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EDITORIAL

This issue contains a strong response to Prof. Moller's position in the indigenous management of wildlife debate. I hope more people will contribute - especially those who can speak for the tangata whenua.

In a related area the Conservation Authority has just produced a discussion paper on Cultural Harvesting - if you want a copy you may contact the New Zealand Conservation Authority, P O Box 10 420, Wellington.

This issue also contains two long reports. One which reports on a seminar on the Antarctic Icesheet, and the other – oddly enough, also about the deep south – is an important Social Science study.

I would appreciate some comment on whether these pieces are too long! Should we only print reports that can be encompassed in five hundred words? There is an "old spouses tale" to the effect that people will not read articles longer than one page. Is this your response?

Keep those cards and letters coming.

K. Green
Editor

Department of Conservation
Te Papa Atawhai

LETTERS TO THE EDITOR

Management and control

The debate on sustainable management of wildlife and indigenous control and management is really about two separate issues. One has to do with how sustainable management is to be achieved, the second with the extent to which indigenous rights are to be accommodated. If indigenous rights are mixed into a discussion of sustainable management then the debate tends to be sidetracked. This is because the labels which are used have great symbolic value and people will argue endlessly over them. Saying that something is "indigenous", "customary" or "traditional" is not, however, particularly helpful. The labels are simply not relevant when usefulness is being assessed. There is, regrettably, a large ideological component in the debate on sustainable management.

An anthropologist recently noted that the way in which indigenous peoples describe their own cultural traditions increasingly draw on Western ideologies which celebrate community, egalitarianism, spirituality, and ecological wisdom. This idealised and romanticised cultural tradition is then counterpoised to an equally caricatured representation of Western culture which is said to be marked by individualism, competition, materialism, and ecological destructiveness. It is difficult to take these stereotypes seriously yet they are constantly employed.

The irony is that if an idea or method is favoured simply because it comes with a currently approved label ("indigenous"), then people may be encouraged to package substandard products that way to avoid scrutiny. Silly ideas sometimes come labelled as "scientific" to try and disguise their actual lack of merit: now a sponsor is as likely to promote them as "indigenous" or "Maori". A debate on sustainable management should try and ignore the labels and concentrate on assessing the usefulness of the ideas and the methods put forward.

Tony Walton
S&R Division, Tory Street

New Programme to support Maori Conservation Initiatives

A new programme to support Maori conservation initiatives gets under way in March with the funding of "tikanga atawhai" projects.

Up to $100,000 has been set aside in this financial year to support projects undertaken by iwi to keep alive traditional techniques of maintaining the environment.

A decision on applications received will be made in early March. Project proposals range from restoration of wildlife habitats to management of natural resources.

The projects are due to be completed by June this year. A further $120,000 is budgeted for the next financial year.

REPORTING BACK

Nature Conservation: the Role of Networks

Denis Saunders and John Craig attended a conference held in Geraldton, Western Australia between 16-20 May 1994.

Over 200 conservation biologists, ecologists, managers, landowners and private citizens from 14 countries met to explore the themes that networks of people are our conservation force and networks of other organisms are our conservation resource. Ninety four oral and 25 poster papers were presented at the conference. The major conclusions were that there was a need for greater trust between professional and government agencies, scientists, community groups, landowners and individuals and a greater involvement of indigenous peoples in tackling nature conservation problems.

In most parts of the world, government agencies have the primary responsibility for conservation of native fauna and flora. However, these agencies do not have the resources to meet their objectives let alone the full demands of the public. The loss of species and the continuing decline in ecosystem functioning is receiving increased attention from the media, the public and through legislation. If nature conservation is to succeed, conservation agencies need to work with and among communities. However, community effort must never be used simply as a substitute for government action.

If government and other agencies and community groups are to work successfully together, it is necessary to recognise that communities are not a cheap labour force to be exploited or used by such agencies. Instead communities are an essential component and must be treated as equal partners in development of policy, objectives and management, if effective conservation is to be achieved. Active and equal involvement produces understanding and commitment whereas education and talking is easily forgotten. It is necessary to identify all the stakeholders in nature conservation, establish their values and needs, and then design programmes with them rather than for them.

Conference delegates were welcomed by the local Yamatji Aboriginal people - a first for an Australian conservation conference. Papers were presented which gave examples of the participation of indigenous peoples in nature conservation in Australia, Costa Rica, New Zealand, Pakistan, Saudi Arabia, Tanzania, and Uganda. The conference recommended that partnership with indigenous people at all levels of planning and action is essential for conservation successes. Indigenous people typically have a strong feeling of place that engenders responsibility and identity - important components for the development of sustainable, long term nature conservation practices. There is also a strong cultural basis for conservation activities which cannot be ignored.

Also present at the conference were 10 High School students from Perth and Geraldton (Western Australia). They made a plea on behalf of their future for plainer language so that more people can understand the issues and hence become involved and active in conservation. They provided a model for networking schools into nature conservation.

The proceedings of the conference will provide a wide range of views and many successful examples of

networking people and nature to achieve greater conservation. This will be published in 1995 as the fourth in Surrey Beatty and Sons (Chipping Norton, New South Wales) Nature Conservation series under the title of "Nature Conservation: the Role of Networks". A short summary booklet will also be made widely available.

Denis A. Saunders and John L. Craig*
CSIRO Wildlife & Ecology, Western Australia 6056, and *Tamaki Campus, University of Auckland.

DoC was represented at this conference by Susan Timmins. Next issue we will have a report on how she saw the Conference papers.

How stable is the Antarctic Icesheet?

Nina Swift attended a seminar presented by James Kennett, Professor of Oceanography, and Director at the Marine Sciences Institute ,University of California, Santa Barbara, 10 May 1994. The seminar presented an historical perspective (Pliocene to the present) on global warming and its effect on the Antarctic ice sheets.

Background

Professor Kennett is a marine geologist, a paleo-oceanographer, and his main interest is in reconstructing past climates, using the marine stratigraphic record. For his talk he used Antarctic climate as a framework for considering concern about global warming, the possible effects of deglaciation or partial deglaciation of the Antarctic icesheets.

Antarctica is covered by two great icesheets, the West Antarctic Icesheet and the East Antarctic Icesheet. The East Antarctic Icesheet, continental based, is up to 5000 m in thickness and is the most massive on earth. This icesheet has accumulated enormous amounts of ice and if melted sea level rise would be about 65 m. The west sheet is a marine based sheet and is mostly below sea level. The two sheets have fundamentally different histories.

Gathering the data

Dynamic Positioning Prof. Kennett has been involved for some time with a multinational ocean drilling programme, the Ocean Drilling Program which is the largest multinational integrated earth science project yet undertaken. The fundamental basis of ocean drilling is "dynamic positioning" of the ship over the target location, which enables the ship to remain on the drill site in one exact location, if necessary for months. This is achieved through triangulating its position with the aid of ocean floor beacons, which keeps the ship exactly on location, despite the buffeting of ocean swells and currents and the winds.

Oxygen Isotopes Prof. Kennett runs a mass spectrometry laboratory in Santa Barbara, and has examined a great many samples of calcareous fossils for their $^{18}O/^{16}O$ ratios. These values tell us indirectly about paleotemperature change in oceans and about the development of ice accumulation in polar regions. This because the oceanic composition of the oxygen isotope ratio changes when ice accumulates on continents. There is a fractionation effect: the lighter isotope, ^{16}O is preferentially evaporated from the oceans and precipitated on land as ice. Thus oceans become enriched in the heavy isotope. Two major effects can be observed in sequences of preserved

marine carbonates - changes in temperature, and changes in ice volume. Increase in the ä$^{18}O/^{16}O$ ratio can reflect changes in both ice volume and temperature, difficult to differentiate, but both in the same direction. The isotopes give a generalized view of global climatic change and are useful in constraining models of paleotemperatures using other methods - it is a very powerful approach.

Factors in Formation of the cryosphere

Tectonics and the Antarctic Circumpolar Current Formation
Prof. Kennett suggested that tectonics have been fundamental in controlling and directing environmental changes. In the high latitudes over the last 100 million years these have been the driving forces in paleoclimatic evolution. Reconstructions of the breakup and redistribution of Gondwanaland components away from Antarctica have been made by Larry Lauver and colleagues. Since the late Cretaceous, seaways have formed, and continental dispersal and opening of the oceans took place during the Cenozoic Era, i.e. the last 65 million years. A reconstruction of the early Oligocene, 36 m.y. ago shows that a protocircumantarctic current had formed, although the South American seaway was not quite opened. The effect was to begin to thermally isolate the continent from the great ocean gyres, especially the warm sub-tropical gyres. Anticlockwise in the southern hemisphere, previously the gyres had pumped warm water to the Antarctic continent keeping it warm. The new circumpolar currents beginning to surround Antarctica were highly effective in leading to increasing thermal isolation. This in turn led to a succession of events in cryospheric development which culminated in formation of the major icesheets in Antarctica. The Antarctic circumpolar is a very massive current. Bound to the north by the Polar Front or Antarctic Convergence, it separates colder, nearly freezing water to the south from relatively warmer waters to the north. Once established this system played a fundamental role in the evolution of the cryosphere. By the early Miocene, 20 million years ago, a continuous circumpolar current had formed. By 10 million years ago, the late Miocene, conditions were quite similar to the present. One of principal events of the Cenozoic was the geographic isolation of Antarctica and its climatic refrigeration due to isolation through its self-contained Antarctic circumpolar current.

Climate Evolution Next, after considering tectonic and circulatory evolution. Prof. Kennett considered climate evolution. Data for this comes from marine sediment cores taken from around Antarctica. Some cores contain **pollen and spore assemblages** derived from vegetation which existed on Antarctica during mid to late Eocene Epochs. The forest and forest undergrowth types were temperate, dominated by *Nothofagus* species. They had disappeared by 30 million years ago, during the Oligocene.

One sedimentary sequence from the Weddell Sea has enabled a detailed climate evolution to be constructed. The sequence dates from 70 million years ago, the late Cretaceous Period, to the present. In this sequence calcareous fossils dominate until about 25 million years ago, when a gradual changeover commences, to biosiliceous planktonic organisms, mostly diatoms and radiolaria. Severe cooling toward the present day system can be inferred. It is well known that the upwelling of cold nutrient-rich deep waters around

Antarctica has created the most biologically productive ocean with its array of trophic hierarchies at the basis of which is the strong diatom production. A salient point to emerge here is this biologic development would be dependent on development of this upwelling state. At 25-30 million years ago Antarctica had not cooled sufficiently, the cryosphere had not developed into its present state, and the winds were much weaker. With the development of an increased meridional temperature gradient between the polar and equatorial regions strong winds formed, which induced this biologically important upwelling.

The cooling of the polar regions and the development of the cryosphere has led to the formation of very cold bottom waters, Antarctic Bottom Water and Antarctic Intermediate Water. These high latitude waters are responsible for the bulk of the oceans having temperatures close to 1°C, and the overall cooling of ocean basin water during the Cenozoic. Further geological evidence for stability of the system is that the Polar Front has not migrated south very far for many millions of years. Geologic migrations of the Front are easily recognised because it marks the boundary between the colder diatomaceous sediments to the south and the calcareous sediments to the north.

Evidence for stability

What does the terrestrial evidence tell us about the stability of the cryospheric system ? Well documented evidence of indigenous pollen and spores in marine sediment cores, show none coming from Antarctica after the Oligocene Epoch. The absence of Neogene pollen and spores in these drilling cores reflects the demise of continental vegetation during the middle Cenozoic Era in response to the developing Antarctic cryosphere.

Further evidence of stability comes from the glacial modelling work of the Belgian worker Philippe Huybrechts who suggests the following air temperature changes at sea level as guides to melting of the Antarctic icesheets:

* up to 5°C - no effect at all,
* > 5°C - the West Antarctic Icesheet begins to melt, no effect on East Antarctic Icesheet,
* > 15°C - the East Antarctic Icesheet begins to melt.

Prof. Kennett points out these temperature increases are very large, even a 2°C warming is a very significant increase in the Antarctic, not to mention any of a 5-10°C average warming.

Peter Barrett and colleagues proposed that during the Pliocene Epoch a major deglaciation occurred of the East Antarctic Icesheet. If correct, this is of major concern. David Modell and Cathy Venz measured the oxygen isotopes in South Atlantic subantarctic cores containing planktonic and benthic foraminifera. They found that ^{18}O decreased during the early Pliocene only, to a level of 0.5 per ml to 0.6 per ml. This amount of change is insufficient to accommodate both much warming of the Southern Ocean and melting of the Antarctic icesheet.

Sealevel Rise

Prof. Kennett summarised a range of estimates for the early Pliocene sealevel rise put forward by various scientists working in the field.

* The most extreme - a high stand of 65 m from indirect methods by sequence stratigraphy, (B. Haq and others).

* Enewenek Atoll - high stand of 29-36 m

Terrace elevations at U.S. Coastal Plains estimates: 29-36 m

* A second U.S. Coastal Plains estimate: - 35±18 m

Kennett does not believe that estimates of very high stands of sea level are supported by the oxygen isotopic evidence. Rather the evidence is for a maximum 2°C rise allowing a rise of up to 65 m for brief intervals during the early Pliocene. The geologic evidence constrains a rise to much less than 65 m

Turning to the icesheets, he believes there is no compelling evidence for any important deglaciation of the Eastern Antarctic icesheet for many millions of years. But the West Antarctic Icesheet, being marine-based is more vulnerable, with a greater potential for destabilization, perhaps a 5 m sea level rise. The question then is what does the geochemical record say about stability? He mentioned two lines of evidence which suggest that the West Antarctic Icesheet was also possibly relatively stable during the warmer Pliocene, (3 to 5 million years ago). The first line comes from study of ice-rafted sediments in the subantarctic South Atlantic by Dietz Warnke. Icebergs travelling north from the Antarctic carry a load of continental detritus with them. Stratigraphic study of the berg deposits is a useful indicator of the size of the cryosphere.

It's well known that initiation of ice-rafted debris off West Antarctica began about 6 million years ago, and this has been a traditional marker for interpreting development of the West Antarctic Icesheet, which, requiring colder conditions formed later than the East Antarctic Icesheet. He argues that with significant deglaciation of the West Antarctic Icesheet we should see the deposition of ice-rafted detritus cease, but this is not the case. Other sites also show no important decrease in the deposition of ice-rafted detritus. This suggests, indirectly that the West Antarctic Icesheet remained relatively stable during the Pliocene warming.

The other line of evidence comes from study of sequences of sediment deposits in the abyssal plains of the Weddell Sea 5000 m below sea level. These basins, lying off Antarctica, which until about 5 million years ago received enormous amounts of turbidity current sediments. He believes this represents a final major development in the cryosphere - the continent has become armoured by its icesheet and has starved the surrounding ocean basins of erosional produced sediments. The present geologic evidence suggests that Antarctica has gone through a sequence of changes leading to increased cooling and ice accumulation over 10's of millions of years. This is associated with the developing isolation of Antarctica by the Antarctic circumpolar current. Once the cryosphere and climate system pass a certain threshold to a colder state, it is unusual, from the geologic record, to observe any reversal to prior warmer states.

Modelling work by G. de Q. Robin, Cambridge, England suggests that once the cryosphere has jumped to this new state much warmer conditions are required to reverse them. This is because of the feedback mechanisms that develop, and operate to increase the cryogenic state. These include albedo feedback, or heat reflectivity off the icesheet, the cooling and thermal inertia of cold waters, and the development of extremely cold deep waters. Deep waters of the oceans are produced largely in the Antarctic. The extreme

cold and high density of these water masses function as huge "heat sinks", transferring the small amount of heat away from the continent into the vastness of the deep ocean. These feedback mechanisms function to maintain the Antarctica as a relatively stable climate system.

To conclude, in spite of the recent anthropogenic warming Dr Kennett does not believe that there is any compelling geologic evidence for short-term destabilizion of the Antarctic cryosphere system. He believes this is a very stable, robust system. He believes however that questions of destabilization need to be asked about the Greenland Icesheet. Study of its geological evolution, Pliocene development, and much greater potential for destabilization are very important. Deglaciation of the Greenland icesheet could lead to a 7.4 m sea level rise.

Nina Swift
S&R Division, Tory Street

NOTES AND NEWS

UPDATE: The Incidence of Sudden Decline in Cabbage Trees

1. The Sudden Decline epidemic is still active in Northland and is most severe in the west, where formerly it was less pronounced.
2. It is still occurring in Auckland City but here and Waikato there are much fewer cabbage trees than 5 years ago, so that S.D is less noticeable.
3. In Bay of Plenty, the incidence has declined and there is reason for cautious optimism. Some sick trees are reported to have recovered, but this should be confirmed.
4. The southern limit of the S.D range has not extended and new instances are very rare in Wellington, Wairarapa and Nelson/ Marlborough (S.D never really became epidemic in these regions).
5. Overall, therefore, there has been a concentration of new cases of S.D. in the far north and a contraction (at least temporarily) from the south. But there are fewer trees for S.D to influence in central regions. Those remaining may exhibit a level of resistance, but fluctuating incidence is compatible with epidemiology.
6. The best conclusion is that S.D is continuing, but its range may be contracting.

Philip Simpson
S&R Division, Tory Street

RESEARCH IN PROGRESS

Before . . . and after! Visitors to Sub-Antarctic Islands

Excerpts from Gordon Cessford and Paul Dingwall's report: Tourism of New Zealand's Sub-Antarctic Islands. . . *There is considerable mutual benefit to be gained by tour operators, tourist visitors, science managers, and the regulating authorities alike in better understanding the tourism opportunities available, and the attitudes of the tourists themselves.*

This study is a first step in achieving such understanding for the New Zealand sub-Antarctic Islands. It was developed as part of a broader Department of Conservation visitor monitoring program for the Sub-Antarctic islands of New Zealand. While these islands are managed as nature reserves for the principal purpose of nature protection, tourism, conducted under appropriate constraints, is regarded as a legitimate and compatible use of the reserves. There are several key elements to the comprehensive tourism regulations covering these islands: legally binding management plans govern the management of the reserves; permits are required to authorize all visits (maximum of 600 visits per year); permit conditions control the numbers of visits, the location of permitted and prohibited landing sites, the activities allowed, and the maximum guide/client ration (1:20); supervision of permits is provided by the requirement that each ship carries an official management representatives; minimum impact codes are applied, with rules against smoking, littering, taking souvenirs, collection of specimens, overnight stays onshore, and disturbance of wildlife; quarantine regulations are imposed to prevent the accidental spread of animal predators (especially rodents) and plant invaders; boardwalk construction protects fragile vegetation and soils, and some interpretive signs are provided as part of an educational program.

Within the overall management strategy for the islands, a two-part visitor survey and monitoring program has been established. The first part is to monitor the physical impacts of tourism on the islands and their ecology. The second part is to investigate the characteristics of the tourists and their visits. The second part is the subject of this paper. It is based upon a survey of ship-borne passengers on selected Antarctic cruises that included visits to Sub-Antarctic islands in their itinerary.

The principal objectives of this survey were to initiate collection of visitor data as part of an ongoing visitor monitoring program; provide descriptive information about visitor characteristics; describe visitor trip motivation and expectations; determine visitor satisfaction and their achievement of expectations; identify their impact perceptions and their attitudes to management practices; and provide a basis for revised future surveys and international research cooperation.

Pre-visit and post-visit questionnaires were constructed, and were administered on-board to passengers by the official representative of the Department of Conservation. This methodology allowed comparison of passenger perceptions of the islands and their management both before and after their visits. This added to the descriptive visitor profiles and impact perception information also being gathered. The questionnaires

were brief, but designed for open-ended responses.

Conclusions

The profile of ship-borne Antarctic and Sub-Antarctic tourists provided by the findings reinforces previous casual observations of other participants and researchers. Most tourists are in older age groups, are most often American, are from professional backgrounds (or retired), and include a high proportion of women relative to other outdoor pursuits. The relatively "passive" style of cruise-ship travel and its expense would appear to be key factors in determining this type of socio-demographic profile. However, should developments in travel options occur, such as cheaper charters of ex-Soviet ships, the lower prices resulting may open cruise opportunities for younger and less affluent tourists. This may be significant not only for the added numbers it would represent, but also for the different types of tourism activities it might encourage. Confinement to the comfort of the ship, its highly programmed and directed activities, and a highly regulated onshore setting for visits may be less appealing to a more adventurous and fit younger tourist. This may bring added pressure on managers from those tour operators who might desire new access and facility arrangements in response to a more diversified market demand.

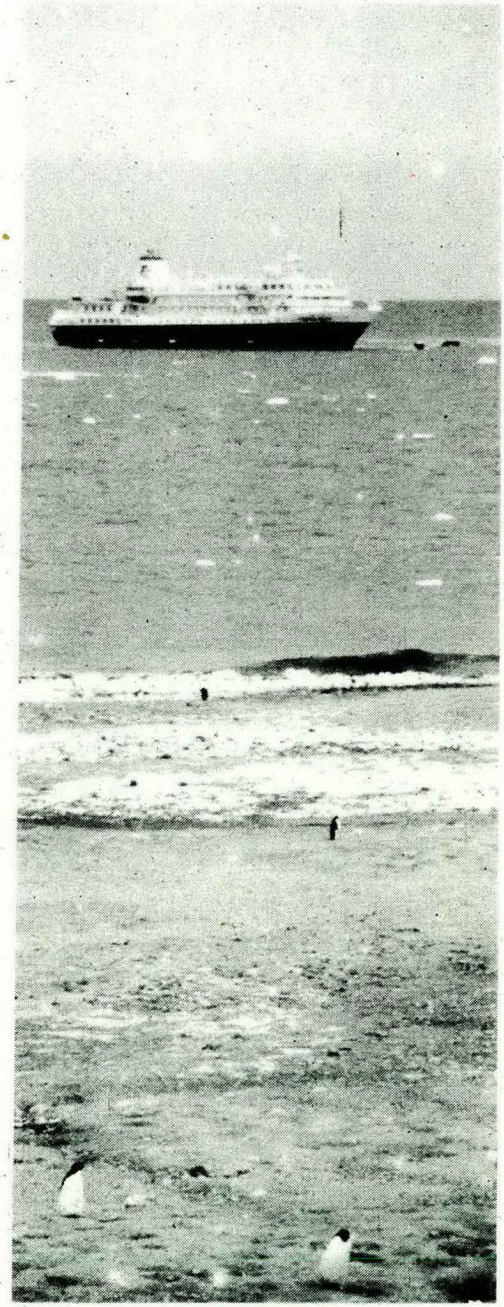
Currently, for ship-borne tourists this market demand appears to be largely met by the opportunities provided. Overall satisfaction with visits appears to be high, and the positive experience outcomes reported by tourists emphasize the value attributed to unique wildlife and "wilderness" characteristics of the islands. An obvious management implication of this is that activities, impacts, facilities, or other developments that compromise the perception of a "pristine" state could diminish the values attributed to these islands by visitors. Factors that could affect these perceptions may include conspicuous scientific impacts such as tagging of wildlife, establishment of sample plots, and siting of instruments; the simultaneous presence of other ships and visitor groups; the development of onshore facilities for protection, information, or visitor convenience; and other evidence of visitor impacts such as litter, vegetation damage, and soil trampling. This is a useful finding for managers because low-impact management obviously receives support and justification from the needs of the tourists, in addition to its recognized importance on ecological and scientific grounds.

However, there were some aspects of the trips with which tourists felt dissatisfied on the basis of their experiences. These could potentially lead to new and/or increased impacts through the actions of tour operators in trying to resolve the perceived problems. These points of dissatisfaction did not arise from any perceptions that the environment was being compromised, but rather from the lack of time onshore and to a lesser extent the quality of guiding and information. Managers may have cause for concern, because the actions of operators to try and remedy these problems may be contrary to the management objectives for the islands. This is particularly relevant if operators endeavour to schedule more time on the islands for each person, for example. On the other hand, changes to smaller group sizes and more numerous and competent guides may allow more time to be spent ashore while still complying with the reserve management objec-

tives. The latter case could foster a positive and cooperative association between island managers and tour operators.

Potential for development of an adversarial relationship between tour operators and managers is further reduced by the positive attitudes that tourists reveal toward island reserve management. The survey results suggest that the tourists, appreciating that they represent an intrusion into island life and have an impact on it, accept the regulatory regime associated with Sub-Antarctic island visits. Impacts are not perceived on the Bounty Islands, mainly because there are no landings on these. But on the Auckland and Campbell Islands, where landings are relatively commonplace, about a third of visitors considered there were impacts. In the main, these were related to trampling of vegetation. But for both island groups, the role of wooden board-walks was noted as a useful management solution. This is a significant finding as it suggests that the protective role of boardwalks is accepted, despite the obvious compromise to a "wilderness" perception the appearance of boardwalks represents. Clearly, there is tolerance among tourists for some level of onshore facilities for environmental protection purposes. What is not apparent is what levels of onshore facilities would be tolerated or demanded in the interests of visit enhancement or comfort. It is the proliferation of impacts represented by such potential changes that must be carefully regulated in the future.

The overall result of the study can offer some encouragement to managers of the island reserves. It suggests that public and commercial support for maintaining the natural states of the islands and their strictly protected



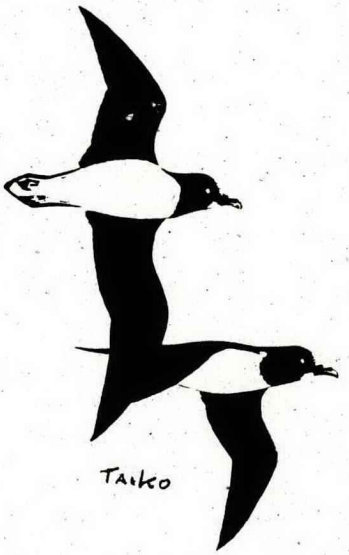
status is likely to grow as a result of tourist visits to them. Achievement of satisfaction by the "ecotourist" to the Antarctic and Sub-Antarctic region will be an important outcome for both tour operators and conservation managers. This preliminary study has demonstrated this for New Zealand Sub-Antarctic islands, and in doing so has provided insights for other areas of the Antarctic region and continent, where the same principles will apply. The further work being undertaken in this area will provide an ongoing contribution to the understanding and management of Antarctic tourism.

The findings of this study lead to a number of recommendations for future management of the islands as tourism destinations, and associated research directions. They include:

- Fostering cooperative social research with other island administering agencies and Antarctic Treaty partners, particularly Australian agencies in the Australian Antarctic Territories, and with British and South American researchers in the Antarctic peninsula
- Engendering cooperative research support between operators and island managers for the benefit of both tourism sustainability and island conservation
- Development of uniform and readily comparable baseline monitoring programs of tourist numbers, nationalities, and trip types, including those conducted by tour operators, with the information derived being accessible to researchers and managers for use in a commercially sensitive and appropriate manner
- Undertaking work to test the common assumption that tourist visitors may become "Antarctic advocates" on their return home, and the degree of "environmental-education" achieved
- Analysis of management developments that may prove most beneficial to enhancing visitor satisfaction while minimizing detrimental impacts on natural values of the islands; and
- Continuing this current research program in future cruise seasons to establish a comprehensive database for tourist profiles, satisfactions, and perceptions, and to test and refine methodologies.

Gordon Cessford and Paul Dingwall
S&R Division, Tory Street

If you want more detailed information read the full report *Tourism on New Zealand's Sub-Antarctic Islands* in Annals of Tourism Research, Vol. 21, No. 2. pp. 318-332, 1994, Also of interest is: *An Ecotourism Case Study in Sub-Antarctic Islands.* In Annals of Tourism Research, Vol. 21, No. 2, 344-354, 1994.



NZ's Most endangered Seabird

The Chatham Taiko telemetry expedition

From 4 Oct. to 17 Dec. 1993, staff from S&R Division, Threatened Species Unit and Canterbury Conservancy joined forces with 21 volunteers to form a rotating team to catch, put transmitters on, and track Chatham Taiko. The previous attempt to do this in 1988 was unsuccessful because many Taiko had become shy of the light used to catch them at night. They are naturally attracted to this upwardly directed floodlight, then caused to land by dazzling them with spotlights. We hoped that the 5-year interval, since the light's last prolonged use, would have let the population become less light-shy.

Chatham Taiko are our most endangered seabird: only 50-100 survive, only 4 breeding pairs are known and only one pair was successful during 1987-92, two in 1992-93; the breeding population is restricted to the south-west corner of Chatham Island, in bush with predators, competitors for burrows, and habitat-damaging feral stock. All 9 known burrows were found by a similar telemetry operation in 1987, and this enabled predator traplines and poisoning grids to be initiated, to the benefit also of other fauna (Chatham Pigeons) and flora (through large possum kills).

But are there other burrows? Searches since the 1987-88 telemetry and follow-up searches had not found any new burrow sites. Could the population, estimated as at least 45, be supported by only 1-4 breeding pairs? The 1993 telemetry expedition aimed to throw light on this enigma by tracking more Taiko, hoping to find more burrow areas.

Twelve Taiko (11 unbanded) were caught at the light and a transmitter tail-mounted on the first 9 caught. We had 10 transmitters available, so kept the tenth for a promising bird (dirty from digging, or with a bare brood patch), but the last 3 caught were all clean non-breeders. These 9 Taiko gave us 63 trackings of individual visits to the south-west of Chatham I.: this time all the transmitters were on different frequencies so we could identify each bird. (In 1987 all were on the same frequency so that all birds could be constantly monitored.) With the higher level of expertise in the team this time - most were also there in 1987 - we were confident that they could handle this greater responsibility. And they did.

Alan Tennyson and Felicity Maxwell were on the spot in late November to track two of these birds to burrows, both near the confluence of Taiko Valley with the Tuku River, so these new burrows were only about 1 km from the main group of known burrows. However, neither of these burrows looked to have been in long use; in fact, it looked as if they were natural holes that had just been found by these Taiko. It will be interesting to follow them for a few years to see whether breeding takes place, or whether the birds have mates. Three other Taiko with transmitters landed, presumably at burrows, one in Taiko Valley, but the other two far away: 2 km south-west and 4 km north-west. We were unable to reach these birds on the ground, and subsequent searches were unsuccessful, so future searches will need to be made.

A significant discovery during this expedition was that individual Taiko were visiting both known breeding areas as well as the places where they landed. Thus our concern that they do not know of the sites being protected is unfounded. However, it is a big worry that some are choosing to seek burrows away from these relatively safe sites. We found no evi-

dence of actual breeding burrows at the new sites, though further searches are needed.

What of the future? This operation has shown that we need to doubly value the known breeding sites in Taiko Valley and North Taiko Hill, for no others were found. It is still a puzzle as to where these new Taiko (11 of the 12 were unbanded) were raised, so it is important to band all the fledglings raised in the known burrows. In future, captures at the light will reveal whether unbanded birds keep turning up, indicating other unknown breeding burrows. Light-shyness will be a problem for the next few years, so another expedition, possibly with more telemetry, is not likely to be worthwhile for 3-4 years. None of the 4 fledglings banded during 1989-93 was caught in this operation, so it seems likely that all birds caught were over 5 years old.

Thanks to the continuing commitment of Chatham Islands Field Centre and Canterbury Conservancy to the protection of Taiko from predators, the security of the species is improving. In the longer term, however, debate continues about the relative merits of:

1. Protection with predator-proof fencing of smaller areas round the main breeding sites (difficult logistically)
2. Protection with permanent poison grids, and perhaps local trapping, of extensive areas inside stock-proof fences (predator-proof later?)
3. Provision of a small, heavily protected site nearer the coast, and attempts to attract non-breeders there by play-back of vocalisations.

Taiko seem to be trying to tell us that they prefer option 2. However, costs are a significant factor, of course.

M.J. Imber
S&R Division, Tory Street

REVIEWS

On Edge

"Microclimate and vegetation edge effects in a fragmented podocarp-broadleaf forest in New Zealand" by Andrew Young and Neil Mitchell.* Biological Conservation *67 (1994): 63–72.

The edge effects described by these authors are differences in microclimate and vegetation composition and structure between forest margins and interior. This partially DoC-funded study was conducted in remnants of forest, in one valley system in Rodney Ecological District, ranging in size from 1.4 to 50 ha. Over the c.100 years since fragmentation the remnants have been surrounded by pasture and subjected to an irregular but generally light grazing regime.

Microclimate variables recorded were light (photosynthetically active radiation -E/m²/week), air temperature (°C) and vapour pressure deficit (calculated from air temperature and relative humidity – mB). Vegetation characteristics measured were density and basal area of all native species at the forest edge and in the centre of the remnant.

The findings pinpoint several gradients which would be expected:

(1) Photosynthetically active radiation (PAR) inside the forest is generally 1.5–5% of that 30–50 m outside the forest. There is a steep gradient across the forest margin up to 10 m inside the margin and light levels in forest stabilise beyond this point.

(2) Air temperature and vapour pressure deficit (VPD) decrease across the forest margin and stabilise within forest up to 50 m from the forest edge. The gradient apparently varies with season, becoming less

steep in late winter. It is worth noting here that temperature and VPD measurements were taken once during the day in March and September only.

(3) Forest edge vegetation samples had greater biomass and smaller stems than the forest interior. There was also an increase in species richness at the edge.

The authors have defined three microclimate zones for remnants:

(1) an outer edge zone 10 m deep where PAR, air temperature and VPD all decrease;

(2) an inner edge zone up to 50 m deep where air temperature and VPD continue decreasing and PAR is stabilised; and

(3) an interior zone where PAR, air temperature and VPD remain more or less constant.

Using the 50 m zone as the zone of most change in microclimate, the authors show that it is not until a remnant is >9 ha that the forest interior microclimate zone is greater in size than the edge zone. Thus, remnants <9 ha are dominated by edge effects, and those < 1 ha are unlikely to support forest interior conditions. Much depends on remnant shape too, of course, and these calculations are based on hypothetical circular remnants.

So, what does all this tell us, in terms of management of remnants? Firstly, PAR decreases sharply within 10 m of the forest edge, thus changes in density, biomass, and species richness of the vegetation, which are generally influenced by PAR, should not occur more than 10 m inside the forest edge.

Secondly, remnants <9 ha in size are likely to have more edge than interior, in terms of microclimate, so vegetation responses associated with edges will be greater in these smaller reserves. Note that species richness can be high in the forest interior because of relict species, i.e., single individuals of uncommon species in the original forest.

Here I should point out that the edge of a forest remnant is essentially the same as the edge of a forest gap. The former is human-induced (in this case) and the latter is often not. In effect, a study of forest edges is the same as a study of forest gaps. Species richness increases in a gap because light-demanding colonists invade and some of the forest species may still be present and persist. Microclimate alters, with greater extremes in temperature and VPD, and greatly increased PAR in gaps. Wind is likely to have more effect on the forest edge, although large gaps can be affected in the same way.

It is notable that the authors confined themselves to study of native trees, shrubs and climbers because one of the biggest problems with forest edges (or gaps) is that many of the light-demanding colonists are introduced plant species which have the ability to substantially alter the community which they invade.

It is also notable that the authors do not consider the effect that the "irregular but generally light grazing regime" might have had on the vegetation patterns which they observed.

The general message to be taken from this paper is, I guess, that regularly shaped reserves of <9 ha may require more management effort in terms of weed control, buffer plantings, etc., than larger reserves, and will lack species requiring forest interior environments.

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Green, Kaye (comp.) 1994. **DoC Science Project Summaries – 1992/1993. Vol. 1 Output classes 2.0–4.6.** *S & R Internal Report No. 143.*

Towns, David, McFadden, Ian, Thomson, Phil, Robertson, Hugh, and Colbourne, Rogan 1994. **Offshore Islands Co-operative Conservation Project with ICI Crop Care Division: Phase two (Red Mercury Island).** *S & R Internal Report No. 142.*

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