CONservation SCIENCE newsletter

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CONTENTS

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

This issue has three letters from readers expressing views on our Masthead. *Conservation Science Newsletter* is a fairly pedantic title, but there are several inferences that can be drawn from the way we display it. If enough people feel that it does not present a fair view of the contents then we will consider changing it.

The new Departmental Identity Programme will require the redesigning of all our publications, so as to better show the new logo and wordmark. Change could be made at that time, if enough readers want it.

In the last two months as I have been moving around the Conservancies I have become aware that there are exciting things going on at Field Centres. They are making innovative use of science. *Conservation Science Newsletter* is a good forum to exchange ideas, and let others know what you are doing. We will publish anything reasonable that you send us. Best new idea each issue gets a chocolate fish!

Kaye Green
Editor

LETTERS TO THE EDITOR

I would like to add my voice in support of the conscience title. I must admit that it took me a while to click as to the double meaning, but when I did, I thought it was clever. As to it being distasteful or injurious to our credibility – I believe that most of us involved in science in this department consider ourselves to be Conservation Biologists/ Scientists. In other words, we value the indigenous biodiversity (and cultural diversity) of New Zealand in all its variability and forms. These are our values (and surely values drive our consciences), and we should be proud of them. It's the reason we work here. I assume that the critic feels that this makes our science less valid – sure, our philosophies drive what we want to research (as in any outfit), but our scientific methods are rigorous and beyond reproach.

Craig Miller
Science, HOKITIKA

Science a Con?

My criticism of the newsletter is NOT that it's a play on CON-SCIENCE, but that its glaring connotation is that SCIENCE IS A CON. That was what was wrong, too, with *Science Faction Fiction!* Calling the newsletter *CONSERV-ATION SCIENCE* would seem to me to be unambiguous and appropriate; a simple modification to the masthead, only.

Geoff Walls
Science, NAPIER

You asked for responses to the new masthead of the Science and Research Division newsletter. When the first edition came out I was dismayed to see it called Fiction-Faction*. The implication was that Science was a mixture of facts and fiction. While this is undoubtedly true (otherwise there would never be any refinement of knowledge) it is not the sort of statement to make in a social and political environment in which Science is increasingly unpopular, accused of being monocultural, unaffordable and unfathomable to most New Zealanders. Now my shock is heightened, because Science (and therefore the work of the Science and Research Division) is not only a harbinger of fiction, it is a con as well!

Actually, I like the association with "conscience". If science (small s) had been built as a way people (all people) develop, instead of an unconditional search for truth; or, if Science (big S) was seen as part of all cultures instead of a tool of Western imperialism, then the Twentieth Century may have been a positive experience instead of being, for most people, a bummer. Science needs a conscience. Conservation Science needs a new conscience.

Conscience: I'd stick with the new name, as an example of enlightened misadventure.

Philip Simpson
S & R Division

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* *This fixation that the former title of this fledgling factsheet was* Science FICTION Faction *is, in fact, fallaceous. Philip is not alone in falling for this feckless fable. Fellow S&R facilitators have forcefully fomented this fiction with fearsome fervor! A furtive ferreting through fastidiously filed back-copies (or a look at the National Bibliography) will establish that the fulsom title was, forsooth,* Science FACTION Fiction! *The Science Faction so felicitously feted presumeably included the fortunate folks of Science & Research Division. — Ed.*

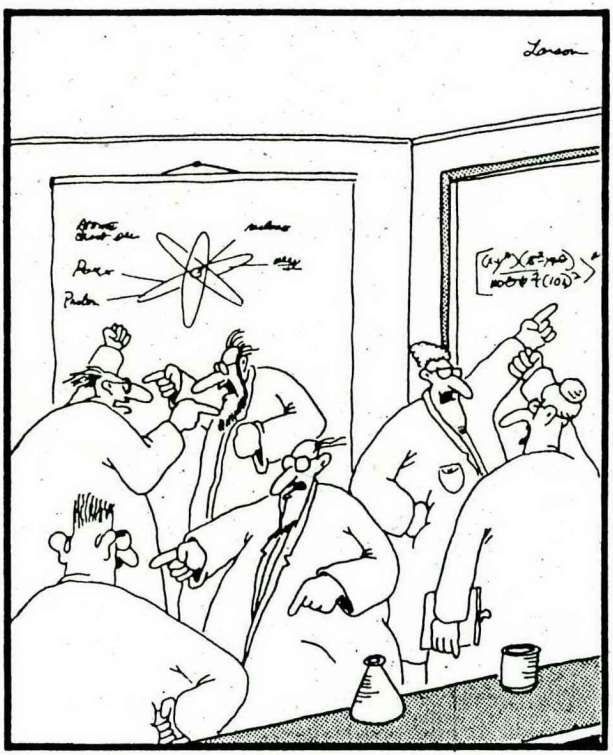
DEPARTMENT OF CONSERVATION

SCIENCE AND RESEARCH REVIEW

SUPPLEMENTARY SUBMISSION

NELSON/MARLBOROUGH CONSERVANCY

Eureka we have found the problem.



Another case of too many scientists and not enough hunchbacks

NEW ZEALAND ORNITHOLOGICAL CONGRESS TRUST BOARD

P O BOX 12397, WELLINGTON
NEW ZEALAND

ASSISTANCE TO ATTEND 21ST INTERNATIONAL ORNITHOLOGICAL CONGRESS - VIENNA 20-25 AUGUST 1994

The NZ Ornithological Congress Trust Board is offering travel assistance fellowships valued at NZ$1000 each for up to two persons to attend and participate in the 21st International Ornithological Congress to be held in Vienna 20-25 August 1994. Registration papers can be obtained from XXI IOC, Interconvention, Friedrichstrasse 7, A-1043 Vienna, AUSTRIA.

Preference will be given to (a) New Zealand amateur or professional ornithologists who are members of the OSNZ or the Royal Society of New Zealand, or (b) Post Graduate students from a New Zealand University who are undertaking a topic relevant to the study of birds. Successful applicants will be required to forward to the Board by 30 November 1994, a report of their attendance at the Congress suitable for publication in the OSNZ NEWS - the quarterly newsletter of the Ornithological Society of New Zealand.

Applicants for these fellowships should forward their ornithological CV, reasons for attending the Congress with supporting letters from two referees to:

NZOCTB TRAVEL FELLOWSHIP,
P O BOX 12397, Wellington.

Applications will close on **12 November 1993** and decisions of the Board will be advised in December 1993. The Board reserves the right to make no awards.

J.R. Roberts
Business Manager
NZOCTB

NOTES AND NEWS

Definitions

Some time ago it became apparent to Dick Veitch and I that staff in policy divisions and conservancies were using these terms in very different ways. Their technical use in the department needs to be clarified and made more precise than current dictionary definitions. I, therefore, drafted out some definitions and circulated them to Conservancy Advisory Scientists and to all Head Office Policy divisions for comment. As a result, I feel that the definitions below are those most appropriate for DoC.

INVENTORY A list of species, sites, objects, facilities or locations at a defined time in a defined place or area.

SURVEY A single measurement, or assessment, of the presence or absence, the condition, or numbers, of: species, sites, objects, facilities, or locations; at defined places or areas; taken in a defined time span. In the social sciences, a survey may include measurements of human attributes or attitudes.

Surveys will usually be carried out with a defined methodology and recorded in a retrievable format. They can form part of a suite of similar surveys carried out at different locations at the same time.

MONITORING Repeated surveys by standard or directly comparable methods, at identical or comparable places or areas, or of human groups and their activities.

Monitoring is intended to demonstrate or describe either a statis situation, or to record information relating to a changing situation or trend.

Richard Sadleir
S&R Division

The Video Workshop

Did you know that DoC staff have access to our own facilities for the production of videos for educational, or advocacy purposes? Lindsay Canham and his crew based in Rotorua, can help you realise your project with the aid of a well tailored video.

The following videos have been made and are available to borrow so as to give you an idea of what is possible.

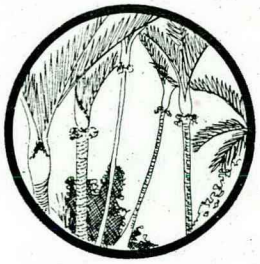
High and Dry: Whale Stranding in New Zealand
Narrated and scripted by Mike Donoghue. This tape gives a step by step guidance about how to handle a whale stranding. Very good value as a refresher for already trained staff or as an introduction for untrained staff.

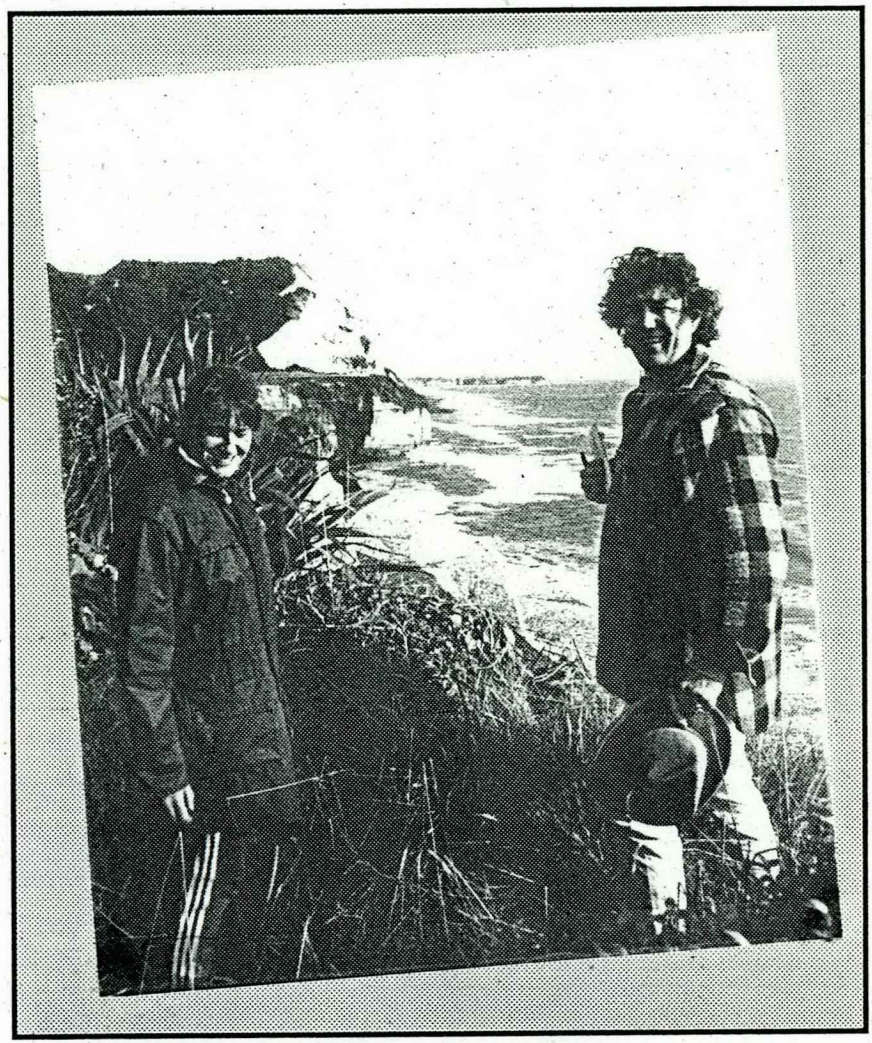
Facing the Future
A short tape with graphics – introducing CMS to the public.

The Saddleback Returns
The story of the transfer of Saddlebacks from Tiritiri Matangi in the Hauraki Gulf to Mokoia Island in Lake Rotorua by the Department and Rotorua Lakes High School. This tape illustrates good community interaction.

Mayor Island (Tuhua)
A general travelogue showing the recreation and conservation values of this Maori owned island.

Kaye Green
S&R Division





Tory Street scientists Kevin Jones and Philip Simpson have been involved in a multi-disciplinary effort on stabilising archaeological sites, using different vegetation covers. One task has been to visit a number of sites and to consult with Field Centre reserve managers. Here Fiona Wilson (CO with responsibility for historic resources in Wanganui Conservancy) discusses Katikatiaka pa, North Taranaki, with plant ecologist, Philip Simpson. In the distance are the Whitecliffs (Parininihi) and Pukearuhe.

The site is in a perfect conservative cover of tall grass. But how long will it remain so? And what should be encouraged in the longer term? These are questions the site stabilisation guidelines will answer.

RESEARCH IN PROGRESS

Update on North Island kokako research and management on the mainland

After the 1988 kokako workshop at Rotorua, two quite different research approaches were taken to resolve the relative roles of browsers and predators in kokako decline. One was a basic study of breeding attempts and outcomes at Rotoehu in the Bay of Plenty, asking the questions: How many of these pairs try to breed? How do the attempts fare? The second was a direct management intervention, in which perceived pest mammals were heavily controlled (at Mapara, King Country, and at Kaharoa, Bay of Plenty) to see if kokako numbers would then increase. This becomes known as Research by Management (RbM). To talk of the first of these first . . .

The Rotoehu study is a collaboration between Landcare Research Rotorua and DoC Bay of Plenty (Paul Jansen). In the three seasons from 1990–91 to now, 62–73% of monitored pairs have attempted breeding each year. In 1991–92, pairs made 1 attempt each, but in the season before and after this there was an average of at least 2 attempts per pair. This season, one pair made 4 attempts! Of 49 nesting attempts monitored so far, 8 (16%) have fledged young. Of the 28 explained failures, 22 were predations and 6 were desertions. Evidence from video cameras and other sleuthing reveal that ship rats are the main predators of eggs, kahu the main predator of chicks and that possums are predators of eggs (filmed twice) and probably chicks and adults (circumstantial evidence). In three years we have encountered two deaths of incubating/brooding females and have learned that most single birds in the study area are males. This year we filmed a new interaction mechanism I label "disturbance" whereby passing rats and possums cause older chicks to leap from nests. It's not predation at that stage, but most of these chicks later died.

These data suggest that predation and related mechanisms are more important than food shortage (competition) in kokako decline at Rotoehu, although with 27–38% of pairs failing to attempt breeding each year, competition is probably also real. What with rats eating fruit and possums killing kokako, the old terms "predators" and "competitors" as implying clear aggregates of particular species should only be used after careful thought. Many intricacies of interaction are possible . . . could possum browsing improve the hunting success of kahu?

Clearly, management to increase kokako on the mainland must target several pest species together. It is interesting that mustelids and feral cats have not entered a single video camera frame yet at Rotoehu, but perhaps they will. Also, given that we know virtually nothing of predation of subadults or adults away from nests, mustelids and feral cats should continue to be controlled in RbM blocks.

Kokako juvenile output has been high in RbM trial areas this year, especially in managed blocks. It was 50% (of pairs which fledged young) at Mapara (cf. 20% in 1991/92); 85% at Kaharoa (cf. 30% in 1991/92) and 33% at Rotoehu (unmanaged; cf. 7% in 1991/92). Juvenile output at Kaharoa technically exceeded that of Little Barrier Island! (83% in 1992/93). Juvenile survival at Rotoehu was poor – probably only 4 of

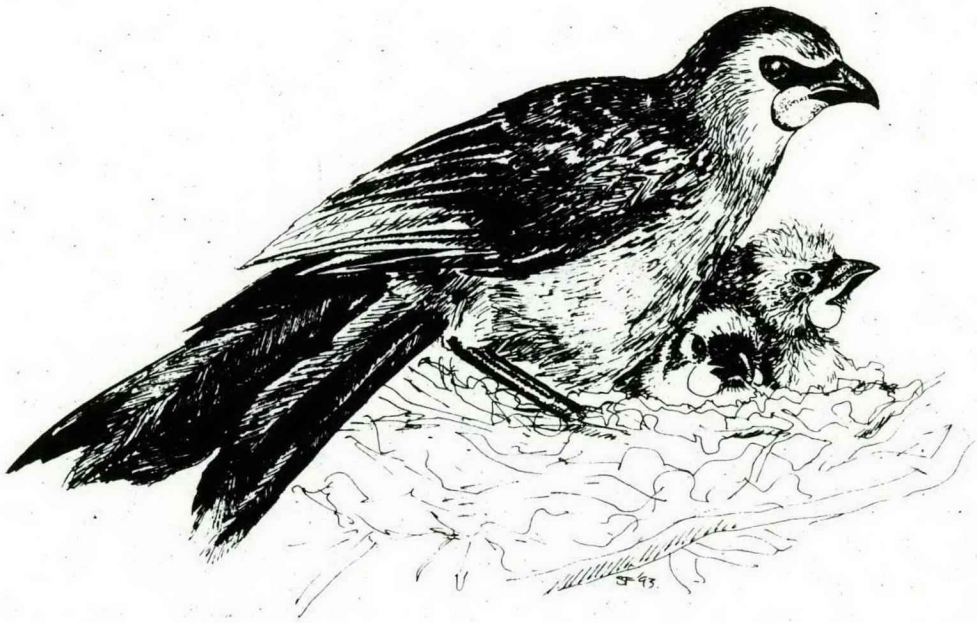
the 8 fledged young are still alive. We have to await the next territorial adult census on 1 November 1993 to see what recruitment will be in the three blocks. Adult density is increasing at Kaharoa (the only known increasing kokako population on the mainland) and is stable at Mapara where pest control has been less successful.

I am acutely aware of the need for careful interpretation of these data. Nevertheless, a coherent picture of mainland kokako decline is emerging:

1. Most birds are trying to breed but failing, due to a suite of predators which prey on and/or disturb every stage of the nesting cycle. Rarely, nesting females themselves are killed.
2. Some pairs do not attempt to breed each year, for unknown reasons. (The best way to test food shortage as the cause would be to supplementary feed).
3. Large scale pest control (excluding, for the moment, kahu) with existing technology can reverse the decline. While recovery of pest populations is rapid, kokako are long-lived and pulses of management effort may for the while suffice. In the coming year we plan to explore this and related questions by modelling kokako populations.

A final, stimulating thought to chew on in the bath – are kahu over-abundant? Are they the black-backed gull of the mainland forest remnant?

John Innes (and team)
Landcare Research, Rotorua



Paper Wasp Research

With so much effort being put into research on vespulid wasps, one might think that the other introduced social wasp, the Asian paper wasp (*Polistes chinensis*), was being ignored – not so. The Department of Conservation and the Lottery Grants Board have funded a study by myself, Ray Pierce (DoC Whangarei) and John Dugdale (Native Plants & Animals Division, Manaaki Whenua/Landcare Research, Auckland). We are looking at the ecology of this species, to determine its impact on our native fauna.

As all northerners know, the Asian paper wasp is abundant in urban and rural areas in the top half of the North Island. It has also been recorded as far south as Nelson (in the DSIR wasp survey of 1990). You don't hear of this species inhabiting our forests. Are they really not there; or are they just less conspicuous than the *Vespula* wasps because they live in much smaller colonies and are quieter in flight. And what about other native habitats? The main aim of our research in the 1991/92 season was to determine in which native habitats Asian paper wasps are abundant.

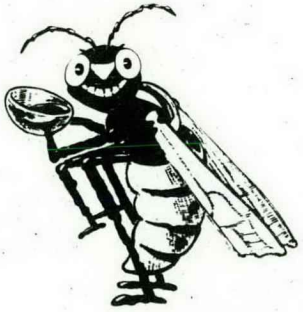
A search of 79 sites around Northland revealed that the Asian paper wasp reaches high densities in open, sunny places. They were present in 89% of native shrublands and 73% of flax swamps and salt meadows. They occurred in less than half of the manuka /kanuka forests (46%) and mangrove swamps (43%). They were found in only three dense forest sites (21%). One nest was found in a salt marsh.

Malaise trapping in Waipoua and Puketi forests and in the shrublands at Lake Ohia confirmed that the Asian paper wasp prefers open habitatas. None were caught at Puketi and, in 400 trap-days, only six were caught at Waipoua. Five of these were in a trap set in shrubland at the northern edge of the forest, and the sixth in a large roadside clearing, 1.5 km inside the forest. By contrast, 85 wasps were caught in 265 trap-days at Lake Ohia. This catch rate was similar to that at a rural garden site used as a "moderate wasp abundance" control site (it contained at least 20 nests/ha and 700 wasps/ha in late March).

The native fauna of our forests may not be threatened by Asian paper wasps, but the inhabitants of shrublands and coastal fringe habitats may be facing predation and competition. Preliminary diet studies show a large proportion of lepidopteran larvae as prey. We do not know if the species is adding to the wasp problem, or whether it is out-competing the Australian paper wasp and German wasp. (By the way, the common wasp (*V. vulgaris*) was not recorded at any site).

Work continues, with funding promised from DoC for the coming season for continued population monitoring and diet studies.

Kay Clapperton
from *Wasp Times*



Biosite: A species information management tool

Biosite is the working name given to a facility being piloted by the Information Services Unit as part of its conservation information project. This facility would be designed to make use of the power of Oracle to manage species information. Most importantly, it should provide the standard species information recovery tool that many managers and planners have been asking for.

The concept has evolved over several years, and originally arose from a desire to rationalise the various small, stand-alone dBASE species distribution databases the Department manages. At that time, it was envisaged a generic facility would be developed that would allow users to store and retrieve distribution information relating to any species. It was anticipated that existing databases (e.g., blue duck, threatened plants, amphibians and reptiles) would be subsumed within the generic facility.

However the development of the Index database over the past two years has seen a change in emphasis in the way species information is used. Index, in essence, aims to group records on a spatial basis (place), rather than allowing extraction of data only by topic (e.g. species). While this product has been quite successful, it has raised expectations at the conservancy level for a facility to allow updating of records within Index. At present, the only way of doing this is to get the records modified in the parent database (e.g., WERI), and down-loaded into Index, a cumbersome and time consuming task for all involved.

To address this problem, the concept of Biosite was developed. In principle, Biosite will manage four pieces of information. These are:

species observation (e.g., blue duck)

location (co-ordinate, e.g., grid ref.)

date of observation

source (observer or data source)

These are the 'core' elements – any number of other items may be attached in the future.

This approach is different in concept from the way DoC has approached management and storage of species information in the past. Previously data on a species has been channelled through one or a small number of technical specialists, who have also managed the database. Examples are WERI, kea, kaka, blue duck etc. This model (which is not entirely precluded by Biosite) centralises control, allowing good QA, but restricts access to a small number of specialist users. Biosite would allow a far wider range of users to enter data, but will require QA of records to be managed at a local or regional level. This is a significant change, which although almost inevitable in a fully relational networked database environment, will require some careful management to ensure good quality datasets.

The real power of Biosite would come from data structures and linkages behind the individual records. In the case of a species record, an extensive taxonomy (not visible to the average user) will 'classify' each record. This would allow extraction of records by, for example, Kingdom, Phylum, Class, Genus, etc., as well as common tags such as owl, seabird, bug, conifer, amphibian, or animal. This principle could be extended to include attributes

such as status of a species or taxonomic group, allowing selection of records of threatened species or weeds. This should give considerable flexibility and power to users. On the 'site' side of Biosite, we will be developing links with other databases such as the land register, concessions, facilities and so on. This could be used to routinely answer questions such as "what is the association of kiwi records with DoC huts?", even though the source data resides in separate databases. Biosite data will also be able to be 'split' using digitised boundaries where these exist, such as conservancy, territorial authority, field centre area, or map sheet. As further digitised information becomes available, it should become possible to select on the basis of an area such as a national park or conservation unit.

Although we are initially setting up Biosite as a database, like Index, it will probably ultimately become a utility with no data files of its own. In this form, "Biosite" would put away records into other databases, "Index" would grab them back again in various combinations. In the meantime Biosite will, we believe, provide a much needed facility, allowing DoC staff to computerise and manage `their' species information, and at the same time continue the process of data integration that is the key to successful management information systems.

Euan Nicol
S&R Division

Software Review – Microsoft Access

I looked at ACCESS over about four days. It is a large application and I barely scratched at the surface in this time. I tried to evaluate it as a potential successor to dBASE looking in particular at it's ease of use in comparison to dBASE.

ACCESS's requirement for a 386 PC puts it beyond many current DOC machines. It took about 12 megs of disk space when I loaded it.

To get an overall look at what ACCESS could do I followed through the introduction using the demonstration database that comes with the software. I then attempted to duplicate in ACCESS a database application I had recently set up in dBASE IV. The two dBASE files were imported without any problems and after some false starts and much use of 'cue cards' – ACCESS's on-line help system, and the manuals I set up a screen form similar to my dBASE one. With further experimentation I was able to print one of the reports the user had requested – all done without programming.

The appeal of ACCESS is that it is a Windows application and thus has all the point, drag and click facilities of the Graphical User Interface. In addition it is more fully relational than dBASE, enabling users to manipulate data from more than one table in queries and reports without recourse to programming.

So how does it measure up against dBASE? ACCESS is a large and complex package requiring as much initial investment in time and effort as dBASE. A single file database is easy to handle, but to set up a relational database of several tables you need some database theory and proper data analysis. These areas are covered only briefly in the user manual, but there is included a list of recommended books on database design.

Querying and reporting is very powerful. The icons, point, drag, click etc.

will be very familiar to Windows aficionados, but needs lots of reference to on and off-line help initially. Fortunately the manuals are well laid out and seem to be comprehensive in these areas.

A lot of streamlining of applications can apparently be done by use of macros, but when all else fails ACCESS includes a programming language. While the dBASE language is at the easy end of the scale of programming languages ACCESS basic must certainly fall towards the difficult end. A non-programming user could make a start in programming and achieve things in dBASE, but this would be extremely difficult in ACCESS. However, the rest of the package provides so much there should be no need for the user to resort to programming.

A disconcerting feature for me was that ACCESS ran very slowly on my PC. With a small single file database the performance was tolerable, but using the demonstration database with a form accessing data from 2 tables, including a picture, there were delays of 15 seconds just to skip to the next record. In the simple application I set up it took 30 seconds to load the form and varied between 2 and 8 to skip. Delays between steps while building forms or reports were longer to the extent of being irritating.

ACCESS is a database of the future and at the introductory price of $195 a bargain. For those currently using Windows and Excel it's certainly worth a go particularly for relatively simple database requirements. However, if you are unfamiliar with database and tentative in Windows it is not an easy answer.

Kevin Moynihan
S&R Division

CONFERENCE NOTICE

Statistics in Ecology and Environmental Monitoring

University of Otago, Dunedin, New Zealand

13–17 December 1993

Programme

The first 3 days will be devoted to papers on any topic relevant to the overall theme of the conference. The remaining 2 days will consist of parallel sessions on:

1. Modelling ecological populations, particularly in the areas of: endangered species, pest populations, parameter estimation, simulation.
2. Environmental monitoring, particularly with reference to: sampling design, analysis to detect change, remote sensing.

To receive further information contact

Conference Secretary
Centre for Applications of Statistics and Mathematics
University of Otago, P O Box 56, Dunedin, New Zealand.

INSECTS OF THE WAIPORI ECOLOGICAL DISTRICT

by B H Patrick, B I P Barratt, J B Ward & I D McLellan

1993

Published by Department of Conservation
P O Box 5244, Dunedin

42 pages with 33 colour photos

Price: $36 (including GST)

Money must accompany orders

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NEW SCIENCE & RESEARCH PUBLICATIONS

REPORTS

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

Collier, Kevin J. 1993. **Towards a protocol for assessing the natural value of New Zealand rivers.** *Science & Research Series No.58.*

Five criteria for assessing aquatic reserve value were determined at a workshop at the 1987 Limnological Society conference. A trial assessment was carried out on seven sections of the Tongariro River to determine the utility of the method. It provided sensible scores but refinement of descriptors and weightings is necessary before the method is generally applied.

Collier, Kevin J. 1993. **Flow preferences of aquatic invertebrates in the Tongariro River.** *Science & Research Series No.60.*

Aquatic invertebrates were collected from four sites along the river in December 1990 to determine water depth and velocity preferences of the major taxa. Additional sampling at another previously unsampled site was used to verify conclusions derived from the calculation of preference curves. Preference curves linked with hydraulic surveys and diet of blue duck and juvenile trout may indicate likely effects of different flow regimes on food supplies in the Tongariro River.

Green, Kaye 1993. **DOC Science Project Summaries – 1991/1992. Vol.1 Output classes 2.0–4.6.** *S & R Internal Report No.140.*

Green, Kaye 1993. **DOC Science Project Summaries – 1991/1992. Vol.2 Output classes 5.0–8.0.** *S & R Internal Report No.141.*

Executive summaries, indexed by locality, researcher, and key output.

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.

Patrick, B. 1993. **Use of CCA tanalised timber in or near waterways.** *Conservation Advisory Science Notes No. 43,* Dept. of Conservation, Wellington. 2p.

Robertson, C.J.R. 1993. **Assessment of tinted glass for public observatory, Taiaroa Head nature reserve.** *Conservation Advisory Science Notes No. 42,* Dept. of Conservation, Wellington. 9p.

Herbert, J.M., Dowding, J.E. and Daugherty C.H., 1993. **Genetic variation and systematics of the New Zealand dotterel.** *Conservation Advisory Science Notes No. 41,* Dept. of Conservation, Wellington. 14p.

Grange, K.R., 1993. **An analysis of fish abundance and distribution data, Mayor Is. (Tuhua) marine reserve baseline survey, 1993.** *Conservation Advisory Science Notes No. 40,* Dept. of Conservation, Wellington. 34p.

Haddon, M., and Anderlini V., 1993. **Evaluation of southern Hawkes Bay coast intertidal data.** *Conservation Advisory Science Notes No. 39,* Dept. of Conservation, Wellington. 38p.

Lee, W.G., 1993. **1992-93 Assessment and reorganisation of the tussock flowering line in Takahe Valley, Fiordland National Park.** *Conservation Advisory Science Notes No. 37,* Dept. of Conservation, Wellington. 9p.

Johnson, P.N., 1993. **Okaia flat, Otago Peninsula: Botanical values and grazing.** *Conservation Advisory Science Notes No. 36,* Dept. of Conservation, Wellington. 18p.

Nugent, G., 1993. **Recalibration of the regression model used to predict deer densities in the Blue Mountains recreational hunting area.** *Conservation Advisory Science Notes No. 35,* Dept. of Conservation, Wellington. 5p.

Rose, A.B., 1993. **Long-term possum control: Getting the framework right.** *Conservation Advisory Science Notes No.34.* Dept. of Conservation, Wellington. 4p.

NEW CONTRACT REPORTS

Copies have been sent to all CAS, to librarians and to the Head Office library. (Further copies are available to staff on request, and for sale from this office.)

James, Bev. 1993. **The determinants of environmental attitudes: A review of the literature.** Dept. of Conservation, Wellington. 17p.

James, Bev. 1993. **The Maori relationship with the environment.** Dept. of Conservation, Wellington. 17p.

James, Bev. 1993. **Environmental issue, values and behaviour. Stage 1 of the Environmental Attitude Project.** Dept. of Conservation, Wellington. 24p.

The Centre for Resource Management
P O Box 56, Lincoln University, Canterbury

Announces NEW PUBLICATIONS

"Integrated environmental monitoring" *Information Paper no. 37*
Jonet Ward and Ruth Beanland

"Risk management strategies for the long run use of resources - the impact of climate change on agriculture" *Information Paper no. 38*
James Baines and Janet Gough

"Guidelines for monitoring additional dispute resolution processes within the Resource Management Act"
Information Paper no. 39
Carolyn Blackford

"Risk as a criterion for determining environmental policy priorities"
Information Paper no. 40
Janet Gough

"Cultural sensitivity of the contingent valuation method"
Information Paper no. 41
Ray Lambert, Lindsay Saunders and Tracy Williams

"Environmental education of New Zealand business: needs and responses" *Information Paper no. 42*
Margaret O'Brien and Tracy Williams

"Co-operative land management in New Zealand" *Information Paper no. 43*
Carolyn Blackford, Peter Ackroyd and Tracy Williams

"Politics, economics and pastoral land management in New Zealand: tenures for the times"
Information Paper no. 44
Peter Ackroyd

"Transport investment planning"
Information Paper no. 45
Brett Longley, Ian McChesney, Lindsay Saunders, and Nigel Jollands

PLEASE WRITE TO THE ABOVE ADDRESS FOR PRICE LIST AND ORDER FORM!

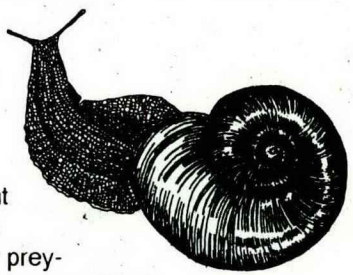
Biology Section, Wellington Branch
THE ROYAL SOCIETY OF NEW ZEALAND

Ecology and evolution of carnivory in New Zealand land snails

30 September 1993, 7.30 pm

Science House, 11 Turnbull Street, Thorndon, Wellington

The large, worm-eating, *Powelliphanta* snails belong to the elite of New Zealand invertebrates, being protected by law. Less conspicuous members of the family Rhytididae have an intriguing array of habits that make them equally worthy of attention.



This talk will describe recent work on the genera *Wainuia* and *Rhytida*. *Wainuia urnula* is a common snail in bush near Wellington, but its unique diet of land hoppers (amphipoda) went unnoticed until 1989. *Rhytida* species specialise in eating other snails. Their prey-handling techniques provide strong clues to a direct evolutionary connection with Australia and South African rhytidids.

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