideae* and other groups such as (perhaps) the southern members of the *Dendrobiinae*, over which has been superimposed in more recent times 'invaders' and, if you like, 're-invaders' from the north comprising both original 'northern' and 'southern' elements from New Guinea and the Indonesian Islands. This mixture has then been sifted by millions of years of changing sea levels and climates to give us the present-day orchid flora. A possible conclusion of all this is that Cape York Peninsula does not really represent a distinct region as far as orchids are concerned. It could more reasonably be considered a transition area between the tropical Australian region and New Guinea.

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APPENDIX 1:
List of Orchids of Cape York Peninsula north of 15° S

This list has been compiled from the records included in the various orchid reports presented earlier; from a list of specimens in Queensland Herbarium (BRI) collected north of 15° S on Cape York Peninsula (and in Torres Strait) and from various publications.

Nomenclature

Since the reports were written there have been major changes proposed to the nomenclature of Australian orchids. Many of the new names at both generic and specific level have not been fully accepted and it is fair to say that the names of Australian orchids are in a state of flux. In this publication the original reports are presented as originally published without updating the names, but in chapters other than the original reports, the names used are those which I consider the most appropriate. The reasons for these choices are given in the *Introduction*.

The first column of the list includes names that are used in the original reports, synonyms and new records from the study area. Those names which I consider most appropriate are in **bold**. Synonyms and other names proposed over the last five years, but not as yet fully accepted, are mentioned in the 'Nomenclature' column.

Reliability of records

Some of the records listed below are not be supported by specimens in Queensland Herbarium (BRI). Where this is known to be the case, an attempt has been made in the 'Notes' column, to estimate the reliability of the observational record. Distributions of terrestrial species that flower in the wet season when access is difficult, are hard to determine and in many genera such as *Calochilus* and *Habenaria*, the distributions are likely to be much larger than suggested here and in the reports. When the flowers last only a week or so, as with *Nervilia*, this effect is magnified.

Distribution (Dist.):

- M McIlwraith Range area
- I Iron Range area
- E east coast areas generally
- C central Peninsula area
- W west coast area
- N northern area (north of 12° S),
- TI Torres Strait Islands

Generalised habitat (Hab.):

- NVF notophyll vine forest – mostly upland areas in the McIlwraith and Iron Ranges
- SDF semi deciduous vine forest – lowland rainforest in wetter east coast areas
- VS vine forest on coastal and near coastal sand dunes
- GF gallery forest along streams
- DVT deciduous vine thickets, mostly in more seasonal areas
- TOF tall open forest on better drained sites, usually with *Eucalyptus tetrodonta*
- LOF low open forest, mostly dominated by *Melaleuca viridiflora*
- LMF layered mixed forest, including some rainforest and some open forest elements
- MF mangrove forest
- TH tall heath
- SF swamp forest
- E epacrid forest, restricted to subcoastal areas north of about 12° S

Name	Dist.	Hab.	Notes	Nomenclature
***Acriopsis emarginata* D.L. Jones & M.A. Clem.**	I, M	NVF LMF	A very distinctive epiphyte, widespread, but uncommon in moist eastern habitats. One specimen from McIlwraith Range in BRI.	Listed in the reports as *A. javanica* var. *nelsoniana*. The Australian specimens have only recently been elevated to the status of a separate species. Also known as *A. lilifolia* (J. Koenig) Ormerod
Acriopsis javanica Reinw. ex Blume var. *nelsoniana*				See under *Acriopsis emarginata*.
***Aphyllorchis queenslandica* Dockrill**	M	NVF	A terrestrial saprophyte, recorded from Leo Creek area in upland rainforest.	
***Apostasia wallichii* R.Br.**	M, I	NVF	Widespread terrestrial species on rainforest margins.	
***Appendicula australiensis* (F.M. Bailey) M.A. Clem. & D.L. Jones**	M	NVF	Specimens from near Leo Creek, growing as an epiphyte or lithophyte.	Listed as *Podochilus australiensis* in the original reports.
***Arthrochilus apectus* D.L. Jones**	N	LMF	Terrestrial, recorded from the Heathlands area in Jones and Clements 2004.	
***Arthrochilus aquilus* D.L. Jones**	N	LMF	Terrestrial, recorded from the Heathlands area in Jones and Clements 2004.	
***Arthrochilus corinnae* D.L. Jones**	N	LOF	Terrestrial, recorded from the Dalhunty River area in Jones and Clements 2004.	
Arthrochilus dockrillii Lavarack				Records of this species from the Peninsula are referable to the recently described *Arthrochilus lavarackianus* (syn. *Phoringopsis lavarackiana*). See under that species.
Arthrochilus irritabilis F. Muell.				This species does not occur on Cape York Peninsula (D.L. Jones, pers. com.). Specimens identified as this species are *A. sabulosus* (or possibly *A. rosulatus*).
***Arthrochilus lavarackianus* (D.L. Jones) Lavarack**	N, TI	LOF	A small terrestrial species with a single narrow leaf. It grows in sandy, well drained sites. It has been recorded from several locations between Hopevale and Bamaga.	This species is very closely related to *Arthrochilus dockrillii*. The name *Phoringopsis lavarackiana* has been proposed for this species.

Name	Dist.	Hab.	Notes	Nomenclature
Arthrochilus rosulatus D.L. Jones			Grows in well drained sandy soil.	A specimen in BRI from west of Cooktown labelled *A. irritabilis* may be this species. Doubtful occurrence in the study area.
***Arthrochilus sabulosus* D.L. Jones**	N, TI	E	Terrestrial, similar to the southern *A. irritabilis* and recorded from Horn Island by D.L. Jones.	Specimens in BRI labelled *A. irritabilis* from Cooktown and Iron Range are almost certainly this species
Arthrochilus sp. 1, 2 & 3 in Torres Strait report.				Uncertain identity, probably referable to one or more of the species listed above.
***Bromheadia pulchra* Schltr.**	M, I, N, E, C, W	SF	Widespread terrestrial species growing on the margins of swamps.	The name *B. finlaysoniana* (Lindl.) Miq. has also been used for this species on Cape York Peninsula.
Bromheadia venusta T.E. Hunt				See under *B. pulchra.*
***Bryobium dischorense* (Schltr.) M.A. Clem. & D.L. Jones**	M	NVF	A small creeping epiphyte reported once from higher altitudes in the McIlwraith Range. No specimen in BRI, but a reliable report of a readily recognisable species.	Listed as *Eria dischorense* in the original reports. Botanical opinion now favours placing this and the following species in the genus *Bryobium.*
***Bryobium eriaeoides* (F.M. Bailey) M.A. Clem. & D.L. Jones**	M	NVF SDF	Specimen in BRI from eastern McIlwraith Range. An epiphyte.	Listed as *Eria eriaeoides* in the original reports.
***Bryobium irukandjianum* (StCloud) M.A. Clem. & D.L. Jones**	M	NVF	Specimen in BRI from the Leo Creek track. Rainforest epiphyte.	Listed as *Eria irukandjiana* in the original reports.
***Bryobium queenslandicum* (T.E. Hunt) M.A. Clem. & D.L. Jones**	M, I	NVF SDF	An epiphyte reported from McIlwraith Range and specimen from Iron Range in BRI.	Listed as *Eria queenslandica* in the original reports.
***Bulbophyllum baileyi* F. Muell.**	M,I, TI, N, E	NVF SDF VS MF E	Widespread epiphyte or lithophyte in moist environments.	The name *Carparomorchis baileyi* has been proposed for this species.
***Bulbophyllum blumei* (Lindl.) J.J. Sm.**	N, TI	VS E NVF	An epiphyte of cloud forest on Moa Island and in rainforest near the Jardine River. A widespread species in New Guinea.	Also recorded as *B. masdevalliaceum.* The name *Ephippium masdevalliaceum* has been proposed for this species.

Name	Dist.	Hab.	Notes	Nomenclature
***Bulbophyllum bowkettiae* F.M. Bailey**	M, I	NVF	Creeping epiphyte or lithophyte from rainforests of the McIlwraith and Iron Ranges.	The name *Serpenticaulis bowkettiae* has been proposed for this species.
***Bulbophyllum gracillimum* (Rolfe) Rolfe**	I	NVF	Rare epiphytic species in rainforest on ridges from the Tozers Gap area.	The name *Cirrhopetalum gracillimum* has been proposed for this species.
Bulbophyllum leratii (Schltr.) J.J. Sm.				See under *B. gracillimum.*
***Bulbophyllum longiflorum* Thouars**	I, M	NVF	Rare epiphyte from moist positions near Leo Creek in the McIlwraith Range uplands and from Tozers Gap near Iron Range.	It has been proposed that the Cape York Peninsula plants should be regarded as an endemic species - *Cirrhopetalum clavigerum* Fitzg.
Bulbophyllum masdevalliaceum Kraenzl.				See under *B. blumei.*
Cadetia clausa D.L. Jones & M.A. Clem.	TI	NVF	Localised epiphyte in rain forest on Moa Island. Flowers not opening.	Recently described, similar to *C. collinsii.*
***Cadetia collinsii* Lavarack**	M, I	NVF	An epiphyte from moist shaded positions in rainforest.	Listed as *Cadetia* sp. in original reports.
***Cadetia maideniana* (Schltr.) Schltr.**	M, I, TI	NVF	An epiphyte growing in shaded positions. Similar to *C. collinsii*, but larger.	
Cadetia sp. McIlwraith & Iron Range Reports				See under *C. collinsii.*
***Cadetia taylori* (F. Muell.) Schltr.**	M, I	NVF	An epiphytic or lithophytic rainforest species growing in shaded positions.	
***Cadetia wariana* Schltr.**	M, I, TI	NVF	In the McIlwraith Range grows mostly on rocks. On Moa Island growing on trees in cloud forest.	May be synonymous with *Cadetia funiformis* (Blume) Schltr. The name *Sarcocadetia wariana* has been proposed for this species.
***Caladenia chamaephylla* D.L. Jones**	TOF	E	Records from Starcke N.P. These are perhaps just inside the southern boundary of the study area (15° S).	There is also a specimen labelled *C. carnea* from north of Cooktown, but this is almost certainly referable to *C. chamaephylla.*
***Calanthe triplicata* (Willemet) Ames**	M, I	NVF	Rainforest floor in shade in upland areas.	Proposed as an endemic species - *Calanthe australasica* D.L. Jones & M.A. Clem. This has yet to be widely accepted.

Name	Dist.	Hab.	Notes	Nomenclature
***Calochilus caeruleus* L.O. Williams**	M, I		M. Brown (pers. com.) reports '*C. holtzei*' near the road north of Coen. This might be *C. caeruleus*.	'*C. holtzei*' was reported in the *Wet Season Orchids of the Iron Range Area* report. This is possibly actually *C. caeruleus* but cannot be confirmed without a specimen.
***Calochilus cleistanthus* D.L. Jones**	N	LOF	Recorded from the Cockatoo Creek area in Jones and Clements 2004.	Identifying *Calochilus* species on Cape York is difficult as they flower in the wet season and are cryptic.
Calochilus holtzei F. Muell.			Reported in the *Wet Season Orchids of the Iron Range Area* report.	These plants are possibly *Calochilus caeruleus* L.O. Williams.
***Calochilus metallicus* D.L. Jones**	N, TI	LOF	Terrestrial from open habitats on sandy soil.	Recorded from the several northern areas in Jones and Clements 2004.
Calochilus sp.			Northern Peninsula report.	See under *C. metallicus*.
Calochilus sp. 1 & 2 in Torres Strait report.				Uncertain identity, one is probably *C. metallicus*.
***Cheirostylis ovata* (F.M. Bailey) Schltr.**	M, I	NVF	Small species growing in leaf litter on rocks in shaded sites in rainforest.	
***Chiloschista phyllorhiza* (F.Muell.) Schltr.**	M, I, E, W, N, TI	VS DVT MF	Distinctive leafless epiphytic species.	
***Corybas* sp.**	M	NVF	Non flowering plants seen on exposed ridge.	Possibly *C. cerasinus* D.L. Jones and B. Gray
***Corymborkis veratrifolia* (Reinw.) Blume**	I, M	NVF	Distinctive tall terrestrial species in lowland rainforest in the McIlwraith Range – Iron Range area and at Mt Webb north of Cooktown.	
***Crepidium fimbriatum* (Lavarack) Szlach.**	M	NVF	Terrestrial species restricted to upland parts of the McIlwraith Range.	Listed as *Malaxis fimbriata* in original reports.
***Crepidium marsupichilum* (Upton) Szlach.**	M,I, E, N, W, TI	SDF LMF	A widespread terrestrial species usually on the margins of rainforests.	Listed as *Malaxis marsupichila* in original reports
***Cymbidium canaliculatum* R.Br.**	M, I, E, C, W	TOF LOF	Common epiphyte in the drier open forests in exposed sites.	
***Cymbidium madidum* Lindl.**	M, I, E, C, W	NVF SDF LMF MF SF	An epiphyte of moister open and closed forests.	

Name	Dist.	Hab.	Notes	Nomenclature
***Dendrobium antennatum* Lindl.**	M, TI	NVF	A rare epiphyte restricted to the eastern gorges of the McIlwraith Range plus one report from near the airstrip on Saibai Island (G. Stocker pers. com.).	The name *Ceratobium antennatum* has been proposed for this species.
***Dendrobium baileyi* F. Muell.**	M	NVF	Epiphyte seen only in the wettest forests of the McIlwraith Range.	The name *Grastidium baileyi* has been proposed for this species.
***Dendrobium bifalce* Lindl.**	E, N, TI	NVF GF	Large epiphyte in lowland rainforest, occasionally on rocks.	The name *Leioanthum bifalce* has been proposed for this species.
Dendrobium bigibbum* Lindl. var. *bigibbum	M, I, E, C, W, N, TI	SDF VS DVT	A spectacular epiphyte of seasonally dry habitats in the northern Peninsula and Torres Strait.	The name *Vappodes bigibba* has been proposed for this species.
***Dendrobium bigibbum* Lindl. var. *superbum* Hort. ex Rchb.f.**	M, I, C, E	SDF VS DVT	The Cooktown orchid. An epiphyte or rarely a lithophyte of seasonally dry habitats such as vine thickets and beach scrubs, but usually not open eucalypt forests. Mostly in southern parts of the Peninsula.	The name *D. phalaenopsis* is preferred by some authorities, but I regard this as a variety of *Dendrobium bigibbum*, as I do not believe it to be separate from the northern plants. The name *Vappodes phalaenopsis* has also been proposed for this species.
***Dendrobium canaliculatum* R.Br.**	M I, E, C, W, N, TI	LOF TH	Occurs almost exclusively on the paperbark *Melaleuca viridiflora*.	The darker form from Cape York Peninsula is often referred to as var. *nigrescens* but is, in fact, the type form. The name *Cepobaculum canaliculatum* has been proposed for this species.
***Dendrobium cancroides* T.E. Hunt**	M	NVF	Epiphyte seen once in a moist gully in the McIlwraith Range.	The name *Grastidium cancroides* has been proposed for this species.
Dendrobium capitisyork M.A. Clem. & D.L. Jones				See under *Dendrobium tetragonum* var. *giganteum*
***Dendrobium carronii* Lavarack & P.J. Cribb**	M, I, E, N, TI	LMF LOF	Similar to *D. canaliculatum*, but occurring in moister habitats mostly near the east coast of the Peninsula.	The name *Cepobaculum carronii* has been proposed for this species. Sometimes reported as '*D. canaliculatum* var. *nigrescens*'.
***Dendrobium discolor* Lindl.**	M, I, E, W, N, TI	NVF SDF VS GF LMF DVT MF SF	Abundant epiphyte or lithophyte in all but the driest habitats.	The name *Durabaculum undulatum* has been proposed for this species.

Name	Dist.	Hab.	Notes	Nomenclature
***Dendrobium insigne* Blume**	TI	SDF	Epiphyte, specimen in BRI from Dauan Island.	The name *Grastidium* insigne has been proposed for this species.
***Dendrobium johannis* Rchb.f.**	M, I, E, N, TI	LOF LMF TH	In moister open forest habitats, often near rainforests.	Some authorities include *D. trilamellatum* in this taxon. I prefer to treat them as separate species. The name *Cepobaculum johannis* has been proposed for this species.
***Dendrobium jonesii* Rendle**	M, I	NVF	Usually in upland areas, often along creeks growing as an epiphyte or lithophyte.	Listed in the earlier reports as *D. ruppianum.* The name *Thelychiton jonesii* has been proposed.
***Dendrobium litorale* Schltr.**	SDVF	TI	Recorded from Mt Cornwallis on Dauan Island in Torres Strait, growing as an epiphyte or lithophyte.	The name *Aporopsis litoralis* has been proposed for this species.
***Dendrobium lobbii* Teijsm. & Binn.**	I, E, N,	TH LOF	A terrestrial, growing in sandy, swampy, exposed habitats.	The name *Aporum lobbii* has been proposed for this species.
***Dendrobium luteocilium* Rupp**	M, I, TI	NVF	Usually grows on rocks in moist areas of the McIlwraith and Iron Ranges.	The name *Grastidium luteocilium* has been proposed for this species.
***Dendrobium macrostachyum* Lindl.**	M, I, C,	NVF SDF DVT GF	An epiphyte, typically of the gallery forests along major streams. Deciduous in the dry season.	Reported in the original reports as *D. stuartii.* Also known as *D. tetrodon.*
***Dendrobium malbrownii* Dockrill**	M	NVF	An epiphyte, restricted to the McIlwraith Range uplands.	The name *Monanthos malbrownii* has been proposed for this species.
***Dendrobium mirbelianum* Gaud.**	TI	NVF SDF	An epiphyte reported from Dauan Island in Torres Strait.	The name *Durabaculum mirbelianum* has been proposed for this species.
***Dendrobium nindii* W. Hill**	M, I	SDF GF	One non-flowering epiphytic plant seen on Capsize Creek – identification uncertain, but probable.	The name *Durabaculum nindii* has been proposed for this species.
Dendrobium phalaenopsis Fitzg.				See under *Dendrobium bigibbum* Lindl. var. *superbum.*
***Dendrobium rigidum* R. Br.**	M, I, E, C, W, N, TI	NVF SDF VS GF DVT LMF MF SF	A widespread species common in many habitats.	The name *Dockrillia rigida* has been proposed for this species.

Name	Dist.	Hab.	Notes	Nomenclature
Dendrobium ruppianum A.D. Hawkes				See under *Dendrobium jonesii.*
Dendrobium semifuscum (Rchb.f.) Lavarack & P.J. Cribb				See under *Dendrobium trilamellatum.*
***Dendrobium smillieae* F. Muell.**	M, I, E, N, TI	NVF SDF VS GF LMF SF	A widespread epiphytic or lithophytic species common in many moister habitats.	The name *Coelandria smillieae* has been proposed for this species.
Dendrobium sp. in Iron Range report.				See under *Grastidium tozerense.*
Dendrobium stuartii F.M. Bailey				See under *Dendrobium macrostachyum.*
***Dendrobium teretifolium* R. Br. var. *fasciculatum* Rupp**	M, I, E, W, N, TI	VS GF DVT SDF LMF SF MF	A widespread epiphyte or lithophyte common in many habitats.	The name *Dockrillia calamiformis* has been proposed for this taxon.
***Dendrobium tetragonum* A. Cunn. var. *giganteum* P. Gilbert**	M, I,	NVF SDF	An epiphyte, recorded from gallery forests in upland rainforests of the McIlwraith and Iron Ranges.	Known as *D. tetragonum* in the original reports. The names *Tetrabaculum capitisyork* and *Dendrobium capitisyork* have been proposed for this species.
***Dendrobium tozerense* Lavarack**	M, I	NVF	Mostly on rocks, sometimes on trees in high rainfall areas of the McIlwraith and Iron Ranges.	The name *Grastidium tozerense* has been proposed for this species.
***Dendrobium trilamellatum* J.J. Sm.**	M, I, C, W, N, TI	LOF	An epiphyte of the harshest, most seasonal melaleuca forest.	Listed as *D. semifuscum* in the original reports. Some authorities regard this as synonymous with *D. johannis*, however I regard them as related, but separate species. The name *Cepobaculum trilamellatum* has been proposed for this species.
***Dendrobium wassellii* S.T. Blake**	M, I	NVF	An epiphyte almost exclusively on hoop pines in the McIlwraith Range. Rarely on rocks.	The name *Dockrillia wassellii* has been proposed for this species.
***Dendrobium* X *superbiens* Rchb.f.**	N, TI	LMF	A natural hybrid between *D. bigibbum* and *D. discolor.* It occurs sporadically over northern Cape York Peninsula and the southern Torres Strait islands.	The name *Vappaculum* X *superbiens* has been proposed for this species.

Name	Dist.	Hab.	Notes	Nomenclature
***Didymoplexis pallens* Griff.**	TI		A saprophytic terrestrial recorded from Dauan Island, but possibly more widespread.	No above ground parts except for the flowers which are present in the wet season for a few weeks only.
***Dienia ophrydis* (J.Koenig) Seidenf.**	M,I, N	NVF SDF LMF	A terrestrial species from rainforest margins in several locations in the eastern Peninsula.	Some authorities prefer the name *Dienia montana* for this species. However I favour the name *Dienia ophrydis*. It is listed in the reports as *Malaxis latifolia*.
***Diplocaulobium glabrum* J.J. Sm.**	M, I, E, N, TI	NVF LMF	An epiphyte from the margins of rainforests and moist open forests.	
***Dipodium elegantulum* D.L. Jones**	E	TOF	A leafless terrestrial species. Specimen in BRI from near Cape Melville.	
***Dipodium ensifolium* F. Muell.**	E	LOF	A leafy terrestrial species. There is a specimen from BRI from Cape Bedford. This is only marginally in the study area.	
***Dipodium hamiltonianum* F.M. Bailey**	C	TOF	*D. hamiltonianum* is reported by Dockrill from Cape York Peninsula.	Specimens in BRI from near the Coen Road, but these seem likely to be *D. stenocheilum* or *D. elegantulum* based on the colour.
Dipodium pandanum F.M. Bailey				See under *D. pictum*. Some authorities regard this as the correct name for the Peninsula plants.
***Dipodium pictum* (Lindl.) Rchb.f.**	M, I	NVF	Grows initially as a terrestrial, then later as an epiphyte, climbing up tree trunks in rainforest areas.	Listed in the original reports as *D. pandanum*.
***Dipodium stenocheilum* O. Schwarz**	W, C, N	TOF	A seasonal leafless terrestrial of open forest areas.	Specimens from Weipa, Heathlands and Lakefield in BRI.
***Dipodium variegatum* M.A. Clem. & D.L. Jones**	W, C, N	TOF	Specimens from Weipa, Somerset and Aurukun. A seasonal leafless terrestrial species.	There are specimens labelled *D. variegatum* in BRI. It seems likely that these are actually referable to *D. stenocheilum*.
Dockrillia calamiformis (Lodd.) M.A. Clem. & D.L. Jones				See under *Dendrobium teretifolium* var. *fasciculatum*.
Dockrillia rigida (R.Br.) Rauschert				See under *Dendrobium rigidum*.

Name	Dist.	Hab.	Notes	Nomenclature
***Dockrillia sulphurea* D.L.Jones & M.A.Clem.**	N	VS GF DVT	An epiphyte or lithophyte from moister habitats on the northern part of the Peninsula.	Very similar to *D. calamiforme*, but with sulphur yellow flowers. This species does not have a name in the genus *Dendrobium* at this point in time.
Dockrillia wassellii (S.T. Blake) Brieger				See under *Dendrobium wassellii*.
Empusa habenarina (F. Muell.) M.A. Clem. &D.L. Jones				See under *Liparis habenarina*.
Ephemerantha comata (Blume) A.D. Hawkes				See under *Flickingeria clementsii*.
Ephemerantha convexa (Blume) A.D. Hawkes				See under *Flickingeria convexa*.
Eria dischorensis Schltr.				See under *Bryobium dischorensis*.
Eria eriaeoides (F.M. Bailey) Rolfe				See under *Bryobium eriaeoides*.
***Eria fitzalanii* F. Muell.**	M, I, E, N, TI	NVF SDF LMF E	A widespread epiphyte in moister situations.	The names *Hymeneria fitzalanii* and *Pinalia fitzalanii* have been proposed for this species.
Eria inornata T. E. Hunt				See under *Eria kingii*.
Eria irukandjiana St Cloud				See under *Bryobium irukandjianum*.
***Eria kingii* F. Muell.**	M, I	NVF SDF	Epiphyte, restricted to rainforests on trees or rocks.	Listed as *Eria inornata* in the original reports. The names *Hymeneria kingii* and *Pinalia kingii* have been proposed for this species.
Eria queenslandica T.E. Hunt				See under *Bryobium queenslandicum*.
Eulophia pelorica D.L. Jones & M.A. Clem.				See under *Eulophia pulchra*.
***Eulophia pulchra* (Thouars) Lindl.**	M,I	NVF	A rare terrestrial species, which has flowers with a petaloid lip.	Recently described as a separate species *Eulophia pelorica* but I do not consider the Peninsula populations are separate.
***Flickingeria clementsii* D.L. Jones**	M, I	NVF	Mostly occurs in trees and on rocks near streams. No specimen in BRI, but a very distinctive species with branching stems.	Listed as *Ephemerantha comata* in the original reports. I am not convinced that the CYP plants are different from those in New Guinea and Indonesia (*F. comata*) and believe further research is required.

Name	Dist.	Hab.	Notes	Nomenclature
Flickingeria comata (Blume) A.D. Hawkes				See under *Flickingeria clementsii*.
***Flickingeria convexa* (Blume) A.D. Hawkes**	M	NVF	A small creeping species reported from higher altitudes in the McIlwraith Range.	Listed as *Ephemerantha convexa* in the original reports. The name *Abaxianthus convexus* has been proposed for this species.
Galeola foliata (F. Muell.) F. Muell.				See under *Pseudovanilla foliata*.
***Geodorum densiflorum* (Lam.) Schltr.**	M, I, E, C, W, N, TI	DVT TOF LMF	Widespread terrestrial species, often in disturbed sites.	
Grastidium baileyi (F. Muell.) Rauschert				See under *Dendrobium baileyi*.
Grastidium cancroides (T.E. Hunt) Rauschert				See under *Dendrobium cancroides*.
Grastidium insigne (Blume) M.A. Clem. & D.L. Jones				See under *Dendrobium insigne*.
Grastidium luteocilium (Rupp) Rauschert				See under *Dendrobium luteocilium*.
Grastidium tozerense (Lavarack) M.A. Clem. & D.L. Jones				See under *Dendrobium tozerense*.
***Habenaria elongata* Schltr.**	N, TI	TOF LMF	An abundant terrestrial species near the coast and in eucalypt forests in northern areas.	
***Habenaria euryloba* D.L. Jones**	N	LOF	Recorded by D.L. Jones near Cockatoo Creek.	Very similar to *H. praecox* – see also under that species.
Habenaria ferdinandii Schltr.				See under *H. propinquior*.
***Habenaria fuscina* D.L. Jones**	N	LOF	Recorded by D.L. Jones at Heathlands.	Very similar to *H. praecox* – see also under that species.
***Habenaria hymenophylla* Schltr.**	W	DVT	Specimens in BRI from near Weipa.	
***Habenaria macraithii* Lavarack**	M	LMF GF NVF	A terrestrial species from near Brown Creek, Iron Range area.	Discovered on an AOF trip and named after Gerald McCraith AM.
Habenaria ochroleuca R. Br.				See under *H. euryloba* and *H. praecox*.
Habenaria papuana Kraenzl.				See under *Peristylus papuana*.
Habenaria praecox Lavarack & Dockrill	N	LMF		Very similar to *H. euryloba*. Records from Cape York Peninsula will probably prove to be *H. euryloba*, *H. fuscina* or *H. vatia*. Listed as *H. ochroleuca* in the original reports.

Name	Dist.	Hab.	Notes	Nomenclature
***Habenaria propinquior* Rchb.f.**	N, TI, W, C	LOF	A widespread species flowering in the wet season.	Listed as *H. ferdinandii* in the original reports.
***Habenaria rumphii* (Brogn.) Lindl.**	TI	LOF	Recorded from Saibai Island, but likely to be more widespread on the Peninsula.	No specimen in BRI but a very distinctive species and a reliable observation.
***Habenaria vatia* D.L. Jones**	TI	LOF	Recorded by D.L. Jones from Moa Island in Torres Strait.	Very similar to *H. praecox* – see also under that species.
***Hetaeria oblongifolia* Blume**	M, I	NVF SDF GF	A common terrestrial species from rainforests at low altitude.	
***Liparis collinsii* B. Gray**	M	NVF	This terrestrial species is restricted to upland rainforest areas in the McIlwraith Range	The name *Diteilis collinsii* has been proposed for this species.
***Liparis condylobulbon* Rchb.f.**	M, I	NVF	A rare epiphyte of upland rainforest areas in the McIlwraith and Iron Ranges.	The names *Cestichis condylobulbon* and *Stichorkis condyloblbon* have been proposed for this species. The latter name is accepted by Kew.
***Liparis habenarina* (F.Muell.) Benth.**	I, N, TI	TOF LMF	Terrestrial, recorded from Iron Range north to Moa Island in Torres Strait, in eucalypt forests.	The name *Empusa habenarina* has been proposed for this species, but has not been widely adopted.
Liparis sp. in McIlwraith report.				See under *L. condylobulbon*.
Luisia atacta D.L. Jones				See under *Luisia tristis*.
Luisia teretifolia Gaudich.				See under *Luisia tristis*.
***Luisia tristis* (G. Forst.) Hook.f.**	M, I, E, W, TI, N	NVF SDF VS GF DVT MF SF	A widespread epiphyte, often in exposed locations, but not in eucalypt forests.	The name *Luisia tristis* is now widely accepted for this taxon overseas. The name *Luisia atacta* has been proposed for northern Australian plants, but this has not been widely accepted.
Malaxis fimbriata Lavarack				See under *Crepidium fimbriatum*.
Malaxis latifolia J.E. Sm.				See under *Dienia montana*.
Malaxis marsupichila Upton				See under *Crepidium marsupichilum*.
Malaxis sp. "Leo Ck."				See under *Crepidium fimbriatum*.
***Micropera fasciculata* (Lindl.) Garay**	M, I	SDF	Reasonably abundant epiphyte in lowland rainforest.	No specimen in BRI, but a very distinctive species and therefore a reliable record.

Name	Dist.	Hab.	Notes	Nomenclature
***Nervilia aragoana* Gaudich.**	M	GF LMF	Seasonal terrestrial species recorded only from McIlwraith Range, but probably more widespread.	
***Nervilia crociformis* (Zoll. & Moritzi) Seidenf.**	I	LMF DVF	Recorded from one location near the Iron Range airport, on the margin of rainforest, but possibly more widespread.	
***Nervilia holochila* (F. Muell.) Schltr.**	M, I, E, C, W, N, TI	TOF LMF	A widespread and abundant terrestrial species, flowering before the wet season.	
***Nervilia peltata* B. Gray & D.L. Jones**	N, TI	TOF LMF	Reported from the Islands of Torres Strait and from the Bamaga area, but possibly more widespread.	
***Nervilia plicata* (Andrews) Schltr.**	M, I, E, C, W, N, TI	TOF LMF DVT	A widespread and abundant terrestrial species, flowering before the wet season.	If the Australian plants are considered to be different to the overseas plants the correct name would be *N. dallachyana*.
Nervilia sp. in Cape York, Jardine River and Torres Strait reports.				See under *N. peltata*.
***Oberonia carnosa* Lavarack**	M, I	NVF	Restricted to the McIlwraith Range – Iron Range rainforests, growing on rocks or trees in exposed locations.	
Oberonia complanata (A. Cunn.) M.A. Clem. & D.L. Jones				See under *Oberonia flavescens*.
***Oberonia flavescens* D.L. Jones & M.A. Clem.**	M, I	NVF SDF	An epiphyte restricted to the McIlwraith Range – Iron Range rainforests.	Listed as *O. muelleriana* in the original reports.
Oberonia muelleriana Schltr.				See under *O. flavescens*.
Oberonia palmicola F. Muell.				See under *Oberonia rimachila*.
***Oberonia rimachila* D.L. Jones & M.A. Clem.**	M, I	NVF	An epiphyte restricted to the McIlwraith Range – Iron Range rainforests.	Confusion remains over which species is on CYP. BRI is accepting *O. palmicola*, but Jones & Clements claim that this species does not occur on the Australian mainland.
Oberonia sp. in Iron Range report.				See under *O. carnosa*.

Name	Dist.	Hab.	Notes	Nomenclature
Oberonia titania Lindl.				See under *O. rimachila.*
Oeceoclades pulchra (Thouars) P.J. Cribb & M.A. Clem.				See under *Eulophia pulchra.*
***Peristylus chlorandrellus* D.L. Jones & M.A. Clem.**	M	NVF	A rare terrestrial species from deep shade on the rainforest floor.	Listed as *Habenaria papuana* in original report. Very similar to the widespread overseas species *P. tradescantifolius.*
Peristylus papuanus (Kraenzl.) J.J. Sm.				See under *P. chlorandrellus.*
***Phaius pictus* T.E. Hunt**	M	NVF	One observation (no specimen) from near Leo Creek in upland rainforest.	A reliable record as it is a distinctive species. Note: *Phaius tankervilleae* was recorded in the McIlwraith Range report, but this seems to be an error as this species is no longer considered an Australian taxon.
***Phalaenopsis amabilis* subsp. *rosenstromii* (F.M. Bailey) Christenson**	M, I	NVF SDF	Restricted to rainforests in the McIlwraith Range – Iron Range area.	No specimens in BRI, but a most distinctive species, easily recognised. Also known as *Phalaenopsis rosenstromii* and *Phalaenopsis amabilis* var. *papuana.*
***Pholidota imbricata* Hook.**	M, I, E, N, TI	NVF SDF GF SF MF	A widespread epiphyte or lithophyte in rainforests.	Listed as *P. pallida* in original reports.
Pholidota pallida Lindl.				See under *Pholidota imbricata.*
***Phreatia micrantha* (A. Rich.) Lindl.**	M, I	NVF	Occurs as an epiphyte or lithophyte in rainforest.	Listed in the reports as *Phreatia robusta.* The name *Rhipidorchis micrantha* has been proposed, but it seems that the name *Phreatia micrantha* has international acceptance.
Phreatia robusta R. Rogers				See under *Phreatia micrantha.*
***Plectorrhiza brevilabris* (F. Muell.) Dockrill**	M	NVF	Epiphyte, recorded as an observation only – no specimen. Also reported from the McIlwraith Range by Dockrill (1992).	

Name	Dist.	Hab.	Notes	Nomenclature
Podochilus australiensis F.M. Bailey				See under *Appendicula australiensis.*
***Pomatocalpa macphersonii* (F. Muell.) T.E. Hunt**	M, I, N	NVF SDF GF	An epiphyte of rainforest, widespread on the Peninsula.	
***Pomatocalpa marsupiale* (Kraenzl.) J.J. Sm.**	M, I	NVF SDF	Occurs as an epiphyte or lithophyte in rainforest.	
***Pseudovanilla foliata* (F. Muell.) Garay**	M, I	NVF SDF	A rare climbing orchid in rainforest.	Listed as *Galeola foliata* in the original reports.
Pteroceras hirticalcar (Dockrill.) Garay				See under *Sarcochilus hirticalcar.*
Rhinerrhizopsis matutina D.L. Jones & M.A. Clem.				Specimens of '*R . moorei*' from the McIlwraith Range and Iron Range have recently been elevated to the status of a separate species. This move has yet to be accepted.
***Rhinerrhizopsis moorei* (Rchb.f.) Ormerod**	M, I	SDF	A medium to large epiphyte from lowland rainforests.	Listed as *Sarcochilus moorei* in the original reports.
Rhipidorchis micrantha (A. Rich.) D.L. Jones & M.A. Clem.	I			See under *Phreatia micrantha.*
Rhynchophreatia micrantha (A. Rich.) N. Halle				See under *Phreatia micrantha.*
***Robiquetia gracilistipes* (Schltr.) J.J. Sm.**	M, I, N, TI	SDF GF	An epiphyte or lithophyte often growing in trees lining watercourses.	Listed as *Robiquetia tierneyana* in the original reports.
Robiquetia tierneyana (Rupp) Dockrill				See under *R. gracilistipes.*
***Robiquetia wassellii* Dockrill**	M, I	NVF SDF GF	An epiphyte of shaded positions in upland rainforest. Endemic.	
***Saccolabiopsis armitii* (F. Muell.) Dockrill**	M, C	SDF DVT	A small epiphyte of drier vine forests, can be leafless in the dry season.	
Saccolabium rhopalorrachis (Rchb.f.) J.J. Sm.				See under *Trachoma speciosum.*
***Sarcochilus hirticalcar* (Dockrill) M.A. Clem. & B.J. Wallace**	M	GF NVF	An epiphyte of creek side forest in the McIlwraith Range uplands.	Listed as *Pteroceras hirticalcar* in the original reports.
Sarcochilus moorei (Rchb.f.) Schltr.				See under *Rhinerrhizopsis moorei.*
Schoenorchis densiflora Schltr.				See under *Schoenorchis micrantha.*
***Schoenorchis micrantha* Reinw. ex Blume**	M, I, N, E,	NVF LMF VS	A small epiphyte occurring in a variety of habitats, but usually in moist open forests.	Listed as *Schoenorchis densiflora* in original reports.

Name	Dist.	Hab.	Notes	Nomenclature
***Schoenorchis sarcophylla* Schltr.**	M	NVF	A small epiphyte found on branches overhanging upland creeks in the McIlwraith Range.	
***Spathoglottis plicata* Blume**	I, W, N, TI	SF LMF	A large terrestrial species recorded from several locations north of about the Archer River. Usually grows in soaks and swamps.	There is a specimen from northern Cape York Peninsula labelled *S. paulinae* in BRI, but this almost certainly represents *S. plicata*.
Spathoglottis sp. in Iron Range & McIlwraith reports.				See under *S. plicata*.
Taeniophyllum glandulosum Blume				See under *T. muelleri*.
***Taeniophyllum malianum* Schltr.**	M, I	NVF SDF DVT	A leafless epiphyte restricted to the rainforests of the McIlwraith Range-Iron Range area.	Also in New Guinea.
***Taeniophyllum muelleri* Lindl. ex Benth.**	M, I	NVF SDF	Leafless epiphyte, all the records are from the McIlwraith Range-Iron Range area, but it is likely to be more widespread in rainforests.	Listed as *T. glandulosum* in the original reports.
***Thelasis carinata* Blume**	M, I	NVF SDF	A rare rainforest epiphyte or lithophyte.	
***Thelymitra pauciflora* R. Br.**	E	TOF	This terrestrial species is recorded from Mt Saunders, just north of Cooktown and is only marginally in the study area.	
***Thrixspermum congestum* (F.M. Bailey) Dockrill**	M, I	NVF SDF	Epiphyte, reported from rainforests in the McIlwraith and Iron Ranges – no specimens in BRI.	
***Thrixspermum platystachys* (F.M. Bailey) Schltr.**	M, I, N	NVF SDF VS	Epiphyte, reported from rainforests in the McIlwraith and Iron Ranges, also a specimen from Heathlands in BRI.	
***Trachoma speciosum* D.L. Jones, B. Gray, M.A. Clem. & J.J. Wood**	M	NVF	A small epiphyte from upland rainforests.	Listed as *Saccolabium rhopalorrhachis* in original reports. Possibly should be placed in the genus *Tuberolabium*. This group requires further research.

Name	Dist.	Hab.	Notes	Nomenclature
Trachoma stellatum **D.L. Jones, B. Gray, M.A. Clem. & J.J. Wood**	M	NVF	A small epiphyte from upland rainforests.	Overseas opinion places this species in the new genus *Parapteroceras*. Another possibility is the the genus *Tuberolabium*. More research needed.
Trichoglottis australiensis **Dockrill**	M, I	NVF	Usually grows as an epiphyte in shaded positions in upland rainforest.	Very similar to *T. papuana* from New Guinea.
Vanda hindsii **Lindl.**	M, I	NVF SDF	Grows on rocks or trees in lowland rainforests.	Listed as *Vanda whiteana* in some of the original reports.
Vanda whiteana Herbert & S.T. Blake				See under *Vanda hindsii*.
Zeuxine oblonga **R.S. Rogers & C.T. White**	M, I, TI	SDF NVF	A common terrestrial species in lowland rainforests.	

APPENDIX 2:
Name changes other than orchids

Not only orchid names have changed since the writing of the AOF reports. Below some of the plant names that appear in the text of the reports are listed along with the current accepted or recommended names.

Name used in reports	**Currently accepted name**
Callitris columellaris	*Callitris intratropica*
Caryota rumphiana	*Caryota albertii*
Coelospermum reticulatum	*Pogonolobus reticulatus*
Dischidia rafflesiana	*Dischidia major*
Eucalyptus alba	*Eucalyptus pachyphylla*
Eucalyptus confertiflora	*Corymbia confertiflora*
Eucalyptus hylandii	*Corymbia hylandii*
Eucalyptus nesophila	*Corymbia nesophila*
Eucalyptus novoguinensis	*Corymbia novoguinensis*
Eucalyptus papuana	*Corymbia papuana*
Eucalyptus tessellaris	*Corymbia tessellaris*
Eugenia bungadinnia	*Syzygium bungadinnia*
Eugenia suborbicularis	*Syzygium suborbiculare*
Fenzlia obtusa	*Myrtella obtusa*
Hydnophytum formicarium	*Hydnophytum moseleyanum*
Leptospermum fabricia	*Neofabricia myrtifolia*
Lycopodium spp. (tassel ferns)	*Huperzia* spp.
Melaleuca angustifolia	*Asteromyrtus angustifolia*
Melaleuca brassii	*Asteromyrtus brassii*
Melaleuca leucadendron	*Melaleuca leucadendra*
Melaleuca sp. aff. *symphyocarpa*	*Asteromyrtus brassii*
Melaleuca symphyocarpa	*Asteromyrtus symphyocarpa*
Sarcocephalus coadunatus	*Nauclea orientalis*
Schefflera versteegii	*Schefflera elliptica*
Sinoga lysicephala	*Asteromyrtus lysicephala*
Syzygium rubiginosum	*Syzygium forte*
Tristania exiliflora	*Tristaniopsis exiliflora*
Tristania longivalvis	*Welchiodendron longivalve*
Tristania suaveolens	*Lophostemon suaveolens*

1. Four wheel drive track on Cape York

2. Anthill on the Peninsula road

3. Lower Chester River showing the effects of a major flood

4. Upper Chester River

5. Bamaga rainforest

6. Beach north of Pascoe River mouth.
The hills in the distance yielded some interesting records

7. Crossing the Pascoe River

8. Upper Neville Creek

9. Massy Creek Falls

10. ***Dendrobium bigibbum***
at Horne Creek

11. ***Bromheadia pulchra***
Massy Creek

12. ***Bulbophyllum blumei***
Jardine River area

13. ***Bulbophyllum gracillimum***
Tozer Range

14. ***Bulbophyllum longiflorum***
Tozers Gap

15. ***Cadetia collinsii***
Rocky River

16. ***Cadetia wariana***
McIlwraith Range

17. Bruce Gray inspecting ***Diplocaulobium glabrum*** near the tip of Cape York Peninsula

18. ***Diplocaulobium glabrum***
Cape York Peninsula

19. ***Dendrobium antennatum***
Rocky River

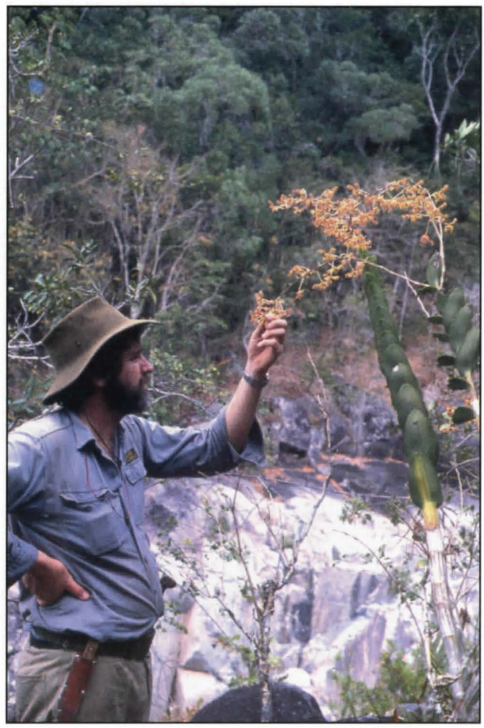
20. ***Dendrobium* (*antennatum* x *discolor*)**
Massy Creek

21. ***Dendrobium bifalce***
Iron Range

22. ***Dendrobium carronii***
Hann Creek

23. ***Dendrobium carronii***

24. ***Dendrobium discolor***
Massy Creek



25. ***Dendrobium discolor***
Rocky River

26. ***Dendrobium discolor***
on a rockpile at Tozers Gap

27. ***Dendrobium johannis***
McIlwraith Range

28. ***Dendrobium jonesii***
McIlwraith Range

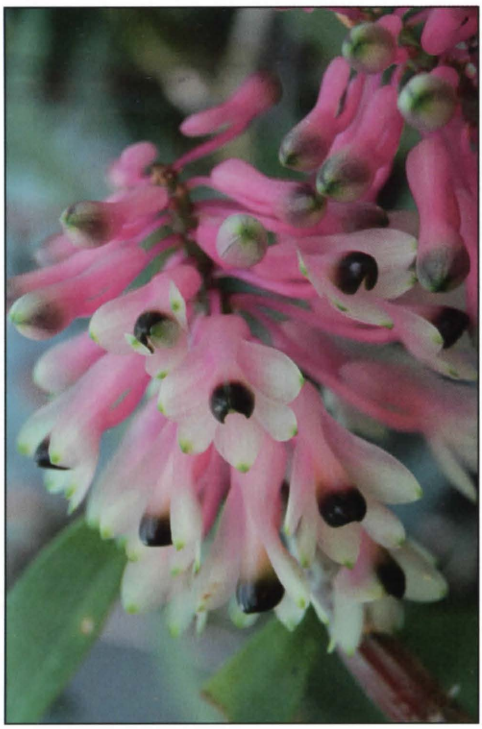
29. ***Dendrobium jonesii***
McIlwraith Range

30. ***Dendrobium lobbii***
Brown Creek

31. ***Dendrobium rigidum***
near Wilderness Lodge

32. ***Dendrobium macrostachyum***
Archer River

33. ***Dendrobium malbrownii***
Leo Creek Road

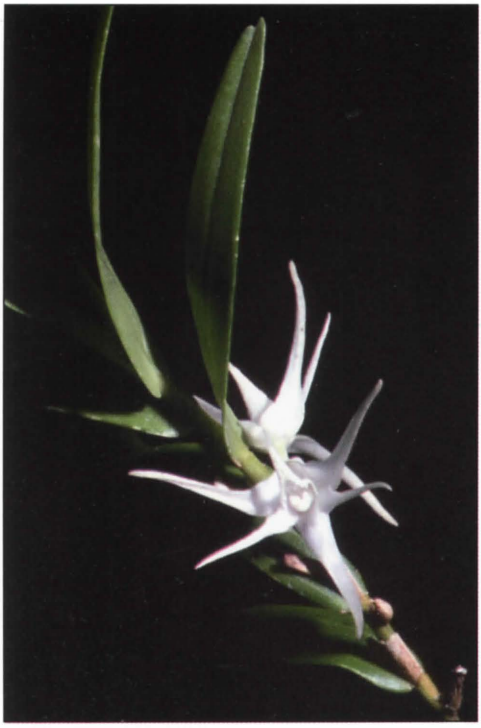


34. ***Dendrobium smillieae***
Tozers Gap

35. ***Dendrobium tetragonum* var. *giganteum***
McIlwraith Range

36. ***Dendrobium trilamellatum***
Carron Valley

37. ***Dendrobium trilamellatum***
McIlwraith Range



38. ***Dendrobium tozerense***
Tozers Gap

39. ***Dendrobium wassellii***
McIlwraith Range

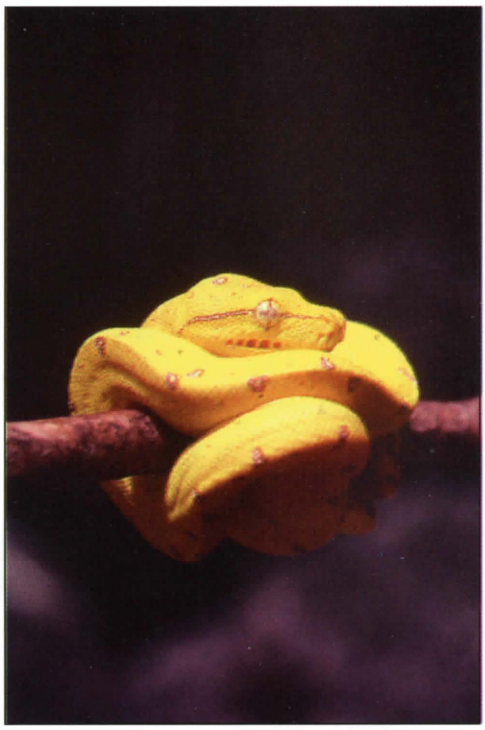
40. ***Dipodium pictum***
Leo Creek area

41. ***Flickingeria clementsii***
Leo Creek

42. ***Habenaria elongata***
tip of the Peninsula area

43. ***Habenaria macraithii***
Brown Creek

44. ***Hetaeria oblongifolia***
Capsize Creek



45. Juvenile green tree python –
Morelia viridis

46. ***Liparis condylobulbon***
Tozers Gap

47. ***Crepidium fimbriatum***
McIlwraith Range

48. ***Crepidium marsupichilum***
Iron Range Road

49. ***Spathoglottis plicata***
Captain Billy Creek

50. ***Oberonia carnosa***
Tozers Gap rockpile

51. ***Pholidota imbricata***
Tozers Gap

52. ***Oberonia complanata***
Iron Range

53. ***Phalaenopsis amabilis*** **subsp.** ***rosenstromii***
McIlwraith Range *(photo: D.P. Banks)*

54. ***Pomatocalpa marsupiale***
Claudie River area

55. ***Robiquetia wassellii***
Leo Creek area

56. ***Trachoma speciosum***
Leo Creek

57. ***Trachoma stellatum***
Leo Creek

58. ***Rhinerrhizopsis moorei***
Claudie River area

59. ***Taeniophyllum malianum***
McIlwraith Range

60. ***Trichoglottis australiensis***
Leo Creek

61. ***Sarcochilus hirticalcar***
McIlwraith Range *(photo: M. Harrison)*

62. ***Vanda hindsii***
Tozers Gap rockpile

63. ***Vanda hindsii***
Tozers Gap

64. Dauan Island with the PNG mainland in the background

65. ***Dendrobium* X *superbiens***
Olive River area

66. ***Dendrobium litorale***
Dauan Island

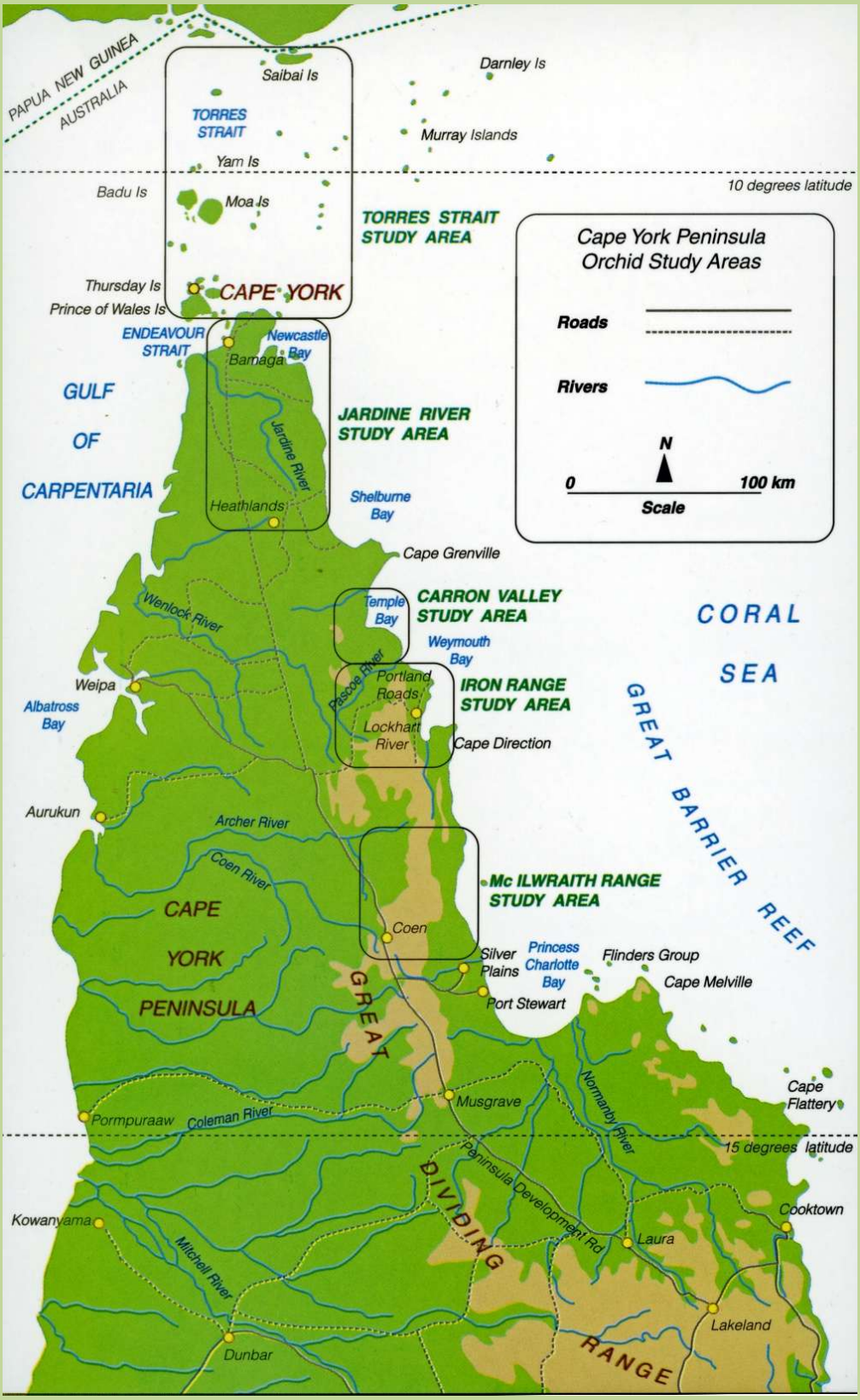
67. Saibai Island with PNG in the background. The village is on a sand dune

68. John Clarkson, Bill Lavarack, David Jones and Bruce Gray at Saibai Island (1989)

Colour Photographs (refer pages 157-180)

All photographs by Bill Lavarack unless otherwise credited

1. Four wheel drive track, Cape York
2. Peninsula road
3. Lower Chester River
4. Upper Chester River
5. Bamaga rainforest
6. Beach north of Pascoe River mouth
7. Pascoe River
8. Upper Neville Creek
9. Massy Creek Falls
10. ***Dendrobium bigibbum***
11. ***Bromheadia pulchra***
12. ***Bulbophyllum blumei***
13. ***Bulbophyllum gracillimum***
14. ***Bulbophyllum longiflorum***
15. ***Cadetia collinsii***
16. ***Cadetia wariana***
17. ***Diplocaulobium glabrum***
18. ***Diplocaulobium glabrum***
19. ***Dendrobium antennatum***
20. ***Dendrobium (antennatum* x *discolor)***
21. ***Dendrobium bifalce***
22. ***Dendrobium carronii***
23. ***Dendrobium carronii***
24. ***Dendrobium discolor***
25. ***Dendrobium discolor***
26. ***Dendrobium discolor***
27. ***Dendrobium johannis***
28. ***Dendrobium jonesii***
29. ***Dendrobium jonesii***
30. ***Dendrobium lobbii***
31. ***Dendrobium rigidum***
32. ***Dendrobium macrostachyum***
33. ***Dendrobium malbrownii***
34. ***Dendrobium smillieae***
35. ***Dendrobium tetragonum* var. *giganteum***
36. ***Dendrobium trilamellatum***
37. ***Dendrobium trilamellatum***
38. ***Dendrobium tozerense***
39. ***Dendrobium wassellii***
40. ***Dipodium pictum***
41. ***Flickingeria clementsii***
42. ***Habenaria elongata***
43. ***Habenaria macraithii***
44. ***Hetaeria oblongifolia***
45. Juvenile green tree python
46. ***Liparis condylobulbon***
47. ***Crepidium fimbriatum***
48. ***Crepidium marsupichilum***
49. ***Spathoglottis plicata***
50. ***Oberonia carnosa***
51. ***Pholidota imbricata***
52. ***Oberonia complanata***
53. ***Phalaenopsis amabilis* subsp. *rosenstromii***
54. ***Pomatocalpa marsupiale***
55. ***Robiquetia wassellii***
56. ***Trachoma speciosum***
57. ***Trachoma stellatum***
58. ***Rhinerrhizopsis moorei***
59. ***Taeniophyllum malianum***
60. ***Trichoglottis australiensis***
61. ***Sarcochilus hirticalcar***
62. ***Vanda hindsii***
63. ***Vanda hindsii***
64. Dauan Island
65. ***Dendrobium* X *superbiens***
66. ***Dendrobium litorale***
67. Saibai Island
68. Saibai Island


PAPUA NEW GUINEA
AUSTRALIA
Saibai Is
Darnley Is
TORRES STRAIT
Murray Islands
Yam Is
10 degrees latitude
Badu Is
Moa Is
TORRES STRAIT STUDY AREA
Cape York Peninsula Orchid Study Areas
Roads
Rivers
N
0
100 km
Scale
Thursday Is
CAPE YORK
Prince of Wales Is
ENDEAVOUR STRAIT
Newcastle Bay
Bamaga
GULF OF CARPENTARIA
JARDINE RIVER STUDY AREA
Jardine River
Heathlands
Shelburne Bay
Cape Grenville
Wenlock River
Temple Bay
CARRON VALLEY STUDY AREA
CORAL SEA
Weymouth Bay
Pascoe River
Portland Roads
IRON RANGE STUDY AREA
Weipa
Albatross Bay
Lockhart River
Cape Direction
GREAT BARRIER REEF
Aurukun
Archer River
Coen River
Mc ILWRAITH RANGE STUDY AREA
CAPE YORK PENINSULA
Coen
Silver Plains
Princess Charlotte Bay
Flinders Group
Cape Melville
Port Stewart
GREAT
Cape Flattery
Musgrave
Normanby River
Pormpuraaw
Coleman River
15 degrees latitude
Peninsula Development Rd
DIVIDING
Cooktown
Kowanyama
Laura
Mitchell River
Lakeland
Dunbar
RANGE