

ANNUAL CONFERENCE 1988

The 36th Annual Conference was held at the University of Otago in Dunedin from 22 to 26 August 1988. Attendance was above average (c. 210), boosted by the presence of environmental managers interested in the three-day symposium on Management of New Zealand's Natural Estate.

The general conference outline was as follows:

- Monday 22 August
 afternoon - Symposium session 1
 evening - wine and cheese social at University College
- Tuesday 23 August
 morning - Symposium session 2
 afternoon - Symposium session 3
 evening - Ecological Society AGM
- Wednesday 24 August
 morning - Symposium session 4
 afternoon - field trips
 evening - TVNZ Natural History Unit:
 Presenting science to the general public
- Thursday 25 August
 morning - Symposium conclusions
 afternoon - Contributed papers session 1
 evening - Ecological Society Annual Dinner at University College
- Friday 26 August
 morning - Contributed papers session 2

The symposium, organised by David Norton, Mark Davis, Colin Meurk and Judith Roper-Lindsay, focused on key questions related to the management of New Zealand's natural estate. Within the four main sessions, the formula of overview, case studies and workshops provided varied opportunities for input, discussion and involvement by the participants. It was appreciated that applied ecology has a major contribution to make to management issues, but that progress depends on good communication between all groups involved. The symposium was very successful, in large part because of the presence of both users and producers of ecological research.

A half day was provided for field trips and there were two options: Otago Peninsula and Flagstaff-Woodhaugh. The Peninsula trip looked at problems associated with the management of fragmented forests/shrublands, salt-marsh areas, the harbour system, and penguins, while taking in spectacular coastal scenery and a look at the new Portobello Marine Laboratory. The Flagstaff-Woodhaugh trip

involved a walk over Flagstaff Summit and discussions on management of urban reserves, the use of fire as a management tool, weed control, and the viability and recovery of small inner-city reserves. Both trips were well attended.

The Natural History Unit of TVNZ presented an enjoyable and informative evening programme about their views on natural history and how they attempt to communicate science and conservation to the general public. Afterwards there was free exchange of views on the strengths/weaknesses of natural history programmes on television, and ideas for consideration for new programmes.

The Organising Committee was: Bill Lee, Alan Graham, Peter Johnson, Alan Mark, Brian Patrick, Tony Perrett and Janice Stenning.

MANAGEMENT OF NEW ZEALAND'S NATURAL ESTATE- An Introduction

David A. Norton

School of Forestry, University of Canterbury, Private Bag, Christchurch.

As we move towards the 21st Century, New Zealand nature conservation needs to develop in three directions;

- 1) identification and protection of the remaining areas with important nature conservation values (primarily through the Protected Natural Areas and QEII National Trust programmes),
- 2) management of the multitude of protected areas we already have to ensure that the values they were protected for are not lost, and
- 3) restoration and recreation of modified or lost natural ecosystems, especially in the more developed parts of New Zealand.

These themes run through the symposium; they are not mutually exclusive and we should be working on all three together now.

If nature conservation in New Zealand is to continue to be successful, it needs to be soundly based scientifically. At the same time, it also needs to fully integrate the views of all interested groups (e.g. conservation managers, scientists, land owners and managers, the Maori people, and local community groups.) Furthermore, the long-term viability of nature conservation in New Zealand is likely to depend heavily on the increasing involvement of local community groups at the management as well as the preservation level.

PROTECTED NATURAL AREA DESIGN AND LOCATION IN NEW ZEALAND

Colin Ogle
Department of Conservation, Wanganui.

Have principles of reserve design been successfully applied to improve the system of New Zealand's mainland reserves, and how useful will they be in the future? Examples are given from the past work of New Zealand Forest Service reserves committees, the Protected Areas Scientific Advisory Committee, and other agencies. How valid and useful are the concepts of Ecological Regions and Districts to the Protected Natural Areas Programme? Is this programme merely improving our biological data bases or has it made significant improvements to the New Zealand reserve system?

RESERVE ESTABLISHMENT AND MANAGEMENT ON BRAIDED RIVERS: THE ASHLEY RIVER

Ken Hughey
Science and Research Directorate, Department of Conservation, Private Bag, Christchurch.

The braided Ashley River in North Canterbury is an "outstanding" habitat for birds. The threatened wrybill and black-fronted tern nest there. No braided rivers have been reserved but many meet criteria set under the Reserves Act (1980). Since 1985 I have promoted reservation of a 10 km section of riverbed near Rangiora. The riverbed is owned, and the water resources managed, by the North Canterbury Catchment Board. A long process of submissions, talks, meetings and lobbying took place as the NCCB prepared its catchment water and soil management plan. Only a major input from staff and students of Rangiora High School, who became involved in bird and allied studies in the area, finally persuaded the Board to action the proposal. In May the Board announced it was setting up a wildlife management area with a management committee to include DOC and other parties. This is not formal reservation but it is progress.

FARMLAND, BUSH REMNANTS AND RESERVE DESIGN FOR THE NORTH ISLAND BROWN KIWI: IS THERE A CONNECTION?

Murray Potter
Department of Botany and Zoology, Massey University.

Many North Island brown kiwi are now restricted to small 'islands' of bush and scrub separated by large tracts of developed farmland. Radio-telemetric home range data from the first sixteen months (September 1985 to December 1986) of an intensive field study of brown kiwi in Paerata Wildlife Management Reserve, Tangiteroria, Northland, are presented. The use of farmland and bush remnants by these kiwi is analysed. Individual birds varied in how far they were ever observed to walk in open pasture, with a maximum of 300 m being recorded. During these excursions the maximum distance between a kiwi and the nearest bush remnant ranged up to 150m, but for most kiwi was less than 50m. Nine of the 22 kiwi tracked made extensive use of bush remnants on farmland adjacent to the 201 ha reserve, and in several cases these remnants served as corridors between larger areas of bush. Only four of the 22 kiwi never used bush remnants outside the reserve. Size and vegetation type of the remnants is discussed. Guidelines for the future design of kiwi reserve, and ways in which existing habitat might be improved are outlined.

TUSSOCK GRASSLAND RESERVE DESIGN: SOME PRACTICAL CONSIDERATIONS

Katharine Dickinson
Conservation Commission of the Northern Territory, Darwin, N. T., Australia.
Alan Mark
Botany Department, University of Otago, Dunedin.

Historically, design of the few tussock grassland reserves has been constrained by individual situations, indifference of the bureaucracy and the lack of generally approved design criteria. Since 1983, the Protected Natural Area Programme (PNAP) has laid the foundation for an adequate representation of tussock grasslands among other ecosystems in the New Zealand reserves system. To retain integrity and long-term viability of reserves Recommended Areas for Protection (RAPs) ideally should embrace whole

catchments, include the range of altitudes, aspects, fertilities, etc., in proportion to their original extent, and be of adequate size (c. 1000 ha) and regular shape. The reliability of flora, vegetation and landform to adequately provide for other components of tussock grassland ecosystems that are less often surveyed, particularly soils and invertebrate fauna, requires further scientific assessment.

The subsequent phase of implementation may confront problems of owner-lessee attitudes and effects of large protected natural areas on the management and economics of individual properties. A system of first and second priority RAPs identified as part of the PNAP surveys are relevant in this context.

Research is inadequate as to minimum viable size for various tussock grassland ecosystems as an aid to assess the value of fragments of indigenous grassland which fall short of fulfilling design criteria.

As few if any tussock areas remain unmodified by human, particularly European, influences, decisions on the level of modification acceptable for recognition of an RAP are important and inevitably subjective. The PNAP recognition of pre-European as the relevant bench mark on which to base human impacts is accepted but evaluated.

Since apparently satisfactory RAPs are being identified on areas which have experienced more than a century of extensive pastoralism, arguments for continuation of existing management regimes, given the impracticability of perimeter fencing at higher altitudes, require consideration and evaluation. The principle of full protection for some areas must also be accepted but should be assessed initially with representative exclosures. This should also allay fears of uncontrolled weed growth, particularly at lower altitudes, among managers and some others.

Discussions and negotiations with the affected owner /lessee on implementation of RAPs should cover the full range of options except that QEII Trust covenants are inappropriate on pastoral leasehold land.

MANAGEMENT APPLICATIONS USING THE MacKENZIE PNA DATABASE

Peter Espie and Graeme Hall
Forestry Research Centre, P.O. Box 31-01, Ilam.

PNA surveys produce an immense quantity of ecological information. To be of use, after the initial

recommendation of priority areas for protection, this information must be organised into easily accessible databases.

Geographic information systems (GIS) merge computer database and mapping technology to provide a powerful resource management tool. Vegetation, fauna, geomorphic, edaphic and other ecological data collected during the MacKenzie PNA survey has been integrated into a micro-computer GIS System. Spatial location or geographic distribution of the data may be classified by ecological attribute (e.g. vegetation type) or analysed by combinations of ecological attributes (e.g. vegetation type by landform). Results may be mapped in two or three dimensions. This gives managers easy access to PNA information with powerful analytical capabilities.

MANAGEMENT OF LARGELY INTACT NATURAL AREAS

Ron Tindal
Department of Conservation, Stewart Island.

This paper will seek to discuss:

- 1) Why manage a natural area?
- 2) Manage species - area or system?
- 3) Problem of boundaries - do they exist?
- 4) Major influences on natural systems together with possible management approaches to limit detrimental effects.

Conclude by emphasizing the essentially long-term commitment of managers and support groups required to ensure maintenance of natural areas.

ERADICATION OR CONTROL BY SUSTAINED HARVESTS:

WHICH OPTION FOR THAR

(Hemitragus jemlahicus)

John Parkes
Forest Research Centre, Christchurch.

The merits of making policies about wild animals based on the real world (rather than on wishful thinking) and conducting management practices that match the policies are discussed. The effects of mismatched policy and practice often lead to too much effort where it is not needed and too little where it is, with consequent inefficient protection of the valued resources.

There are two potential positive policy options to manage Himalayan thar in NZ: eradication or sustained harvest control. DOC first must decide whether thar can be eradicated, then whether they should be eradicated, and then, if they should not or cannot be eradicated, what densities are acceptable in particular areas and who should harvest the herds to attain these densities.

This paper will discuss whether thar can be eradicated in the real world of thar biology, control techniques and costs.

STEWART ISLAND - A CASE STUDY FOR A MARINE PROTECTED AREA

Katherine Wallas
Department of Conservation, Wellington.

The marine environment of Stewart Island is regarded as pristine and unmodified. Patersons Inlet is important from a scientific point of view while the inlet, adjacent coast and islands are popular with the recreational public. Marine farming in the sheltered embayments of the inlet has been considered.

The Department of Conservation is pursuing the possibility of marine protected areas for Stewart Island. A general area was investigated which included Patersons Inlet, the adjacent coast and the offshore Muttonbird Islands. Rapid investigative techniques were used to gain preliminary information about the subtidal reef environment of this area.

Interesting changes in habitats occurred between the mid and outer sections of Patersons Inlet, the adjacent coast and the islands. Macrophytes occurred in high diversity and dominated the subtidal reefs in island, coastal and outer inlet areas. In the middle of the inlet, however, reefs were dominated by echinoderms. The studies of reef fish indicated that fish diversity was highest at the outer inlet and island sites. At mid inlet locations diversity was low while blue cod and spotty were numerically dominant. The densities of these species was low at the island sites.

The investigations indicated that, from a biological perspective, a marine protected area should incorporate the full range of marine habitats and associated species. Therefore, Patersons Inlet, the adjacent coast and the Muttonbird Islands should be considered in any proposal for a marine protected area.

NATIONAL PARK MANAGEMENT: MT ASPIRING NATIONAL PARK A CASE STUDY

Bill Hislop
Department of Conservation, Wanaka.

This case study will explore the role of commercial activities in Mount Aspiring National Park. It will look in particular at how current and proposed commercial activities match in with the primary nature conservation objectives of national parks.

SOME FACTORS TO CONSIDER IN THE MANAGEMENT OF SEMI- NATURAL AREAS

Brian Molloy
Botany Division, DSIR, Lincoln.

What we perceive as semi-natural areas occur over a large percentage of the New Zealand landscape. These areas support a wide range of relics and remnants of the past in various stages of modification: the treasured "museum pieces" if you like of the country's natural history.

In general, semi-natural areas support the largest concentrations of people and introduced plants and animals, and a high level of land use. Consequently, the element of change is uppermost and the struggle between "ours" and "theirs" is intense. In addition, the land involved is invariably held in freehold title requiring flexible attitudes from all parties concerned.

In my experience the acquisition and management of protected semi-natural areas are closely interwoven. Similar sets of questions need to be asked, and each case has to be treated on its own merits. In the process some well-worn beliefs and attitudes should be laid to rest.

REHABILITATION OF CUVIER ISLAND

Dick Veitch
Department of Conservation, Auckland.

170 ha Cuvier Island was used by pre-European Maoris as a hunting area, but apparently not lived on permanently. Early Europeans found a flora of typical coastal pohutukawa forest, and apparently intact forest avifauna and other fauna which has probably been modified by the introduced kiore. Goats were

introduced at the time of, or shortly before, the establishment of a lighthouse and lighthouse keepers' farm in the 1900's. Domestic cats became feral. North Island saddleback, red-crowned parakeet and pied tit were eradicated and other species reduced in number. During World War II a radar station was established. A principally pohutukawa canopy remained over three quarters of the island. Goats and cats were eradicated between 1958 and 1960. Regeneration of the forest understorey was rapid. Saddlebacks and parakeets have been successfully re-introduced. Lighthouse keepers left in 1982. Planting of 1000 pohutukawa seedlings on the previously farmed area will be undertaken in August 1988.

THE EFFECT OF REMOVING GRAZING PRESSURE ON GRASSLAND RESERVES: THREE CANTERBURY EXAMPLES

Colin D. Meurk^a, David A. Norton^b and
Janice M. Mattar^c

^a *Botany Division, D.S.I.R., Private Bag,
Christchurch.*

^b *School of Forestry, University of Canterbury,
Christchurch.*

^c *Department of Plant and Microbial Sciences,
University of Canterbury, Christchurch.*

Grazed and ungrazed silver tussock grassland on the Port Hills and *Rytidosperma*-bryophyte-lichen grassland on the Canterbury and Culverden Plains were studied. Removal of grazing resulted in an increase in the cover of naturalized plants, especially grasses (cocksfoot and sweet vernal), and a decrease in the number and/or cover of indigenous herbaceous species (including non-vascular species). The extent of change was greater at the higher rainfall sites and/or at the sites with the longer period since the cessation of grazing. It is suggested that controlled grazing is a desirable management technique for these grasslands where maximum indigenous species diversity is the objective, however, mowing or cutting may be preferable when highly palatable species are involved. Other conservation goals in these grasslands would require different management techniques.

HINEWAI - AN ECOLOGICAL RESTORATION PROJECT ON BANKS PENINSULA

Hugh D. Wilson
160 Salisbury Street, Christchurch.

The 109 ha Hinewai block, ranging from 620 m a.s.l. to 210 m, was purchased in September 1987 by private funding, the Maurice White Conservation Trust. Some 42% of the land is under native forest and scrub ranging from red beech forest through kanuka seral scrub and forest, mixed second-growth broadleaved forest, to small areas of podocarp/broadleaved forest. The remainder is pasture, pasture reverting rapidly to shrubland of gorse, broom and kanuka, and dense mature gorse scrub.

The management policy underway involves control of feral goats and possums, cessation of stock grazing, establishment of a walking track system for management purposes and for public use, and detailed scientific monitoring of vegetational and faunistic changes. Largely for purposes of co-operating with the local authorities noxious weed policies, there will be some planting of seral species propagated from locally collected seed, and in the case of a few paddocks, grazing of sheep will be continued for up to three years.

Further land adjacent to Hinewai is to be purchased when and if it is offered for sale, the long term aim being to restore native vegetation across as much as possible of the whole catchment. Re-introduction of locally extinct fauna is also contemplated.

Information already obtained on vegetational dynamics and the practicalities of management are discussed in this case study.

MANAGEMENT OF REMNANTS FOR THEIR INVERTEBRATE FAUNA

Kelly Duncan and Peter Johns
Department of Zoology, University of Canterbury.

Although invertebrates are relatively more important in the New Zealand biota than they are in most other biotas, too little is known of their taxonomy or their biogeography for general rules of management to be established. Recent taxonomic work indicates that only a small proportion of the invertebrate biota is known and our knowledge of the distribution and habitat requirements of the known species is very

incomplete. Therefore, the assessment of management practices must be on a case-by-case basis, with each reserve being considered individually. As a general rule, however care should be exercised over instituting management regimes which will radically alter the existing regime, even if these new regimes appear to be based on good ecological theory.

In future, research on the taxonomy and distribution of invertebrates must take a higher priority if their management is to ever be placed on a sound footing.

CRITICAL MINIMUM POPULATION SIZES IN MODIFIED HABITATS

David R. Given

Botany Division, DSIR, Private Bag, Christchurch.

Effective population size is an important element of population management, because of the intimate correlation assumed to exist between population size and genetic fitness. As a population is reduced by size it becomes more prone to both deterministic and stochastic effects which can lead to extinction.

It seems that there is no 'magic number' below which populations are doomed and above which they are safe. Rather, as effective size reduces, persistence times reduce and risk of extinction becomes greater. Many factors contribute to each situation, including breeding system, individual and meta-population structure, critical habitat conditions, genetic architecture and past genetic history.

Reduction of habitat areas, edge effects and patterns of patch dynamics in semi-natural areas, leads to reduced persistence times for many species. Long term maintenance of biodiversity requires decisive management, and not preservation (and loss) by default.

INTEGRATING ECOLOGICAL MANAGEMENT WITH OTHER LAND AND WATER USES:

a recreation and tourism perspective on conservation

Allan Rackham

Boffa Miskell Partners, P.O. Box 13-229, Christchurch.

This paper suggests that development and conservation are not mutually exclusive. In the past

decade the principles underlying conservation and development planning have converged.

Examples of the integration of recreation/tourism and conservation both in New Zealand and overseas are used to highlight the opportunities that can result from development. The reasons for successes and failures are analysed. It is suggested that many problems of integration are procedural, resulting from participant attitudes and perceptions, rather than the result of ecological incompatibility.

RECREATIONAL HUNTING AREAS - A THORN IN THE DEPARTMENT OF CONSERVATION'S SIDE?

Wayne Fraser

Forest Research Centre, Christchurch;

This paper briefly outlines the background of recreational hunting areas (RHAs): the legislation and status of RHAs, their locations, and the criteria on which RHAs are selected and managed - soil and water values, and vegetation condition. Past and present 'management' of RHAs has largely overlooked these aspects, however, and concentrated on regular attempts to survey animal numbers. To move towards a more ecologically balanced approach to RHA management, we must integrate information on the vegetation, animal numbers, and the hunter population. Systematic and regular monitoring of these three aspects is recommended as a better basis for management. Simple techniques are available to achieve these objectives, although a shift away from pellet surveys to monitoring hunter offtake would probably provide more reliable estimates of trends in deer numbers.

While acknowledging a potential conflict between hunting values and ecological values in some areas, RHAs represent an important resource for a substantial section of the population (as evidenced by the large numbers of hunting permits issued). In addition, control of deer numbers in RHAs and other areas by recreational hunters represents a significant saving in animal control costs (assuming that this money was, in fact, available). Therefore, RHAs should be seen as a valuable resource and managed accordingly.

HECTOR'S DOLPHIN: A CASE STUDY FOR INTEGRATING CONSERVATION AND FISHING

Elisabeth Slooten and Stephen Dawson
Zoology Department, Canterbury University, Christchurch.

Hector's dolphin is a small coastal dolphin that is found only in New Zealand. In the Pegasus Bay/Canterbury Bight area, over 30% of the estimated number of dolphins present in 1984 have since been killed in commercial and amateur setnets.

New data show that Hector's dolphin has an extremely low reproductive rate and is vulnerable to disturbance. Females reach maturity at around seven years, and may have at most one calf every two years. Maximum life expectancy appears to be around 18 years.

The seasonal and geographical distribution of these captures is such that it is possible to achieve protection of the dolphins without significant impact on the activities of commercial fishers. A conservation strategy to achieve these aims is discussed.

OTAGO PENINSULA: INTEGRATING CONSERVATION AND TOURISM

Chris Stewart and Robin Thomas
Department of Conservation, Dunedin.

On the Otago Peninsula and specifically on Taioroa Head the integration of the conservation of species and habitats with domestic and international tourism pressures is a complex matter. There is no easy integration of the divergent uses; and managers whether they be conservation or tourism managers, have to take into account the effects of one upon the other.

Land status is of critical importance in determining the ability to integrate tourism development and conservation requirements. Nature reserve or wildlife sanctuary status requires a high level of protective management. Any possibility of an adverse effect by development must be looked at very closely by the conservation managers. The onus must be on the developers to convince the guardians of the land and the species that there will be no adverse effect by the development or tourist operation.

Often total preservation of land and species and tourism operations will not be in any way compatible. The Department of Conservation's role is to be primarily the advocate for conservation and DOC must adapt a protection ethic. Integration of protection and tourism development then becomes a political matter.

CONSERVATION OF NZ FOREST BIRDS - THE NEXT DECADE

M.N. Clout
Ecology Division, DSIR, Nelson.

In the past decade the attention of conservation managers has focused on the salvation of endangered species of forest birds by marooning on predator-free islands. On the mainland, the cause of saving native forests has been the predominant concern of the conservation movement.

Over the next decade attention will focus increasingly on conservation on the mainland and the species of forest birds which remain there. A range of issues is already apparent, including restoration of mainland habitats, landscape planning for bird conservation, control of introduced competitors and predators of birds, and possible resumption of traditional hunting of some native birds. To enable conservation managers to deal with those and other issues more detailed ecological research on native birds will be necessary.

BIOLOGICAL CONTROL OF VESPULID WASPS AND OTHER WIDESPREAD PESTS OF NEW ZEALAND BIOTA

H. Moller
Ecology Division, DSIR, Nelson.

The desirability of attempting biological control of widespread pests of the New Zealand biota is discussed. Some of the potential problems and exciting prospects are illustrated by an examination of the current attempt at biological control of German (*Vespula germanica*) and common (*V. vulgaris*) wasps.

PROBLEMS IN PEST CONTROL: THE LESSONS OF PITT AND CHA THAM ISLANDS

G.T. Jane

Department of Conservation, Private Bag, Nelson.

The Chatham Islands pose a number of unique and complex problems in wild animal control. Possums, pigs, feral and domestic sheep, cats, rats, wekas and above all, people, threaten the rare and unique plants and animals.

The climate is severe with strong winds, frequent fogs and low rainfall. Although small, the islands contain a very diverse geology including limestones, schists and volcanic rocks, all of which affect plant distributions.

The fragmented nature of the remaining forest stands means that determining former vegetation pattern is difficult. This problem is further compounded by the severe browsing and its prolonged impact in the majority of stands. Destruction of shrubby vegetation upwind of tall stands by introduced animals leads to windblast damage to the remaining stand and the inevitable decline of the whole forest.

Control of domestic stock is gradually being achieved but removal of wild sheep presents problems in timing. There are also problems because of the genetic value of the resource.

Recovery of the vegetative cover is often rapid but return of the former predominant communities will be slow. In a few areas replantings will be used to assist the return of native fauna and flora. In some areas maintenance of a low level of browsing may be necessary to achieve other project objectives.

FOOD AVAILABILITY AND THE TIMING OF BREEDING IN SNARES ISLAND SNIPE

Colin M. Miskelly

Department of Zoology, University of Canterbury.

Breeding of New Zealand Snipe (*Coenocorypha aucklandica*) in relation to food supply was studied intensively on the Snares Islands over two breeding seasons, and the start of a third. About 20 territories were mapped each year by plotting sightings of colour-branded snipe, using a 20 m grid within the 7.5 ha study area. Areas of the 7 predominant ground covers within each territory were calculated by

assessing ground cover within each 400 m² grid square. Weekly food abundance (kJ/m²) in each ground cover was measured by soil sampling and bomb calorimetry. Cost of food extraction by snipe was calculated by measuring soil compaction (kg/cm³) in each ground cover each week, then converting this value to the energy (kJ) required to intensively probe 1 m². Egg-laying dates for 38 first breeding attempts were spread over about 10.5 weeks each breeding season. Snipe commenced breeding earlier when November prey abundance was high. Peaks in energy availability (abundance minus cost of extraction) within each territory will be compared with laying and hatching dates to determine whether snipe raise their young when prey were most easily obtained.

RECRUITMENT IN TUATARA

M.E. McIntyre

School of Biological Sciences, Victoria University, Wellington.

Some appreciation of recruitment processes in tuatara, *Sphenodon punctatus* (Reptilia:Rhynchocephalia) and the habitat requirements of small juveniles is essential to the long-term management of surviving natural populations. It is also important that this information be acquired while a large and relatively secure breeding population, such as the one on Stephens Island, still exists.

A survey of juvenile habitats and dispersion on Stephens Island in the summer of 1987-88 has provided input to DOC plans for revegetating the island, and a framework for the census of juveniles <140 mm snout-vent. This work utilized a unique opportunity arising in December 1987, when tuatara nests located 12 months earlier by Dr M.B. Thompson (VUW) to monitor incubation conditions, became available to monitor hatching. It was also an ideal chance to intercept hatchlings and examine dispersal movements, since both the nests and the hatchlings are otherwise very difficult to locate. A number of these juveniles were tracked individually using cotton thread attached to the tail, or by radiotelemetry using miniaturized transmitters implanted in the body cavity.

Tracking data combined with population counts and meteorological records, provide guidelines for management of the habitat, and appropriate timing and methods for census. Information on clutch sizes and egg mortality, (MEM & Dr M. Thompson, VUW) in conjunction with new understanding of female

reproductive cycles (Dr A. Cree, VUW), and of habitat quality in relation to population densities (Dr J. Gillingham, CMU), provides a basis to estimate annual production and compare this with field data. A modelling approach is necessary to estimate survival beyond 4-5 months when the hatchlings start to burrow, since part of the population (depending on time of year and weather) then becomes "hidden" underground.

FRUIT FEATURES IN RELATION TO SPECIES ECOLOGY IN THE GENUS *COPROSMA*

Bill Lee

Botany Division, DSJR, Dunedin.

Until now studies attempting to find ecological correlations between fruit features, dispersal and species ecology have had very limited success, partly because of the many constraints that limit interdependence between plants and animals. Previous analyses have utilized a range of plant species from different genera and families. In an attempt to control for phylogeny, I have focused on the genus *Coprosma*, which comprises nearly 20% of the fleshy-fruit producing species in the New Zealand vascular flora. Results suggest that fruit features such as colour, flesh quality and quantity, flesh/seed dry weight ratio and seed weight are significantly related to aspects of the species' ecology. In some cases fruit features may reflect different guilds of vertebrate dispersers.

SAND, SALT, NATIVES AND NEOPHYTES

M.T. Sykes

Botany Department, University of Otago, Dunedin.

Environmental conditions are one of the main controls on the number of niches available in any community. Sand dunes are often unstable and infertile and some authors suggest this may lead to fewer niches, while others suggest it will lead to more. Two types of niche are measured, the realised or field niche - the n -dimensional hyperspace a species actually occupies, and the fundamental or experimental niche - the n -dimensional hyperspace the species could survive in.

Realised niche (Beta-niche) breadths and overlaps are measured along a strong environmental gradient through some New Zealand dune systems. Some

theories suggest that in such areas of instability and uncertainty niches are likely to be broad. Native and neophyte species are examined in this respect.

Autecological responses to the environment are used as dimensions of a species fundamental niche. A number of species have been examined experimentally and their responses to different salinity and sand burial regimes are used as individual dimensions of the species niche.

Correlation between realised and fundamental niche parameters of some New Zealand species are made.

ISLAND BIOGEOGRAPHY AT LAKE MANAPOURI - THEORY AND PRACTICE

Ray Tangney

Botany Department, University of Otago.

Explanations for the island species-area effect are discussed. The equilibrium theory of island biogeography is outlined and discussed in reference to three separate studies of island biogeography on the islands at Lake Manapouri.

The Lake Manapouri studies, based on both vascular plants and bryophytes, using fixed and variable sized plots show little evidence to support the equilibrium theory and it is concluded that habitat diversity offers a better explanation for observed island species richness.

The method of sampling is considered to be important in testing the various explanations for the island species-area effect.

The application of the equilibrium theory to reserve design is discussed. It is concluded that conservation of habitat is important rather than a particular area or shape as such. Individual species ecology is important in considering reserve design for endangered species.

GRAZING AND MANAGEMENT OF NATURAL AREAS: REINTRODUCING AN INDIGENOUS FACTOR?

P. Wardle

Botany Division, DSJR, Christchurch.

The "moas and divaricating plants" hypothesis presented the first scientific challenge to the views that

native vegetation had evolved in the absence of large herbivores. The present paper presents three situations where apparent ecological imbalance in natural vegetation may be related to the collapse of indigenous herbivores. First, it is noted that the "podocarp regeneration gap" is most evident on fertile soils supporting dense undergrowth, and that grazing may lead to vigorous podocarp regeneration. Secondly, attention is drawn to the floristic identity of Tasmanian "marsupial lawns" to New Zealand communities occupying areas with fluctuating water levels. Thirdly, it is pointed out that removal of grazing animals from grasslands, swamps and forest margins often leads to rampant growth of adventive grasses and weeds. It is therefore suggested that research and management should be flexible enough to consider that grazing may have positive roles in conservation.

INTEGRATING ECOLOGICAL INFORMATION: A FIRST STEP IN INTEGRATING ECOLOGICAL MANAGEMENT

M. Harrison

Department of Conservation, Wellington.

The proper management of any part of New Zealand's estate requires that information from a wide range of scientific and other disciplines be taken into consideration. The identification of information with a potential contribution to any management process currently involves extensive literature searches under numerous and often obscure or seemingly unrelated topics. Such a search has little to guarantee that it is truly comprehensive.

A system of geographically based references is proposed to enable estate managers to reference all relevant information from all disciplines.

MANAGEMENT OF WILDLIFE FOR DISEASE CONTROL IN NATURAL AREAS

J. Hone

School of Applied Science, Canberra College of Advanced Education, P.O. Box 1, Belconnen, A.C.T.

The aims of wildlife management for disease control in natural areas are disease oriented - eradication or control to acceptable levels, but this must be achieved with minimal effects on natural area values. To achieve the aims may involve manipulating wildlife abundance, disease transmission or host susceptibility. The attainment of management aims can be by empirical study and modelling of disease processes. A combination of the two is described for two host-disease situations; tuberculosis in brushtail possums and foot and mouth disease in feral pigs. Each situation arises from spill-over effects onto surrounding agricultural land, associated with the economic importance of the diseases. A mathematical modelling of each disease predicts a threshold host density below which the pathogen will become extinct naturally. The threshold density of brushtail possums could be very low suggesting that possum population control to eradicate or control tuberculosis may be difficult. The threshold density of feral pigs may be higher, associated with disease differences, and the management aims may be easier to achieve.

STABILITY AND CHANGE IN A POPULATION OF BRUSHTAIL POSSUMS: 22 YEARS OF MONITORING IN THE ORONGORONGO VALLEY

Murray Efford

Ecology Division, DSIR, Wellington.

Ecology Division has live-trapped possums in the lowland forest of the Orongorongo Valley near Wellington since 1966. Although possum population to modify their habitat by killing trees of palatable species, their average density and breeding performance have not declined significantly. Age structure, sex ratio, breeding rate and mortality have all varied substantially from year to year. Knowledge of how one population 'works' on a long time scale constrains the interpretation of shorter-term comparative studies.

IMPACT OF LARGE SCALE POSSUM CONTROL FOR TB ON NORTH ISLAND KOKAKO POPULATIONS

John Innes
Forest Research Institute, Rotorua.

Large scale possum control operations - mostly using 1080 poison - in the central North Island should be good for kokako since the possum is potentially a serious competitor for food. But obviously this is true only if no or few kokako are themselves killed during the operation.

After a phase of research with non-toxic baits, we have monitored the survival of a total of 76 kokako through 7 1080 operations in 3 years. Two kokako disappeared during operations in a way so as to conform with criteria we established for accepting death by poisoning, although no corpses were found. The predicted mortality in future operations is 2.6% (95% confidence limits 0.32% - 9.34%).

The likely benefit to kokako from the possum control is unknown.

The survival of 40-50 kokako through a cyanide/gin trapping operation is also being monitored this winter. Results may be available by the time of this Conference.