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EDITORIAL

In 1987 Richard Sadleir left an already eminent career as a Scientist and Science Administrator to become the first Science "Manager" in the new Department of Conservation. In this field he has laboured for the past eight years to bring science into the working world of the conservationists; with management driven research, publications, Conservation Advisory Scientists, Seminars, unprogrammed advice which became CAS Notes, and a host of other ideas some more successful than others, but all arise from the commitment of a person both a Scientist and a Conservationist.

Richards's retirement, although he certainly deserves the rest, will be a loss to DoC and to his staff.

Kaye Green
Editor

Department of Conservation
Te Papa Atawhai

NOTES AND NEWS

The winners of last month's contest on a definition of research. One complicated and wry the other simple and to the point.

Number One

The process of iterative hunting for that which is lost; items lost usually scientific nature. Usage attributed to characteristically absent minded or distracted habits of scientists.

Incidentally I note that the word derives from "L. circare", to go around (in circles); need any more be said?

signature indecipherable
(AKA John Holloway)

Number Two

My definition of research is "look again".

Craig Miller

Chocolate fish will be dispatched to both winners. (Ed.)

New species of galaxiid fish

A new species of galaxiid recently discovered on Chatham Island has now been described by Charles Mitchell*. The species has been named *Galaxias rekohua* (pronounced "rare-k'hoe-hoo-ar") after an ancient Moriori name for the Chatham Islands. The fish is described as a small, slender galaxiid-type fish that is readily identified by the presence of pronounced flanges on the caudal peduncle (i.e., the bit between the dorsal/anal fins and the tail) and a moderately forked tail. It also has distinct tubular nostrils. The fish is sufficiently distinct that it appears to have no obvious close relatives from the other galaxiid species in New Zealand.

Presently *G. rekohua* is only known from Lake Tuku a Taupo, a peat lake on Chatham Island, but it is likely to occupy other small lakes in the vicinity. The fish form a landlocked population that coexists with longfinned eels. Its main food is chironomid larvae. Specimens have been lodged with the Museum of New Zealand and a fish collection at the National Institute of Water and Atmospheric Research Ltd, Christchurch.

* Mitchell, C.P. 1995 *Journal of The Royal Society of New Zealand* 25(1): 89–93.

Marcus Simons

Stokell's Smelt (*Stokellia anisodon*)

In a recent paper (*Journal of The Royal Society of New Zealand* 25(1)) Stan Woods and myself reassessed the evidence on the type locality of this South Island species and contrary to Bob McDowall's (1994) paper in the same journal, we found conclusive evidence that Stokell, who originally described the species, was correct in designating the Waiau River, Southland as the type locality, not the Waiau-ua River, North Canterbury. Our evidence revolved primarily around the paratype specimen in the Southland Museum and the data accompanying it which McDowall hadn't checked.

There are implications for conservation in this issue apart from the purely taxonomic argument. Stokell's smelt may be rare or locally extinct at the type locality and there are no other records from either Otago or Southland. Stokell referred to a 'form' of the species from Can-

terbury. The species is currently abundant in Canterbury. Therefore research needs to be directed at reassessing the status of the Canterbury 'form' — is it true *S. anisodon*? If not (which seems unlikely), then the population at (or formerly at) the mouth of the Waiau River, Southland, becomes a high conservation priority for survey, research, and management, in that order.

Brian Patrick
CAS, Otago

World Heritage — Cultural?

The World Heritage Coordinator of the International Council on Monuments and Sites (ICOMOS), Dr Henry Cleere, made an informal visit to New Zealand on 28-30 March 1995. ICOMOS is an international non-governmental organisation of professionals engaged in the conservation of historic and cultural sites. It is the counterpart of the World Conservation Union (IUCN). ICOMOS carries out evaluations of cultural sites nominated for World Heritage Listing under the World Heritage Convention, of which New Zealand is a signatory.

Before taking up his position with ICOMOS, Dr Cleere was Director of the Council for British Archaeology in London. He has been very influential in establishing the methodological and ethical frameworks of cultural heritage management. He is well known for his advocacy of the close links between natural environmental protection and archaeological site protection, and of the obligation to make the archaeological heritage accessible and understandable to the public.

In recent years Dr Cleere has been instrumental in the inclusion of new criteria for cultural sites under the World Heritage Convention. These

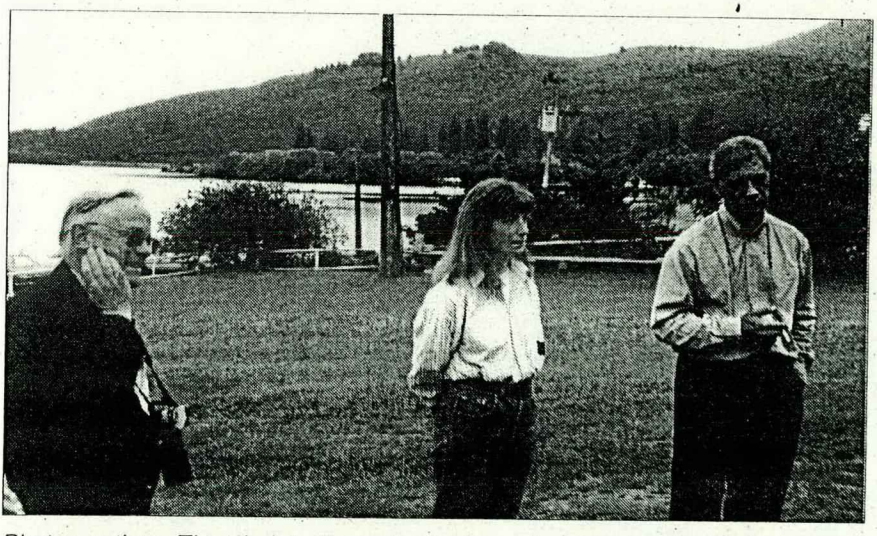


Photo caption: The trip into Tongariro National Park was preceded by a visit to the Waihi marae of the Ngati Turumakina hapu of Ngati Tuwharetoa, southern Lake Taupo. Dr Cleere is in the left of the photo, with Ann Williams and Tumu Te Heu Heu to the right.

recognise the religious, artistic or cultural associations which natural landscapes have for indigenous cultures. Accordingly, Tongariro National Park is now inscribed on the World Heritage List as an "associative cultural landscape", in recognition of its historical and spiritual relationship to Maori. Tongariro National Park was the first cultural landscape in the world to be inscribed with reference to this new criterion. This is recognised as a step towards overcoming the current imbalance of the World Heritage List which is dominated by cultural sites in Europe.

Science and Research staff in Wellington were given the responsibility of coordinating Dr Cleere's short visit to New Zealand. Dr Cleere travelled down from Auckland to Tongariro/Taupo Conservancy with Kevin Jones (Science and Research), visiting Te Wheoro's Redoubt in Rangiriri, the Rangiriri Heritage Centre, and a pa at Crawford Road near Tirau on the way. In Tongariro/Taupo Conservancy, Dr Cleere met with Regional Conservator Paul Green and with other Conservancy staff. Ann Williams and Paul Dingwall (Science and Research) travelled up from Wellington to meet with Dr Cleere. Dr Cleere was able to renew his acquaintance with Tumu Te Heu Heu and to meet other members of the Ngati Tuwharetoa whanau. His trip into Tongariro National Park included brief visits to Te Porere, Whakapapa Village and Visitors Centre, and areas of ski field development above the Top o' the Bruce. Dr Cleere also made field visits to sites in the Auckland area and had discussions with members of the New Zealand national committee of ICOMOS.

Dr Cleere's visit was memorable and inspiring for all concerned. It is felt that New Zealand has gained the friendship and interest of an internationally recognised leader in the field of cultural sites and World Heritage. Dr Cleere hopes to return for a longer visit in the foreseeable future. He has remarked that it would help towards this end if New Zealand could submit a further cultural nomination for the World Heritage List.

Dr Cleere advised that the pre-European archaeological landscapes of New Zealand were unique and were certainly of relevance to the World Heritage List. He thought that pre-colonial first contact sites also stood a good chance of World Heritage status if authentic and adequately protected, because no similar sites have been inscribed elsewhere in the world. Industrial archaeological sites could also be considered. However, he was cautious about early European buildings, structures and towns. He suggested that New Zealand should look around the rest of the world and consider the competition among buildings and towns of the nineteenth and twentieth centuries before investing effort in nominations.

A.J. Challis
S&R Division, Tory Street

REMEMBERING RICHARD

Remembering Richard (of the Antarctic)

Ross Pickard contributed this "story".

In early 1987 a message was taped to the door of the cafeteria asking for a field assistant to accompany a "crusty old director" down into the frozen depths of Antarctica. Part of the baggage that Richard carried over from his days at DSIR Ecology Division was a project on the foraging behaviour of the Adelie Penguin. The rational behind this project was simple - Adelies are the most visible part of the Antarctic food chain, therefore any changes in the food chain should be reflected in the population structure and behaviour of the penguins. It's not often that a desk bound computer nerd gets to use their zoological skills, let alone in a place like Antarctica, so I jumped at the chance. I was doubtful that the visual experience would outweigh the auditory one, Richards' fame as a snorer had preceded him, but was willing to take a chance.

In early November arrived at Antarctica in style - but not comfort. Flying into the ice runway on a USAF Starlifter with the other two members of our project Brian Karl and Kevin Lay after a 5 hour flight with nothing but webbing sets to sit on. Richard still managed to grab a nap by stretching out on one of the large cargo crates after donning earplugs and his ubiquitous airline eye shades.

My first lesson in Antarctica was if you step outside smiling then you had better stay smiling until you got back inside, otherwise your face would crack. It was cold. My second lesson was that Richard in the field away from the pressures of directorialship is a much more relaxed individual, caught up in the joy of doing real science.

It takes a while to acclimatise to the cold of Antarctica. You eat up to 3 times more than you normally would and have to drink lots to stay hydrated in the unnaturally dry air. During the acclimatisation period we were taught how to survive if the unmentionable happens. Despite all prompting and promises of monetary returns I did hold on to the rope when Richard threw himself down a crevasse. You just can't drop a man who has helped you build one of the largest snow mounds in history. It was during this time that Richard let slip the secret that kept me sane. If he hollows out a hole for his hip to lie in - then he doesn't snore. Well not much anyway.

Our project, K121, paid particular emphasis on the foraging behaviour of nesting pairs during incubation. The female would lay then bugger off out to sea for around 20 days before coming back to relieve the male. He then had about 15 days of gorging before the chicks hatched and the daily demands of parenting took over. To find out where they went while feeding, transmitters were glued to the backs of penguins nesting at the Cape Bird rookery and two receiving stations were set up - one on the hills above the rookery, and the other way over on the mainland at Hanson Ridge. This is the only time I've seen 5 minute Araldite take 20 minutes to get sticky. BJ and Kevin manned the rookery station, living in the comparative luxury of a hut, while Richard and I flew some 180 km across the Ross Sea to Hanson Ridge and set up a tent. The week before we arrived winds up to 120 km/hour had been recorded there, so it was with some trepidation that we set up our receiving station in

a portable toilet, weighed down with wire cables and 40 gallon drums filled with rocks and set up our 6 x 6 expedition tent on the sheltered side of the hill.

We needn't have worried. The next 15 days were spent in quiet solitude — except for a beeping receiver, all day sunshine, calm airs, and the most amazing view of glacial valleys, icebergs, and Mt Erebus. The toilet with the best view in the world was even graced by a ministerial visit. But unfortunately for the cameraman of a film crew who visited, Richard had been without fresh fruit for seven days and while not exactly rabid, he could definitely smell an apple in a pocket from 50 paces. The film crew escaped without their lunches, but at least with their lives.

The results, though secondary to the experience, were interesting in their own right. We found that the penguins travelled out to sea in a large curve away from the rookery using icebergs as vehicles. Then returned home in one straight-line swim. Some travelled over 90 km on their return journey, though most stayed in about 40 km from the shore.

Remembering Richard and something he started

Dan Crisp reflects on the last five years of the Science Publications Group.

Our director, Dr Richard Sadleir, who established Science Publications as an early and integral part of S & R Division, is retiring. This reflection is dedicated his leadership of the Division over the past eight years. Richard, I hope you enjoy reading this article as much as I have enjoyed writing it.

How the Science Publications group grew

When I started working for the Science Publications group, our output wasn't very large. It was run by Jane Napper now Jane King. Jane was at that stage doing all the paperwork. There were two editors working part time. Over the years, Mary Cresswell, Jan Heine, Ian Mackenzie, Lynette Clelland and Susan Jane Owen have worked in the group. Ian and Lynette are our current editors, with S.J. assisting the group in setting up for the new DoC Publications Standard. When Jane Napper moved to Christchurch, Kaye Green took over the Coordinator's role. Herman Weenink, a repair man with UBIX found work with us, having spent a number of years with UBIX in their OCE repair division. Herman has been very useful to us as an operator for the Oce CopyPress.

Over the last five years the work of the Group has expanded. In the early days we always sent *Science Fiction/ Faction* out to be printed and bound by an outside copying firm. When we changed the masthead and layout to *Conservation Science Newsletter* it was decided to try printing this publication in-house, using the Oce CopyPress and having it folded and stapled by a nearby copy centre. The number of Series has increased from three to six. Our *Internal Report Series* is now basically used for internal matters which warrant a permanent record. The *Science and Research Series* has been our main-stay with many completed findings of Science & Research staff put into print for the outside world to know. *Conservation Advisory Science Notes* entered the picture in 1993. This series was created for the many specific questions that are asked both of contractors and DoC staff. This series will

soon have a paper change as the grey recycled paper has been found unsuitable for our uses. The *Conservation Science Publications Series* was created for major publications that were meant to be showcase productions for the Division. These were usually printed on glossy paper by an outside printer. A newer series which has been very welcome both in the Division and outside was the *Department of Conservation Technical Series*. This series was created to be a vehicle for texts of an instructional or "how to do it" nature. Knowing our Coordinator, Kaye Green, she will probably have another series started by the end of 1995.

And as I write this reflection, another series has indeed been born! It is the *Science for Conservation Series*, publishing important scientific work commissioned from outside of the Department.

If we are not trying to get a new series up and running, we at Science Publications are trying to come to grips with the new Corporate Publishing Style. This alone is causing some considerable headaches. The group not only has to cope with these problems, we also are constantly being advised and reminded of a new computing environment. When will it ever end?

However, we are very proud of what has been achieved over the years, and our list of publications is a tribute to Richard's foresight in founding the Division's own publishing unit.

Dan Crisp, Clerk
Science Publications, Tory Street

Remembering Richard in Committee

Paul Dingwall remembers Richard's contributions to the development of international science advice.

Richard has made a significant contribution to the Scientific Committee on Antarctic Research (SCAR). This is an international scientific organisation that advises the Antarctic Treaty Parties on science and research matters. It comprises experts from all around the world in all the sciences having application to the Antarctic region. Richard has served for a number of years on SCAR's Subcommittee on Biology. (Richard was always referred to as Dick Sadleir by his SCAR colleagues.)

Richard also participated in the SCAR/IUCN Workshop of experts on Antarctic Protected Areas, convened in Cambridge, U.K. in 1992. This workshop produced a valuable series of recommendations for implementing the new protected area management objectives and principles of the Protocol on Environmental Protection to the Antarctic Treaty.

Richard is also a former member of the Ross Dependency Research Committee, Working Group on Biology, and the Royal Society Committee on Antarctic Science, which advises on all aspects of New Zealand's Antarctic science programme, and is the national link to SCAR.

Hydrilla - an invasive oxygen weed in the Hawkes Bay

by Paul Champion & John Clayton, NIWA, PO Box 11-115, Hamilton

Old mans beard and, to a lesser extent, heiraceum are now well known as weeds rapidly invading and degrading our unique native vegetation. Few know that a similar fate has befallen our submerged plant communities, and once where species-rich meadows of native plants grew, there now grow forests of exotic 'oxygen weeds'. These plants can almost completely fill the water column, often growing up to 6 metres tall, excluding almost all other life. Three oxygen weeds egeria, elodea and lagarosiphon are already well established in many of this country's water bodies, but a fourth potentially worse species, *Hydrilla verticillata*, is currently restricted to only four lakes in Hawkes Bay.

Hydrilla was first described in New Zealand from Lake Tutira in 1963, although it had probably arrived much earlier than this. It's arrival was almost certainly from plants imported to oxygenate goldfish bowls and subsequently was liberated into that lake. Since then it has established in the neighbouring Lake Waikapiro, which is only separated from Tutira by a narrow isthmus and spread to Elands Lake and Lake Opouahi. Spread to these lakes was probably associated with the transfer of food fish from Lake Tutira for the development of trout fisheries in those lakes.

Hydrilla is a notorious water weed overseas, now costing more than water hyacinth to control in the USA. Unlike the other oxygen weeds present in this country, hydrilla is resistant to herbicides registered for aquatic use here, and also produces resistant propagules which persist in the lake sediments ready to recolonise, should the existing cover of this plant be removed. Spread from lake to lake is usually via contaminated boats and trailers, fishing nets (especially eel fyke nets); or liberation of fishbowl, or fishpond contents (either deliberate, or accidental).

A Hydrilla Technical Committee was set up in 1984 after a public meeting in Hawkes Bay. Members of the then Hawkes Bay Catchment Board, MAF Aquatic Plant Section, MAF Freshwater Fisheries, Wildlife Service, Hawkes Bay Acclimatisation Society and Department of Lands and Survey, armed with a wealth of knowledge regarding this plant's performance overseas, were involved with this initiative. There was a general consensus that the only total control option for hydrilla would be with the use of grass carp (still a very contentious issue), but a combination of Tutira's declining water quality and other more political issues stalled any progress regarding the fate of this weed.

Since that time, awareness of hydrilla has grown and DoC now regard it as one of their priority plants for control. Hawkes Bay Conservancy have erected signs warning recreational lake users of the presence of hydrilla from these lakes and motorised boats are prohibited. Noxious weeds legislation prevents the propagation, sale and distribution of hydrilla nationally.

NIWA (formerly MAF Aquatic Plants) have been involved in re-

search relating to this plant since the early 1980's and are currently funded by central government to investigate various aspects of hydrilla. These include evaluation of control options, including herbicides used to control hydrilla overseas, bottom-lining with weed mat and grass carp. Grass carp were considered to be the only effective control option and a trial was set up in Elands Lake to evaluate their performance. Other studies include distribution and viability of hydrilla propagules in the lakes and re-vegetation potential of Elands.

Grass carp trial in Elands Lake

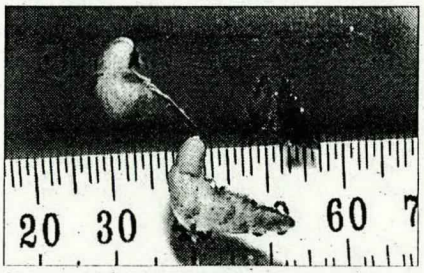
Prior to the introduction of grass carp, hydrilla completely dominated the submerged vegetation of Elands Lake, forming a continuous band from 1 to 4 .5 m depth. This equated to one vegetated hectare with an estimated biomass of 1.5 tonnes dry weight (80 tonnes fresh weight).

Grass carp are used extensively overseas to control aquatic weeds, but their use in New Zealand has always been very restricted, due to concerns about the introduction and impact of yet another alien organism into New Zealand and the concerns of trout fishermen. Sterile fish were produced in the mid 1980's by MAF Freshwater Fisheries in Rotorua. Approval for a trial stocking of sterile grass carp was finally given in 1988 and 400 fish were introduced in November that year. This lake is completely landlocked and is isolated on private land, so therefore escape, or fish removal was considered unlikely.

Monitoring over the first year failed to detect any decline in weed density, but in April 1990, an estimated 99% of the weed biomass was removed. The next inspection in spring 1990 indicated no plants of hydrilla remained, but in April 1992 a small number of stunted plants were found, usually growing from under fallen tree branches, or in less than 10 cm of water, presumably in areas where grass carp could not reach.

Hydrilla propagules

Samples of lake sediments were taken beneath areas where hydrilla once grew, using large catch bags. These were sieved and revealed both tubers and turions, see photograph.



Large white tubers, smaller green turions.

Overseas literature suggested that turions had a life span of one year and tubers 5 years before they decay and loose viability. Viable turions were recovered from sediments until 1993, after which all those found were rotten. However viable tubers were still recovered in April 1995 and a few stunted plants were seen in the shallows at the same time. These had all regrown from tubers and were carefully removed by hand.

To assist in the prediction of where these propagules could be found studies were undertaken in Lakes Tutira and Waikapiro, with sediment cores being taken at metre depth intervals under hydrilla beds. Tubers were found between 1 and 2 metres depth and turions from 1.5 to 5 metres. Turions were far more numerous than tubers with average abundance of 500 turions per square metre and 100 tubers per square metre. Average tuber numbers in Elands Lake were 30 per square metre, five years after the removal of hydrilla weed beds by grass carp.

Removal of grass carp

If hydrilla, and its tubers can be eradicated from Elands Lake, it is intended to remove grass carp to allow the restoration of native vegetation (see next section). Grass carp are adept at avoiding netting, and within small lakes, the most effective method is rotenone.

This piscicide reduces oxygen uptake by fish and these float to the surface, where they can be collected. Fish will recover completely if placed in oxygenated water.

A similar recovery of fish was successfully completed in Parkinsons Lake, near Waiuku, in 1980, after the removal of egeria oxygen weed in that lake by grass carp.

Seed banks and re-vegetation

A diverse native community of underwater plants developed in Parkinsons Lake, within six years after grass carp removal, without the need for planting.

Sediment cores were taken from Elands Lake, processed and examined carefully for seeds to determine which plants, if any, were likely to recolonise the lake after carp removal. Cores contained viable seeds of eight native plants. In addition, five native shallow water plants are still present in the margins of Elands, their shallow water habitat and dense turf nature preventing total destruction by grass carp. From these results and observations, it would be expected that when grazing pressure by grass carp is lifted, then a diverse native vegetation will develop in this lake, provided that hydrilla has been eradicated.

Implications of this work

Hydrilla tubers are still present in Elands Lake five years after the elimination of the massive weed beds of this plant. Small numbers of germinated tubers have been found each year in areas where grass carp access may be partially restricted. Provided that these stunted plants do not produce further propagules and that a big enough population of fish can be maintained to continue grazing off any re-growth, then it may be feasible to eliminate hydrilla.

Grass carp should not be removed form Elands Lake until no further hydrilla plants, or viable tubers are detected for two consecutive years. A further two years surveillance for hydrilla regrowth should also be undertaken after carp removal. Unequivocal eradication of hydrilla from Elands Lake is at least a further five years away.

Lake Tutira is a much larger lake than Elands (174 compared with 4 hectares) and any eradication attempt in this lake would be considerably more difficult.

The Elands Lake trial has demonstrated an effective and high degree of control of hydrilla within two years of grass carp introduction . A similar result in the remaining three hydrilla infested lakes would almost certainly be achieved if grass carp were utilised. This would reduce the chance of hydrilla spread to almost zero, but the consequence would be devegetation over a long time frame.

Water quality did not deteriorate in either the Elands trial, or Parkinsons Lake after de-vegetation using grass carp and is not expected in the remaining hydrilla lakes. There would certainly be major effects on invertebrate communities, which could impact the fisheries, but in other cases where vegetation has been lost from a lake (such as in the Waikato), fish often change their diet depending on food availability with little effect on fish numbers.

Summary

Hydrilla would almost certainly become a major weed in New Zealand should it escape from the relatively isolated lakes in the hills of northern Hawkes Bay. Restriction of boat use, lakeside publicity and legislation to prevent the distribution of this plant have reduced the potential for spread, but at present this threat is still a reality. The perfect solution would be the eradication of hydrilla from the country. It is unknown if this is an attainable goal, but an almost zero risk of spread could be attained if grass carp were to be introduced into the remaining three lakes.

On-going evaluation of Elands Lake will allow a better understanding of hydrilla propagule longevity in New Zealand and hopefully also answer the question "Is eradication of hydrilla achievable?"

NEW SCIENCE & RESEARCH PUBLICATIONS

Possums as conservation pests. Proceedings of a *Workshop on possums as conservation pests, organised by the Possum and Bovine Tuberculosis Control National Science Strategy Committee. Christchurch, New Zealand 29–30 November 1994.* Compiled by C.F.J. O'Donnell. 1995.

A NEW SERIES!
SCIENCE FOR CONSERVATION
Presents the results of investigations contracted to science providers outside of DoC.

Thomas, M.D. and Fitzgerald, H. 1995. **Bait-station spacing for possum control in forest.** *Science for Conservation: 5.*

Partridge, T.R. 1995. **Interaction between pingao and marram on sand dunes. Completion of permanent plot studies.** *Science for Conservation: 3.*

Cowan, P., and Pugsley, C. 1995. **Monitoring the cost-effectiveness of aerial 1080 and ground hunting for possum control.** *Science for Conservation: 2.*

Atkinson, I.A.E. *et al.* 1995. **Possums and possum control; effects on lowland forest ecosystems.** *Science for Conservation: 1.*

REPORTS

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

Flux, I, Bradfield, P., Clegg, S. 1995. **Preliminary results and observations on North Island kokako productivity and ecology at Mapara Wildlife Reserve, King Country, July 1993–June 1994.** *Science & Research Series No. 88.*

Sheppard, Brian 1995. **Department of Conservation science planning handbook for 1996–97.** *S & R Internal Report No. 149.*

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 $2.25 (incl. GST) per copy.

Walls, G. and Scheele, S. 1995. **Collapse or recovery: Pitt Island vegetation 1980–1993, with reference to Chatham Island.** *Conservation Advisory Science Notes No. 120,* 68p.

Douglas, M.E. 1995. **Alkaline single cell batteries and rechargers: results of preliminary tests.** *Conservation Advisory Science Notes No. 119,* 17p.

Shaw, T. 1995. **Population census, habitat assessment, and management of the endangered fern *Davallia puketi*.** *Conservation Advisory Science Notes No. 118,* 23p.

Simpson, P. 1995. **Alongside the water — Parewai: a concept to restore ecological.** *Conservation Advisory Science Notes No. 117,* 5p.

Chapman, M. 1995. **A geological assessment of the Moss Creek track, Kauaeranga valley, Thames.** *Conservation Advisory Science Notes No. 116,* 14p.

Booth, A.M. 1995. **The Little Shearwater in the 1994 breeding season on Lady Alice Island: breeding success, and timing and causes of breeding failure.** *Conservation Advisory Science Notes No. 115,* 10p.

Davis, P. 1995. **The domestic fuelwood sector in Whangarei and Northland, and the role of manuka as a fuelwood and a forest.** *Conservation Advisory Science Notes No. 114,* 33p.

Jacobs, R.J., Lewes, C., Laird, I.K. 1995. **Track markers: improving their visibility.** *Conservation Advisory Science Notes No. 113,* 23p.

Parsons, M.J. 1995. **Status or the introduced brown seaweed *Undaria* in New Zealand.** *Conservation Advisory Science Notes No. 112,* 24p.

Barrier, R., West, D., Boubée, J. 1995. **Fish passage over the Whangamarino weir.** *Conservation Advisory Science Notes No. 111,* 6p.

Jones, K. and Carson, D. 1995. **Civil war sites in the United States: management lessons for New Zealand.** *Conservation Advisory Science Notes No. 110,* 7p.

Rogers, G. 1995. ***Calluna vulgaris* — Poukai Range, Egmont National Park.** *Conservation Advisory Science Notes No. 109,* 4p.

SCIENTIFIC PAPERS

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

Park, Geoff. 1994. **The polynesian forest: Customs and conservation of biological diversity.** Pp.131–154 (Chapter 8) in Morrison, J.; Geraghty, P.; Crowl, L. (Eds): Land use and agriculture. *Science of Pacific Island Peoples, vol.2.* Institute of Pacific Studies, University of the South Pacific.

McFadgen, B.G., Knox, F.B., Cole, T.R.L. 1994. **Radiocarbon calibration curve variations and their implications for the interpretation of New Zealand prehistory.** *Radiocarbon 36 (2):* 221–236.

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