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Conservation Science Newsletter is issued six times per year in Feb., Apr., Jun., Aug., Oct., and Dec. Contributions should reach the Editor by the 1st of the month in which they are to appear.

EDITORIAL

A New Cash Crop

It was interesting to listen to Dr Moller from Otago University arguing for a return to customary wildlife management, and sustained usage. He cited Zimbabwe as a shining example of conservation through the sustainable use of wildlife.

Zimbabwe is indeed managing its wildlife on a successfully sustained basis. It does this by selling live animals to zoos and trophy kills to big game hunters. The local citizens are involved and benefit in a monetary way. It's not a bad system if all essentials are in place, such as animals which can command large sums from the international market, and have a strong breeding history.

The success of the former Acclimatisation Societies (now Fish & Game Councils) in increasing the quality and quantity of exotic gamebirds has shown that this pattern works, where the USERS have money and derive direct benefit from the result.

It seems to me that this is a long way from the sustainable use of wildlife within a traditional system of control.

Kaye Green,
Editor

REPORTING BACK

UNESCO action on biodiversity

As the UNESCO mandate covers the broad fields of education, science and culture, there are many activities which touch directly and indirectly on the topic of biodiversity. Some main actions are as follows:

Diversitas

Diversitas is a scientific programme aiming at improving scientific knowledge on biological diversity particularly the role of biodiversity in the functioning of ecosystems, and the origins, dynamics and maintenance of biodiversity. The programme consists of a mix of syntheses of research fundings, inventorying, and monitoring in field sites, training, and preparation of information materials for different groups of people. Emphasis is given not only to terrestrial ecosystems but also to marine and micro-organism biodiversity. Diversitas is jointly undertaken by UNESCO with two non-governmental partners, the International Union of Biological Sciences and the Scientific Committee on Problems of the Environment.

The international biosphere reserve network

A network of protected areas (311 in 81 countries) is aimed at on site protection of biodiversity in combination with other activities such as scientific research on how to sustainably use biological resources, environmental education and training of specialists. Biosphere reserves serve the development interests of the people that live within and around them. The international network provides a framework for comparisons, cooperation and exchange of information. Biosphere reserves are a major part of the Man and the Biosphere (MAB) Programme of UNESCO launched in 1971.

Local communities and cultural diversity

A number of cooperative activities within UNESCO compile and enhance traditional knowledge on biodiversity, such as the use of plants and animals for medicine, food, construction material, etc., and the role of plants in certain cultures and religions. These actions include the People and Plants initiative of UNESCO, WWF International and the Royal Botanic Gardens and Cultures in Asia project of UNESCO and FAO.

Environmental Education

Begun in 1975, the joint UNESCO-UNEP International Environmental Education project raises awareness of the need for environmental education from primary schools through universities, as well as for the general public. Guidelines and strategies for utilising environmental education materials, and a series of modules on themes relating to biodiversity, such as deforestation, have been published.

Reproduced from ALL OF US, Environmental Education Dossiers, published by Centre UNESCO de Catalunya, Mallorca 285, 08037 Barcellona, Spain.

NOTES AND NEWS

Update on Research for Rural Fire Protection

Fires can cause great damage to agricultural land, native flora and fauna, and public and private property. The potential for loss has increased as the urban fringe has expanded. Recognising this, last year the National Rural Fire Authority, New Zealand Forest Owners' Association, Local Government Association, and the Department of Conservation initiated a Forest and Rural Fire Research Programme at NZ FRI. (See *Notes & News*, in issue No.4, p.5)

New Zealand has traditionally lagged in fire research, but overseas technology does exist to predict the likelihood, severity, and effect of fires, and the aim of the programme is to adapt this technology to New Zealand conditions. If land managers have an understanding of their fire environment (i.e., fuels, weather and topography) and expected fire behaviour, they are better equipped to prepare for and deal with fire situations, should they occur.

The programme has a strong technology transfer focus, and visiting Canadian fire researcher Marty Alexander spent much of his 12 months here running fire behaviour training courses and seminars, which were very well supported by the Department of Conservation. Marty and NZ FRI scientist Grant Pearce also upgraded and standardised the New Zealand Fire Danger Rating System, including the production of the *Fire Weather Index System Tables for New Zealand* in conjunction with the NRFA. The recent appointment of scientist Liam Fogarty aims to continue this focus on technology transfer, and Liam will assess the applicability of many overseas fire protection practices and procedures to New Zealand, promoting these through the production of a quarterly *Fire Technology Transfer Note* and through training courses.

In the next year Grant will continue research into fire behaviour, so that the next generation Fire Danger Rating System will reflect the damage potential and suppression difficulty of fires in unique New Zealand fuel types. Emphasis is being placed on tussock grassland and scrub (gorse and manuka/kanuka) fuels, because annual burning and land clearing operations in these vegetation types have historically caused the most problems. Fire behaviour models for these fuel types would appear to be of prime interest to the Department of Conservation, as well as to other fire authorities such as district councils and forest owners, where the threat to protected lands comes from adjacent areas.

The development of fire behaviour models for specific New Zealand fuel types will enable better timing of prevention efforts, and setting of preparedness levels for suppression resources before a fire event. They can be used by fire authorities to provide guidelines for use with permit issue for the regulation of operational burning. For example, unsafe weather conditions and firebreak width requirements can be specified to reduce the probability of escapes. Better predictions of fire behaviour during a fire event will also enable fire managers to make the most appropriate use of suppression resources and methods, thereby reducing the overall costs of fire fighting.

Leigh Tarlton
NZ FRI, Rotorua

More Definitions: "Restoration", DoC, and the World

The use of the word "restoration" originates from the corporate plan, particularly Key Output 4.4 Restoration and Key Output 5.3 Island Restoration. This usage is inconsistent with the conservation terminology fostered by the leading international natural and historical heritage organisations, IUCN and ICOMOS. The world charters of both organisations define "restoration" with exactly the same meaning:

World Conservation Strategy, IUCN 1991 - "To return a degraded population to its original condition."

ICOMOS 1981 - "Returning a place to an earlier known state".

These international definitions were developed to facilitate clear communications within and between heritage organisations.

It is only rarely that a place can be genuinely returned to a previously known state. This may be impossible because of unavailability of species, or incomplete knowledge of a previous state. It may be impossible because of the massive loss of integrity, or cost/benefit realities.

The problem does not normally arise in departmental historic programmes because they already consistently adhere to the international system. Key Output 4.5 was renamed "conserve" historic resources to reflect precisely the outcome sought. The two natural heritage "restoration" key outputs would be better renamed to match IUCN terminology. The World Conservation Strategy (IUCN) adopts the word "rehabilitation" to describe fully the types of outputs expected; "to return a degraded ecosystem or population to an undegraded condition, which may be different from the original condition".

Paul Mahoney
Historic Resources Div., Boulcott St.

Missing Buoy to Return Home

A NIWA oceanographic buoy has been recovered 4 months after it went missing, by DoC staff on Raoul Island some 1200 km from New Zealand.

The large yellow NIWA buoy was used to mark the site of wave and current measuring instruments situated 7 km offshore from the Bowentown Heads in the Bay of Plenty. These instruments, worth about $100,000, log wave height, period and direction, and current speed and direction, and then telemeter the data to shore. From the data, water circulation and sediment transport can be computed. Unfortunately the instruments are difficult to see and therefore vulnerable to strike by boats and trawlers. So the NIWA buoy (worth about $4000) stationed close by, and equipped with solar powered flashing lights and radar reflector, served to warn shipping away from the instruments.

The wave buoy and current meter are deployed as part of the Tidal Deltas Study. This FRST funded project has involved researchers from NIWA Ecosystems, Climate and Marine. It is investigating sand storage and trapping at tidal deltas (the bars and shoals at the entrances to estuaries and harbours), and the exchange of sand between estuaries, beaches and the inner continental shelf. The results has application to assessing the coastal sand resource for mining and beach nourishment, and beach erosion and harbour entrance stability.

The NIWA buoy went missing from its moorings in 34 m water depth some time prior to 21 October 1993. It headed north against the East Auckland current, presumably driven by winds, travelling at least 1200 km in about 4 months (an average of 0.1 m/s, or 0.3 miles/hr). Its discovery was quite remarkable, considering that the four DoC staff at Raoul are the only

inhabitants between the Bowentown Heads and Tonga!!

The DoC staff are stationed at Raoul to run the meteorological station and carry out conservation duties on New Zealand's northern most nature reserve. They are based on the remote island for a year at a time and their only contact with the outside world is by radio and telephone interconnect. Occasional ships and yachts call each year bringing supplies and company.

A buoy marked with a Hamilton address turning up on one of the few beaches on Raoul must have been a highlight! They plan to rescue the buoy from the deserted beach where it was spotted, put it on one of the few ships that visit each year, and send it back home to Tauranga.

Terry Hume, NIWA Water Quality Centre, Hamilton

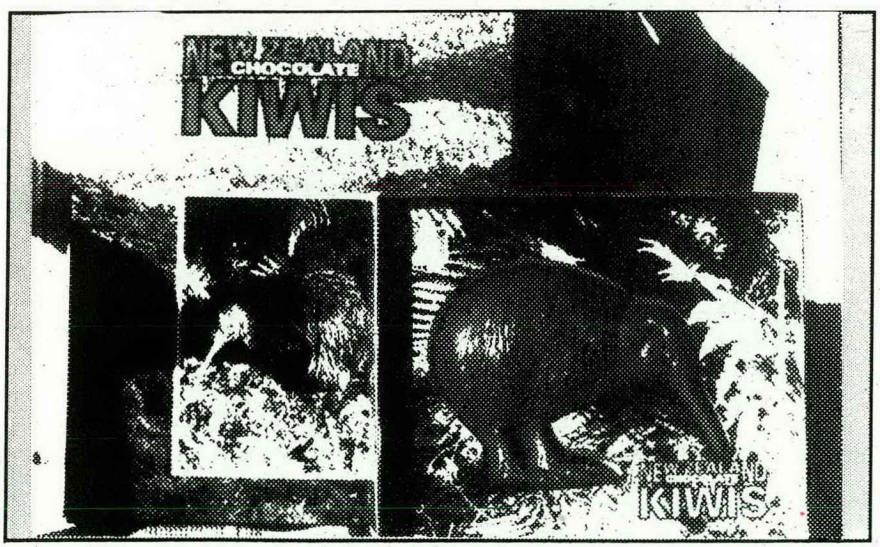
Apteryx chocolatus

Sound tapes and coloured slides are frequently borrowed from our Central Audio-Visual collection, but seldom does Ferne McKenzie, the librarian, see and enjoy the end product from the services she provides.

Recently a box containing some chocolate kiwis arrived from a client. The outer carrying box (which holds 10 kiwis) features a view of Stewart Island by Dick Veitch plus a NI Brown kiwi. The kiwi mould is designed by Taranaki artist Graham Marshall. The box also gives a comprehensive explanation of the kiwi in both English and Japanese.

Ferne is always on the lookout for more images for the Department's collection, and is quite happy to duplicate from originals and returning originals to the photographer. If any image is being published, Ferne insists the photographer and the Department be credited. If there are any unusual projects, such as postcards, the chocolate kiwis, and the board game which is still being worked on – Ferne goes 50/50 in payments with the photographer.

P.S. If anyone is interested in the chocolate kiwi as a retail product, Ferne will be happy to pass on details. She insists that she was chief sampler and not a sales agent!



RESEARCH IN PROGRESS

Amphibian and Reptile Distribution Scheme

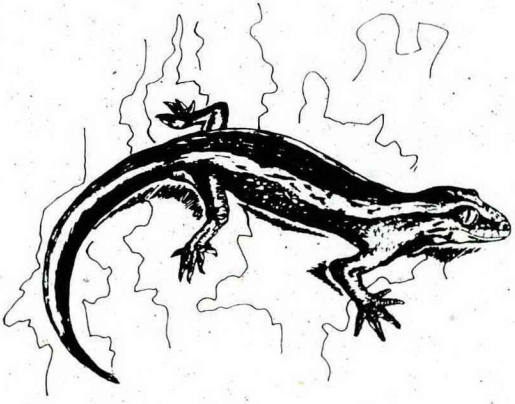
One of the many species distribution databases managed by Science and Research is the Amphibians and Reptiles database (ARDS), which records reptile and amphibian sightings from New Zealand. At the moment it contains just under 4000 records, including many from offshore and outlying islands. It is the data behind the Atlas of the Amphibians and Reptiles of New Zealand produced by Ross Pickard and David Towns in 1988. Information is received on a record card which contains fields for a number of geographical, environmental and habitat parameters. The information is currently stored on computer in dBase, from which listings by site or species can be generated quite easily. Summary information is also being currently being transferred to Biosite (see last issue of *CONscience*). When this Oracle database becomes live, among other things it will permit direct retrieval of information by Conservancy staff, as well as sorting by higher taxonomic groups, on the basis of 100 m or 1000 m grid squares. Conservancy staff will also be able to add sighting records to Biosite themselves. Eventually the ARDS will be completely rewritten in Oracle, so that it can link directly into Biosite.

Some of the information already obtainable is rather surprising. For example, the "common skink" from the West Coast of the South Island is a different species to the "common skink" from Otago and Canterbury, and that neither species are the same as the North Island "common skink". Also, the database contains sightings over 100 years old!

The database can only get better with your input, both in terms of correcting existing errors and accumulating new data. There are some glaring omissions at present, because people have tended to record only rare species in out-of-the-way places (the "rare-occurrence" syndrome). For example, tuataras are recorded from only six islands, instead of the 24 or so they are known from. There is no record of tuataras on Stephens Island, among other well-known localities. Some taxa are not recorded at all! For example, Chatham Island skinks. How many DoC staff have visited the Chathams or Stephens Islands in the last few years? Some areas, such as the entire West Coast of the South Island, still have no more than a dozen records, so there is still a lot of work to be done to make this database really comprehensive.

As database manager, I will be happy to supply blank record cards to anyone who wants them. If you are unsure of the species identity, please send at least one photo of the animal with the record, if you can. Dorsal views are best, then lateral, then ventral (preferably all three), together with some idea of the size of the animal.

Geoff Patterson
S&R Division, Tory Street



New Technologies for an Old Pest

The introduction of possums (*Trichosurus vulpecula*) to New Zealand was a tragedy for the native vegetation, particularly forests.

Landcare Research scientists are investigating the application of remote sensing technology to monitor possum damage to New Zealand's indigenous forests. Damage has traditionally been assessed by rather expensive manual/visual survey methods, but these cannot cover all areas and have limitations in places with difficult access.

Remote sensing offers the potential to monitor canopy condition and trend economically. Scientist Craig Trotter has recently shown that colour-infrared photography (taken from aircraft) could be analysed to yield a parameter, termed the *vegetation index*, which provides a measure of forest canopy condition. The vegetation index is essentially proportional to the amount of canopy leaf area present.

Craig's study was carried out on the pohutukawa forests on Rangitoto Island, Hauraki Gulf, for the Department of Conservation (DoC). "Good access, great cooperation from DoC's regional office in Auckland, and a wide range of tree damage, made Rangitoto Island an ideal first trial site", said Craig. In Rangitoto's case, canopy condition provided a direct measure of possum browse. The study showed that canopy damage as measured by ground survey methods was well correlated with the vegetation index produced from the colour infrared photos.

Categorisation of canopy condition into 5 classes - from undamaged to dead/grossly defoliated trees - could be carried out reliably and automatically on digitised versions of the photos. The study also showed that satellite imagery would be useful for surveys over larger areas, for catchment-scale canopy condition and trend monitoring.

According to Craig, "What is really exciting is that maps of canopy condition can be prepared from colour-infrared photos for under $100/km^2$, while satellite imagery could offer costs of as low as $20/km^2$. This is much cheaper than equivalent ground based surveys."

Whether the current satellite resolution (20–30 m) is sufficient for canopy condition monitoring or whether the more detailed resolution (about 1.5 m) available from an aerial photograph is required, is the subject of some discussion amongst natural resource managers.

Further research on this issue, together with overcoming the remaining technical obstacles required to operate the vegetation index as a monitoring tool, is the subject of continuing DoC sponsored research. For more information contact Dr Craig Trotter, telephone (06) 356-7154.

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Ecological impacts of shellfish dredging on coastal soft-sediment communities

Marine fishing is one of New Zealand's major industries, and an important recreational activity. Fisheries are sustained by natural productivity, yet very little is known about how fishing and marine ecosystems interact. Unlike other human influences on the marine environment, fishing occurs throughout New Zealand's Exclusive Economic Zone from deep to near-shore waters. There is therefore potential for effects on marine ecosystems.

The issue of adverse environmental impacts of fishing is important for both conservation and the fishing industry, because commercially exploited species are integral components of natural systems. This means that understanding these impacts could have positive benefits for the fishing industry, in terms of management and sustainability.

Study of scallop dredging

NIWA recently completed a 3-year study, commissioned by the Department of Conservation, to investigate the impact of scallop dredging on the structure of marine soft-sediment communities. Two sites in the Mercury Bay area of the Coromandel Peninsula were chosen for experimental dredging. One was located in the centre of Opito Bay, an area regularly used by commercial scallop fishers. The other was situated at Cathedral Cove, Hahei (now a marine reserve). Both sites were on bare sandflats at about 24 m depth. These habitats can seem quite barren places but they actually contain a large number and wide variety of animals which play important roles in ecosystem functioning. In this study we collected over 200 different types of sediment-dwelling animals.

We used various techniques to sample these seafloor communities: visual observations (diving), cores (the best way to sample such areas), and a suction dredge (to collect larger animals). Initial sampling of each site revealed no pre-experiment differences in the densities of animals within sites, but considerable differences in the communities between sites. Small crustaceans were common at Hahei, while polychaete worms were common at Opito Bay.

The experiment commenced in autumn by dredging half of each site with a commercial scallop dredge. Samples were collected from both the dredged half and reference (undredged) half of each site as soon as possible after dredging and again three months later.

Impacts of dredging.

Similar effects were immediately apparent at both sites. The dredge had smoothed over the natural sediment surface and partially exposed animal burrows. As these animals are usually buried in the sediment, this could expose them to higher levels of predation. At both sites, scavenging snails were highly active. Starfish were also active, although many were torn to pieces by the dredge.

Because the animal communities at the two sites were different, we carried out separate analyses on the changes in density of common animals and community structure. At both sites, eight of the 14 common animals were affected by dredging immediately and/or three months later. In general, the dredged plots had lower densities of animals. In core samples from Hahei, dredging reduced the variety of animals immediately and the total number of individuals was still lower in the dredged plot after 3 months. At Opito Bay, both the variety and total number of animals were still lower in the dredged plot three months after

dredging. For the larger animals collected in suction dredge samples, a greater number and a larger variety were found in the dredged plot both times at Hahei. At Opito Bay, only the variety of larger animals increased with dredging. These effects were a result of large mobile scavengers/ predators being attracted to the disturbed plots.

Survey of dredged sites

To complement the dredging experiment, larger-scale surveys were conducted of other sites in Mercury Bay with different dredging histories. Sites which had not been commercially dredged had a higher variety and number of surface dwelling animals (e.g. sponges) and a greater diversity of surface sediment features. Tremendous variation was evident in the composition of the seafloor communities, e.g., the common animals at each site were mostly different. This variation among sites in a small length of coastline with basically similar sandy bottom habitats emphasises the diversity of these coastal seafloor communities. Despite this variation, two animals (a cumacean and a shellfish) which showed increased densities with dredging in the experiment, were also higher in the commercially dredged survey sites.

Ecological effects of dredging

This study was designed to assess a once-only dredging effect on seafloor communities in sandy habitats. It thus concentrated on the effects on the mostly hidden residents of marine sediments. These animals are very important in soft-bottom marine systems. They influence the movement of chemicals between sediments and water. They stabilise the seafloor, making the habitat suitable for other species. They also provide food for many larger bottom-dwelling animals, such as octopus, starfish and fish. Repeat dredging of the same patch of seafloor, which commonly occurs in commercial dredging operations, must result in much more disturbance than observed in our experiment. Habitats with more obvious residents, such as reef or garden-forming animals, may be expected to show even greater effects.

Our results highlight the damage or death of non-target organisms caused by one fishing method (scallop dredging) in one area. While different communities in different habitats can be expected to respond differently to habitat disturbance by fishing, in general fishing gear which removes surface-dwelling organisms, modifies sediment topography. When used over large areas it is likely to result in reduced diversity in seafloor communities. Communities subjected to repeated disturbance are likely to become dominated by juvenile stages, mobile, rapid colonists and quick-growing species.

A broad, ecosystem-wide perspective of fisheries issues is necessary in order to achieve well-managed, sustainable exploitation of natural fisheries. It is likely that this can be achieved in harmony with objectives set for the conservation of marine ecosystems. Our results were used to make recommendations minimising the negative side-effects of dredging, ranging from development of fishing gear and practices which creates less disturbance to creation of Marine Protected Areas in coastal soft-sediment habitats.

Simon Thrush, Vanda Cummings, and Judi Hewitt
NIWA

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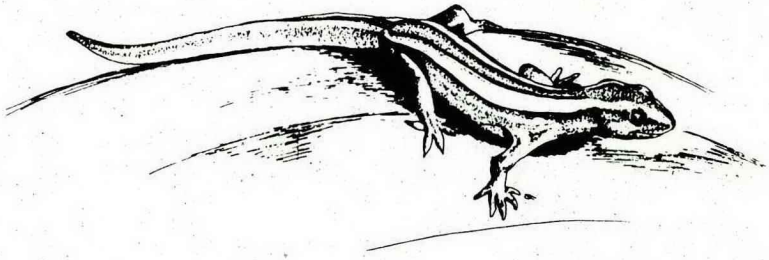
Cattle grazing around lakes -- an ABSTRACT

Tanner, C.C. (1992) A review of cattle grazing effects on lake margin vegetation with observations from dune lakes in Northland, New Zealand.

Lake margin vegetation has become increasingly valued as a habitat for wildlife and as a moderator of sediment and nutrient inputs from surrounding catchments. This has encouraged action to exclude livestock from lake shorelines. Cattle grazing effects are reviewed in relation to natural grazing of lake margin vegetation. Direct consumption and trampling of plant biomass by livestock affects the structure, diversity, productivity, succession and nutrient dynamics of plant communities. In addition, livestock grazing may affect lake marginal vegetation and water quality by pugging and erosion of lake shores, nutrient addition, bacterial contamination and promotion of weed invasion. Agricultural modification of surrounding catchments also causes many indirect effects such as increased nutrient runoff and changed hydrological regimes. However, low levels of grazing can result in beneficial changes in lake margin vegetation by reducing domination by tall rank species and increasing plant and habitat diversity. Observations of cattle grazing impacts on the lake margin vegetation of Northland dune lakes showed a graded range of effects dependant largely on grazing pressure. Ungrazed, agriculturally undeveloped shorelines were characterised by *Leptospermum scoparium* growing to the wetted margin, grading into an inshore zone of mixed sedges (*Baumea juncea, B. huttonii, Leptocarpus similis,* and *Eleocharis acuta*) to 0.3-0.8 m depth, an outer sedge zone of *Eleocharis sphacelata* to 1-2 m depth, then a sharp boundary into fully submerged communities of charophytes and *Potamogeton* spp. in deeper water. At sites subject to heavy grazing pressure inshore sedge communities were absent, leaving only a remnant outer zone of emergent *E. sphacelata* in water too deep to graze. Sites with light to moderate grazing pressure were associated with more open inshore sedge zones showing an increased diversity and abundance of short shallow-water species including *Myriophyllum, Potamogeton, Lilaeopsis, Juncus* and *Triglochin* spp., and in some areas the endangered species *Hydatella inconspicua*. It is concluded that although heavy grazing of lake shores is clearly detrimental to marginal vegetation, low levels of grazing may be an appropriate management tool in areas of some lakes to promote more diverse inshore habitats for plants and wildlife.

Copies of this paper can be obtained from the author at NIWA, Private Bag 3123, Hamilton, New Zealand.



NEW SCIENCE & RESEARCH PUBLICATIONS

REPORTS

Copies have been sent to all CAS, to librarians and to the Head Office library.

Imber, M.J. 1994. **Report on a tuna long-lining fishing voyage aboard *Southern Venture* to observe seabird by-catch problems.** *Science & Research Series No. 65.* 12p.

Observations during 8 days fishing east of northern New Zealand. Most bait-takes occurred in daylight, particularly before dusk. More birds followed in the wake during hauling than during setting.

Patrick, B. 1994. **Hawkdun Ecological District invertebrate survey.** *Science & Research Series No. 64.* 17p.

Results of a literature search and survey of Hawkdun E.D., key areas for the protection of invertebrate communities are listed.

Please note: Publication of *Science & Research Series No. 63* has been delayed.

CONSERVATION ADVISORY SCIENCE NOTES

Copies have been sent to all CAS, to librarians and to the Head Office library. Further copies are available from Science Publications, at $1.50 per copy + GST and postage.

Walls, G. 1994. **Community involvement in conserving biodiversity in the South Pacific.** *Conservation Advisory Science Notes No. 62,* 48p.

Hall, J.V. 1994. **Accelerated life environmental tests of various outdoor signs.** *Conservation Advisory Science Notes No. 61,* 9p.

Walmsley, B. 1994. **Turf management report.** *Conservation Advisory Science Notes No. 60,* 9p.

Haddon, M. 1994. **Evaluation of southern Hawkes Bay coast intertidal data II: The use of presence/absence data.** *Conservation Advisory Science Notes No. 59,* 59p.

Lambert, D. and Millar, C. 1994. **Genetic tools and conservation problems.** *Conservation Advisory Science Notes No. 58,* 31p.

Hamel, J. 1994. **Map of archaeological sites on Pukekura Pa.** *Conservation Advisory Science Notes No. 57,* 22p.

Doak, W. 1994. **Management of a solitary, sociable dolphin situation.** *Conservation Advisory Science Notes No. 56,* 8p.

Ombler, J. 1994. **Forestry and environmental issues.** *Conservation Advisory Science Notes No. 55,* 5p.

Simpson, P. 1994. **Local cabbage tree surveys: the Wairau valley, Marlborough.** *Conservation Advisory Science Notes No. 54,* 6p.

Patrick, B. 1994. **The importance of invertebrate biodiversity: an Otago Conservancy review.** *Conservation Advisory Science Notes No. 53,* 13p.

SCIENTIFIC PAPERS

LIMITED DISTRIBUTION to DoC libraries and CAS ONLY! (With the permission of the Copyright Holder.) Others please consult your library.

Arand, J., Basher, L., Wardle, R., and Wardle, K. 1993. **Inventory of New Zealand soil sites of international, national, and regional importance. Part Two – North Island and northern offshore islands.** *New Zealand Society of Soil Science Occasional Publication 2.* 131p.

Reed, C.E.M, Nilsson, R.J., and Murray, D.P. 1993. **Cross-fostering New Zealand's black stilt.** *Journal of wildlife management* 57(3): 608–611.

CONFERENCES IN 1994

AUSTRALIA

6–10 March 1994

Royal Australian Planning Institute
Biennial Conference
"A sense of Place – A Place for People"
Venue: Hobart, Australia
Contact: Conference Design Pty Ltd
55 Patrick Street
Hobart
Tasmania 7000
Ph: (002) 31 3223
Fax: (002) 31 3224

13–27 March 1994

ANZECC 6th Australasian Regional Seminar on National Parks & Wildlife Management.
Venue: Canberra, Australia
Contact: 6th Australasian Regional Seminar
Australian Nature Conservation Agency
GPO Box 636
Canberra, ACT 2601
Australia

11–14 April 1994

21st Meeting of the Vertebrate Pests Committee of the Agricultural and Resource Management Council of Australia and New Zealand.
Venue: Mildura, Victoria
Contact: J. Morgan Williams
MAF Policy (Science)
Ministry of Agriculture and Fisheries
PO Box 8640
Christchurch

15–20 May 1994

The Role of Networks
Venue: Geraldton, Western Australia
Contact: Dr Denis Saunders
CSIRO Divn of Wildlife and Ecology
LMB No. 4
PO Midland
Western Australia 6056
Fax: 619 2520134

INTERNATIONAL

21–24 April 1994

The Seventh International Meeting of the Society for Human Ecology
Venue: Michigan, USA
Contact: Robert J. Griffore
Dept of Family & Child Ecology
107 Human Ecology Building
Michigan State University
East Lansing, MI 48824-1030
USA

CONSERVATION
TE PAPA ATAWHAI

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