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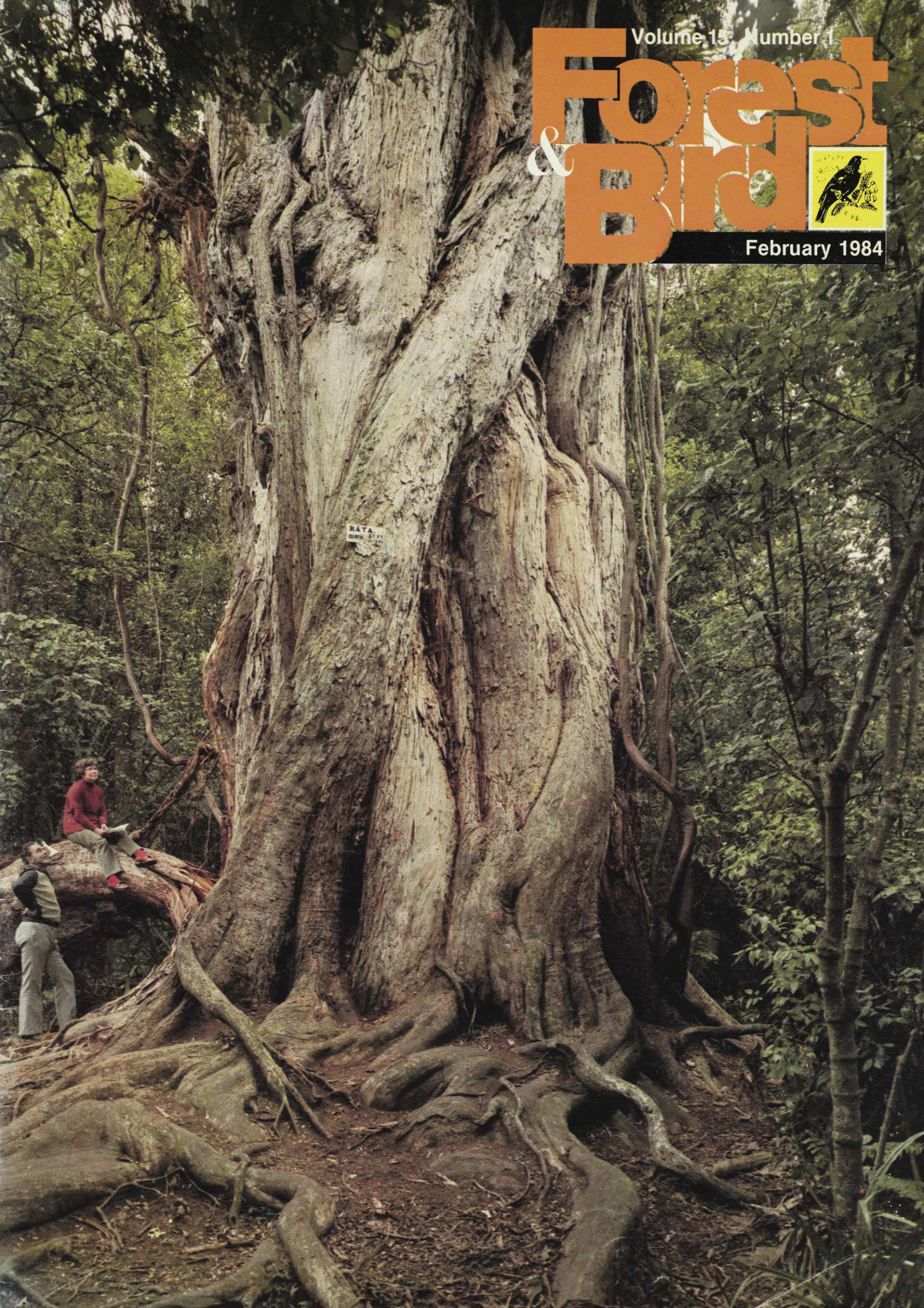
February 1984



A black shag dries its wings at Lake Wairarapa. The lake is our lead article on page 2.
Photo Brian Enting

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Cover: North Island Rata in the Society's Bush Reserve at Bushy Park, Kai Iwi. This is one of New Zealand's notable trees. Photograph: J. Johns.

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Forest & Bird

"Our New Journal"

We live in an era of High Tech — High Touch. So I read. The latter necessary to offset the effects of the former. We can only manage and enjoy the marvels of instant information (in frightening volume), instant consumer items (consistent and antiseptic), and nearly instant travel (congested and exhausting), if we are regularly reminded of ourselves and the real world. Of course technology is real but for many people it is superreal. Surrealist.

What I mean is that we have to be reminded of past values and enjoyment of ourselves and our surroundings. This increased requirement is satisfied externally at least by High Touch. Television combines both High Tech and High Touch. That is why it is so much enjoyed and some say so dangerous. In no other way do we enjoy in such large masses the benefits of Tech and Touch.

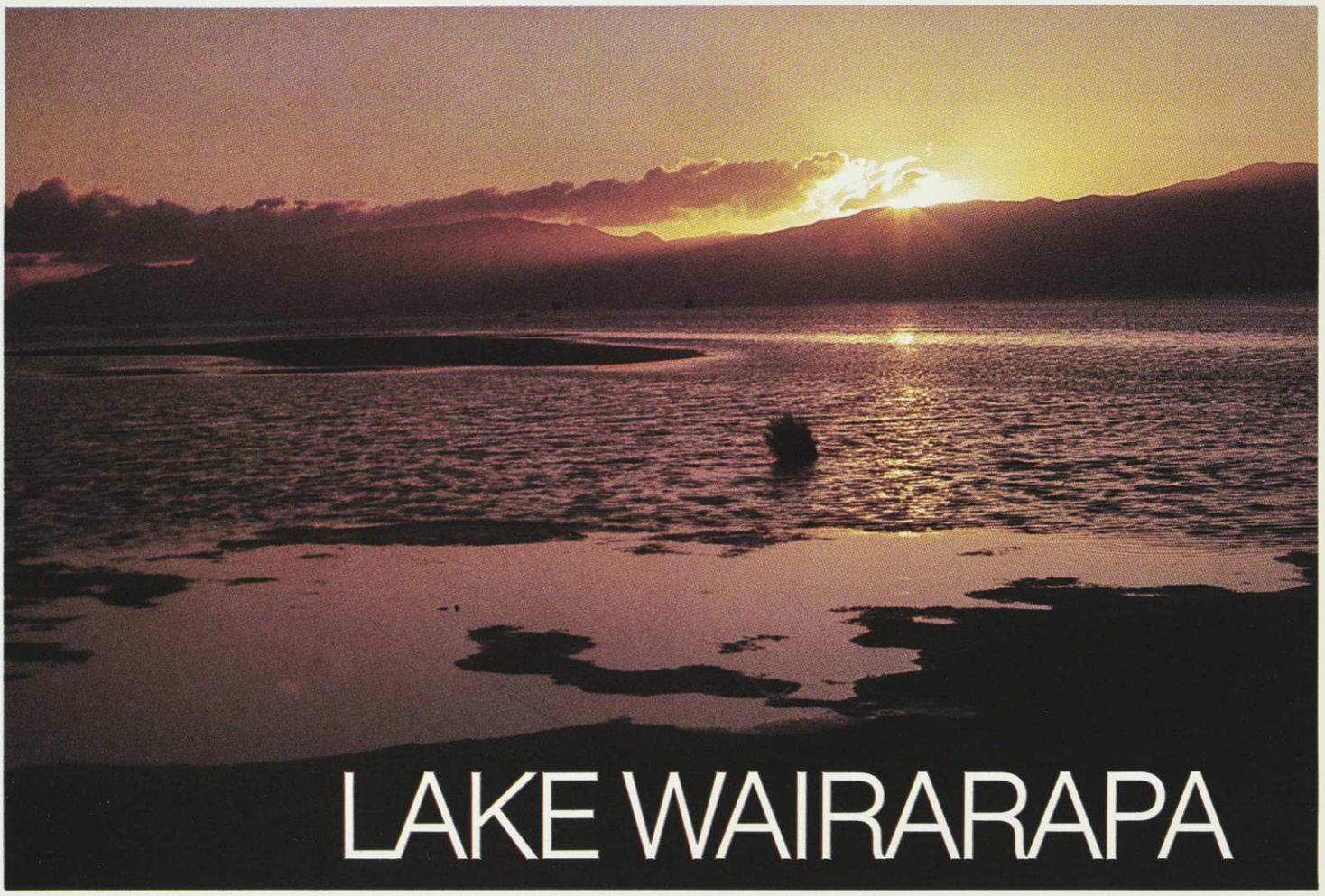
Our Society does not seek to avoid technology. Our membership lists and finances are on computer. Bird counts and analyses of all resources are all assessed by sophisticated technical machines and methods. We must now deal with and understand the methods of industry and social science.

On the other hand our journal Forest and Bird is the anodyne. And with this edition the Touch is Higher than ever before. We have chosen to change to the proven A4 format to improve presentation both of pictorial and printed content. This is an expensive matter but it is very important indeed that the journal is appreciated and read. I think we shall soon be placing it on the bookstands for public sale. At a proper price.

I cannot part with the topic of the Journal without expressly recording the thanks of the Society to the members of the Wellington Branch who for 20 years now have packed and posted each edition.

I hope you will enjoy the new format and that, as I must write this in December 1983, the New Year of 1984 will see you and our Society prosper considerably.

A. A. T. ELLIS



LAKE WAIRARAPA

—its natural values include plants

Colin C. Ogle[1] **and Tom C. Moss** (Member)

***Myriophyllum propinquum*: the common, native water milfoil occurs widely on the lake-shore as stunted plants, and in swamps and pools in this more upright form; feathery stigmas of female flowers are visible.**

1. Scientist, New Zealand Wildlife Service, Wellington.

Lake Wairarapa and its adjacent wetlands have become increasingly important in the current debate on uses for New Zealand's wetlands. To date, the conservation emphasis on Lake Wairarapa has been on the spectacular: the 73 or more species of birds, some of which occur in large numbers. This has tended to over-shadow the presence of a fascinating native flora which is at risk from development also.

THE Wairarapa Catchment Board plans to take some 2600 ha of the lake and its eastern shores to establish 43 dairy farms. Agricultural development has already removed or otherwise modified much of the wetland of this district. If more of the wetlands are taken, how will existing natural values of such lands be affected? Are these values represented on existing farmlands, or can they be substituted by artificial wetlands in new developments? Even if new habitat can be created for all the wetland birds, will this provide also for the full range of other animals and plants currently in the wetlands?

***Pratia perpusilla*: a member of the lobelia family, occurring locally from about Rotorua southwards; in beds of summer-dry ponds at L. Wairarapa. The plants shown produced wrinkled, hairy leaves on the driest mud, but reverted to green, almost hairless plants in cultivation.**

The patterns of vegetation

The lake and its shores have a complex pattern of plant communities, reflecting differences in physical conditions and the direct and indirect modifications caused by man. Habitats with a major component of native plants include shallow and deeper waters, wet pastures, and swamps.

☐Shallow waters

Perhaps the most interesting plant communities are on temporarily exposed flats of the main lake and, on a much smaller scale, on seasonally dry beds of neighbouring ponds. For much of the year these flats are covered by shallow water whose depth is determined by rainfall, wind,

***Gratiola sexdentata*: scattered in summer-dry lagoon beds e.g. near Boggy Pond; a member of the foxglove family.**

and the Wairarapa Catchment Board's operation of control gates on the lake's outlet. By far the most extensive areas of vegetated flats around Lake Wairarapa are those along the eastern shores. Prevailing north-westerly winds push water across the lake to cover its eastern flats, even in summer. These waters recede when the wind drops. The effect is not unlike that created in estuaries by tides, but is, of course, irregular and unpredictable. Waves sort and distribute silt and sand as on tidal shores, while gales can create local sand storms when lake bed materials dry out. With the diversion of the Ruamahanga River from the lake in 1975, the main source of new silt has been removed.

The native turfs

Intermittant immersion, exposure, wave action, and grazing by waterfowl prevent the establishment of all but a highly specialised group of turf-forming, aquatic plants. Almost no exotic species are present in these native turfs.

The plants are characterised by their diminutive size, creeping rhizomes or stolons, and very small leaves which are mostly narrow, slightly fleshy, and, in some species, finely sub-divided.

Flowers are small but sometimes quite conspicuous. Flowering happens mostly when plants are exposed, and is most abundant between January and March. Slight undulations in the surface allow plants on the rises to flower before those of the same species in adjacent hollows.

***Elatine gratioloides*: the sole member of its family in New Zealand, found locally throughout. Mostly on beds of summer-dry lagoons at L. Wairarapa; exposed plants are semi-succulent, with minute flowers in leaf axils; submerged plants are green.**

Turf plants are important stabilisers of sand and mud, trapping particles and binding them together with a web of roots and creeping stems. J. J. Gaudet (Gaudet, in Mitchell 1974) noted that plants rooted in shallow water protect river banks or the shores of lakes subjected to large changes in water level.

Species in the native turfs

A number of plant surveys have been needed to cover most of the shores of Lake Wairarapa. The combined observations of Mr Tony Druce (DSIR), members of the Wellington Botanical Society, and the authors have revealed 182 native plant species in the entire wetlands. Among these, there are 55 species of turf-forming, shallow water plants, all less than 10cm tall. Others, which are characteristically taller plants of sheltered sites, sometimes occur in exposed turfs as stunted specimens.

Some turf species are abundant on shores of this lake, and of many other lakes in New Zealand. Others are uncommon or very local at Lake Wairarapa, and in a few cases are equally so nationally. For one mat-forming daisy, *Cotula maniototo*, Lake Wairarapa is the only known site in the North Island. It is also the only North Island location for dioecious (separate-sexed) plants of *C. dispersa*, otherwise confined to parts of the South Island. *Carex cirrhosa* is a small sedge which is found here and on shores of about three other North Island lakes and in Canterbury. Although mostly 30–50cm tall, the related sedge, *C. buchananii* is in the turf communities also. It is common in parts of the South Island, but in the North Island it is local and confined to the east, from Hawkes Bay southwards. One of our smallest native sedges, *Eleocharis pusilla*, and pillwort (*Pilularia novae-zelandiae*), are both known locally in the North Island and from isolated sites in the South Island.

The small size and, often, the superficial similarity of these turf plants make their field recognition and study difficult. Perhaps it is partly this challenge which makes them rewarding as they begin to yield their identities and features to the persistent observer. Even their names might have been designed to deter the beginner, as few of the species have well-established common names. It is interesting to recall that systematic botanists — those who formally describe and name plants — reflected their views of the similarities between these plants in some of the names they gave to them. As examples, at Lake Wairarapa we have *Limosella lineata* a small plant in the foxglove family, and *Ranunculus limosella*, a tiny buttercup with leaves which resemble those of *Limosella*. And consider the names of the unrelated trio of *Glossostigma elatinoides*, *Elatine gratioloides*, and *Gratiola sexdentata*, all three of which are at Lake Wairarapa.

Other plants which have proved difficult to distinguish in Lake Wairarapa's turf community are those with thin, cylindrical, or strap-like leaves. These include quillwort (*Isoetes*), which is an aquatic relation of the club-mosses; pillwort, which is a most unfern-like fern; the sedge, *Eleocharis pusilla*; and small forms of certain other monocotyledons, such as *Triglochin striatum*, *Ruppia*, *Lepilaena*, *Zannichellia*, and *Potamogeton pectinatus*. Even some dicotyledons present resemble the above species, including *Cotula maniototo* (with its winter leaves), *Lilaeopsis* and *Limosella*.

***Ranunculus limosella*: a tiny, but common buttercup of lake-shore turfs; flowers arise from buried creeping stems; the 4 petals are long and purplish, the 4 sepals are rounded and more translucent.**

***Myriophyllum votschii*: female plants of this small milfoil are shown bearing flowers with 4 feathery stigmas each; a local plant of turfs at L. Wairarapa, known only a little north and south of Jury Island on the eastern shores.**

Zonation

It must be stressed that the turf plants do not occur as a random mixture of species. Each kind has its own particular niche, resulting in zonations of species responding to differences in such physical factors as water depth, the time exposed to the air, degree of wave action, nature of the substrate, and grazing pressure by waterfowl. The turf communities also suffer considerable damage from the hooves of livestock, especially cattle, which have free access to much of the shore.

An interesting variation in the floristic composition of the turfs can be seen in parts of the old lake bed which were cut off as natural ponds and lakes behind dunes along the eastern shores. Some which have been stop-banked, including Boggy Pond, hold water much of the year, but many shallow ones are dry for long periods. Not being subject to periodic immersion by wind-driven waters, the muddy beds of these ponds can become sun-baked and cracked in summer and support extensive mats of species which are rare or unknown on the exposed shores of the main lake. Conspicuous plants of these special habitats include *Pratia perpusilla*, *Potentilla anserinoides*, *Gratiola sexdentata*, *Ranunculus macropus*, *Epilobium pallidiflorum* and *Elatine gratioloides*.

□Plants of deeper waters

In permanent sheltered waters some lake plants become much taller, and new species appear. That part of the course of the Ruamahanga River which is now a narrow arm of the lake extending east-wards from Jury Island contains abundant milfoil, *Myriophyllum triphyllum*, its only known location in the lake. *Potamogeton pectinatus* (fennel-leaved pondweed), *Ruppia polycarpa* (horse's mane weed), and a tall sedge, *Scirpus lacustris*, all grow larger and more profusely here than elsewhere.

□Wet pastures

Much of the main lake is now bordered by grazed pasture, but this is often rough and seasonally very wet, and some is invaded by exotic woody plants such as crack willow, gorse, tree lupin, and alder. Open, poorly drained areas retain a mixture of native and exotic herbaceous plants. Common species are the cutty-grasses (actually sedges), *Cyperus ustulatus* and *Carex* species, and rushes (*Juncus* species), tall fescue and Mercer grasses, penny-royal and lotus major.

□Swamps

Wet pasture grades into the wettest fertile swamps, mostly fringing the ponds adjacent to the main lake. Raupo (*Typha*) is sometimes dominant here, but there are beds of other native plants such as water milfoil (*Myriophyllum propinquum*), large species of sedge (*Carex* and *Scirpus*), jointed rush (*Leptocarpus*), and exotic plants including water purslane (*Ludwigia palustris*). Some areas of flax, toetoe, manuka, cabbage tree, and *Coprosma propinqua*, are interspersed with stands of willow. Native forest trees are rare along the eastern shores, but a few slender kahikatea remain, and solitary trees in wet pastures include ribbonwood (*Plagianthus*), kowhai, ngaio, and totara.

Even the willow forests contain some herbaceous native plants which are of local occurrence nationally. The slender swamp nettle, (*Urtica linearifolia*)

View north-east over eastern shores of Lake Wairarapa. Turf communities can be seen on foreground shores; Jury Island and the old course of Ruamahanga River beyond Boggy Pond in the far right.

Photograph C. J. R. Robertson

Big Lagoon, J. K. Donald Reserve, east shore of L. Wairarapa (February 1982). The Donald Reserve is the largest surviving area of swamp and ponds which is contiguous with the main lake. Some ponds, including Big Lagoon, have been artificially deepened in an attempt to retain water in summer and autumn. This creates habitat for tall exotic and native plants rather than small, wetland turf ones, as well as for waterfowl, bitterns, herons, frogs and perch.

***Hypsela rivalis*: a member of the lobelia family, local in the North Island, more widespread in the South Island; thinly scattered in lake-shore turfs at L. Wairarapa.**

***Crassula* sp. (*Tillaea sinclairii*): one of the most abundant species of the lake-shore turfs; has the smallest leaves of any flowering plant present.**

***Callitriche petriei*: this native starwort is thinly scattered in the lake-shore turfs; a rather local New Zealand species. Stomata show clearly in upper surfaces of the leaves.**

Photographs
with exception of aerial photo all by
Colin C. Ogle

***Callitriche petriei*: one each of the very reduced male and female flowers are shown: the male consists of one stamen only (see the yellow anther), and the female shows two lobes of the ovary and two styles.**

and a white-flowered native violet (*Viola lyallii*) are examples, but the most notable rarity is a species of *Crassula* (= *Tillaea acutifolia*).

The state of botanical knowledge

Much of the botany of the Lake Wairarapa wetlands remains unknown. No detailed vegetation map has yet been made for the area, the precise nature of the plant zonations is undescribed, and, undoubtedly, there are species present which have so far escaped notice because of their rarity of their likeness to other plants. The taxonomic status of some plants remains unclear; for instance that of *Isoetes*, *Pilularia*, *Lilaeopsis*, and perhaps an unnamed species of *Glossostigma*.

Finally, there is the question of the roles the plants have in the ecology of the wetlands. Clearly, some bird species use certain areas of the lake shore, while others seem to prefer different parts. Some connections between the vegetation and the wildlife use of the wetlands should emerge from the current year's study at Lake Wairarapa by the Wildlife Service.

Botanically, Lake Wairarapa's eastern shores are still a fascinating natural system. Not only do they deserve protection but with suitable management the total biological and scenic values of the complex might be enhanced. This could lead to an increased public awareness and use of the wetlands for their intrinsic rather than exploitable values.

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THE Kokako

PERSPECTIVE AND PROSPECT

Callaeas cinerea wilsoni

by Rod Hay, Scientist, Forest and Bird Society

Two seasons have passed since the winding up of field-work for the Society's Kokako research project. While the results are being published in scientific journals, it is appropriate to present a synopsis of the study, its conclusions and an account of where the kokako goes from here.

'The cry of the crow is indescribably mournful. The wail of the wind through a leafless forest is cheerful compared to it. Perhaps the whistling of the wind through the neck of an empty whiskey bottle is the nearest approach to it, and is sadly suggestive of departed spirits' [*sic*].

Charles Douglas' words (Pascoe, 1957) may have been prophetic of the fate of the South Island or orange-wattled kokako but many New Zealanders have pitted their money, skills, energy and emotion against the possible disappearance of the spirit and substance of *Callaeas cinerea wilsoni*, the North Island kokako. Cynical folk have described it as the most common rare bird in the country, popping up wherever logging is proposed, whilst to others it is seriously endangered. The 'official' account (Williams and Given, 1981) categorises the bird as vulnerable (meaning that even an apparent abundance in some areas or a widespread distribution does not mean long-term safety), and the South Island one as extinct. There is little doubt that the concern, which led to protest over attempts to log remnants of Pureora and to the call for more research on the requirements of the species, was well warranted.

The Kokako is one of the most ancient vertebrate New Zealanders, belonging with the huia and saddleback in the endemic wattlebird family, a group whose ancestors became isolated from relatives in other landmasses at the time of the first fragmentation of the southern super-continent Gondwanaland some 80 million years ago (Fleming, 1978). As such, its relatives beyond New Zealand are unknown though it may be associated with the birds of paradise and bower-birds.

According to Maori tradition (Reischek, 1886) the kokako was common in all suitable forests of the North Island and sub-fossil records tend to support this. Buller (1892) regarded the distribution as being somewhat eccentric in the late 1800's but there were dense populations occurring sparingly in the northern part of the North Island, through the Waikato, Rotorua, Urewera and Taranaki regions and down into Wairarapa.

The South Island kokako was found over a large area of South, Stewart, Resolution, Durville, and Stephens Island but less is known about its distribution than about that of the North Island kokako, because it declined in numbers more rapidly. Potts (1873) describes them as having been abundant on Banks Peninsula and in scrub fringing the beds of some of the larger eastern rivers. They also occurred from Northwest Nelson to Fiordland in the west.

Despite some very recent sightings (McBride, 1981; R Buckingham, pers. comm.), this subspecies must be regarded as being very close to extinction. This is perhaps paradoxical as more habitat remains in the South Island, where birds occurred commonly in beech forest (Travers, 1871). This choice of habitat, combined with the habit of foraging and nesting on or near the ground (Potts, 1873) would undoubtedly have rendered them more susceptible to predation by stoats and rats (Clout and Hay, 1981).

The range of the North Island kokako has shrunk considerably this century (Lavers, 1978) and a number of causes have been suggested. Paramount amongst these must be the loss of large areas of habitat. Extensive tracts of lowland North Island forest were decimated for establishment of pasture following the arrival of Europeans in New Zealand, mainly between 1880 and 1930 (Nicholls, 1980), the countryside becoming a patchwork of small and very small bush remnants.

As with a number of endemic birds, introduced predators may have had a considerable effect on kokako (St Paul and McKenzie, 1974) but little was known of breeding success or adult survival in the face of these. A further possible cause of decline was the spread of browsing mammals; goats, pigs, red deer and particularly the possum, and the effects of likely competition with kokako for food.

The controversy which led to Forest and Bird's commitment to kokako study and conservation is now well known. The New Zealand Wildlife Service had carried out a series of surveys of the species in the early 1970s and these resulted in the identification of a number of forests regarded as crucial for its continued survival (Crook, 1975; Crook, *et. al.*, 1971; 1972; Imboden, 1978; Coker, 1978). The forests so identified contained the largest and most extensive known population of Kokako. Rated highly by the Wildlife Service were two areas of virgin podocarp/hardwood forest within Pureora State Forest; the south east corner of North Pureora near Ranginui Road and the area around Pikiariki Road immediately to the east of Pureora Forest Village. Reserve

Waipapa Ecological Area — North Pureora. Prime Kokako habitat.

The closest the author ever got to a South Island Kokako. One was seen running along this log in Stream Valley fifteen years ago by Mr K P McBride.

status was recommended for both these areas. The New Zealand Forest Service accepted reservation of one area (Ranginui Road) but proceeded with a clear-felling operation in the other. In the late 1970s public opposition to clear-felling and selective logging in this and other parts of the forest built up significantly and the issue was highlighted by a tree-top protest in the remains of the clear-felled area by members of the Native Forests Action Council. The ensuing debate resulted in a decision by the Minister of Forests to heavily reduce logging in Pureora for three years so that assessments could be made of the effects of logging on wildlife populations in general and the kokako in particular.

Approach to the study

There are a number of requirements for tackling a study such as this. Firstly, previous information on the species must be assimilated. Next, the questions which the research is going to address must be formulated, taking into consideration what is already known, what is practical and the broad conservation needs. The final requirement is to get to know the bird itself, something which can only be gained by sufficient time in the forest.

With a pile of references, mostly old, and the sound of a snatch of Hunua Range song amongst my only previous experiences of kokako a preliminary period of getting to know them led to a strengthening of the neck muscles, a barrage of stick wounds to the shins, an appreciation of the best methods of study and an affection for the birds themselves. Aside from extensive survey results, some anecdoted details on feeding and breeding and a large amount of speculation, there was a dearth of good data on which to base conservation recommendations. Of necessity, therefore, the study was a broad one, designed to provide information on feeding, breeding and general habitat requirements and to relate those to present and future forest management.

Major questions

What were the key questions being asked about these birds?

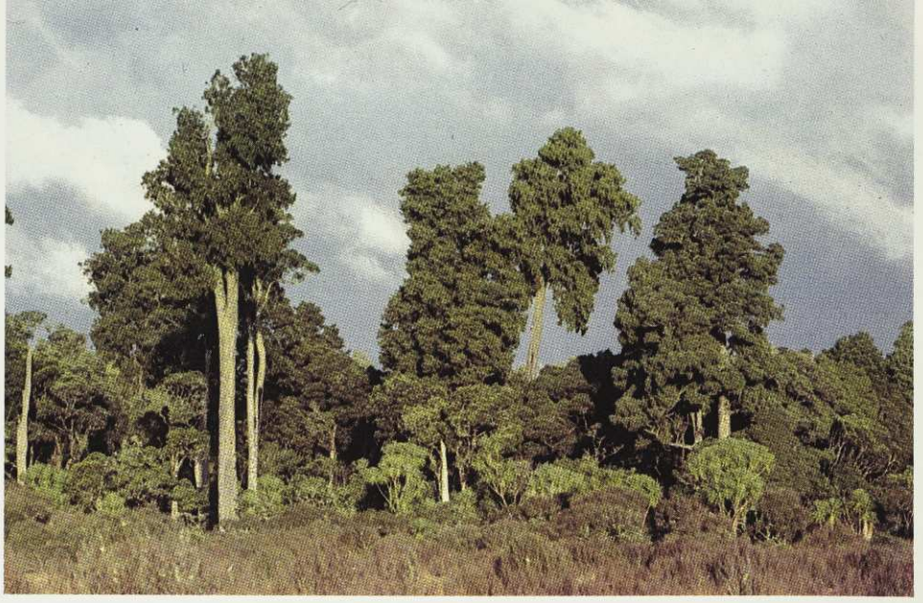
Firstly, and most controversially, was selection logging affecting their ability to survive? Secondly, was the impact of browsing mammals, particularly the possum, on the habitat sufficient to render it unsuitable for kokako? Finally, as the viability of a species ultimately depends on its ability to breed with sufficient success to balance the natural and unnatural rates of mortality, how important were the effects of predation by small mammals?

It is clear that, to acquire sufficient information to answer these questions one needs basic data on habitat, particularly food requirements.

Method of study

Three study areas were chosen:

1. Several sites within Pureora State Forest Park, including an intensive study area of 40 ha of unlogged medium density podocarp/hardwood forest (Pikiariki Road), and areas of high density and logged and unlogged medium density podocarp forest.
2. Rotoehu Forest. One study area of 125 ha of mainly lightly logged tawa/kohekohe forest.



Forest Margin Pureora.

Cut-over tawa forests — Mapara

3. Mapara Forest. This forest has been heavily logged in the past but still supports a moderately dense population of kokako. In this area a representative 35 ha was chosen as study area.

Kokako feeding and other behaviour was studied using a time sampling technique. This involved following birds for several hours during each study period and recording their behaviour during a five second period each minute they were observed. Once a bird or pair was located, observations began immediately, data being recorded on tape. I kept track of the minute intervals — using the strident chimes of an alarm wristwatch with its timer set at that interval. The sound that it made more than once prompted a visitor to enquire which bird went beep-beep-beep-beep in such a regular fashion!

During each sampling period the following details were noted: time, bird activity, average canopy height, bird height in relation to ground and canopy, type of perch, topography, location in territory, food type, food source (tree epiphyte, liane, invertebrate, etc), plant species, number of birds. This information was collected monthly from a number of kokako territories in each study area and later coded for analysis.

Assessments of population in the logging study were made by repeating surveys and thus attempting a full census of birds present in the following areas of Pureora:

1. 355 hectares of dense podocarp/hardwood forest.
2. 251 hectares of medium density podocarp/hardwood forest recently logged at 30 percent level of extraction.
3. 567 hectares of unlogged forest immediately adjacent to the above logged block and of the same forest type.
4. 478 hectares of tawa forest which had been cut-over for podocarps between 1941 and 1948.

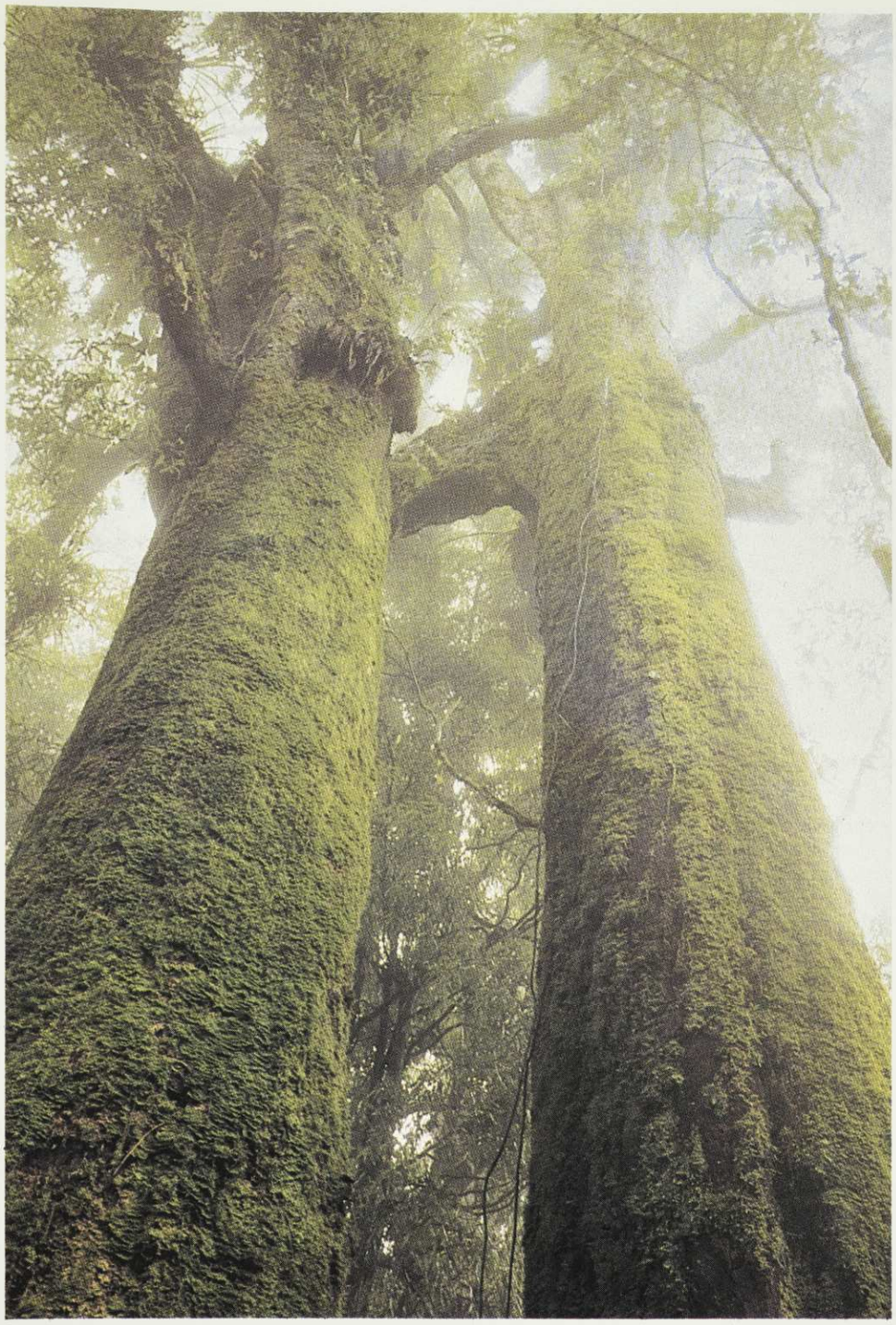
The technique used was to mark stations on a 500 metre grid and for two observers to walk through the area for the two hours following dawn, their route passing through the stations but not stopping at them, recording the positions of all birds seen or heard calling or singing. The rest of the day was then spent traversing the same area playing a tape-recording of the kokako 'mew' call (Hughes, 1981) for five minutes at each station and noting all responses. Each area was surveyed four times over the period of the study, each survey taking between two and five days. By the end of the period no new birds were located and, for the purposes of the study, the completion of a full census was assumed.

Attempts were made to locate nests in the intensive study areas by following well known pairs, some of which were colour-banded. In addition, surveys of all known pairs within the other study areas were made following each breeding season to search for juveniles and assess breeding success for a larger sample of birds.

Pellets of possums collected in the Pureora and Mapara study areas were analysed for cuticle fragments at Ecology Division, D.S.I.R. in order to determine key elements of their diet.

Vegetation studies

For each study area, John Leathwick of New Zealand Forest Service collected large quantities of information on vegetation. Forests were divided into different types using information from plot studies and a multitude of colour aerial photos. The major types were then examined in more detail using a technique known as point height intercept analysis (Park, 1972) in which a series of vertical sightings are made through the forest and the type of vegetation in each height class noted. In this way a detailed picture of species composition and forest structure was built up. It is more relevant to bird study to know the volume of forest occupied by



Large epiphyten strewn matai trees at Pureora.

Feeding on Pepperwood berries

different classes of tree species rather than just the number of individuals! Finally, the tagging of a large number of food trees enabled regular assessments of their patterns of flower and fruit production. One astonishing result of this was discovering a large matai which changed sex half-way through the study!

Kokako diet

A huge variety of foods is consumed by kokako (their voracious appetites extending even to berries hand-proffered to birds caught for banding in mist-nets).

Invertebrates, including beetles, cicadas, the bag-moth (*Liothula omnivorus*) and particularly the green sixpenny scale insect (*Ctenochiton viridis*) featured in the diet mainly during summer. For example, at Pureora the scale insect formed up to seventy percent of items eaten in one month. (A policy of sampling all foods did not normally extend to invertebrates but field assistant Neil Howie assured me of the sweetness of scale-insects.)

Fruits of a variety of trees and shrubs were taken in the autumn when they were most abundant while leaves were eaten throughout the year, particularly in the spring, when other foods were scarce.

Some plant species were apparently selected for, featuring in the diet more prominently than their actual abundance would suggest. Preference was shown, for example, for five-finger (*Pseudopanax arboreus*), raukawa (*P. edgerleyi*), broadleaf (*Griselinea littoralis*), putaputaweta (*Carpodetus serratus*), kaikomako (*Pennantia corymbosa*) and a number of species of liane and epiphyte. Overall use of podocarps (the main group of timber species) was lower than expected from their abundance, but this varied considerably between seasons and years; eg matai (*Podocarpus spicatus*) use ranged between 1 percent and 80 percent in different seasons, while it contributed approximately 18 percent of the foliage of the forest. This is probably related to the periodicity of fruit production exhibited by these species (Beveridge, 1973). Matai was the only podocarp to produce large quantities of fruit during that period of the study and use of the other species could be expected to increase during years of high seed production. There was a greater use of podocarps if the large quantities of lianes such as supplejacks (*Ripogonum scandens*) and epiphytes such as the spleenwort (*Asplenium flaccidum*) were included with their host trees in the analysis.

Competition for food

There is considerable overlap between the foods favoured by the kokako and possums, deer and goats. This suggests that there is a strong likelihood of actual competition occurring and having a deleterious effect on kokako. Subsequent analysis of distribution and rates of spread of possums (Leathwick, Hay and Fitzgerald, 1983) provides considerable support for this hypothesis.

These mammals have reduced the abundance of preferred food plants in much of the remaining kokako habitat and the present distribution of the birds suggests that this is an important factor contributing to their decline. With few exceptions the best areas for kokako — the

Pureora area, the northern Ureweras, the Bay of Plenty and Puketi — have only had a short history of possum-browsing. Some lowland Bay of Plenty forests have a relatively long history of browse but those forests have a lot of species such as kohekohe (*Dysoxylum spectabile*) which may be better able to withstand it.

Breeding and predation

Despite extensive searches for nests, only five were found during three study seasons and all of these were preyed on despite protection of the sites. There is only circumstantial evidence to indicate what the predators might have been. In one nest, at Mapara, a twelve-day old chick was partly eaten in the nest possibly by a rat, whilst in another, at Pureora, foil placed around the trunk below a nest that was preyed on recorded foot-prints of a possum. In the second nest that season of this same pair the eggs were lost shortly after a stoat-like creature was glimpsed in the canopy nearby.

Many nests weren't found simply because they failed before being located while other pairs apparently did not attempt to nest each season. The lack of information on nesting prompted a series of more extensive post-breeding surveys for juveniles (distinguished by small pink wattles, persistant dependence on adults for food and undeveloped song). The results, shown below, indicated that breeding success was usually poor.

Study area		Number of pairs	Number of juveniles
Pureora	1979–80	15	1
	1980–81	15	2
Mapara	1979–80	18	0
	1980–81	16	2
Rotoehu	1979–80	10	2
	1980–81	13	1
Mean number of fledged juveniles per pair per year			= 0.09

Despite what seems to be a devastatingly low reproductive output, could it be sufficient to balance the annual death rates of adults? Unfortunately there is little information on this, apart from reports of birds living for up to 25 years in small isolated bush remnants.

Selection logging

At the beginning of the study, previously logged forests containing kokako had been upheld as examples of their survival despite interference in the habitat. To test these suggestions the surveys were conducted of several areas of Pureora previously mentioned, with the following results:

Dense podocarp forest — 0.10 birds/hectare; Medium dense podocarp (virgin) — 0.06 birds/hectare; Medium dense podocarp (selectively logged) — 0.00 birds/hectare; Cutover tawa forest (early logging) — 0.01 birds/hectare.

Where previous wildlife surveys had shown that kokako occurred, recent selection logging had apparently preceded a complete demise of the population. What are the possible reasons for this?

Kokako use a wide variety of food types and plant species, but this does not mean that they do not rely on particular foods at particular times. Any reduction in plant diversity and abundance could render the habitat less suitable.

Selective logging, whilst removing only a proportion of trees, tends to take the larger, older ones which support the greatest loads of lianes and epiphytes.

Immediate post-logging conditions favour the growth of plant species not heavily used by kokako. Tracks and clearings are colonised initially by wineberry (*Aristotelia serrata*), tree ferns and other species were not used by kokako during this study.

Kokako do occur in cut-over forest, but usually in areas where logging ceased many years ago. Kokako populations were probably larger then and there was a more substantial reserve for recolonisation of disturbed areas and, in most instances (eg Mapara Forest, North Pureora Forest), these localities were not occupied by possums at the time of logging.

Thus it is important to analyse all current conditions before attempting any sort of forest management.

Mist net site for kokako trapping.

Nest-finding the hard way!

Prospects

As the most basic aim of the study was to help ensure the continued survival of kokako on the mainland, recommendations were drafted accordingly, the most important of these, prohibiting logging in areas of Pureora State Forest Park where kokako occurred, giving high priority to controlling browsing mammals in kokako areas, an experimental predator control programme and periodic monitoring of populations and breeding success in several key areas.

The most important part of the whole programme was the accepting by the Minister of Forests of these recommendations, and not unexpectedly, ordering a permanent halt to logging in virgin areas of North Pureora. Another important step was the successful attempts by John Innes of FRI to control predators in the Pikiariki Road study area. It must be emphasised, however, that this control was only a small-scale experiment but it illustrates what could be achieved in certain key areas.

What remains to be achieved and what are the prospects for long-term survival? The greatest chances centre on the largest forest remnants — or in appropriately managed small remnants. In all areas — controlling browsing mammals must be accorded the highest priority. Thus the recreational hunting area which exists over the most important kokako area in Pureora unacceptably compromises this

Even kokako suffer from hook-grass!

This single chick reached the age of 12 days before being eaten (by a rat?).

requirement. In some of the smallest remnants, particularly those which have had adjacent forest recently cleared, perhaps the best policy is removal of birds to the 'insurance' colony of Little Barrier Island, a project at present being carried out by the Wildlife Service. Important that this work is, it must not be seen as the answer to the kokako's long-term survival for even an island the size of Little Barrier will support only a relatively small number.

Commitment

Since Kokako have survived this long, there seems to be good reason for them continuing to survive on the mainland provided a commitment is made to take the appropriate action. We need to keep a close watch on the situation, ensuring that adequate habitat remains and that control of mammalian competitors and predators is accorded the highest priority where practicable. In some areas, the employment of 'game keepers', whose sole responsibility is the protection of the birds, appears to provide the best solution to the problem.

Let's ensure that the star of radio's 'morning bird call' continues to give live performances!

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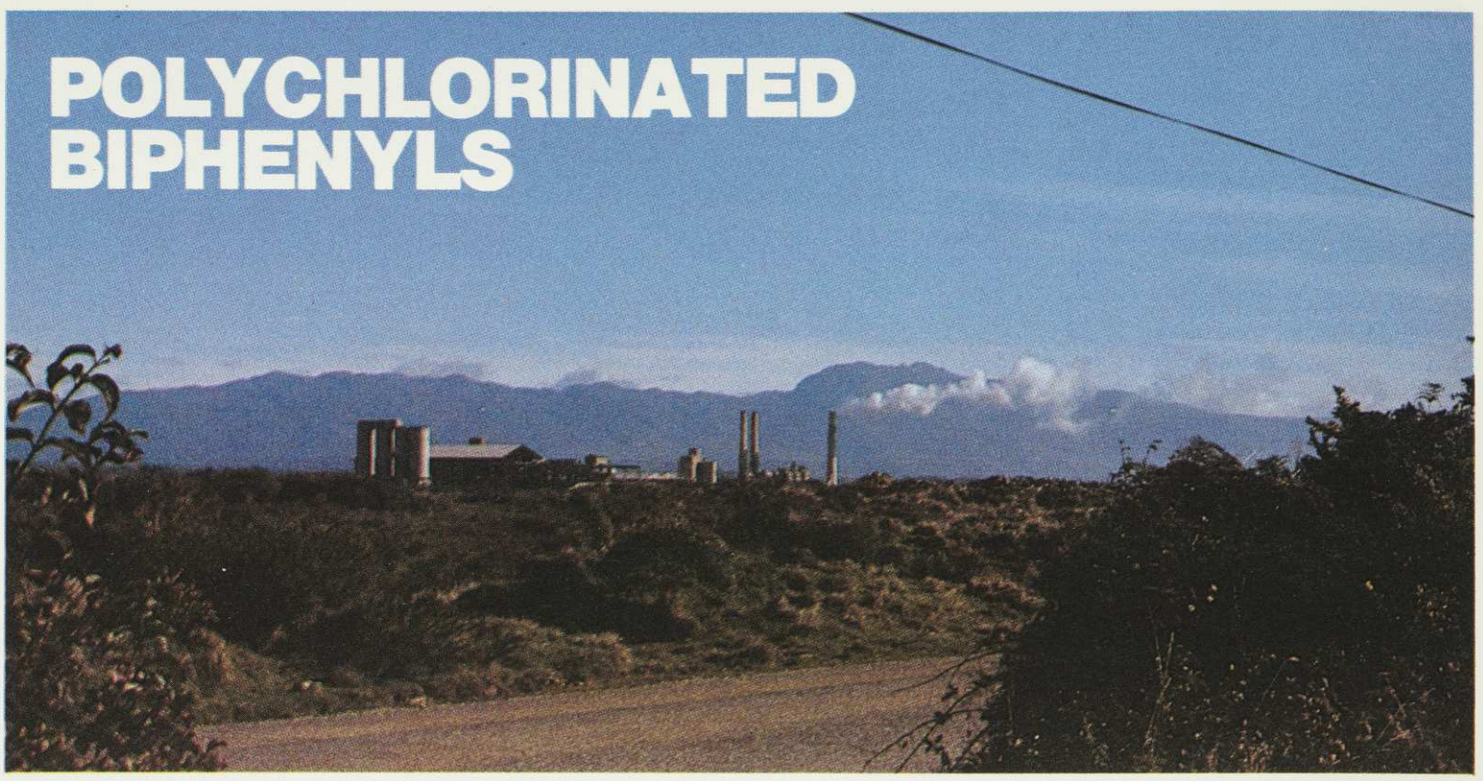

An Environmental Hazard in New Zealand?

by Alastair S. Gunn and Michael G. Crooymans

Alastair Gunn is a Senior Lecturer in Philosophy at the University of Waikato. He teaches and publishes on ethics, especially environmental and professional ethics.

Michael Crooymans works in the information resource section of the N.Z. Dairy Board. He was formerly a research assistant in the Philosophy Department at the University of Waikato.

Introduction

Polychlorinated Biphenyls (also known as PCBs) were discovered in 1881, but their properties and potential uses were not realised until later. The Monsanto Corporation began large-scale commercial production in 1930. In 1966 Soren Jensen, who was involved in the analysis of chlorinated pesticides discovered that unexplained peaks on a chromatogram were due to PCBs. Jensen's tests on museum specimen feathers showed PCB residues dating from 1942.[1] It became evident that samples previously thought to have contained only DDT may have contained PCBs, and that PCBs were a widespread environmental pollutant. From 1971 Monsanto voluntarily restricted production to closed systems, ceasing production altogether in 1977.

The structure of PCBs (which is similar to that of DDT) consists of two phenyl groups joined together, with up to ten chlorine atoms attached.

PCBs possess a unique combination of properties: they

- are highly stable, indeed almost indestructible
- are virtually non flammable
- are poorly soluble in water
- have a high boiling point
- are good electrical insulators
- have a high dielectric constant
- are soluble in fats

PCBs therefore have many applications.

Controlled Systems (PCBs are in sealed units and can be recovered). These include:

- coolants in transformers
- dielectric fluids in capacitors: in ripple control equipment, and for power factor correction in products such as lighting fixtures and appliances containing electric motors.
- heat transfer fluid in heat exchangers and hydraulic fluids.

Uncontrolled uses (PCBs are not recoverable). These uses include:

- ☐ plasticisers in products such as plastics, paints, varnishes, sealers and carbonless copying paper.
- ☐ fire retardants in rubber and neoprene
- ☐ in pesticides.

It is estimated that around one million tonnes of PCBs have been produced worldwide. PCBs have entered the environment directly from many of these uses and from the improper handling and disposal of closed systems such as transformers. The manufacture of products containing PCBs has also caused pollution: for instance, approximately 227,000 kg contaminates the bottom of the Hudson River in New York State, the result of regular daily discharges from two General Electric Corp. capacitor plants.[1]

Environmental effects

PCBs have been detected in the tissues of many animals around the world and even at a depth of 3,300 metres in the North Atlantic ocean. Since they are very stable, they remain in the environment for a very long time.

Because they are insoluble, and become tightly bound to soil particles, they do not leach quickly like soluble substances, but gradually spread by water percolating through the soil. They are also readily taken up by plants. Soil containing PCBs, is thus a long-term source of environmental contamination.[2]

Aquatic organisms including salmon eggs, mayfly nymphs, oysters, crabs, shrimps and several species of fish, have been shown to absorb PCBs directly from water. PCBs are mostly adsorbed onto particles, however, and settle on the bottom of bodies of water. Bottom-feeding organisms are known to remobilize and accumulate PCBs. This is likely to happen gradually, so that the bottoms of lakes and seas continue to act as sources of PCB pollution for many years.[3,4]

PCBs bioaccumulate and also biomagnify, so that a few parts per

trillion (ppt) in bottom feeding micro-organisms, may end up as a concentration of several parts per million (ppm) in fish. Typically, therefore, organisms high in the food chain show relatively high concentrations of PCBs. Baltic Sea mussels averaged 4.3 parts per million (ppm) in their fat, herring averaged 6.8 ppm, seals 34 ppm, and guillemot eggs 250 ppm.[5] Levels in fat are generally higher than in the rest of the body because PCBs concentrate in animal fats. Thus a peregrine falcon was found to contain 65 ppm overall but 1980 ppm in its fat.[6] An extreme case was that of a Swedish eagle owl whose fat contained 12 000 ppm of PCBs, or 12 g per kg.[4] Concentration generally increases with age, but stress, starvation and reproduction may cause the release of the fat-stored PCBs into the bird's system.

PCBs are hazardous to human health if consumed directly via food contamination. Two serious incidents have occurred in Japan (1968) and Taiwan (1980): rice oil contaminated by PCBs leaking from a factory pipe, caused the symptoms of 'Yusho disease' in over 3000 people. These symptoms — which include the serious skin condition chloracne, metabolic disturbances, and adverse effects on bones, joints, and teeth — were produced by ingestion of as little as 0.5 grams of PCB. There is also statistical evidence that occupational exposure may lead to lung cancer.

The effects of PCBs on animal life vary. Their acute toxicity to birds and mammals is relatively low, less than that of DDT. However continuous low-level exposure and the resultant build-up in tissue leads to a variety of effects including damage to vital organs, especially the liver. More importantly, PCBs share with DDT the ability to interfere drastically with reproduction in some animals. Quite small quantities of PCBs affect calcium metabolism in birds: the result, in species such as peregrines, pelicans, sea eagles, gannets and frigate-birds is a thinning of egg-shells. Such eggs are much more likely to break, and hatching success may also be affected by lower water retention.[6]

Many invertebrates are also killed by quite low concentrations of PCBs.

Recognizing the sensitivity of aquatic life, and the effects of accumulation, a number of authorities have proposed standards for water quality. Since the effects of chronic low level exposure to a given level of any chemical can never be known for certain, water quality standards are partly arbitrary; responsible authorities might be expected to err on the side of caution. Thus the United States Food and Drug Administration allows a maximum level of 1 ppt in drinking water; the United States National Academy of Sciences recommended a maximum of 2 ppt to protect aquatic life,[9] while the World Health Organization has suggested 5 ppt as a maximum for unpolluted water.[4]

PCBs in New Zealand

Our research shows that between 100 and 500 tonnes of PCBs have been used in closed systems in New Zealand. We have no idea of the amount of PCBs that have been used outside controlled systems in New Zealand, but at least 14 tonnes was imported for such uses in 1973. New Zealand was still importing PCBs for use as plasticisers in 1977, four years after the OECD had strongly recommended that they be used only in closed systems.

Research by Solly and Shanks shows that environmental contamination by PCBs is local, if not national. Of 621 mammal and bird specimens collected from the main and outlying islands, 57 specimens contained at least 0.1 ppm of PCBs. The highest levels, in the range of 4.98–7.61 ppm, were found in predators — kingfisher, gannets, giant petrel, harrier, sea-leopard and fur seal.[10] Two small scale analyses of human autopsy fat samples showed detectable levels in all the subjects: one 1974 survey of 51 samples showed an average concentration in fat of 0.82 ppm while a 1975 study of 35 samples averaged 0.35 ppm. The highest level was 4.67 ppm, and levels increased with age.[11]

New Zealand is unlikely to suffer disasters such as the 'Yusho' incident, and our waterways will not become contaminated to the extent of some American rivers such as the Hudson. Nonetheless, we have large quantities in use and in storage awaiting disposal, which could add to the existing contamination. PCBs present a hazard because:

- People who are unaware of their presence or possible effects are unable to take precautions when handling PCBs or equipment containing PCBs.
- Equipment may be accidentally damaged and PCBs spilled.
- Improper disposal of all or any existing units creates a long-term hazard.

PCB safety in New Zealand is hindered by widespread ignorance even among those whom we expected to be well informed. We contacted the appropriate departments of the Technical Institutes: of the 12 who replied, only one indicated that it gives its electrical students a good training in the hazards and safe handling of PCBs. Three others made some reference to PCBs, while eight make no mention at all; indeed, four of these did not know about the hazards of PCBs themselves. Several of these Institutes have asked us for material suitable for incorporation in their course.

Many electrical workers and others who *are* aware of the hazards of PCBs will find it difficult to know when to take precautions as many units containing PCBs are unlabelled. This includes many of the several thousand capacitors used by the electrical supply authorities for power factor correction. Indeed, our enquiries show that many manufacturers are themselves ignorant of the contents of capacitors they use in their own products.

An unfortunate result of this lack of awareness is that numbers of defective capacitors have been 'put out with the rubbish'. The Health Department takes the view that to dispose of what is calls 'small quantities' of PCBs — up to five litres — in rubbish tips is a safe practice. We disagree. Rubbish tips provide a long-term source of PCB contamination, through slow leakage and possibly plant uptake. Moreover, the organic material in a tip eventually decays, leaving the PCBs free to recirculate in the environment.[2]

The Health Department's public utterances, and replies to enquiries, suggest that they do not fully appreciate the potential hazards of PCBs.

However it is the long-term, chronic effects on health which are of significance.[2] This is the view shared by the industry: Landis and Gyr, a former manufacturer of capacitors containing PCB, takes the view that *no* PCBs regardless of quantity, must be placed in tips.[12] Monsanto itself states that high temperature incineration is the only safe method of disposal.[13]

Recent controversy over a trial burn of PCBs at the Golden Bay Cement Company's kiln, Tarakohe, shows that even within New Zealand officialdom there is much disagreement about the safety of PCBs. On the one hand, the Health Department believes that PCBs are not particularly dangerous. The Electricity Department, however, circularised all registered electricians in 1979, informing them that PCBs are 'quite toxic', and stating that they must not be dumped. The department recommends that 'Precautions should be taken by wearing protective clothing, plastic gloves, and face protection'.[14]

The question of the environmental effects of PCB incineration at Tarakohe has also provoked a variety of official responses. High temperature incineration is usually regarded as a safe means of PCB destruction, and a 1982 trial burn of PCBs in the rotary kiln at Tarakohe more than met the United States Environmental Protection Agency's standard of 99.9% destruction.[15] Local opposition has come from Federated Farmers, horticulturalists, fishermen, and others. They claim that the Health Department's supervision of the trial was 'sloppy', that the PCBs were handled in a lax manner, and that monitoring of stack gases was inadequate. They argue that a spill in Golden Bay could ruin the shellfish industry and have harmful effects on waders and other wildlife on Farewell Spit. In reply, J. Roxborough, the Nelson District Medical Officer of Health, claimed that the media had 'emotionalised and sensationalised' the danger and that if a drum of PCB were to fall into the Bay no more than an acre of seabed would be affected.[16] In turn, a Fisheries scientist stated that even a small spill could cause serious damage to the mussel and scallop and to Farewell Spit.[17]

This debate between supposed experts would border on the farcical were it not for the fact that there is certainly *a* risk of environmental damage from the improper disposal of PCBs. Even those who confidently assure us that it is perfectly safe must acknowledge that PCBs, like any other toxic, bioaccumulative, long-lasting chemical, needs to be handled properly. The argument is really about the degree of risk, and extremist comments on both sides are not likely to lead to the best solution. It is not true, as has been claimed, that a spilled cupful of PCBs could destroy Golden Bay. It is pointless to quote horrendous statistics for PCB concentration in salmon from Lake Michigan as if they represented the likely

result of cement kiln incineration at Tarakohe. But it is also ridiculous to suggest that a 200 litre drum would contaminate no more than an acre.

Conclusion

PCBs are an example of a problem with no ideal solution. Any society which produces and uses hazardous materials has to accept an increased level of risk as the price to be paid for comfort and convenience.

The wildlife which may be affected is not given a choice, of course. We owe it to the rest of Nature to take the greatest of care in the management of all potential environmental pollutants.

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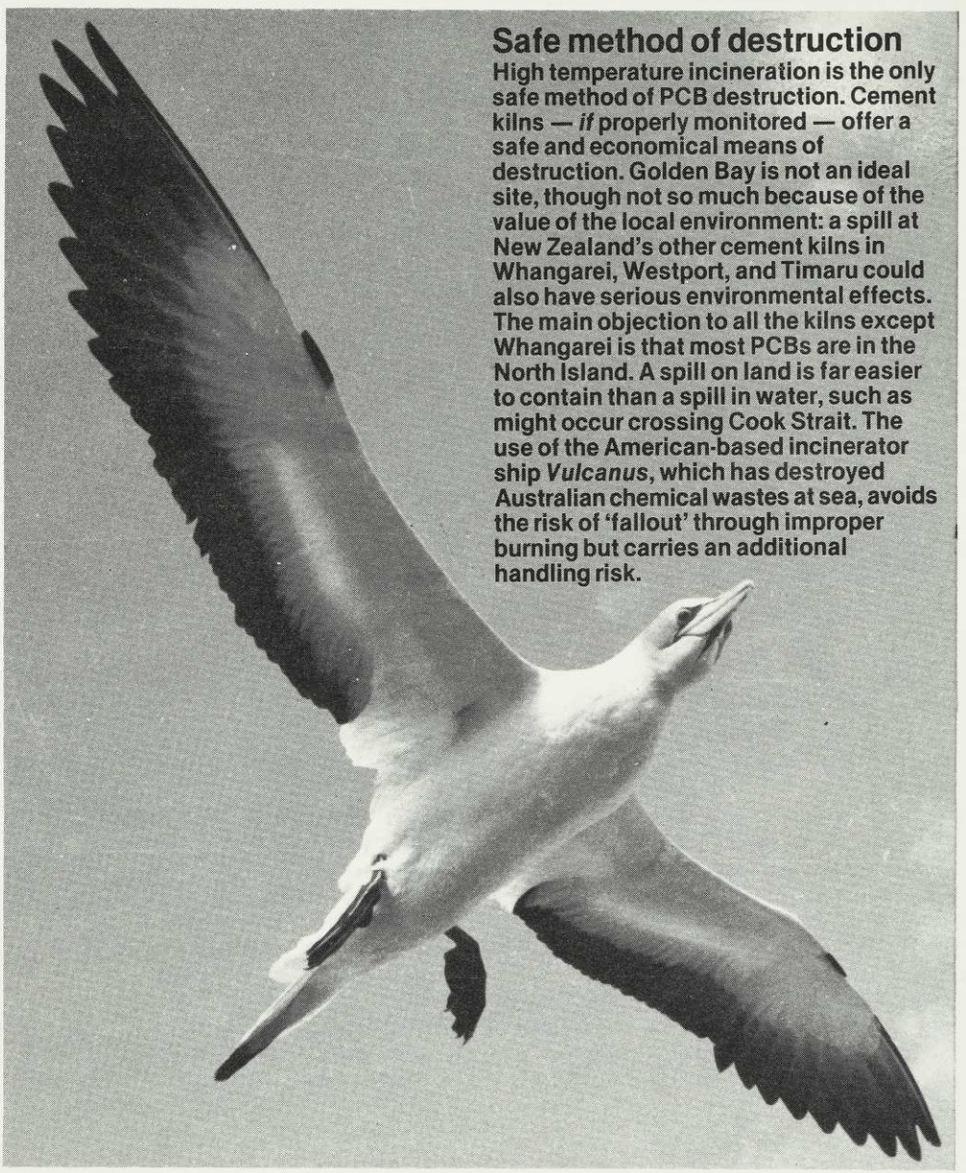

Safe method of destruction

High temperature incineration is the only safe method of PCB destruction. Cement kilns — *if* properly monitored — offer a safe and economical means of destruction. Golden Bay is not an ideal site, though not so much because of the value of the local environment: a spill at New Zealand's other cement kilns in Whangarei, Westport, and Timaru could also have serious environmental effects. The main objection to all the kilns except Whangarei is that most PCBs are in the North Island. A spill on land is far easier to contain than a spill in water, such as might occur crossing Cook Strait. The use of the American-based incinerator ship *Vulcanus*, which has destroyed Australian chemical wastes at sea, avoids the risk of 'fallout' through improper burning but carries an additional handling risk.

Photograph I. Millar

Supplements to issue

Accompanying this issue are a leaflet from Forest & Bird Mailorder and a supplement, *Bush Telegraph*.

Bequests and donations

Recently the Society has received a number of bequests, and you may wish to consider helping in this way to further our aims to protect the native forests and birds and other threatened areas and species of New Zealand.

The expertise of our Society is more and more called upon in all fields of conservation, and conservation education, and we are only limited by the finances we have available.

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Here is a suggested form of bequest:

I give and bequeath a ..... proportion of my estate to the Royal Forest and Bird Protection Society of New Zealand (Incorporated) and I declare that the receipt of the Secretary for the time being of the said Society shall be a complete discharge to my executors of the legacy hereby given to such Society.

Donations to the Society's funds are also of great help in its work, and such donations are qualified as tax deductible.

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Leiopelma hamiltoni

Photograph D. Garrick

HAMILTON'S FROG

This little frog is the rarest of our three tiny native frogs. It is present only on two islands in the Cook Strait area remote from the two other members of the genus, *L. hochstetteri* and *L. archeyi* who live in the Northern half of the North Island.

These three frogs are as unique in the class of amphibia as the tuatara is in the class of reptilia. Charles Darwin opined that frogs were absent from oceanic islands but that New Zealand was apparently an exception to this rule. Their presence in New Zealand is therefore a pointer not only to the geological history of New Zealand, but because of their rarity — the changes that have occurred to the country since the European colonisation.

Our frogs simply could not have survived a long sea passage, and so migration from elsewhere to New Zealand would have been impossible. They must therefore have been living on the chunk of Gondwonaland which broke away some 80 million years ago and together with the ancestors of the tuatara they were carried away on the land which was to become the isolated New Zealand of today. So together with tuatara they represent the most archaic of our fauna.

They are quite unique with primitive bone structures and many features not shared by the other frogs of the world. Thus they represent the most ancient of the branches of the frog family tree.

They are tiny, only 40–47 mm long. They lack the vocal sacs responsible for the croaking of other frogs and the best they can manage is a high pitched squeak. They lack important parts of the ears and have no external ear drums so obvious in other frogs. But they do have large bulbous eyes which aid in night vision.

Only *L. hochstetteri* is found close to streams but it also shares the high ridges and areas right away from open water where *L. Archeyi* and our subject *L. Hamiltoni* are found. As if to underline this *L. Hochstetteri* has webs between its hind toes, but its two cousins have no webs — after all they're no use when there's no water to swim in, and its no use having free swimming tadpoles. So these little frogs have modified the procreation method. They lay their eggs on the ground in clusters, each egg surrounded by a gelatinous watery capsule within which the embryos go through all the development. Froglets complete with legs and a tail emerge and the tail drops off after a few weeks leaving two well developed but useless tail wagging muscles which they carry on through life.

Hamilton's frog was found 350 metres up on Stephens Island in Cook Strait in 1915, this was in a small rock patch with deep voids between the rocks providing a microclimate some 40 cm down, where Hamilton's frog was living quite unsuspected on spiders, millipedes, beetles, slugs, etc that occurred in the damp habitat beneath the stones.

The rock patch was sheltered by high forest with the rocks covered by moss, and it is near the high top of Stephens Island, which often sports a cloud cap which became most important to the later survival of the frog.

Several were dug up subsequently but by 1927 the forest shelter had disappeared and the windswept summit with its now bare rock patch was a very changed habitat, apparently not conducive to our frog's survival. However the microclimate below the rocks coupled with the moist cloud cap combined to preserve the frogs in a minimal habitat.

In 1951 the Wildlife Service planted taupata trees as shelter round the rock patch and muehlenbeckia and grasses over the rocks and better conditions for these little frogs now exist. Indeed their position is now extending and secure and some frogs have been seen venturing out into the grassy surrounds.

In 1958 Hamilton's frogs were discovered on Maud Island living in a sloping forested area from 150 metres and upwards containing some rock falls and providing a most suitable habitat. Close research has gained much information and established that some hundreds of frogs inhabit the shady forest floor.

When Forest and Bird assisted the purchase of Maud Island as a sanctuary for bird life in 1976 it was as much to protect Hamilton's frog in this its second habitat as to provide for kakapo and saddlebacks.

The reader must be asking why if there are Leiopelma frogs in Coromandel and the Northern half of the North Island and others in the Cook Strait region, when there must be dozens of suitable habitats remaining in the lower half of the North Island and in the Northern South Island, why no native frogs? It is faintly possible, of course, that they live their secret hidden lives quite unsuspected in other areas, (after all the Maoris were apparently quite unaware of the frogs), so one cannot be sure that they have been wiped out by our modifications to the land.

I for one, hope that perhaps other colonies will be discovered in time. They hide themselves so well in inextricable places that predators would be hard put to get at them. Moreover I suspect that they taste 'terrible' to stoats, rats, etc — if this is the case, then there's hope. After all they were unaffected apparently by the recent stoat invasion of Maud Island and continue their expansion of range. Perhaps that is a pointer!

Probably the rarest frog in the world, Hamilton's frog is also one of the most archaic. Surely, these two factors make it essential that we protect this unique endemic little amphibian which is even rarer than the tuatara.

A word of warning, if you should be lucky enough to find native frogs. They should not be handled or taken and their hiding place must not be disturbed, they are absolutely protected. Record or photograph their presence if possible and inform the Wildlife Service.

DAVID G. COLLINGWOOD

Reference and further reading

Richard Sharrell. '*The Tuatara Lizards and Frogs of New Zealand*', Collins 1966.

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Ben D. Bell. *Forest and Bird* No 204, May 1977, pp 12–17.

This series of articles is sponsored by the National Provident Fund in the cause of conservation.

TUSSOCK GRASSLANDS, MOUNTAINLANDS AND RIVERS — 60th JUBILEE YEAR NOVEMBER COUNCIL MEETING

Professor Kevin O'Connor describing the natural and cultural history of the high country at Porter's Pass.
Photograph: A. F. Mark.

Society attention focused on the tussock grasslands and braided rivers of the eastern South Island at the Council meeting held in Christchurch from 18–20 November.

Natural areas of national importance

These natural areas cover nearly a third of the South Island. They incorporate distinctive landscapes (eg Kaikoura Ranges, Mackenzie Basin) special plant species (eg Kaikoura Rock Daisy, Castle Hill Buttercup) and interesting and rare animals (eg Otago giant lizards, black stilt, wrybill). Despite much of this land being in public ownership, few of its natural and scenic values have any permanent protection.

The wrybill — endemic bird under threat

Society Councillors from throughout New Zealand gathered at the University of Canterbury on 18 November. Attention focused that evening on the plight of the wrybill. Ken Hughey of Lincoln College, who is studying wrybills which breed in Canterbury's braided riverbeds, described the adaptions of this bird to its hostile breeding habitat. He also criticised naturalists for forgetting ecosystems such as braided rivers with their specially adapted plants and animals.

High country field trip

The Council group of eighty were joined next day by eighty members from Mid-Canterbury and Canterbury branches for a trip into the Rakaia and Waimakariri Basins. At Porters Pass (970m altitude) we sheltered from blasting nor-westers amongst snow tussocks, and *Dracophyllum* while Professor Kevin O'Connor from Lincoln College described

to us natural and cultural influences in the high country. He elaborated on this topic later that evening.

With the kind permission of Castle Hill Station runholder, Max Smith, we explored the limestone landscape of the Castle Hill Nature Reserve accompanied by Society Distinguished Life Member, Lance McCaskill. Within the 6.4 hectare fenced area grow the entire world population of the Castle Hill buttercup, *Ranunculus paucifolius*. It is now thriving, thanks both to reserve protection since 1954 and to weed control and the propogation of young plants. It was a momentous occasion for our group to be shown these special plants by their guardian, Lance McCaskill.

Lunch amidst the beech forests of Craigieburn Forest Park gave us a chance to discuss erosion and re-afforestation programmes with Forest Service scientist, Alan Nordmeyer. Forest Service is responsible for high country wild animal control. They have identified some half million hectares of high country which they consider might benefit from artificial revegetation. Landscape architect, Dianne Lucas, later described the landscape changes that might result from large scale exotic plantings. Mindful also of the North Island Contorta Pine disaster, council members expressed caution about any large scale high country pine planting. From Craigieburn we crossed into the Rakaia catchment, and botanized the grasslands and shrublands of the Acheron Gorge. 69 native plant species were found including flowering *Ranunculus*, snowberries, *Corokia*, bluebells and aniseed.

Rapid agricultural development is evident throughout the Rakaia high country with cultivation of the flatter country and oversowing and topdressing of the more extensive steeplands. This highlights the urgency of securing some examples of native high country vegetation, particularly at lower altitudes, before it all disappears.

The Rakaia river was in high flood after two weeks of nor-west rain. Rod Hay described the birdlife of the river and his ordeals when camping in the Rakaia riverbed.

Council meeting

This year the Council meeting was brief. The executive reported on Society activities over the last six months. Rod Hay reported on his recent field work in the South Pacific. Environmental Defence Society lawyer, Kevin Williams, discussed their work on Canterbury river conservation and wetlands. Conservation officer, Ann Bell, outlined our draft wetland policy. This was adopted by Council with branch comments to be forwarded to Head Office by 31 March 1984.

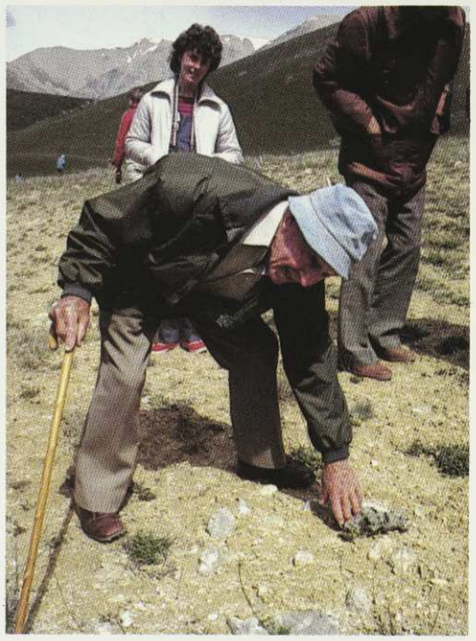
High country seminar

This three hour seminar was to familiarize councillors with some of the natural and recreational values of the high country Professor Alan Mark described the distinctive plant communities throughout our tussock grasslands. His message was clear. Scientific arguments must be backed with widespread public support if reservation proposals are to succeed.

Dianne Lucas, who originates from Bendigo Station in Central Otago, shared

Distinguished Life Member Lance McCaskill in his natural environment — Castle Hill Nature Reserve.
Photograph: A. F. Mark.

Lance McCaskill tenderly handling the Castle Hill Buttercups as he describes how weeding is essential for the survival of the species.
Photograph: R. Hay.



with us her love for the expansive high country landscape. She showed how easily this landscape character can be altered by structures, by afforestation and by pastoral development.

Graeme Loh, a Wildlife Service officer, described how many of the high country wildlife species are now extinct (ie Moas, and native quail). Other species have declined in numbers and are now on the verge of extinction (ie takahe and black stilt). He also discussed poorly known animals including the giant lizards of inland Otago, and the insects which have evolved on the isolated block mountains of Otago.

Allan Evans, deerstalker and past-president of Federated Mountain Clubs, described different forms of high country recreation. Problems of access and erosion were described as well as the changing face of recreation in the high country with the development of commercial skifields and commercial tourist hunting activity.

Director General of Lands, Bing Lucas, put forward his Department's high country policy which is now to identify and protect distinctive and representative natural areas before pastoral lease land is freeholded.

In discussion, speakers agreed that the scale of transformation of natural ecosystems in the high country has reached crisis proportions. Large areas of publically owned pastoral lease land are being reclassified and freeholded. Since 1972, the area of land held under pastoral lease tenure has been reduced through freeholding by 36 per cent from 4 million hectares to 2.6 million hectares. Because of the enormous difficulty associated with nature conservation on privately owned land, it was considered essential that further freeholding should only occur once adequate protection is given to the natural values of the land. Before irrigation decisions are made it is also imperative that natural values of the regions rivers and wetlands should be identified and protected.

Society Deputy President, Dr Alan Edmonds, concluded by urging all Society members to take a close interest in this important issue. High priority will now be given to the preparation of a Society tussock grassland policy.

Special thanks for the success of the council meeting are extended to all the invited speakers and to Christchurch Branch Chairman, Michael Beaven, and all his Canterbury Branch members.

NOTE FOR FEBRUARY JOURNAL

Something to watch for...

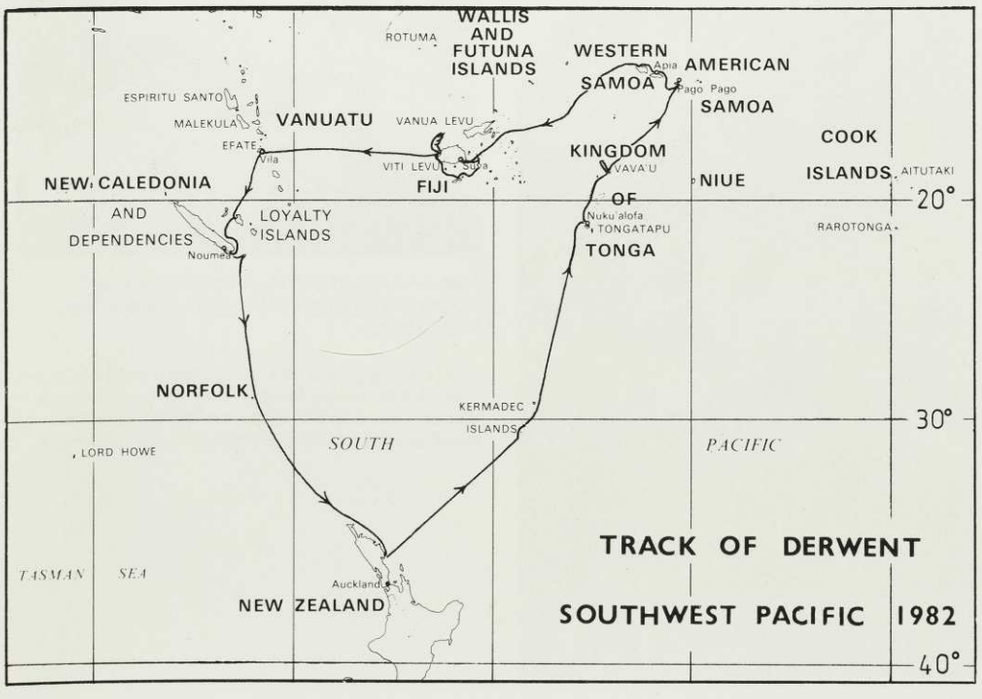
On 28 March 1984, at 4.50 pm a short programme on the origins and founding of our Society will be screened on T.V.2 on the programme 'Today in History'.

The endangered Castle Hill Buttercup *Ranunculus paucifoluis*.
Photograph: R. Hay.

The endangered Castle Hill Forget-met-not, *Myocotis colensoi*.
Photograph: R. Hay.

THE SOUTH WEST PACIFIC EXPEDITION

ABOARD THE YACHT *DERWENT* 1982



The route of the sloop *Derwent* on the 5500 nautical mile voyage round the south west Pacific, 1982.

by Tim Lovegrove
author and the photographer

Abstract

Sixteen members of the Forest and Bird Society and Ornithological Society of New Zealand spent five months during the winter of 1982, taking part in a privately organised wildlife expedition to the Pacific aboard the Whangarei sloop, *Derwent*. The expedition visited the Kermadecs, Tonga, American and Western Samoa, Fiji, Vanuatu, the Loyalty Islands and New Caledonia.

***Derwent* anchored at Lautoka, Fiji, with a group of crested terns resting on the rocks on the foreground.**

THE SOUTH WEST PACIFIC

Objectives and aims

The major objectives of the expedition were to carry out surveys of endangered species and threatened habitats. The knowledge gained from the expedition will be used to draw the attention of the authorities in the islands to local conservation problems.

Preliminary studies have already been carried out by Dr Arthur Dahl for the South Pacific Regional Environment Programme. However considerably more information is needed, so that a list of conservation priorities for the South West Pacific can be drawn up.

A series of reports containing appropriate comments on conservation needs have been prepared and sent to those people who are concerned with conservation and environmental matters in the various island governments.

In many cases conservation awareness, such as we see in New Zealand is just non existent in the Pacific Islands. It has been only during the past few years that several terrestrial and marine reserves have been created. However these reserves will almost certainly need more effective long term protection; eg in Western Samoa, encroaching slash and burn agriculture, and native gardening methods still threaten the recently created O Le Pupu Pu'e National Park.

Since many of the natural communities on the islands are small, they are very vulnerable to over exploitation and irreparable damage. The well documented high extinction rates of organisms on islands in various parts of the world certainly illustrates this.

There has been little consideration in the past for the obvious long term values of establishing nature reserves — not only for their prime function of preserving unique and diverse natural systems — but also to provide an important and renewable source of income as centres for the growing market of nature tourism. This aspect must surely appeal to government planners and decision makers.

In many cases the tourist dollar is a very important source of revenue for the small island economies. Thus the Pacific Island states have much to gain from the prudent use of their relatively undisturbed open spaces.

Today many of these potentially valuable areas are at risk; especially on the larger islands, where several big multi-national companies have recently acquired timber concessions — eg the Unilever concessions in the Solomon Islands. Unilever has already wrought irreparable destruction on some of the islands, eg New Georgia and Gizo. The latter island is where Charles Darwin carried out some of his pioneering evolutionary studies last century. Recently, a new company, IFI, which has some American backing, has obtained harvesting rights for the whole of San Cristobel Island. It appears that there has been no thought for conservation needs.

Another unique forest type that is rapidly disappearing is the dakua, or Fijian kauri, on Vanua Levu. It seems that at the present rate of cutting that the entire resource will have vanished by 1990. It is also likely that the Vanua Levu form of Fiji's unique bird, the silktail, will have gone with it. At present the Fiji National Trust is having difficulty raising even $50 000 to secure a token 100 ha remnant of this before it is too late.

It is surely time for the New Zealand conservation organisations to look further afield — and we need look no further than our closer Pacific island neighbours.

A GENERAL ACCOUNT OF THE SOUTH WEST PACIFIC EXPEDITION

Derwent set sail from Whangarei on 17 May 1982 with a crew of eight aboard for the first leg of the voyage to Tonga, sailing via the southern islands of the Kermadec Group.

Aboard for this first ocean passage was the permanent crew of six; Andrew Davis, Stephen Dawson, Tony Crocker, Gillian Eller, Tim Lovegrove and Chris White, and two other short-term crew members, Anthea Goodwin and Colin Miskelly.

Four days out from New Zealand we sighted Curtis and Cheeseman Islands, the two rather little known southern outliers of the Kermadec Group. Since it is very difficult to anchor safely in the deep water near these islands, we stood off the northern side of Curtis while Colin and Tony were put ashore for a few hours.

Even during this brief foray on the island they made several exciting discoveries. In a small rock crevice they found the downy chick of a white-bellied storm petrel. This was the first confirmed record of this species breeding at the Kermadecs.

Little shearwaters were found ashore amongst the dense sedge in large numbers. The birds were taking part in pre-breeding activities. The exact breeding place of this species in the Kermadecs was hitherto unknown. They had escaped notice previously, mainly because earlier parties had visited the islands during summer, and thus missed the winter-breeding little shearwater.

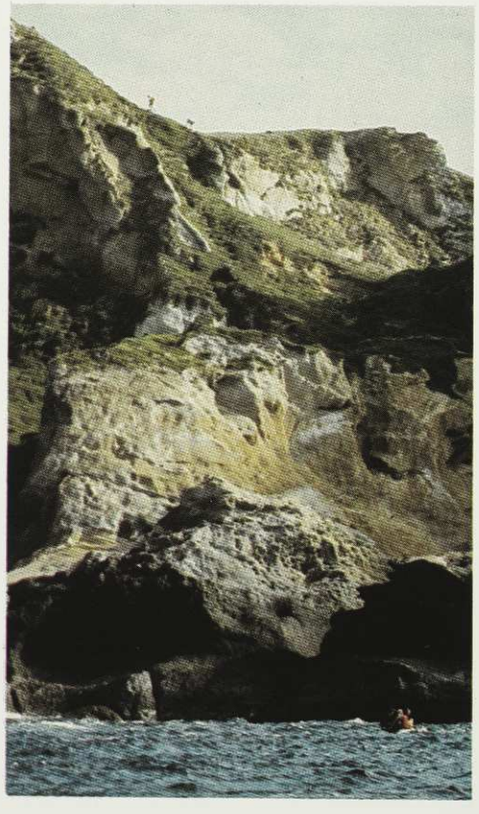
Another find was a phoenix petrel, which was soaring about over the high ridges of Curtis and attempting to land. There is an early record of this species ashore on Raoul Island, but we still do not know whether this tropical species does in fact breed on the Kermadecs.

Black-winged petrels, wedge-tailed shearwaters, red-tailed tropic birds, blue-faced boobies, white-capped noddies and grey ternlets were all seen on and near Curtis and Cheeseman Islands.

The following day was spent at Macaulay Island, about 60 kilometres northwards. It was here that the Wildlife Service eradicated the goats during the early sixties — over 3000 animals were removed from the island. Today much of Macaulay is covered with a rank grassland, the few woody ngaio shrubs are confined to the inaccessible western cliffs. We managed to get Colin and Andy ashore onto the rocky shore platform at the south eastern tip of Macaulay.

This island is the only known breeding place for the distinctive Sunday Island or white-necked petrel. These handsome seabirds were quite numerous at sea around the island. Later we were to encounter them northwards through the Tonga Group and near Samoa.

Young wedge-tailed shearwaters were just leaving the island on their northward migration. Some of them still had traces of down, and they flew awkwardly. By day there was a continuous stream of black-winged petrels coming and going to feed well grown young.



A white-necked petrel, which flew aboard during the night off Macaulay Island in the Kermadecs.

The landing place on the northern side of Curtis Island, Kermadec Group. Two of the crew can be seen scaling the ridge on the skyline, and three others are in the inflatable just offshore.

The only land bird observed on Macaulay was the Kermadec red-crowned parakeet, which was common and absurdly tame.

It was another four days off the wind sailing north eastwards from the Kermadecs to the southernmost outlier of the Tonga Group, 'Ata. This island is one of a chain of high volcanoes which lie roughly on a north-south line down the western side of the Tonga Group. Evidently it has a large breeding population of seabirds, because they were numerous in the surrounding waters. All three local booby species, the red-footed, brown and blue-faced boobies were soaring around the boat as we approached the island.

Herald petrels, wedge-tailed shearwaters, red— and white-tailed tropicbirds, frigatebirds and noddies were all seen near 'Ata. Most of these species probably breed there. 'Ata is uninhabited these days, and since it is more than 100 kilometres from Tongatapu, it is seldom visited by the Tongans.

The following day, 28 May, *Derwent* arrived in Nuku'alofa, the capital of the Kingdom of Tonga. The low lying island of Tongatapu has a dense population — some 60 000 people on a mere 260 square kilometres of land. With so much pressure from humanity most of the land is taken up with plantations and gardens, so little of the original forest cover remains.

Through the chief forest officer in Nuku'alofa, Mike Mckee, we arranged a visit to 'Eua, the large, high island that lies about 25 kilometres south east of Tongatapu. The forestry department arranged accommodation for our party at the sawmill at Kolomaile. Since the anchorages at 'Eua are poor, we left *Derwent* in Nuku'alofa with part of the crew aboard, while the remainder took the local daily ferry to 'Eua.

Gary Buelow, a young botanist from Hawaii, who was familiar with 'Eua, joined us on this trip, and showed us the best forest areas and places of botanical interest.

There are still extensive tracts of indigenous forest on 'Eua; especially along the top and eastern side of the high escarpment, which runs the length of the island. Important canopy trees are tavahi, *Rhus taitensis*, Tamanu, *Calophyllum neo-ebudicum* and Ngatata, *Elattostachys falcata*.

Quite large areas of the island have been cleared. However those places not in gardens or being grazed by cattle are being rapidly overrun by the rampant introduced wild guava.

Exotic forestry has been established on 'Eua for some years now, and some of the production of the sawmill at Kolomaile was of exotic species such as *Grevillea robusta*.

'Eua is well known for its big, colourful red-breasted musk parrot, which was apparently introduced to the island from Gau (in Fiji), in pre-European times. Other forest birds were numerous, although the number of species was comparatively few. Unlike the island groups to the west, Tonga has few landbirds. On 'Eua we noted, banded rail, Pacific pigeon, crimson-crowned fruit dove, barn owl, white-rumped swiftlet, white-collared kingfisher, Pacific swallow, Polynesian starling, Polynesian triller and wattled honeyeater.

***Derwent* with the spectacular 1000 metre volcanic island of Kao in the background.**

While the ornithologists were examining 'Eua, the three marine biologists looked at several of the marine reserves which have recently been created near Nuku'alofa. It was clear that in some places the marine life had suffered from overfishing. Some of these reserves such as Pangaimotu and Ha'atafu Beach, are visited by many tourists, so much damage is caused merely by the trampling of hundreds of feet. With proper controls and some form of management these places will hopefully recover in future. These reserves were only gazetted in 1979, so perhaps three years is a little too early to expect to see a spectacular recovery.

On 7 June the expedition left Nuku'alofa and headed northwards to the islands of Tofua and Kao. These two volcanoes are distinctive landmarks. Flat-topped Tofua has an active vent and a remarkable crater lake. Neighbouring Kao rises symmetrically to a spectacular cone over 1000 metres high — the highest land in the Tonga Group.

The following day the *Derwent* team landed on another of the volcanoes — Late. This uninhabited forested island is about the same size as Auckland's Rangitoto, but twice as high. Late's botany was studied recently by Bill Sykes of the DSIR Christchurch. However the island's fauna has received very little study.

We managed to land without too much difficulty onto the basaltic rocks on the northern coastline of Late. Forest birds were common, including the handsome endemic Tonga whistler, which we encountered elsewhere in Tonga only in the Vava'u Group.

Since Late is isolated and uninhabited, and apparently lacks introduced mammals, it would make an ideal nature reserve. More detailed studies of its flora and fauna are needed.

It was only a short passage the sixty odd kilometres from Late to the Vava'u Group. Vava'u is a remarkable cluster of large and small uplifted coral islands which present a verdant picture from seaward.

In Vava'u we retraced the steps of the two Whitney South Sea Expedition collectors, Rollo Beck and Jose Carreia, who visited the group in the mid 1920s. Many of the islands seemed to be little changed from Beck and Correia's descriptions of nearly sixty years ago. However some of the outer islands, eg Maninita, have fewer birds on them today. These places are no doubt visited quite frequently by the locals, who now own solid outboard powered dories rather than the frail wind and man powered outriggers of yesteryear.

In Neiafu,the main port of Vava'u, we were greeted by Bill Ringer of Tutukaka, who joined *Derwent* for this leg of the voyage through north Tonga.

From Vava'u we set out north westwards to the remote uninhabited volcano, Fonualei — another of the places visited by Beck and Correia in the mid 1920s. It seems that Fonualei has received very little attention from ornithologists since then.

Fonualei last erupted in 1952. However there are still plenty of hot spots, especially on the lower slopes of the 300 ha island, and along the jagged crater rim.

Fonualei has huge seabird colonies. Probably some quarter of a million sooty terns breed there. This may be one of the largest colonies of this pelagic species in the South West Pacific. Several hundred great frigate birds soared overhead when we landed on the gravel beach on the north western side of the island. Male frigates were displaying with their bright red gular sacs fully inflated. Red-footed boobies

were also seen ashore, perched in low shrubs on the seaward slopes and in small trees growing in one of the old craters.

The wedge-tailed shearwaters had departed several weeks previously on their northward migration. Everywhere their vacant burrows honeycombed the soft tuff.

The herald petrel was a new find for Fonualei. These tubenoses were engaged in high speed courtship chases above the island. Odd birds were flushed from dense cover on the crater escarpment. This species almost certainly breeds locally.

Common noddies, white terns, and both species of tropicbirds were seen also. Forest birds were few. We encountered only four species, the Pacific pigeon, friendly ground dove, wattled honeyeater and Polynesian starling. Although Fonualei is very arid, pukekos, banded rails and spotless crakes were also found. Apparently in the Whitney Expedition days there was a shallow lake in one of the craters. However this must have dried up many years ago.

Fonualei is another of the Tongan volcanoes that would make a superb reserve. Along with 'Ata, Hunga Tonga and Hunga Ha'apai, and Late it already has some degree of protection because it is so isolated.

From Vava'u the expedition headed north eastwards the 500 kilometres to Tutuila, the largest island of American Samoa. There we anchored in the spectacular but rather badly polluted Pagopago Harbour. We were joined here on 21 June by Beth Brown of Papakura, who stayed with the *Derwent* team during the voyage through the Samoas.

Although much of Tutuila is heavily forested, the island has its fair share of introduced mammals, eg rats and cats. The giant African snail is widespread and does considerable damage to crops.

We carried out five minute bird counts along the ridge top from Mt Alava to Fagotogo and surveyed wader habitats in the extensive Pala Lagoon near Pagopago Airport. Forest birds were seen and heard in moderate numbers in the steep valleys north of Mt Alava. Apparently the giant honeyeater, the ma'o, formerly occurred on Tutuila, but it has not been reported there for many years.

The wildlife of American Samoa has recently received considerable study by the US Fish and Wildlife Service, who have produced a comprehensive report. It appears that the most valuable remaining wildlife habitat in eastern Samoa is in the Manua Islands, especially the high (1000 m) island of Tau, where several species of tubenoses still breed in large numbers.

It was an easy overnight sail the 120 kilometres from Pagopago to Apia, which lies on the northern side of Upolu, the most populous island of Western Samoa.

The high volcanic islands of Western Samoa because of their size and topography, (Upolu measures 70 km by 25 km, and Savai'i 70 km by 40 km), still have large tracts of primeval forest, especially on the higher country of the hinterland. Upolu is the older island of the two geologically, being much more dissected than the young basaltic volcanoes of Savai'i, which rise to a spectacular 1800 metres.

Forest birds are numerous. Possibly only one species has been lost from Samoa since the days of ornithological discovery — the enigmatic Samoan wood rail, which looked like an oversized and flightless spotless crake.

Several valuable reserves have already been created in Western Samoa. The most accessible of these is the attractive Tusi Tala Historic and Nature Reserve, only a few kilometres inland from the centre of Apia. It was here that Robert Louis Stephenson built his homestead, Vailima. Stephenson's tomb is located nearby atop forested Mt Vaea.

Two well formed tracks lead from an information centre to the grave, which is sited on a small cleared spur about 350 metres up on the slopes of the mountain.

Forest birds are common in the Tusi Tala Reserve — it is an excellent place for the naturalist first visiting Samoa to become acquainted with some of its birds.

A red-footed booby on its nest.

Adult brown booby at Fonualei.

Adult male lesser frigate bird, showing its distinctive white flank patches — Fonualei.

The crater formed by the 1952 eruption on Fonualei, Tonga. Purple swamphens (pukekos), and banded rails were found in the dry, scrubby forest on the slopes.

A forestry track through the rainforest at the 1000 metre level, on the slopes of Savai'i, Western Samoa.

From left: Tony Crocker, Gill Eller and John Brown beside a dakua (Fijian kauri), a few kilometres from Suva, Fiji.

The area of most outstanding natural beauty that we visited in Western Samoa was the inland part of the recently designated O' Le Pupu Pu'e National Park, which lies on the southern slopes of Upolu.

By prior arrangement with Ian Armitage, the Chief Forest Officer in Western Samoa, we were taken to Togitogiga the base and ranger station for the park. Our guide Kalati Poai, the ranger in charge, showed us parts of the 3000 hectare reserve.

O' Le Pupu Pu'e embraces some of the most enchanting forest that we visited anywhere on our voyage through the south west Pacific. The tall rainforest is growing on ancient basalt flows. During the dry season the rivers flow at a mere trickle, and the streambeds, which are almost like solid paved roads, give remarkably easy access into the inland montane valleys.

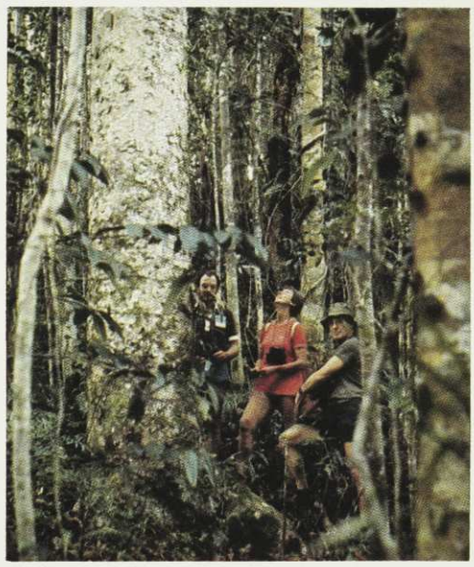
In one place the streambed drops down to a lower level and disappears into an extensive lava cave, which is home for hundreds of tiny insectivorous bats and nesting white-rumped swiftlets.

It was in the dense forests here that we first encountered the elusive giant forest honeyeater of Western Samoa, the ma'o. Although it is of rather sombre plumage it must have the most bizarre songs of any bird — long wailing notes, which are of a rather similar timbre to those of our kokako.

One marine reserve has been established on Upolu — the Palolo Deep Marine Reserve, which was established in 1979. This is situated only about one kilometre from Apia, just outside the harbour proper. It was visited by *Derwent*'s three marine biologists, who found that it contained a spectacular diversity of corals and reef fishes.

The greatest area of unmodified forest remaining in Samoa grows on the slopes of the biggest island, Savai'i. The island's 30 000 inhabitants live mostly along the coast, so the forested hinterland is usually little disturbed.

On Savai'i sheltered Asau Harbour was our base. Here Ian Armitage had arranged for the local forestry people, some of them also expatriate New Zealanders, to give us some assistance with transport up to the edge of the virgin forest, about 10 kilometres inland from Asau Harbour.



Asau is the centre for a developing timber industry in Western Samoa. There are extensive young plantings of *Eucalyptus deglupta*, *Tuna australis*, *Terminalia* sp., teak and mahogany over an area of about 8000 ha, an area formerly clothed with dense indigenous rainforest.

We camped for several days at the 1000 metre level. Here we were surrounded by unmodified indigenous forest, which was dominated by immense banyans. It was a place that teemed with birdlife.

We were hoping to locate three rare endemic species, the tooth-billed pigeon, the ma'o, and the Samoan silvereye. We made about a dozen separate sightings of the tooth-bill. It is a bird that has captured the imagination of ornithologists ever since its discovery in the middle of the nineteenth century. It would appear that the tooth-billed pigeon is still quite widespread on Savai'i in suitable areas of undisturbed forest. It probably also occurs in the remoter forested valleys of Upolu.

There were several pairs of ma'o singing within a short distance of our camp. It is certainly a bird of the tall unmodified forest. The Samoan silvereye, which is endemic to Savai'i, was not difficult to find above the 1000 metre level.

Other forest birds were in good numbers. We made five minute bird counts along some of the narrow forestry tracks, which run through otherwise unmodified rainforest. If one ventured off the tracks it was heavy going — the forest is dense and the rocky terrain is pock marked with hundreds of small craters. These are about 100 metres across and 20 metres deep and covered with a mantle of tall forest — just the country to stop an advancing army and all but the most determined ornithophile!

Bird counts were easier done along the tracks, where there was usually a slight gap in the canopy, and where one could see more than just a metre or two ahead.

It was on Upolu and Savai'i in the dense undisturbed forests that we had our first views of the shy island thrush. It is a handsome relative of our European blackbird — but for a bird that seldom sees man it is unbelieveably scary.

It was clear that some of the habitat, where we saw ma'o, tooth-billed pigeon and Samoan silvereye, was shortly going to be felled to make way for exotic plantings. Trials have been set up at various altitudes to establish which of the exotic species grows best. The long term objective apparently was to have 8000 ha in exotic forest; from which about 500 ha would be felled each year to supply the sawmill at Asau. At present a considerable quantity of indigenous timber is being processed at Asau for finishing and veneers.

There is a pressing need for a large reserve on Savai'i, so that a worthwhile area of its mantle of pristine indigenous forest can be preserved. The higher parts of the island have been little studied.

There has been some tentative planning by the Forestry Division in Apia to create a large reserve on the summit and southern slopes of the island — in an area where there are deep valleys and cascades. However before such a reserve can be designated there are many problems of multiple land ownership to be resolved.

From Western Samoa the expedition headed westwards the 1000 kilometres to Fiji, where a month was spent visiting various islands and wildlife areas of interest within the Fiji Group. In Suva on 21 July, Nan Rothwell and John Brown, Ornithological Society members from Auckland joined the *Derwent* crew.

It was perhaps in Fiji more than anywhere else that we visited in the South West Pacific that we saw the most need for some sort of conservation action. One only needed to go a few kilometres from the centre of Suva to Mt Korobaba (a proposed recreation reserve), to see the sort of exploitation that is going on. Despite being a proposed reserve the few remaining large dakua trees, (Fijian kauri, *Agathis vitiensis*), some of which were over a metre in diameter, were being felled and dragged from the forest along badly eroded skidways.

Now that our own kauri is in short supply in New Zealand, Fiji is now New Zealand's biggest supplier of this valuable timber. The director of the Fiji Museum, Fergus Clunie, told us that in less than ten year's time the last big dakua will have been felled in Fiji, and these magnificent trees will only be a memory. The best stands of dakua on Viti Levu have already gone, and now the loggers are rapidly felling the kauri forests on Vanua Levu.

Apart from forest clearing, introduced

animals, especially the mongoose, have had a devastating effect on the birdlife on the main islands of Fiji. It is the same sad story that we know so well in New Zealand. Even what we would regard as a resilient species, the pukeko, has vanished from the main islands because of predation by the voracious mongoose.

Fortunately some of the large outer islands, eg Taveuni, Kadavu Ovalau and Gau, and most of the smaller ones, are still free of this animal. Apparently there are still petrel colonies in the hinterland of Viti Levu, but the long term survival of these must be in doubt with predators such as the mongoose at large in the forests.

From Suva *Derwent* sailed eastwards to Gau, where we searched for that least known of all the tubenoses, the MacGillivray's petrel. Only one specimen is known to science — it was collected by the crew of H.M.S. *Herald* in October 1855.

We made several forays onto the high forested ridges inland from our anchorage at Herald Bay on the north western side of Gau. When questioned, the local inhabitants seemed to have little knowledge of any burrowing or surface nesting petrels on the island.

A thorough search for MacGillivray's petrel needs to be given immediate attention. Recently, Dick Watling has visited Gau, where he found a few burrows of the small collared petrel. If that species survives, then there might be a chance that the similar-sized MacGillivray's still exists. Unfortunately Gau does have black rats and some feral cats, although we caught only kiore in our trapline, which was set at Herald Bay. Along with the mongoose the wild pig is also absent from Gau.

We made a brief stop at Kadavu, the big southern island of the Fiji Group, Kadavu has three endemic birds — a fruit dove, a fantail and a honeyeater. We found all three in moderate numbers.

Some of the forest in the area we visited at Tomba Kavala, near the eastern end of Kadavu showed considerable hurricane damage, where fierce salt-laden winds had caused die back in the canopy.

The spectacular needle-like *Araucaria* pines on the cliff edges at Lifou, in the Loyalty Islands.

Much of the forest on the drier northern slopes of the island has gone, and has been replaced by an induced grassland with pockets of dry scrub — similar to that in the dry zone of Viti Levu. Petrels apparently still breed on some of the high forested peaks, such as Nambukelevu, a distinctive conical landmark, which overlooks the western tip of the island.

From Kadavu the expedition headed back to Viti Levu — this time to the western side of the island, where we based ourselves at Lautoka. Here we carried out surveys of bird life in open grassland, remnant stands of dry zone forest, and in the recently-established plantations of *Pinus caribaea*. We were given valuable assistance by the staff of the Fiji Pine Commission, who provided transport to places of interest.

Centuries ago the whole of the western sides of the main islands supported a dry forest — but that soon vanished once man arrived on the scene. Over vast areas the forest has been replaced by the induced grassland of mission grass, *Pennisetum polystachyon* and reed, *Miscanthus floridulus*.

The Fiji Pine Commission has found that the indigenous forest remnants in the damp valleys form excellent natural firebreaks between the exotic plantings. Therefore their present policy is to preserve as much of this forest type as possible. Fires are a persistent problem, especially when the cane farmers are burning off during the dry season. The relict stands of native bush held an astonishing variety of birds. This contrasted sharply with the exotic monocultures and open grassland, which not unexpectedly had very few species.

Several short forays were also made to various small islets and stacks in Nadi Waters — the sea area west and south of Lautoka. The most interesting place visited was White Rock, a small guano covered stack about 20 kilometres off the coast, between Lautoka and the Yasawa Islands. Brown boobies, crested terns, black-naped terns and white-capped noddies evidently breed there.

The Yasawa chain is known to most visitors to Fiji as the area one sees on the Blue Lagoon Cruises. The Yasawa coastline is outstandingly attractive for yachtsmen also, for there are many delightful, sheltered anchorages.

Most of the Yasawa Islands are inhabited, and as with the western side of Viti Levu, forest patches are few, and the terrain on the hillsides is rather arid and rocky. Many of the small pockets of forest that do remain have been badly chewed out beneath by goats. The most forested island in the Yasawas was the jagged limestone outcrop of Sawa-i-lau. This island is one of the local scenic attractions for it has spectacular sea caves.

Sawa-i-lau was the only place in the Yasawas where we encountered the elusive island thrush. Fiji goshawks and barn owls were also present.

Young plantings of *Pinus caribaea* on the ridges, with indigenous forest in the valleys; Lololo Forest, Viti Levu, Fiji.

Spectacular forested valleys at Haute Yate.

Before *Derwent* left Lautoka, Nan Rothwell and John Brown headed back to New Zealand. Prior to departing on 17 August, another naturalist, Maria Hansby, joined the crew for the leg to New Caledonia, sailing via Port Vila and the Loyalty Islands.

By mid August the south east trades were blowing savagely. This wind pattern had set in some weeks previously, well before we had arrived in Suva. We were thankful that we had the wind behind us for the next leg of the voyage westwards to Vanuatu. It was a brisk downwind sail in huge seas the 900 kilometres to Port Vila. The passage took just under four days.

We were holed up in Port Vila for about a week, watching the rain tumbling down and listening to the wind blowing incessantly through the rigging. A planned foray northwards to Port Sandwich, near the southern tip of the little known island of Malekula had to be abandoned.

The flightless kagu, New Caledonia. This individual was one of a number of birds that had been successfully raised in captivity. Recently some of these birds have been released back into the wild at Haute Yate.

***Parasitaxis ustus*, a parasitic podocarp, known from only a handful of localities in southern New Caledonia. This one was growing in the Haute Yate Reserve.**

When we finally did get a reasonable break in the weather, only a day or two before we were due to set sail for the Loyalty Islands, we took the opportunity to make some bird surveys in the forests above Radier, a locality on the shores of Havannah Harbour. It was here that we encountered our first megapodes.

From Vila *Derwent* headed southwards the 300 kilometres to Lifou, the large central island of the French administered Loyalty Group. The main reason for visiting Lifou was to look at the status of its three endemic silvereyes. The most extraordinary of these is the large Lifou silvereye — a species which lacks the eye ring, so distinctive in most members of the genus *Zosterops*. It is aptly named *Z. inornata*. This species seems to spend most of its time in the thick undergrowth and shrub layers of the forest.

The other distinctive silvereye is the small Lifou silvereye, which seems to be a canopy inhabitant. The remaining silvereye on Lifou is a handsome black faced subspecies of our grey-backed silvereye.

Many of the other forest birds were the same species that occur on mainland New Caledonia, which lies only about 100 kilometres away to the west.

From Lifou it was only a short overnight voyage to the Havannah Passage — the main reef entrance for vessels approaching Noumea from the east.

The coastal forests of new Caledonia appear most spectacular from seaward. These are dominated by lofty *Araucaria* pines, which form dense stands in places. On closer inspection one finds cycads growing in the understorey — you could have been wandering through a forest on ancient Gondwanaland.

The hinterland of the main island — or La Grande Terre as the locals call it — appears to be severely eroded and extraordinarily barren. This is the serpentine country, which has its own unique flora.

When we arrived in Noumea on 1 August, we were greeted by Yves Letocart, a ranger from the Service des Eaux et Forêts. This contact with the forestry people had been arranged for us by the New Zealand High Commission in Noumea. We were also greeted by three new expedition members, George Schischka, and Tony and Annette Habraken.

A day or two later we headed inland with Yves to the magnificent 16 000 ha forest park at Haute Yate, which is about an hour's drive from Noumea. Much of the country near Noumea is disappointingly barren and rocky. However not far inland, the Haute Yate area has extensive tracts of diverse forests.

New Caledonia has some 3500 species of plants, of which 80 percent of the species are endemic. This is twice the number of species we have in New Zealand, all occurring in an area the size of Northland. New Calendonia is a botanist's paradise with many relict species, some with highly localised distributions.

One of the main reasons for our visit to Yate was to see the habitat of the endangered endemic bird the kagu, *Rhynocetos jubatus*. This area is now one of the species' strongholds.

This flightless relative of our extinct *Aptornis* probably now numbers only a few hundred individuals in the wild. Pigs are quite numerous at Yate. We saw plenty of sign where wild pigs had been feeding, and one of the foods they were taking was the large *Placostylus* snail, a preferred food of the kagu.

In Noumea there is a captive breeding programme for the kagu, and so far about twelve birds have been raised in captivity.

Tubenoses such as the Tahiti and New Caledonian petrels breed on the higher ridges at Yate. However pigs and feral cats

THE SOUTH WEST PACIFIC EXPEDITION

The two petrel islands, Île Amere (foreground), and Ile Kie (more distant), that are included in the vast Yves Merlet Marine Reserve, off the southern tip of New Caledonia. Mainland New Caledonia is visible in the distance.

Some members of the *Derwent* team soon after arriving back in Whangarei on 23 September 1982. From the left: George Schischka, Anton Habraken, Steve Dawson, Andy Davis, Gill Eller, Bill Ringer, Tony Crocker, Chris White and Tim Lovegrove. With the exception of Bill, this was the crew which sailed *Derwent* home on the last leg of the voyage from new Caledonia.
Photograph: Northern Advocate.

are taking their toll of them also. It is quite possible that some petrel colonies will be wiped out before they are even discovered.

Bush birds are numerous at Yate, especially in the varied forests along the banks of La Rivière Blanche and La Rivière Bleue. This place is one of the strongholds of the rare crow honeyeater, *Gymnomyza aubryana*, a relative of the curious ma' o of Samoa. The rhythmic clicking song of the crow honeyeater was one of the most distinctive sounds of the dawn chorus at Yate.

Another local specialty was the handsome New Caledonian goshawk. The endemic cloven-feathered dove occurs here also. The only other place where we encountered that species was at the Île des Pins. Also locally common was the giant pigeon or notou.

Haute Yate is undoubtedly one of the most outstanding wilderness areas of New Caledonia. Fortunately it already has some measure of protection.

On our way southwards to the Île des Pins we paused at several of the small coral cays in the lagoon. Some of these islets have breeding colonies of petrels, shearwaters, gulls and terns. Part of the extensive system of coral reefs south of New Caledonia has been created a reserve. This is the 16 000 ha Yves Merlet Marine Reserve, which comprises barrier and lagoon reefs, and two valuable petrel islands, Île Kie and Île Amere.

The last stop before setting out on the homeward voyage to New Zealand was spectacular Île des Pins — named the Isle of Pines by Cook in the 1770s. There is a splendid anchorage at Kuto on the south west corner of the island — not far from the crumbling ruins of the old penal establishment.

Near Gadji on the northern side of the island is a broad expanse of forest, which was logged some years ago. Only the biggest trees were removed, leaving the remainder of the forest quite intact. At Gadji forest birds were common, including the notou and the cloven-feathered dove.

From Île des Pins the expedition set out on the 1500 kilometre voyage back to Whangarei. As usual on the ocean passages detailed records were kept of the seabirds. The highlight was witnessing the return migration of the short-tailed shearwaters, which breed in Bass Strait and winter in the North Pacific. They were heading back south on a very broad front, which extended practically from Île des Pins to a point not far north of the Three Kings.

We arrived back in Whangarei on a warm, sunny morning in late September, after the most idyllic ocean crossing of the voyage.

For a group of keen naturalists, apart from being the experience of a lifetime, the voyage had given us a special appreciation of some of the conservation problems of the Pacific Islands.

In many cases unique forests are being threatened merely by rapidly expanding populations. However there are also many places where the small island governments have been perhaps too ready to allow large multinational companies to obtain logging rights for timber reserves which are definitely non renewable in one or even several generations.

There is a desperate need for more conservation planning in the South West Pacific — before it is too late. Unfortunately conservation movements such as we know them just do not exist in the Pacific Islands. The stimulation is going to have to come from concerned groups overseas. Perhaps it is time that New Zealand conservation groups directed some of their attention and experience to the needs of our near Pacific neighbours.

Acknowledgement
The group wishes to express its gratitude for assistance from the Projects Assistance Fund of the Ornithological Society of New Zealand and from the Auckland Branch of Royal Forest and Bird.

KAIMANAWA FOREST PARK

Rugged, remote, and very largely unspoiled . . . Kaimanawa Forest Park covers some 75 000 hectares of the Kaimanawa Ranges south-east of Lake Taupo.

Tongariro National Park lies to the west of the park, and Kaweka Forest Park to the east. Secondary roads from the Desert Road to the west, State Highway 1 to the north-west, and the Napier-Taupo highway to the north-east lead the visitor into Kaimanawa Forest Park.

The ranges of the Kaimanawa Mountains, snow covered in winter, are irregular and broken. They are separated by the headwater valleys of several major rivers including the Tongariro, Mohaka, Ngaruroro, and the Rangitikei. A number of smaller rivers drain directly into Lake Taupo.

The central and southern part of the park is steep mountain land with forested river valleys, extensive scrubland, and alpine grassland. To the north and east it is less rugged and almost entirely forested.

The rocks of the area are mainly indurated sandstones and mudstones originally the products of erosion of an ancient land deposited on an ocean floor 200–270 million years ago. But the soils are mainly derived from geologically very recent volcanic eruptions of pumice and ash, the latest being the Taupo eruption only 1800 years ago.

Greywacke (sandstone) is exposed on some of the higher ridges where the ash and pumice mantle has been washed away, but on the lower slopes ash deposits are still quite deep, and the lower reaches of the rivers and larger streams are bordered by high pumice terraces. Remnants of older volcanic flows welded into hard rock (ignimbrite) can be seen, the most well-known area being the Ignimbrite Saddle, at the head of the Waimarino River.

Vegetation

Beech (*Nothofagus*) forest covers most of the park, but podocarps are common along the north-western perimeter. Tussock grasslands and subalpine scrub occur along the high tops and in the valley heads in the central part of the park.

Fires in the southern and central regions during Maori and early European times partially destroyed the forest which has now been replaced by tussock grassland, manuka scrub, montane heath and herbfield.

There are several distinct forest associations. In the north-east, in a wide arc between the Tauranga Taupo and Oamaru Rivers, the forest is dominated by red beech (*N. fusca*) usually in association with abundant smaller silver beech (*N. menziesii*) and giving way to pure silver beech forests at higher altitudes. Much red beech along the north-eastern margin was felled in the 1950s and 1960s for the fencing timbers required by farm development in the Taupo region, but both species are now regenerating vigorously in the gaps created. Many old red and silver beech trees in both logged and virgin forest were overthrown during the exceptionally violent gale in Easter 1982.

The wild horse herd which ranges over the southern Kaimanawas was recently given protection under the Wildlife Act 1953. They are often encountered in small family groups.

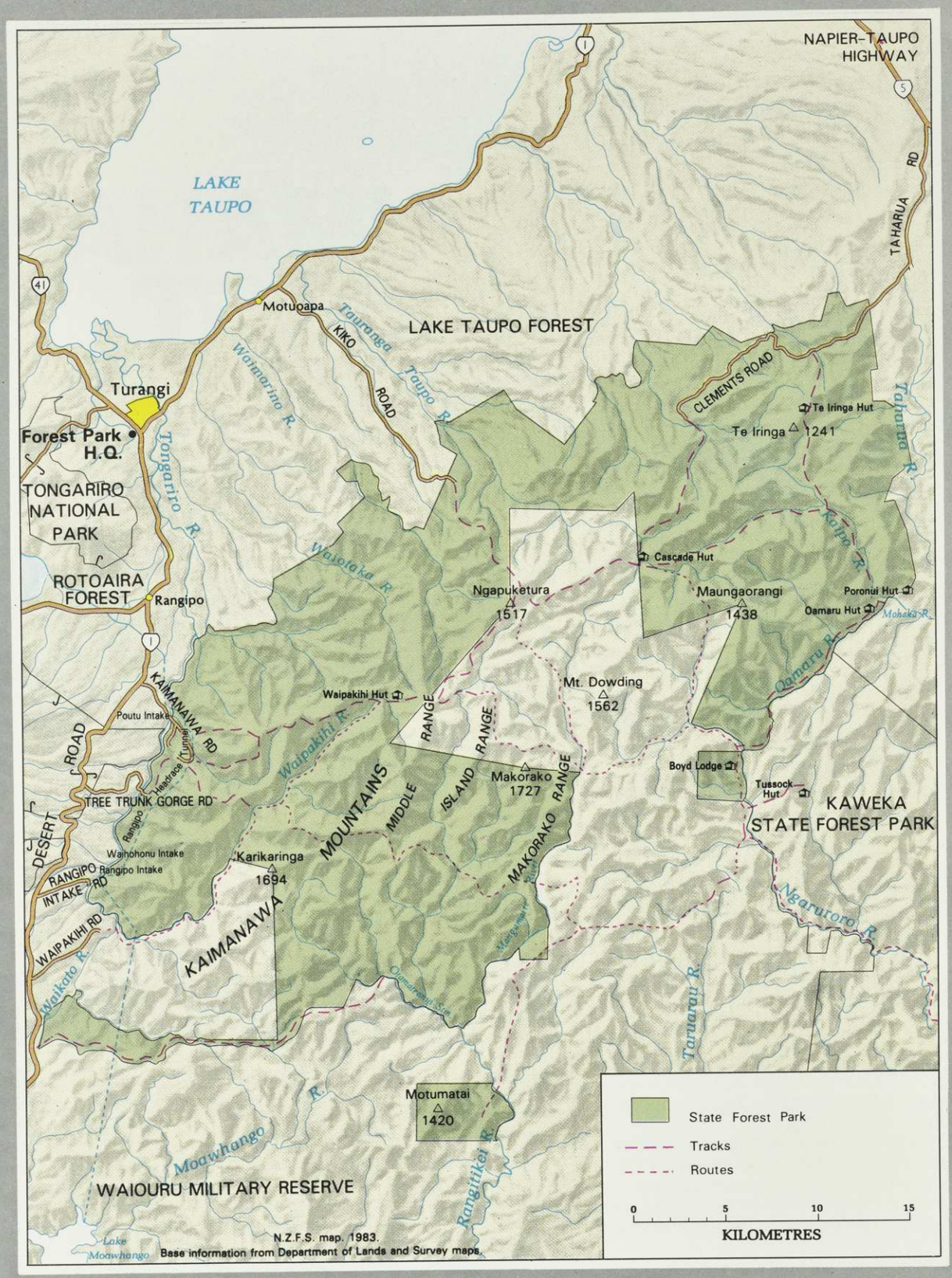
Further south, from the Waipakihi Valley eastward to the Ngaruroro River, almost all the forest is mountain beech (*N. solandri var cliffortioides*) with some mountain toatoa (*Phyllocladus asplenifolius var. alpinus*) and snow totara (*Podocarpus nivalis*).

Silver and mountain beech occur together at some points (eg about the Maungarangi Trig and in the lower Waipakihi Valley) and very occasionally all three species of beech grow together.

On the north-west flank of the park a podocarp/beech forest mixture covers the terraces and valley sides above the Tongariro, Waiotaka, Waimarino, and Tauranga Taupo Rivers. Scattered pure podocarp stands occur of matai (*Prumnopitys taxifolia*) and miro (*Pr. ferruginea*) with scattered rimu (*Dacrydium cuppressinum*) totara (*Podocarpus totara*) and kahikatea (*Dacrycarpus dacrydioides*), and an understory of maire (*Nestegis spp.*) and kamahi (*Weinmannia racemosa*).

Unfortunately many of the mature totara trees are dying, as in other parts of the North Island, from a cause which has not yet been clearly identified. The mountain beech forest, particularly to the south-west, is also deteriorating in places, with unsightly patches of dead trees caused by a combination of insect and fungal attacks on trees damaged by storms or weakened by the stress of droughts. However prolific regeneration of young trees is occurring within these stands.

At higher altitudes in the west, successive belts of red beech and Hall's totara (*P. hallii*), red and mountain beech, and finally pure mountain beech occur below the timberline.


NAPIER-TAUPO HIGHWAY
LAKE TAUPO
LAKE TAUPO FOREST
TAHARUA RD
Motuoapa
Tauranga Taupo R.
KIKO ROAD
Waimarino R.
Turangi
Forest Park H.Q.
Tongariro R.
TONGARIRO NATIONAL PARK
ROTOAIRA FOREST
Rangipo
Waiotaka R.
CLEMENTS ROAD
Te Iringa Hut
Te Iringa 1241
Taupo R.
Kaipo R.
Cascade Hut
Ngapuketura 1517
Maungaorangi 1438
Poronui Hut
Oamaru Hut
Mohaka R.
Oamaru R.
Mt. Dowding 1562
Waipakihi Hut
KAIMANAWA RD
Poutu Intake
Waipakihi R.
RANGE
ISLAND RANGE
MIDDLE
MOUNTAINS
Makorako 1727
MAKORAKO RANGE
Boyd Lodge
Tussock Hut
KAWEKA STATE FOREST PARK
ROAD
TREE TRUNK GORGE RD
Headrace (Tunnel)
Rangipo
DESERT
Waihohonu Intake
Rangipo Intake
RANGIPO INTAKE RD
Karikaringa 1694
KAIMANAWA
WAIPAKIHI RD
Waikato R.
Ngaruroro R.
Motumatai 1420
Moawhango R.
WAIOURU MILITARY RESERVE
Rangitikei R.
Lake Moawhango
N.Z.F.S. map. 1983.
Base information from Department of Lands and Survey maps.
State Forest Park
Tracks
Routes
0 5 10 15
KILOMETRES

The beautiful Waipakihi Valley, with its broad river flats flanked by beech forest and open tops, has attracted trampers and hunters for many decades.

One of the five huts within Kaimanawa Forest Park provided and maintained by the Forest Service for public use.

Above 1220m the mountain beech forest becomes stunted and usually gives way to tussock and heath-like vegetation with occasional fringes of mountain toa toa and bog pine (*Halocarpus bidwillii*), and rare pink pine (*H. biformis*).

The wide expanse of alpine grasslands to the south is dominated by snowgrass and tussock (*Chionochloa* and *Festuca spp.*) with a variety of subalpine and alpine plant associations.

Expanses of colourful red tussocks (*Chionochloa rubra*) occur on the open country to the east where the original cover was destroyed by earlier fires. In the absence of recent fires, areas of red tussock, particularly on valley slopes, are progressively being replaced by manuka scrub (*Leptospermum scoparium*).

History

There is little physical evidence of the use of the area by the Maori in early times other than the numerous Maori place names on old maps and in Maori land court records. However archaeological sites have been found close to the forest park.

Areas such as the Oamaru Valley are associated with Maori settlement and warfare in the mid 17th century involving the Ngati Whiti, Ngati Maruahine, Ngati Tuwharetoa, and Ngati Kurapoto tribes.

The first recorded visits of Europeans were those of the botanists Bidwill in 1839 and Colenso in 1847. Surveyors Smith and Cussen traversed the country in the 1870s and 1880s.

European settlers arrived in the late 1800s attracted by the large expanses of tussock country for grazing sheep. Fire was used extensively to clear land and stimulate new growth. Many names of landscape features, such as Mt Dowding and Boyd Rocks, recall these pioneer graziers. The sites and remains of early sheep farming huts can still be seen.

The search for gold also attracted people and signs of early prospecting include the mine shaft of the Pioneer goldmining claim at Motumatai. The gold search extended to the headwaters of the Rangitikei, Taruarau, and Ngaruroro Rivers and up the main rivers and streams draining into Lake Taupo from the Kaimanawa Ranges.

Wildlife

A wide variety of native birds is found in the forest park. In forested areas the most common are the tui, fantail, bellbird, pigeon, rifleman, kaka, robin, tomtit, grey warbler, whitehead, parakeet, white eye, and morepork. During the summer shining and longtail cuckoos inhabit the park, and though rarely seen or heard the kiwi is also present.

In more open places paradise, grey, and blue ducks, fernbird, black shag, pipit, harrier hawk, and bush falcon are found. Many introduced birds also make their home within the park. As in all forest parks the birds are strictly protected.

The native land snail *Powelliphanta*, commonly referred to as paryphanta, was discovered only recently in the Otamateanui Stream catchment to the south of the park. These snails, which grow up to 5cm in diameter, are one of the many species and sub-species of Powelliphanta found throughout the North Island of which the larger kauri snails are perhaps best known.

It is recognised that paryphanta must once have been more widespread along the axial ranges of the North Island but climatic or vegetation changes wiped out colonies in most areas. Hence only scattered colonies remain. A significant feature of the Kaimanawa discovery is that the colony is situated within the area covered by the comparatively recent

pumice ash showers which were thought to have eliminated these snails from the volcanic plateau.

Introduced animals

A variety of introduced animals have found their way to or been liberated in the forest park since the latter part of last century. Red deer, sika deer, and sheep, together with the numerous wild fires in Maori and European times, have considerably modified the vegetation.

By the 1930s the deer population had increased so greatly that control operations were carried out to reduce the depletion of vegetation and trampling of soil.

Deer numbers are now at a level in most of the park where control can be achieved by recreational hunters. A Recreational Hunting Area has been gazetted over 24 000 hectares of the northern part of the park so hunters can follow their sport without interference from commercial operators.

Recreational hunting will remain the only form of control in this area unless deer numbers increase to a level where unacceptable damage is caused to the vegetation.

The Sika (Japanese) deer herd, which also inhabits the neighbouring Kaweka Forest Park, is the only herd of this species in the southern hemisphere. Sika are keenly sought after by hunters for their recognised trophy heads and skins.

Red deer are found throughout the park in low to moderate numbers. In the main areas of high Sika population though, red deer are scarce, due apparently to the aggression and close feeding patterns of the Sika deer.

Wild pigs are only found in low numbers around the park margins. Their numbers remain fairly static, kept in check by local hunters. Rabbits reached pest proportions in the open tussock country about 1920 and control was carried out, but now they are only found in isolated pockets and present no threat to forest or neighbouring farms. Hares are common throughout the open country from valley floors to highest ridges.

Possums are found throughout the park. Numbers are generally low in the extensive beech forests which contain a limited range of tree and shrub species palatable to possums. Higher populations exist in the mixed beech/podocarp forest along the western perimeter and where the beech forest has been modified by logging in the north-east.

Wild horses have been present in the area around the headwaters of the Moawhango River for more than a century. Now numbering less than 200, the horses are the remnant of a herd which once grazed an extensive area of the volcanic plateau. They show characteristics similar to wild horses of Britain and Europe which are thought to be an adaptive response to the environment in which they have lived for so long.

The herd is recognised as unique and of such significant scientific interest as to be worthy of preservation. Unfortunately it has been threatened with extinction recently from indiscriminate slaughter and capture. The Kaimanawa wild horses are now protected under the Wildlife Act 1953 which provides severe penalties for offenders caught shooting, capturing, or disturbing them.

Ecological areas

Ecological areas are set aside to preserve representative ecological communities and rare or unique natural features. They may include landscape features, plant or animal life.

These areas are made available for scientific study of natural processes and environmental changes as well as providing genetic pools for indigenous plants and animals.

Five ecological zones identified within the Kaimanawa Forest Park management plan were selected to give a balanced representation of the major forest associations within the park.

They were, however, not of such unique character as to justify forest sanctuary status.

The proposed ecological areas within the park are as follows:

1. Tiraki Ecological Area (2000 hectares)
The proposed Tiraki reserve comprises almost pure red and silver beech forest from 600m to 1150m a.s.l., characteristic of the north-east zone of the park. Podocarps and hardwoods other than kamahi are extremely rare. Mountain and black beech appear very occasionally on exceptionally dry sites.

2. Ecology Stream Ecological Area (3800 hectares)
The forests in the central and southern zone of the park westward from the Ngaruroro catchment to the Umukarikari range are entirely mountain beech from 800m to 1350m a.s.l. The proposed Ecology Stream reserve is representative of this zone and includes the whole catchment of this stream within the park boundary, plus some minor tributary catchments of the Rangitikei River, extending above treeline to the ridge crest at Makorako (1727m) the highest point in the park.

3. Waipakihi River Ecological Area (1200 hectares)
The proposed Waipakihi reserve represents the regionally unique mixed beech forest pattern of the lower Waipakihi catchment. It contains silver beech/mountain beech and adjacent red, silver, and mountain beech forest in the catchments of two minor tributaries of the Waipakihi River flanking the Umukarikari range.

It is especially significant for silver beech, since this species does not recur for considerable distances east or south.

4. Waiotaka Ecological Area (C. 5000 hectares)
In contrast to the other three proposed scientific reserves, which highlight differing patterns of almost pure beech forest types, the proposed Waiotaka Ecological Area comprises a large segment of the podocarp-hardwood and podocarp-hardwood-beech forest characteristics of the north-west sector of the Park.

The core of this proposed reserve is in the Waiotaka Valley, where there is an altitudinal sequence from lower forest margin regenerating podocarp-hardwood forest, through large areas of valley-side rimu-miro-matai forest with local admixtures of red beech, to higher belts of red beech — Hall's totara-kamahi or red-mountain beech, up to a zone of pure mountain beech at the head of the valley.

It is proposed to extend the reserve beyond the tree-line in the south to cover montaine shrubland, herbfields and wetlands on the open country at the north end of the Umukarikari Range. Pink pine, which is extremely rare in the Kaimanawa region, occurs at the tree line here.

On the north, the proposed Ecological Area extends across the lower Waimarino Catchment, to encompass mixed podocarp and podocarp-red beech stands on the pumice breccia flanking the greywacke foothills, and part of the regionally unique pure red beech forest of the Upper Waiotaka.

This northern extension also includes toatoa and tanekaha, the first-named on the line of its national southern limit and the second on the line of its North Island southern limit. Especially abundant native birds in the Waimarino Valley include kaka and parakeets.

Recreation

The Kaimanawa Ranges have been popular for hunting, tramping, and their very good fishing rivers, for years. A good choice of routes is available, both loop tracks and complete crossings of the park.

Sudden changes of weather and extreme conditions often occur and can be traps for the unwary or the ill-prepared.

Kaimanawa Forest Park also has a lot to offer family groups and casual visitors and this type of recreational use is expected to increase.

Access roads from the Desert Road built for the Tongariro Power Development Scheme will be maintained and available for public use. As restoration work is finished and the construction forces move out more picnic and camp sites and short bush walks will be developed on the fringes of the park at these road ends.

Another attraction for the casual visitor is the 18km forest drive along Clements Road. This is reached via Taharua Road from the Napier-Taupo highway. This pleasant drive through attractive beech forest offers picnic and camp sites as well as access to the park interior.

Production

An area of 2700 hectares in the northern part of the park is recognised as having

potential for small scale production of high quality red and silver beech timber. Most of this forest has been previously cut over for fencing materials and regeneration is prolific. No production is currently planned.

'The 1982 Easter storm blew down beech forest in the Clements Road area. The Forest Service bush milling team carried out a trial to see if high quality timber could be recovered from the fallen trees. It was decided not to salvage because most of the trees were defective or damaged, and the cost of extracting the few good trees was prohibitive.'

A small area of pine plantation is within the park and this is managed in conjunction with the neighbouring Lake Taupo Forest.

Pinus contorta

An annual programme is carried out to remove *Pinus contorta* within the area adjacent to the southern part of the park. Workers from the park spend about three weeks 'weeding' young contorta from a 4–5 km wide strip of Ministry of Defence land south of the park. They also cover the Maori land between the Desert Road and the park's western boundary.

It is hard work. Twelve or fifteen people move in a long line about 40 metres apart. The land is mostly covered in tussock and often the young pines can't be seen till they're about three years old. It is important to remove them before they seed and this can happen as early as four years old.

Each pine is either pulled out by the roots, or if it is too big for that, chopped off at ground level. This must be carefully done because even the tiniest shoot left on the stump will flourish.

On the steeper country close to the park a helicopter is used for the weeding. A spotter sits up front. When any pines are seen the helicopter hovers and one of the 'weeders' jumps on to the slope to clear the area.

Part of the buffer zone is weeded every year and now all of it has been covered twice, some of it three times. The programme is an ongoing one aimed at keeping the park free of any heavy infestation.

Visitors to the park are asked to pull out any wilding trees they see, or to advise the Forest Service so they can be removed to prevent further spread.

Colourful red tussock is a feature of the upper Ngaruroro River. Extensive areas of red tussock and manuka have replaced forests destroyed by fires in Maori and early European times.

Ohinewairua fire

The destructive fire in February 1983, which destroyed 15 000 hectares in the central North Island, damaged 260 hectares within Kaimanawa Forest Park.

This was mostly tussock and manuka scrub on the very steep faces above the Rangitikei River. The Forest Service is monitoring this for soil erosion (as are the other authorities which administer the rest of the burnt land) to see if artificial establishment of plants should be carried out.

Aims of management

Kaimanawa Forest Park is a tremendous asset with its scenic charm and wilderness-like qualities.

In managing this park the main aims of the Forest Service are to:

- protect soil and water;
- preserve and protect special areas of the natural ecosystems;
- conserve historic, cultural and scenic values;
- develop recreation facilities in ways that are compatible with the other values.

The largely unspoilt character of the central and southern region of the forest park is being retained with minimal recreational development.

Photos: N.Z. Forest Service.

The New Zealand

SEA LION

—a problem of bycatch

by S. J. Owen

New Zealand Sea Lion female suckling a nine month old pup on Enderby Island. In the background lies a harem bull.
Photograph : B. J. Marlow

The New Zealand Sea Lion is an animal about which little is known and which few New Zealanders will get the chance to see. Now however it is being affected by an intensive squid fishery to the north of its principle breeding grounds. Greenpeace New Zealand this year began a campaign to ensure the survival of these animals — New Zealand's largest indigenous mammal . . . .

The Auckland Islands are a group of six main islands and numerous small islets, 400 kilometres south of Stewart Island. Since 1934 the Aucklands have been a nature reserve and are home to many species of birds and mammals including the Auckland Island flightless teal (*Anas aucklandica aucklandica*). Enderby Island, one of the islands in the archipelago, is one of two breeding sites of the Southern Royal Albatross, the other being Campbell Island. Fur seals (*Arctocephalos forsteri*) and Elephant seals (*Mirounga leonina*) breed on the Auckland Islands as, unfortunately, do rats, mice, rabbits, goats and feral cattle in various combinations on the various islands.

All but 100 of New Zealand's endemic sea lion (*Phocarctos hookeri*) also breed on the Aucklands. Enderby Island, Dundas Island and Figure of Eight Island all have rookeries during the breeding season from November to February. In addition there are small rookeries on Campbell Island and the Snares. Although sub fossil evidence exists to indicate that they once ranged as far north as Northland, only occasional sub-adult and adult males now straggle to Stewart Island and the southern coasts of the South Island.

With a population presently estimated to be between 5 000–7 000 they are, along with the Australian Sea Lion (*Neophoca cinerea*), the rarest of the five species of sea lion worldwide. When the Auckland Islands were first discovered in 1806 they soon became a target for sealers, and the abundant populations of fur seals and sea lions there were virtually wiped out. In 1823, at the height of the sealing, 13 000 skins were taken on one voyage of the schooner 'Henry', but by 1830 a boat sent to look for seals found no more than 20 sea lions and not a single fur seal. Not until human settlement ceased on the islands in 1856 did the sea lions begin returning to the Aucklands.

Mature breeding bulls of 6–8 years and over are large animals, reaching three metres in length and 300–400 kg. Their fur is a rich chocolate brown and, as the name implies, they have a thick dark brown mane from the head to the forequarters. These males arrive at the rookeries in early November and set up territories along the beaches which they defend for the duration of the breeding season without leaving them to feed. Less bulky, younger males of around 4–6 years old line the waters edge and attempt to capture females entering or leaving the sea — usually unsuccessfully.

Female New Zealand Sea Lions begin breeding when they are approximately 4 years old and are smaller than the males with tawny belly and silvery fur. They begin arriving at the rookery at the beginning of December, give birth to one pup shortly after arriving, and 6–7 days later mate with one of the territorial bulls.

Little is known about the population dynamics of the New Zealand Sea Lion, including recruitment rates, population distribution by age and sex, and age class mortality. Pup mortality prior to the end of the breeding season on Enderby Island was estimated to be 9 percent of the 460 pups born there in 1981. However this rose to over 50 percent in the last, 1982/3 season. Many pups were trapped in rabbit burrows which honeycomb the area above the rookery, and many more were caught in a peat bog which covered much of the island that year.

Sea Lion mortality is also now being affected by the large squid fishery to the north and east of the Auckland Islands.

Fisheries/Sea Lion interaction

Since the setting up of New Zealand's 300 kilometre 'Exclusive Economic Zone' in April 1978, there has been a large increase in fishing activity around the Auckland Islands.

The area north and east of the Auckland Islands is an important spawning area for squid, and the New Zealand squid fishery trawls intensively in that area during January to August each year. Over recent years the squid fishery around the Aucklands grew from a catch of 8 982 tonnes in the 1978/9 season (1 April 1978 – 31 March 1979) to 26 316 tonnes in the 1981/2 period. At present up to sixty boats trawl in the Aucklands area at the height of the season, mainly foreign (USSR, Japanese and Korean) and Joint Venture vessels. Joint Venture vessels are foreign boats with a New Zealand company partner. Japan and Russia are the main squid trawler Joint Venture partners along with some Korean and, more recently,

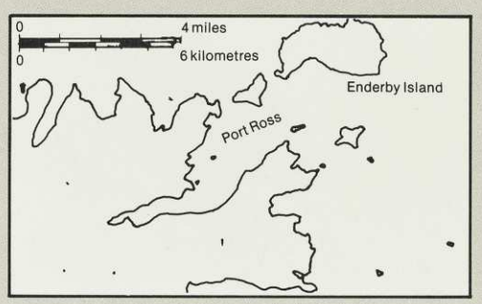
Taiwanese. There is little domestic input in the area at present although the 'Otago Buccaneer' and 'Otago Galliard' have recently began trawling for squid around the Aucklands.

Unfortunately squid is an important part of the sea lions diet, particularly during the breeding season,and they appear to follow trawlers to feed. According to the Fisheries Research Division of MAF these vessels can net up to one hundred sea lions each year, and although insufficient data is available as yet to give accurate figures for the bycatch, this is conservative and could easily be three to five times that many.

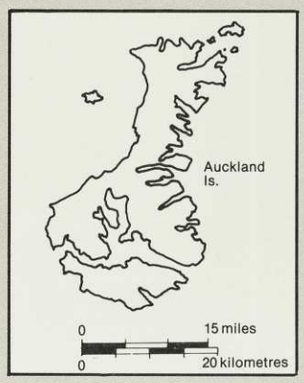
An important aspect of the bycatch is the proportion of breeding females. According to a press release given by Mr MacIntyre in October this year, 'reports by Fisheries Officers on observation duties confirm that most of the sea lions caught are mature females.' Since between December and August (a period which overlaps with peak trawling around the Aucklands) the females are both pregnant and suckling their young the death of a female during this time of year in effect means that not one but three sea lions die.

Although the Auckland Islands are a nature reserve, and no trawling is supposed to occur within the 20km territorial limit, this does not offer adequate protection for the sea lions as the reserve stops at the foreshore. In 1981/2 squid trawlers fished within the 12 mile zone on at least seven occasions. Also since sea lions will travel at least 100 kms to feed this takes them well outside the 'protected' area and into the centre of trawling activity.

The recently declared 'National Reserve' status given to the Snares Islands and mooted for the other sub-Antarctic islands (the Aucklands, Campbell Island, Antipodes Island and Bounty Island) will also make little difference to the New Zealand Sea Lion. The main advantage of National Reserves over Nature reserves, which was the Snares status up till now, is that the protection cannot be withdrawn except by an Act of Parliament, but they too stop at the foreshore of islands so do not protect the vital feeding grounds.



Auckland Islands and detail of the Port Ross area (from R. H. Taylor (1971), *N.Z. J. Bot. vol 9*).

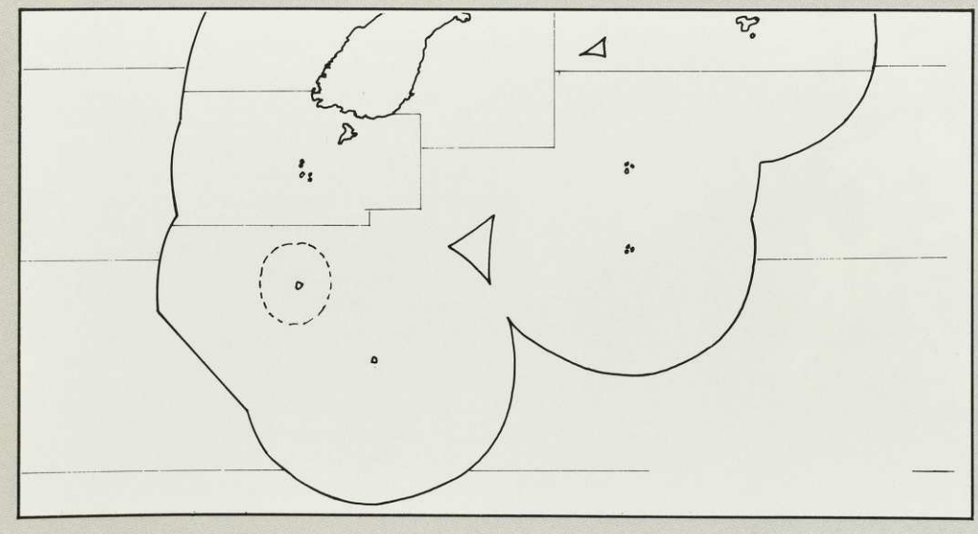


In a meeting in October with Mr MacIntyre and representatives of FRD and Fisheries Management, Greenpeace proposed that an area 100 kms around the Auckland Islands be declared a Marine Mammal Sanctuary. Under the Marine Mammal Protection Act 1978 the Minister may 'specify the activities which may or may not be engaged in within the sanctuary and may impose restrictions in respect of the sanctuary'. The sanctuary would therefore not necessarily ban squid fishing within it entirely, but it would allow for restrictions when and where the danger is greatest to the sea lions. Its advantage would be that emphasis must be placed on the protection of the marine mammal — even if in so doing it is to the detriment of maximum trawling efficiency.

To ensure the effectiveness of this first step observers should be placed on board the squid trawlers around the Auckland Islands. Although under the Marine Mammal Protection Act anyone killing or injuring a marine mammal is required to report it, the number of accidents including New Zealand Sea Lions which are in fact reported is largely at variance with FRD's estimate of the numbers taken. Observers would ensure that accurate information could be collected, without which any restrictions placed on the sanctuary would in all probability be meaningless. However due to the limited numbers of accredited MAF personnel available it may be necessary to use contract observers. They may prove an obstacle as it will require negotiations with the foreign fishing nations concerned.

Another major problem to be overcome will, as usual, be economic. MAF estimates that it will cost $11 800 to put two observers on board a vessel for five weeks. Although not all the boats would have to be sampled all the time to get an adequate statistical sample, the cost would nevertheless be high. Consequently Greenpeace proposed that at least part of the cost be borne by the fishing companies, both foreign and Joint Venture, involved in trawling in the area. In effect this would be carrying out the principle that those who exploit a resource should contribute towards the research required to determine the effects of that exploitation.

This coming summer foreign and Joint Venture trawlers have been allocated a catch of 30 000 tonnes of squid from Area E of the Exclusive Economic Zone. If the trend of past seasons is followed most of this will again come from around the Auckland Islands, and unless steps are taken the New Zealand Sea Lions will continue to be subjected to intensive trawling in their feeding grounds.



Area E of New Zealand Exclusive Economic Zone showing the proposed marine mammal sanctuary around the Auckland Islands.

Elingamita

AT THE THREE KINGS ISLANDS

Precipitous West Island from the south-east. The main *Elingamita* population is found beneath the pohutukawa forest on the upper slopes.

by Anthony Wright, Botanist, Auckland Museum

A visit to rugged little West Island in the Three Kings Group in December of last year afforded the first ever opportunity for the rare *Elingamita johnsonii* to be photographed in the wild. With its glossy karaka-like leaves and spectacular bunches of bright red berries, it has great potential as a garden plant.

Inflorescence of *Elingamita johnsonii*.

The Three Kings Islands lie some forty kilometres from the northern tip of the North Island and are little visited due to the difficulty of landing on their steep cliffs from the surrounding tempestuous seas. The four main islands support at least ten endemic species of plants — that is, species known to grow naturally in no other place. Of these endemics, two are represented by single plants only: *Tecomanthe speciosa* and *Pennantia baylisiana*. The former, a vigorous liane, is widely cultivated on mainland New Zealand. The latter is listed in the *Guinness Book of Records* as the world's rarest tree. Not only is the *Pennantia* reduced to a single tree, but that tree is female. The species is apparently dioecious — that is, male and female flowers are produced on different plants — and no male tree survives to pollinate the lone female.

But the record for the least viewed tree must go to *Elingamita johnsonii*. Confined to tiny West Island in the Three Kings Group, the genus is named after the steamship *Elingamite* which was wrecked on West Island in 1902 with considerable loss of life. The species name commemorates Major Magnus Johnson, its discoverer.

After the *Elingamite* wreck, pressure was brought to bear on the Government by shipping interests to erect a lighthouse on West Island. Marine Department officers investigated, and their report clearly illustrates the difficulties

associated with landing on the island. They said 'The Western Islet is an extremely precipitous rock of such a nature that it would be hazardous and dangerous to land on it, and after landing it would need an experienced mountaineer to scale it. To erect a light would be a difficult and tedious task, and to locate a staff there to attend to it would practically make them prisoners'. In their opinion, landings might be possible one day a month on average!

After several unsuccessful attempts, Major Johnson succeeded in landing on West Island in January 1950. He made a comprehensive collection of plants which was handed to Professor Geoff Baylis of Otago University, who has undertaken the bulk of the botanical research done on the Kings. Amongst these specimens was a new species, a member of the family Myrsinaceae, but not belonging to any known genus. Johnson returned to West Island with Baylis in January of the next year to collect further material. Photography was impossible as the landing was made in dense fog, later described by Baylis (1958) as 'depressingly reminiscent of the circumstances primarily responsible for the wreck of the *Elingamite* about fifty years previously'.

Following this visit, Baylis (1951) formally described the new species. He noted that it was represented by 'perhaps a dozen trees . . . members of a windswept forest scrub in which the true habit cannot be seen'.

All this history led our 1982 Offshore Islands Research Group party to have small hopes of landing on West Island, but we were lucky enough to get ashore ('acliff' might be a better term!) at the first attempt. No fog this time — we were blessed with early summer sun, so out came the cameras.

The first plant was spotted in low scrub just above the wreck of the *Elingamite*. Although superficially similar to karaka, *Elingamita* has slightly lighter green leaves and very thick fleshy looking branchlets. However, one sight of the fruit (a spectacular bright red colour when ripe) makes it obvious that this is a very different species. This first-found plant bore flower panicles, bunches of green fruit and remnants of bunches of ripe red fruit, indicating the probability of a two year cycle from flowering to fruit maturity.

Climbing up through the dense two metre high 'petrel scrub' of flax, taupata and *Hymenanthera novaezelandiae* through which odd *Elingamita* trees were scattered, we came to a small area of pohutukawa forest near the summit of the island. The pohutukawas provided a more or less continuous canopy some 10–12 metres high, beneath which was an understorey of *Elingamita* from 2–4 metres high. Standing in one spot twelve mature trees were counted, each bearing hanging bunches of ripe red fruit. Dozens of seedlings were found in the rich, light humus between the rocks — there were

Bunches of ripe fruit on small trees beneath the pohutukawa canopy.

Unripe fruit, probably a year old.

nine growing in an area just three centimetres square where a bunch of berries must have dropped. The seedlings also possess a conspicuously thickened, fleshy looking stem.

Surprisingly, there was no evidence of birds eating the ripe fruit. Although plants were found over an area several hundred metres square, they have not yet been dispersed to all suitable looking habitats on West Island. It remains to be seen whether birds will eat the berries, and if so, how long it takes before *Elingamita* is established on other islands in the Three Kings.

It was good news to be able to report that the population of this rare and little known plant was healthy and expanding. Some seed was brought back to Auckland, and plants will eventually be available through the nursery trade.

References

Baylis, G. T. S. 1951: *Elingamita* (Myrsinaceae) a new monotypic genus from West Island, Three Kings. *Records of the Auckland Institute and Museum 4(2)*: 99–102.

Baylis, G. T. S. 1958: A botanical survey of the small islands of the Three Kings Group. *Records of the Auckland Institute and Museum 5(1&2)*: 1–12.

Karaka like foliage, and inflorescences.

Not an apple! A single ripe *Elingamita* fruit, about 15mm across.

Photos: A. E. Wright

Two dry summers, and a shortage of water to meet irrigation demands have focused attention on the possibility of diverting 15 m³/second of water from the Cameron River, which drains into the Rakaia through an extensive wetland system and Lake Stream. The diversion is back through Lake Heron, which would become a storage lake, and then by a canal into the Ashburton River, where the water would eventually be channelled into the Rangitata Diversion Race.

Niggerheads extending well out into the lake, indicating a very low lake fluctuation.

Photograph E. A. Norris

Mr Gerry McSweeney identifies some of the fauna for branch members. Part of the 200ha of swamp land is in the background.

The Lake Heron Issue

E. A. Norris Chairperson, Mid Canterbury Branch

This proposal is mentioned as a possibility for future development in the Ashburton River management plan published earlier this year by the South Canterbury Catchment Board. It is also the basis of a water right application by the Barr Hill Irrigation Association who would use the water to irrigate the higher plains to the south of the Rakaia River. Another application has been by Mt Arrowsmith Station to drain 3675m³ of water per day from 200ha of wetland area along the western fringe of the lake shore. Still another proposal has been made by Southern Energy group who would build a 49m dam at the lake outlet for hydro generation. This would lead to the inundation of much of the valley now drained by Lake Stream.

Lake Heron, which is sited in a depression in an old glaciated valley about 100km NW from Ashburton, was made a flora and fauna reserve in 1931. In 1977 the Lake and a 20.12m strip were made a nature reserve under the Wild Life Reserves Act, 1977.

This year the Mid Canterbury branch has had two field trips to the lake. The first was in March, and was led by Mr D. Howden; the second was in May led by Mr Gerry McSweeney.

Members were impressed with the Lake. They appreciated its scenic and recreational values — many prize winning photos have been taken there — and its wild life values.

Lake Heron and its surrounding ecosystem is a very important wild life habitat. A total of fifty four bird species have been recorded there. Lake Heron and adjacent wetlands is a most important breeding area for the Southern Crested Grebe, which has a total New Zealand population of only two or three hundred. According to studies made by wild life officer Colin O'Donnell the Crested Grebes build their nests floating in water, more or less attached to the shore.

One of the reasons for the Lake's wild life value is the large adjacent comparatively unmodified wetland area. Long term fluctuations on Lake levels are unknown, but a five year cycle is thought to be less than 80cm. If the Lake was used for irrigation water storage, the level would fluctuate within a range of 2 metres. This means the birds would either be drowned, or left high and dry.

If the river was redirected as planned, a further problem could be long term effects on the lake itself. At present it is clear and oligotrophic; under natural processes the Cameron waters are filtered through shingle, and sediment is deposited there, or near the lake to give a productive swamp area where Marsh Crakes nest. With redirection and rechannelling, the sediment can directly enter the lake. Two results are possible:

- The Lake could become eutrophic at a greater rate than otherwise possible, affecting birds and fish populations; and
- the wetland areas could disappear.

One of the disturbing aspects of the data available about Lake Heron and its environs is that very little is known about the long term effects of any modification of the Lake Heron system. However, some

A view of the south west end of the lake.

Photographs E. A. Norris

predictions can be made. For example, it is suspected that Lake Heron is the only source of water in the upper reaches of the Rakaia in winter. Any change may affect the braiding pattern of the river, which in turn could modify Salmon and Trout spawning. Lake Stream is known to be an important Salmon spawning area.

Lake Heron is a shallow lake (60 percent is less than five metres deep). The wildlife service states 'It is a largely unmodified ecosystem, (although cattle can be observed grazing on the wetlands) and an example of an original habitat type not represented elsewhere in the country. Its large size contains viable populations of almost all species which are typical of this habitat type'.

Volume 3 of *The Rakaia River and Catchment — A resource survey*, page 60 states:

'The Lake Heron area is probably the most important Lake and/or wetland habitat remaining in the entire South Island High Country. At present the Lake and its immediate environ are protected as a nature reserve in conjunction with a wild life refuge. This reserve classification overlooks that the outstanding value of the Lake Heron area is attributable not just to the qualities of the area protected, but rather to the whole, complex intergraded Lake Heron/Cameron River/Fan wetland/Lake Stream ecosystem. Modification of any part of this system will have ramifications for the whole system.'

The Mid Canterbury Branch would agree with this view. We feel the society should resist strongly any moves to modify this Lake. There are other options available for irrigation: Lake Coleridge is already modified for Hydro electric purposes. It could well be that its potential would be more effectively realised as an irrigation storage lake rather than hydro electric as at present.

The daming of the Stour River, a tributary of the Ashburton, is another possibility which could be investigated.

One of the pleasing aspects of our visits to Lake Heron has been the presence of other interests, including members of the Barhill irrigation group. They have appreciated our point of view, and appear willing to accept that irrigation water may have to come from another source. We hope to be able to continue this dialogue with them.

BIRDS I HAVE MET

21. Kereru . . . the wood pigeon

by Avis Acres

Kereru usually gives away her presence in the forest by her loud swishing flight. All one can see when she settles on a high branch is a large matronly figure, her plump breast covered by a snow-white apron. in the dim light filtering through the leaves, the rest of her body appears grey.

It wasn't until I visited Kapiti Island that I discovered the glorious colouring of her plumage. Two pigeons were enjoying a feed of clover on the lawn of the caretaker's cottage when we arrived. A flock of red-fronted parakeets feeding on grass seed flew off as we approached but Kereru and her mate ignored us as they waddled about the lawn on their short white-trousered legs.

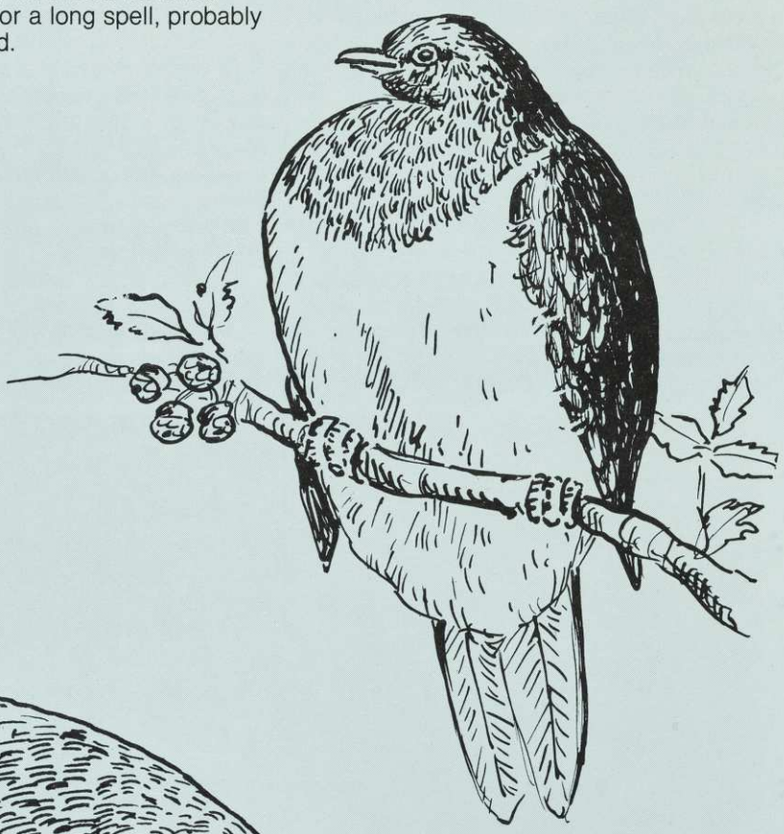
Their vivid green, purple and red feathers shimmered with copper lights in the bright sunshine. Their crimson beaks were tipped with yellow and their red feet had yellow soles. Their eyes were reddish-brown with pink eyelids. No wonder kereru has gained the reputation of being one of our most beautiful birds.

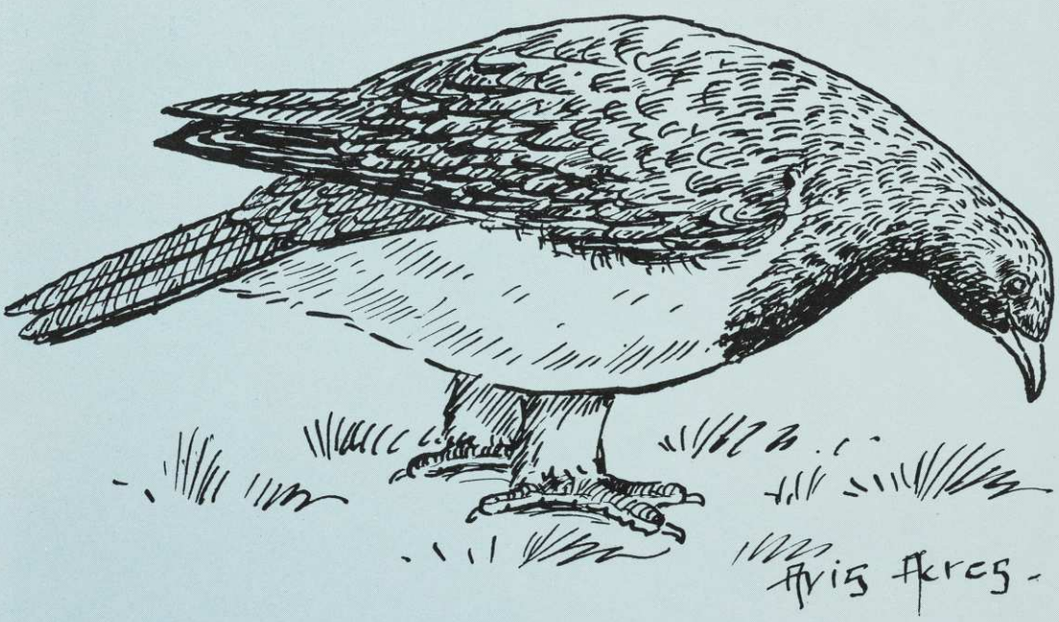
In the early days they were plentiful and provided the Maoris with their main source of food. Being so tame and trusting, they were easily snared or caught in a noose from platforms in the trees. Their flesh was often potted and their feathers used for magnificent cloaks. Their numbers were greatly reduced after the Europeans arrived here and discovered they made a delicious meal. Still more perished with the clearance of forests. Fortunately, kereu is now a protected bird and one pays dearly for pigeon pie with a large fine.

Berries form the main food for the pigeon, also leaves and shoots in the winter. They used to visit our Levin garden in the spring to sample the kowhai buds and were very partial to miro karaka and titoki berries.

Our house was empty for a while after we left levin and we learned from neighbours that the wood pigeons had moved into the garden and nested there. They are very silent birds. I only heard a soft "Ku" occasionally while they were feeding. They had enormous appetites. After a large meal of berries, they would perch on a branch with head hunched into their breasts for a long spell, probably digesting their food.

They are rather careless nest builders, just slinging a few sticks together, making a frail-looking platform, up to twenty feet above the ground. Only one egg is laid and both parents guard the chick closely until it leaves the nest in about forty-five days. At first it is fed with a milky fluid from the parents' crops and later with partly digested berries. The period of incubation is about Twentynine days.





This section is sponsored by the J. R. McKenzie Trust.

LITTLE IMMIGRANTS

by David Gregorie

New Zealand is a long way from anywhere else. It takes a long time to get here no matter how you come.

The first people to come here were the Maoris. It probably took them about three weeks to get here from the islands of the eastern Pacific in their big sailing canoes. They were the first human immigrants.

That was about a thousand years ago. Since then a great many human immigrants have come here from Britain and Ireland, Scandinavia and Yugoslavia, China and India, and the Pacific Islands.

Many of our native birds and animals are immigrants too. Birds, bats and insects sometimes get caught in the howling westerly gales that blow from Australia across the Tasman Sea. Most of them keep flying until they are exhausted and then fall into the sea. A few of them manage to struggle on until they reach New Zealand, tired but alive.

But their troubles are not over. They are in a strange country with strange plants and animals. How can they know what is safe to eat?

They are often alone. And if they cannot find mates of their own kind there will be no young ones to keep the species going. But sometimes flocks of birds of the same kind arrive together. Then, if conditions are right, they might breed and spread all over the country.

Most people are surprised to learn how many of our native birds arrived in this way from Australia. Some of them came so long ago that they were here when the Maoris arrived.

Other birds have settled in New Zealand only in the last few years. Before 1950 welcome swallows were hardly ever seen in New Zealand. Sometimes a stray bird would find its way here from Australia, but that was all. Since 1950 these pretty little birds have been spreading rapidly and now they are quite common in most areas.

White-eyes arrived here about the same time as the first pakeha immigrants — about 140 years ago. The Maoris called the new birds tauhou, or stranger. Now they are one of the commonest birds we have.

Birds from Australia you may see or hear every day include fantails, harrier hawks, pukekos, kingfishers, moreporks, black shags and grey ducks. Others you may see less often include white-fronted herons, Australian coots, banded rails, spur-winged plovers and bitterns. There are many more.

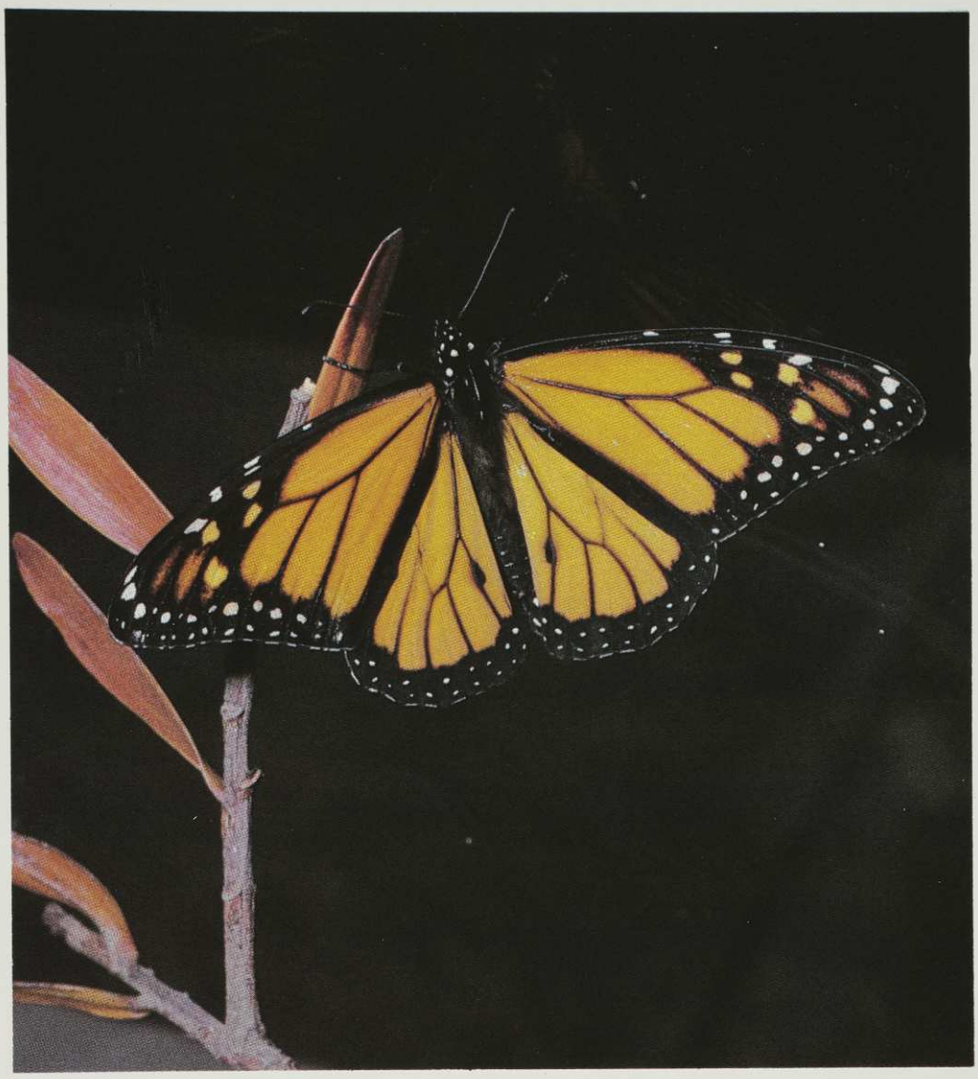
Little blue penguins probably emigrated from here to Australia.

Red-billed gulls live in Australia and South Africa as well as New Zealand. Black backed gulls live in all the countries around the Southern Ocean. Gannets and caspian terns can be found all over the world.

The wonderful white heron, the kotuku of the Maoris, is so common in Australia that Australians wonder why we think it is so special.

A kingfisher glares at the photographer who interrupted his lunch.
Photograph L. J. Richards, Wildlife Service.

A white-eye fluffs its feathers to keep out the cold in Whiteman's Valley near Wellington.
Photograph Brian Enting.



You should not confuse these native birds with introduced birds like magpies, sparrows and blackbirds. They were brought here by human immigrants and released in their gardens and farms. The immigrant birds found their way here without any human help.

Birds are not the only animal immigrants. Many kinds of insects and spiders have been blown across the Tasman by the westerly gales. We even have one immigrant mammal — the tiny long-tailed bat.

One of our best-known immigrants is the monarch butterfly. It comes from America. Small flocks of them were blown across the Pacific, island by island, year by year, until they reached Australia. Then they were blown here.

Plants and animals that are found nowhere else in the world but New Zealand are called endemic species. Birds and animals that have found their own way here are called NATIVE species and those that are brought here by people are introduced. Migratory birds come here regularly every year and visitors just come occasionally.

A white-faced heron on its nest in a lawsoniana tree.
Photograph B. Harcourt, Wildlife Service.

A monarch butterfly rests on a dead kauri twig.
Photograph David Gregorie.

A kotuku, or white heron, pauses on a river bed in its search for food.
Photograph B. D. Bell, Wildlife Service.

A morepork looks surprised by the camera as it rests on its day-time perch.
Photograph C. R. Veitch, Wildlife Service.

WHY SAVE WETLANDS?

MANY PEOPLE THINK THAT WETLANDS ARE JUST SMELLY PLACES....

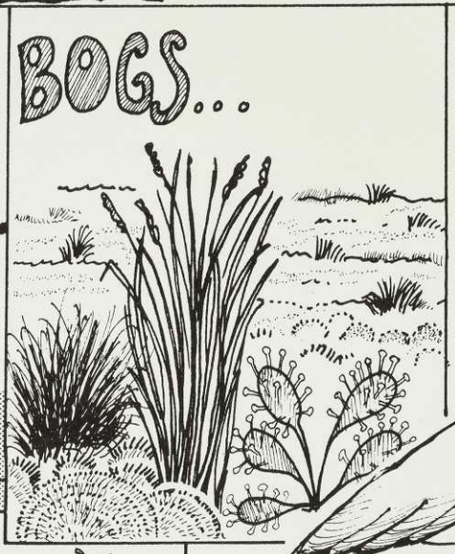
.... BUT THEY ONLY SMELL WHEN THEY ARE MISUSED....

WETLANDS are becoming our RAREST ECOSYSTEMS

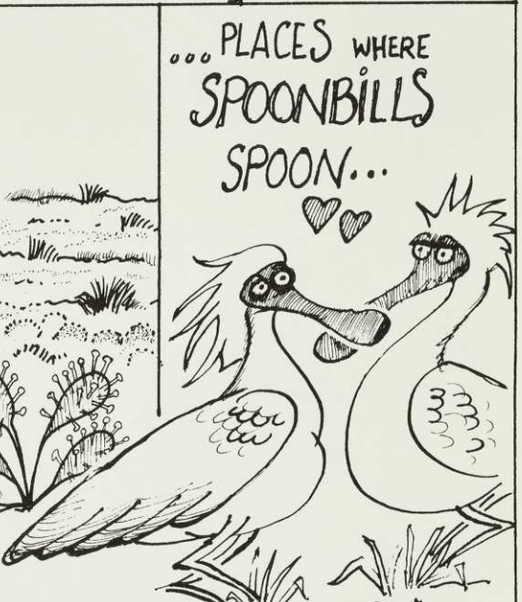
THERE ARE MANY KINDS OF WETLAND ~ E.G. ~

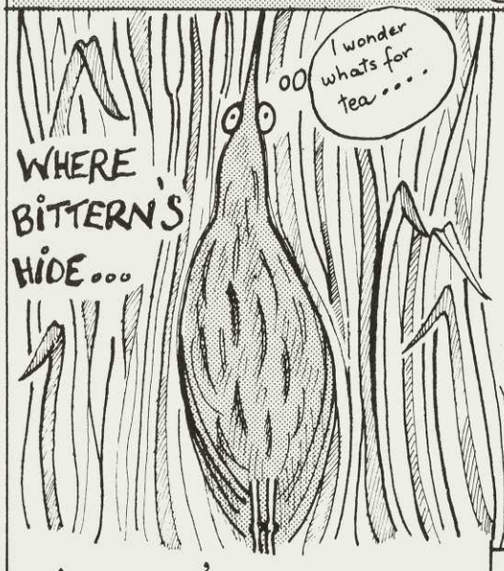
MANGROVE SWAMPS...

BOGS...



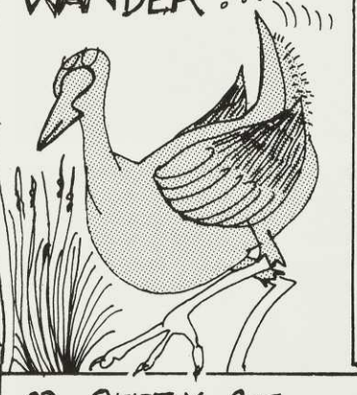
...PLACES WHERE SPOONBILLS SPOON...





WHERE BITTERN'S HIDE...

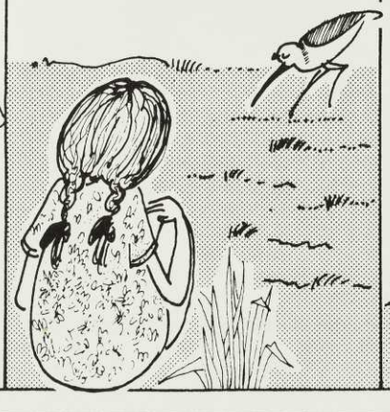
PUKEKO'S WANDER...



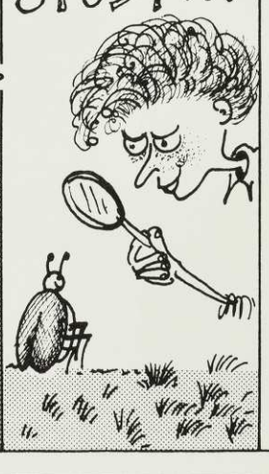
...WHERE YOU CAN FISH... [SWOT SANDFLIES!]

PIC-NIC...

OR QUIETLY SIT...



..OR STUDY...



WHY NOT STUDY YOUR LOCAL WETLAND AND WRITE TO US ?

Bell

Book Reviews

WILDLIFE RANGER — MY LIFE IN THE NEW ZEALAND OUTDOORS

by Ken Francis

Here is an important book by New Zealand's first Wildlife Ranger, which covers a span of 54 years, by anecdote and description of times and troubles in the world of the backblocks and departmental life, as New Zealand grew to nationhood.

Knowing the author as I do, I am pleased to be able to review this book. His marvellous descriptions of happenings in the dim past; the "roughing it" that exemplified his duties, whether on animal control or survey; the almost unbelieveable hardships; the loneliness, miles from help, before the days of helicopter rescue and before the hordes of trampers and climbers invaded the back country.

Recruited to kill deer, then later to become a Government Ranger in Taupo and then Bay of Plenty — the prevention of trout poaching and illegal shooting — capturing of escaped prisoners — adventure all the way. His fascinating working life culminated in his becoming a world authority on kiwis when he was appointed Chief Ranger for Hawkes Bay and manager of the famous Green Meadows Game Farm.

An eminently readable book, amusing and adventurous, and with an admixture of pathos, a reminder of times past. Well done, Ken Francis, your book deserves to be read.

DAVID COLLINGWOOD

Whitcoulls Ltd Publishers,

$15.95.

FIFTY YEARS OF MOUNTAIN FEDERATION

Compiled by Roy Burrell

The formation, tramping and climbing, mountain safety, wilderness, access to mountain land, conservation of the mountain environment — such are some of the twenty two chapters of this informative book to mark the 50th Anniversary of the Federated Mountain Clubs of New Zealand (Inc). A sister organisation to our own Society, it was formed on the initiative of that grand old man, A.P. Harper, who served the Federation as it's president from 1933–1934 and much later became our own president in 1948.

The association between F.M.C. and R.F. & B. is much deeper than the Acts governing National Parks, Forest Service, Reserves and the host of other enactments which touch on New Zealand's naturalness. Today we share membership on the Joint Campaign on Forests and behind the scenes our members continue to earn their spurs in F.M.C. and on the high mountain zones as they have done down the years.

This book is brimming with interest to Forest & Birders. It has historic photos and throws light on much of the work of F.M.C. which has previously been largely unsung and now can be appreciated.

What I welcome is the accurate dating of events and what transpired, the reasoning behind the policies of F.M.C., and the way one can recognise why F.M.C. has become the prestigious body of today. All of this is most readable in this 182 page book with 44 black and white photos and two colour photos.

An important book recommended for all who love New Zealand's naturalness.

DAVID COLLINGWOOD

Available from: Federated Mountain Clubs, P.O. Box 1604, Wellington. $10.00

COLLINS GUIDE TO NEW ZEALAND SEASHORE

by Dave Gunson

The natural history of our sea shore is celebrated in this timely and compendious guide book. It satisfies a long felt need, and gives the New Zealander an insight into, and appreciation of the zone, so important to us all, which girds us about, and which has been so little comprehended in the past.

The author says in his foreword that the intention was quite simply to describe and illustrate those items, animal vegetable and mineral, that the casual observer may expect to encounter on a visit to the New Zealand beach. He has divided the book into two parts separated in the middle by sections on marine and coastal plants. The first part deals with sedentary creatures and those that slither, crawl, and scuttle around the lower shore and shallow waters. The second part deals with the more developed and freer-ranging animals such as insects, lizards, birds, fish, seals and dolphins and whales.

While the subjects do not follow a strict taxonomic sequence in the text, being arranged rather by association and lifestyle, nevertheless the proper order is shown in a taxonomic guide at the end of the book.

There are 240 pages which include over 600 illustrations of species. Sixty-four are in colour. The illustrations are all beautiful drawings by the author, and display with clear and generous definition high artistic craftmanship.

The book is a companion to the other guides, so much a feature of Collins publications. Most useable, easily brought to the site of observation and bound in a robust plasticised cover; a must for those with an interest in the seashore.

Highly recommended, a work of excellence.

DAVID COLLINGWOOD

Collins Publishers, $24.95.

Conservation Newsletter

This one-page newsletter is already distributed monthly to all Society branch committee members. It is designed to up-date all national conservation issues and indicate actions required from branches and members to further the Society's objects (ie submission deadlines, meetings, information available, etc). It also discusses conservation activities in our 46 branches.

If you are not a branch committee member but want to keep right up to date on the key issues, now is your chance to receive *Conservation News*.

SUBSCRIPTION FORM

I want to receive *Conservation News* each month:

Name: _____

Address: _____

_____ Phone No: _____

I enclose an annual sub of $5.00 to cover printing and postage:

Post to: **Conservation News**
P.O. Box 631
Wellington

T Shirts

Ideal for posting overseas

Lower Hutt Branch has T shirts available in the following colours:
Blue, green, yellow, gold, white, and blue.

Prices

6– 8 years	$5.50
10- 14 years	$7.50
S (36 in.), M (38 in.), L (40 in.)	$8.00
XL	$8.50
XXL	$8.50

This includes postage.

When ordering, please give a second choice, and make cheques out to Royal Forest and Bird Society.

Orders from: Alison McDermott
294 Dowse Drive
Lower Hutt
Tel: 695-887

Queen Elizabeth II Scholarships

Ten post-graduate students were awarded Queen Elizabeth II Scholarships by the Society in December. The scholarships will be used for research into the preservation and protection of indigenous flora and fauna. The Society funds available for this purpose were swelled this year by a generous donation from a group of members from the Manawatu Branch enabling a greater number of students than usual to receive this assistance.

Jane Margison, who is studying for an M.Sc. degree at Auckland University will research for a thesis on the plant-soil relationships of the NZ Kauri in a small kauri forest at Huapai.

Ruth Bartlett, in preparing her thesis for an M.Sc. will study the regeneration patterns of the Kauri in New Zealand native forest. This study will investigate the micro-climates of two different sized canopy gaps at Trounson Kauri Park in Northland.

Judith Van Gardingen, who is seeking a M.Sc. in Botany at the University of Canterbury, will research the ecology of *Clematis Vitalba*, in the hope of aiding in the development of an effective control programme.

Alison Cree, has chosen a thesis topic studying the endemic frogs of the Leiopelma genus. These frogs are of great scientific interest because of certain primitive characteristics which make them virtually unique amongst all frogs.

Gretchen Rasch studying for M.Sc. degree in zoology, will research the ecology of the stitchbird, primarily in the Tirikikawa Valley in the southwestern area of Little Barrier Island, to provide solid ground for the successful management and protection of this rare and unique bird.

Ron Moorhouse, studying at Auckland University, is concerned with how the Kakapo adapt to their new environment on Little Barrier Island. With the only known population of Kakapo in Stewart Island under severe pressure, the understanding of how they adapt to relocation is very important.

Colin Miskelly, researching for an Honours Degree in Zoology at Canterbury University, is going to the Chatham Islands to study the little known Subantarctic Snipe, a vulnerable species now restricted to ten vermin-free islands.

Graham Wragg, studying for a Master of Applied Science at Lincoln College, is researching the *Puffinus puffinus* group of shearwaters, preparing a detailed distribution map, and visiting breeding colonies in Marlborough Sounds and the Kaikouras.

Grant Dumbell, Studying at Auckland University for a Ph.D. in zoology will be researching the ecology of Brown Teal on Great Barrier Island. His objective will be to determine the habitat preferences of Brown teal which will assist future conservation programmes within the Wildlife Service and Ducks Unlimited.

David Coronel, is seeking a Ph.D in Zoology at Massey University. He will also study the Brown Teal, both on Great Barrier Island and at Mount Bruce Native Bird Reserve, being interested in the social behaviour and organisation of the birds, particularly as this influences population parameters.

SOCIETY'S LODGES AND HOUSES

Bushy Park, Kai Iwi

24km north of Wanganui

Fine old homestead, lovely grounds, 89ha of native bush.

Make your own programme.

Electric stove, hot water, and other facilities available. Bring your own rations. Bedding supplied. Linen and towels $1.50 per bed*.

Fees: Members: single, $9 per night; double $14 per night. Non-members: single, $14 per night; double, $18 per night. Children aged from 1 to 12 years, $6 per night. Day visitors, members and non-members, $1; children under 12 years, 50c; family group of two adults and children, $3.

Custodian: C/o Bushy Park Homestead, Kai Iwi, R.D.8, Wanganui. Telephone Kai Iwi 879.

The park is closed to daytime visitors on Mondays and Tuesdays.

Patoka Lodge

Hawke's Bay

The lodge is situated 48km from Napier on the Puketitiri Road 8km past Patoka, amid the 14ha William Hartree Memorial Scenic Reserve. The lodge offers quiet retreat and bush walks of botanical interest. There are also many places of interest within a short distance.

The lodge has two bunkrooms, accommodating 10 people. Extra mattresses and pillows are available to sleep up to 20. The lodge has a fully equipped kitchen, including a refrigerator.

Visitors supply their own linen, pillow cases, blankets or sleeping bags, and cutlery. The nearest store is 8km away. No animals are permitted.

An information leaflet is supplied with notice of booking. A key will be posted a week before the date booked and this is to be returned with payment after occupation.

Fees (per night): Adult members, $1.50; junior members, 75c; adult non-members, $2; junior non-members, $1.

A 50 percent deposit is required with each booking.

For information and bookings apply to: June Northe, 212 Kennedy Road, Napier. Telephone Napier 438-193.

Ruapehu Lodge

Whakapapa Village, Tongariro National Park.

Ruapehu Lodge is available for MEMBERS ONLY, and all bookings must be made with the Society's head office, Box 631, Wellington.

Fees: Winter Season (1 June to 31 October) all members, $7.00 per night. Summer Season (1 November to 31 May) Adults, $5.00 per night; Children, $2.50 per night. Securing Deposit (per person), $1.00 per night.

Branch parties have preferential booking up until six months in advance, after which bookings open for individual members. Private parties are limited to 10 members per group. School groups in summer season, by application.

Full payment must be paid four weeks before occupation, (otherwise bookings may be forfeited), after which time there is no refund for cancellation.

No animals or pets are allowed in the lodge or National Park.

There is no key at the lodge, but one will be posted ten days before occupancy. No member may occupy the lodge without first booking through Head Office, Wellington.

Tautuku Lodge

Coastal Otago

Situated 72km from Balclutha on State Highway 92, Tautuku Lodge on the Society's 550ha bush-clad Lenz Reserve in coastal south-east Otago is the place for that weekend or holiday in beautiful, peaceful, unspoilt surroundings.

The reserve has interesting bush walks, and native birds are numerous. The round track is a comfortable 4 hours' walk, and as this is in its formative state, visitors are requested to keep to the marked track route.

The lodge is fully equipped and accommodates eight or nine people. It has a lounge, kitchen, two bunkrooms with innerspring mattresses and foam rubber pillows, washroom with tub, basin, and showers. The cooking facilities in the modern kitchen are excellent.

There is also a self-contained A-frame cabin, for two adults.

Bring with you all food supplies, bed linen, and pillow cases, blankets, towels, tea-towels, etc.

Bookings are accepted up to 9 months in advance. No refunds are made unless cancellation is advised at least 1 month before reserved occupancy.

Rates per night are: Senior members, $5; junior members, $2; senior non-members, $8; junior non-members (5–17 years of age), $3.

A deposit of 50 percent is to be made with each booking.

For free brochure and all bookings send a stamped, addressed envelope to Mrs F. C. Bennett, Papatowai, R.D. Owaka. Telephone 160M.

Turner Cottage

Stewart Island

Turner Cottage, on Stewart Island, is available for renting. The cottage, a two-roomed dwelling furnished for three people, can be obtained at a rental of $6 a day for members and $8 a day for non-members.

For details write, enclosing a stamped, addressed envelope, to: "Turner Cottage", c/o Mrs N. Fife, P.O. Box 67, Halfmoon Bay, Stewart Island.

Tai Haruru Lodge

Piha, West Auckland

A comfortable seaside home situated in Garden Road, Piha, 38 km from central Auckland on the rugged west coast. Eight minutes' walk from the Piha store, with right-of-way access to the surf beach (patrolled in season) and close to bush reserves and walking tracks in the Waitakere Ranges.

A quiet and peaceful haven with a large sheltered garden with native trees, the lodge in fully equipped and sleeps six to eight persons in two bedrooms and an annexe. It has a large lounge with open fire, dining area, and modern kitchen.

You will need food supplies, bed linen, pillow cases, towels, and tea-towels.

Bookings are accepted up to 6 months in advance and a deposit of 25 percent is to be made with each booking.

Rates are:

Summer (mid October to Easter inclusive)

Nightly: $8 per person (children aged 1 to 12 years $4 per night).

Weekends: $32 minimum.

Weekly: $90 minimum.

Winter (after Easter to mid October)

Nightly: $6 per person (children aged 1 to 12 years $3 per night).

Weekends: $24 minimum.

Weekly: $60 minimum.

For bookings send a stamped, addressed envelope to: Mrs B. Marshall, 160 Valley Road, Henderson, Auckland 8. Telephone: 836-5859.

There is no key at the lodge. It must be collected from and returned to Mrs Marshall. A leaflet will be forwarded with the acknowledgment of booking and receipt for deposit.

Waiheke Island Cottage

Onetangi, Waiheke Island

The cottage has comfortable bunk accommodation for eight people and has electric lighting, stove, refrigerator, and hot water. Adjacent to a 49ha wildlife reserve, it is in easy walking distance from shops and beach. It is reached by ferry from Auckland City (two or three return trips daily) and by bus or taxi from the island ferry wharf. Everything is supplied except linen and food. **No animals are permitted.**

Summer (mid-October to Easter, inclusive)

Nightly (not weekends): $2 per person per night.

Weekends: $12 minimum. More than 2 adults, $2 per person per night.

Weekly: $30 minimum. More than 2 adults, $1.25 per person per night.

Winter (after Easter to mid-October)

Nightly (not weekends): $1.25 per person per night.

Weekends: $12 minimum. More than 3 adults, $1.25 per person per night.

Weekly: $20 minimum. More than 2 adults, $1.25 per person per night.

Children 15 years and under: First two, half rates; others, no charge.

A deposit of 50 percent is payable on booking, the remainder before entry.

Booking Officer: Mrs R. Foley, 23 Stoddard Street, Mt Roskill, Auckland. Telephone Auckland 696-769 (evenings).

Gallery
OF NEW ZEALAND FLORA

THE ILLUSTRATION is reproduced from The Art Album of New Zealand Flora, volume 1, by Mr and Mrs E. H. Featon, published by Bock and Cousins in 1889.

Eugenia maire, the black maire, the maire-tawhake of the Maori.

This beautiful small tree is a member of the Eugenia Genus which was named in honour of Prince Eugene of Saxony. The genus is one of trees and shrubs growing in the tropical areas of Asia, America and extending into Chile and New Zealand where there is only the one example, our endemic Eugenia maire.

Of interest is that members of the genus in other countries are important spice and fruit plants, Eugenia pimenta furnishes allspice and is cultivated for that purpose in the West Indies, Eugenia cauliflora of Brazil has refreshing greenage size fruits. The dried flowerettes of one species supply cloves. But the New Zealand Eugenia maire is not useful for culinary or edible purposes so far as is known.

Eugenia maire is a tree reaching 16 m. It has a smooth white bark, with leaves opposite, oblong lanceolate 2–5cm long and pointed at the tip. Flowers are in terminal panicles 1cm diameter and white. The berry is 1cm diameter and red. It flowers in June and July.

The tree is a lowland type favouring swamplands and semi-swamp damp forest conditions, from the North Island to the Marlborough Sounds and top of the South Island. It is described as having the habit of *Metrosideros* (the ratas) in respect of its flower arrangment.

The wood is generally compact heavy and durable and was used for jetty piles and mooring posts on the Waikato River remaining sound after many years. It was highly valued for fence posts and firewood and by 1880 being so popular as a material the tree was fast becoming scarce it was cut out, and with the draining of the swamplands it died off in many places.

In former days the Maoris used the hard wood to construct their digging spades to break up the soil for kumaras and plants.

It was first described by A. Cunningham in *Annals of Natural History 3*, 1839 based on collections made from 1826 to 1834 by himself and his brother R. Cunningham.

This small tree is deservous of some attention, it would make a good shrub in moist areas and would repay with glorious blossom and vivid berry fruits in winter months.

DAVID G. COLLINGWOOD

A forest is more than trees

A forest, large or small, native or exotic, is home to countless varieties of plant and animal life, many of which cannot survive outside the forest environment. It protects the ground from the effects of heavy rains, which cause soil erosion, provides attractive scenic backdrops in the countryside, and gives wide scope for recreation pursuits.

Native Slug

Because of their size and distinctive markings New Zealand's native land slugs are much more spectacular than the common introduced European species found in our gardens. They are much bigger, reaching up to 3–4 cm in length, and more colourful, having leaf-vein-like patterns on their upper side.

A unique feature of these slugs is their possession of a lung of a type not found in any other mollusc. Although similar species are found around the eastern Pacific, New Zealand has by far the largest number.

Slugs are snails which for all practical purposes have lost their shells. A residual shell comprising a few calcareous granules buried within the body is all that remains. Having no shell to prevent moisture-loss, slugs secrete abundant quantities of mucous which helps them retain water.

Slugs are generally found under decaying vegetation and rotting logs, or at the base of flax bushes or palms. They also probably feed on either rotting vegetation or associated fungus. They reproduce by laying eggs which are enclosed in a film of translucent skin, and may be found in groups of twenty or thirty.

New Zealand Forest Service

NZFS5