



Newsletter of the Science & Information Division, Department of Conservation and Land Management

Volume 2, Issue 2

Edited by Patrick Pigott and Pam Burgoyne

Next deadline

WA Herbarium, Locked Bag 104, Bentley Delivery Centre, Como 6983

Aug 30 '96

Edition date June 27 '96

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EDITORIAL

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No you didn't miss it! This is only the second edition for 1996. Apologies to those who submitted material in March, but I got tangled up in bridal creeper! We still need lots of contributions and some feed-back is always reassuring; it tells us that someone is reading the newsletter.

reduce the fragmentation of groups at the Centre. Stage two will begin next month once new storage space has been created to take laboratory equipment not being used daily. Telephone numbers will be retained (hopefully)! 30 JUL 1996

Directorate

- Dr Jim Armstrong announced his resignation from CALM in early June to pursue a career in the private sector. We all wish him well in his endeavours.

Dr Neil Burrows will be acting Director of SID until a new appointment is made.

- Is everyone is aware of the new mailing address for staff at Como and the Herbarium?
Locked Bag 104
Bentley Delivery Centre 6983

Any mail going to the "old" PO Box 104, Como 6152 address will be forwarded for about a year, apparently.

BIO-RESOURCES GROUP WESTERN AUSTRALIA

Herbarium

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Group and Centre notes

BIO-CONSERVATION GROUP

- Keith Morris will be acting HOG until the Directors position is filled. David Pearson and David Coates are A/ Section Managers for Community and Species Conservation Sections respectively.
- Since April, Frank Obbens (who previously worked for WATSCU) started working at the Herbarium on a project monitoring weeds and endangered in the wheatbelt. This is similar to work Frank did for SID in 1993.

Woodvale

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- David Pearson and Angus Hopkins have recently had a couple of bouts in hospital, all is well and they are now back at work.
- Woodvale staff have finally begun the Great Move with scientists and technical staff changing offices and laboratories within the Centre. The idea is to

- The end of the financial year madness caught up with me well and truly. A few people did find me whimpering in my room on one particularly dreadful day and the fact that John and I never actually came to blows is remarkable. Anyway, the worst of it is behind us now, and only the mopping of blood is left to do.
- Our last minute capital works funding has been well put to use with lots of changes carried out in a mad dash. It was indeed a sight to watch our intrepid Collections Manager in total spinout trying to be in 4 places at once as well as maintaining his oriental impassiveness. A new home for the Spirit Collection (and no, that does not mean we have built a bar room!) and the Reference Herbarium finally has its own plumbing! A badly needed upgrade of fire protection system now in place as well as other building improvements to ensure the Collection is well protected. It was tough spending all that money in such a hurry, but well worth it.
- And what about the new DNA Research Lab? Dave and Vicki were given a Herculean task it seems to me, and yet they've been able to achieve miracles in such a short time. I, for one, am thrilled to think that we'll be starting such high profile new research under the Herbarium's roof.
- Diane Johns' smiling face will be missed at our front reception area - she's taken a secondment over at IMB for a minimum of 6 months, and we all wish her well in her new job. Marilyn Mawkes and Angie Walker are both filling the gap for Di, and once a week you'll have to put up with me manning the desk as well. We'll muddle through.

- A new face is Leigh Sage, the 'Duty Botanist' at the Plant Identification Unit (located at the Reference Herbarium). The PIU deals with plant identification/general botanical enquiries and is also tied to the network of Regional Herbaria which are scattered throughout the state. Leigh's job is to oversee the identification of plant collections from the Regional Herbaria and to take over from Ray Cranfield's role as Herbarium Duty Botanist. Leigh has formerly worked as a botanist for CALM, private consultancy firms and Curtin University of Technology. He studied at Curtin Uni between 1988 and 1991, returning in 1994 to do an honours year (his project was entitled "The Conservation Requirements of the Rare Species *Lambertia orbifolia*"). He is fast becoming the Volunteers' favourite person and has taken pressure off those of us at reception who have previously had to cope with difficult public queries. We are most grateful!
- We've just heard that two SID bods have scored Churchill Fellowships - congrats to Anne Cochrane and Trevor Butcher.
- Here's a chuckle for you as a closing note: a sign was displayed in a Belgrade hotel "The flattening of underwear with pleasure is the job of the chambermaid". I wonder if Belgrade hotels are fully booked? HmMMM..

SUSTAINABLE RESOURCES GROUP

Dr. Per Christensen has announced his retirement from CALM to take effect from July 15, 1996. We wish him well. A send-off will be organized and advertised soon. John McGrath will act as Head of Group and Richard Harper as Section Manager in John's stead.

Manjimup

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- Michelle Vellios joined SID Manjimup in February this year to replace Tanya English, who moved to Perth and then worked at SID Como until April. Michelle is a recent school-leaver and has studied office management at TAFE. Please introduce yourself to Michelle and welcome her to the Division.
- People involved in the Kingston forest ecology research project will know Mike Craig, a post-graduate student from UWA who has been studying the response of birds to logging disturbance. Mike has now largely completed his field work and will be going into hibernation for a year or so to analyse data and write-up. Good luck Mike.
- The newly-appointed Environment Minister for the Federal Government, Senator Hill, recently visited the Perup Forest Ecology Centre near Manjimup. He was accompanied by other Federal politicians, staff from Federal environment departments, and CALM

officers. Per Christensen and Ian Wheeler from SID Manjimup introduced the new Minister to a variety of native animals and inducted him in the finer points of Woylie handling. The critical role of feral predator control in fauna conservation programs was emphasised to Senator Hill.

- Head of Group Per Christensen and Section Managers John McGrath and Lachie McCaw spent a day at Dwellingup SID on 11 March talking with staff working on projects in the Sustainable Resources Group. It is intended that members of the Group based at all Centres be visited on a regular basis (at least twice a year) to maintain good communication.
- *Banksia coccinea study*
During autumn Lachie McCaw, Bob Smith and John Neal from Manjimup made a number of field trips to the Stirling Range National Park in conjunction with the study of *Banksia coccinea* funded through a grant from ANCA. The focus of the work at the moment is on assessing the condition of stands older than 20 years since fire as previous work suggested stands in this age class became increasingly susceptible to canker disease. A population of healthy *B. coccinea* were identified in an area last burnt over 40 years ago, but regrettably this area was burnt by a wildfire in mid-April. The fire was deliberately lit by an arsonist and burnt a substantial area in the south-west section of the park. Police are investigating the cause of the fire.

SCIENCE SERVICES GROUP

INFORMATION SCIENCE SECTION

Nicholas Lander is on long service leave until early August this year. Paul Gioia is A/ Section Manager in his absence.

- CALM Web Personal Profiles *alexc@herb.sid*

Staff are asked to provide information about themselves for the internal CALM Web pages. ISS have provided a pro-forma so that you can cut and paste existing details which you have already provided for the SID triennial report; profile, expertise, current SPP's and references. This template can be found by pointing your web browser to file:///N|:calm/sid/profile.htm. Completed examples of profiles can be found in the Science Services Group home page (file:///N|:calm/sid/ssg/ssghome.htm). To aid you there is a word document called profile.doc in the SID Home Directory; enter your details in the appropriate sections and save the file as text only with the name profile.htm in your private directory or on diskette. Contact ISS staff to attach your new profile to the CALM Web.

Of course, the easiest way to view these template files is to link to them via this newsletter, which is also on the CALM Web.

(Editors's note: for more discussion of CALM Web, see SIDNews issues 2 and 3, ie view file:///n:/calm/sid/sidnew3.htm in browser).

• Software Copyright *paulg@wood.sid*

This is an important issue that is of direct relevance to you, if you use software or own a computer within CALM.

Recently, various centres within the Science and Information Division have been approached by Internal Audit Branch within CALM regarding the accountability of software installed on our computers. Obviously, they are concerned that CALM abides by all relevant Copyright laws and that there is substantiation of purchase and ownership of all software on the server, individual desktops and laptops.

According to the Software Copyright Protection Policy No. 3.1, from the Public Sector Management Office, 'Each software user is individually responsible for complying with copyright law'. Accordingly, the responsibility for the software installed on SID machines rests properly with the owner of that machine. (Note that where network-based software is concerned, it is management that is responsible for ensuring appropriate access.)

Within the Science and Information Division, due to the historical role of Information Science Section, there has been an overlap of responsibility for software installation and usage, particularly network software. In some cases we have installed software on other people's behalf. In other cases we have looked after other people's disks within our own disk filing systems, such as they are. Yet in many cases, the software is not owned by ISS, merely managed.

I am keen to remove this overlap, where possible, and hand responsibility back to the rightful people, in line with the Software Copyright Protection Policy. To this end I have asked officers within Information Science Section to do a one-off audit, as soon as possible, of all disks kept within ISS, and all software installed on or accessible to computers. We will be compiling a list of all the software disks or licenses we own as well as a list of all software installed on everyone's computer, both on the local hard disk and on drives T: and U:.

One outcome of this exercise is that we will be handing back all non-ISS disks to their owners. It will be their responsibility to store them safely and, if

required, to make them available in any future software audits. In future, I suggest that the admin assistants at each centre are the most appropriate staff to determine how software audits should best be effected. They may, in turn, delegate this activity to a computer literate person within each section. (Remember, though, that ultimate responsibility for software usage still rests with the user.)

Another outcome will be a list of all software disks or licenses that we own and a list of all the software installed on or accessible to computers. This will point out any shortfalls in the number of licenses owned versus the number installed. It will be the responsibility of individual officers to make up any shortfall by purchasing appropriate software or deleting it from their computer. (Please see the note below regarding purchasing Microsoft products.) Where required, ISS can assist by removing access to it from the network.

The responsibility of Information Science Section will include software installed on ISS computers and network software. By network software we mean software installed on the server specifically for multi-user access, for which we have specifically taken responsibility, and for which we can account for sufficient licenses. It does not include software installed in users' private or public directories that they have installed themselves.

Ideally, all software should be stored on drive S: where ISS can assist in regulating access to network software, particularly where limited user access is required. Please bear in mind, though, that just because a network software can be successfully accessed, it does not imply that it is legal to do so - in the same way that keys left in a car does not imply it is OK to drive off with it. If in any doubt, please consult your local network administrator.

As stated above, ISS will perform this audit as a one-off event so that we can more effectively demarcate responsibility. After this exercise it will be the responsibility of individual sections or users to account for their software.

One last point regarding purchasing: the most common licensing shortfall lies with Microsoft products. This has been exacerbated by their new draconian licensing policies which exclude concurrent usage. (Such is life when you deal with arrogant, monopolist companies.) The department is in the process of negotiating a better deal with Microsoft which will include concurrent licensing, but are awaiting details on how big the shortfall is. Until then, hold off on purchasing Microsoft products.

Como

Matt Williams has received an Executive Director's Study Grant to travel to the USA later this year, during his long service leave. The grant will meet the cost of airfares and accommodation. Matt will be attending the AGM of the Ecological Society of America in Rhode Island during early August, and then visit scientists at a number of institutions across the US. He will back at CALM in early November.

During this time, Matt will be undertaking a project to examine the relationship between habitat patch size and species richness. The objective of the project is to predict possible future extinctions, with a view to developing strategies for the long-term conservation and management of biodiversity in isolated reserves.

The Executive Director's Study Grant and Post-Graduate Scholarship Schemes are available to all CALM staff, and details can be found in CALM policy statement 36.

FORTHCOMING SEMINARS

SID

A new format of 2 seminars in one afternoon has been established by the Bio-conservation and Sustainable Resources Groups. Topics for each speaker are similar to revive interest in seminar attendance. Seminars are usually at Como, however Sep 6 is at Woodvale. Thanks to Stuart Crombie for getting commitments from speakers.

05-Jul, Como, 2.00 pm, **Stuart Crombie** - Root growth and water use of jarrah from seedling to tree and beyond.

3:00 pm, **Lachie McCaw** - Fire patterns in semi-arid woodlands of southern Western Australia.

19-Jul, Como, 2.00 pm, **Dave Ward** - Balga (grass-trees) tell us their fire history.

02-Aug, Como, 2:00 pm, **Stuart Crombie** - Ecophysiology; is it a useful guide for site selection for *Eucalyptus globulus* plantations?

3:00 pm, **Richard Harper** - The importance of various soil properties in growth and survival of *Eucalyptus globulus* (preferred alternative title: "Drought deaths in *Eucalyptus globulus* in relation to soil and site properties").

16-Aug, Como, 2:00 pm, **Neil Burrows** - New fire behaviour and impact models for the jarrah forest

3:00 pm, **Richard Harper** - Aeolian influences on wheatbelt soils and landscapes: past processes and contemporary desertification.

22-Aug, Como, 2:00 pm, **Patrick Pigott** - Management options for remnant Salmon gums (*E. salmonphloia*).

3:00 pm, **Bryan Shearer** - Control of *Phytophthora cinnamomi* in native communities by trunk injection and foliar application of phosphonate.

06-Sep, Woodvale, 2.00 pm, **Neil Burrows** - Fox and cat control - Project Eden.

3:00 pm, **Tony Start** - Of recovery plans and Potoroos and Woylies.

20-Sep, Como, 2:00 pm, **Ian Dumbrell** - Effects of fertilizer and thinning on wood density in *Pinus radiata* in WA.

3:00 pm, **Liz Barbour** - Genetic deployment in plantations

Also watch out for monthly lunchtime seminars at Como TC

Botany Dept., UWA Seminars

Every Mon (during Sem.) 4 pm in Top Floor Seminar Room

Conservation Biology Discussion Group

23 Jul, 1996 (4th Tues of the month) 5.30 pm at University House, UWA. *Topic to be announced.*

Contact Kristina Lemson Botany UWA
(klemson@uniwa.uwa.edu.au)

School of Environmental Biology, Curtin Uni

Every Wed (during Sem.) 12.00 noon, Watson Lecture Theatre (307:101)

18 Jul, Peter Mathiesson (Maffe Directorate of Fisheries Research) Gender Benders - An Environmental Problem

07 Aug, Brendon Lepski - What is Afghan thistle? & Tiffane Bates - The effect of rabbit middens on the environment

21 Aug, Dr John Long (WA Museum) Sledging into the prehistoric past

28 Aug, Jonathon Majer - Patterns of diversity in eucalypt canopies

04 Sep, Peter Mawson (CALM) Viral blindness in kangaroos

Wildflower Society - Perth 63-65 Merriwa St. Nedlands

09 Jul, Neil Gibson (SID CALM) *Goldfield Woodlands*

13 Aug, Byron Lamont (Curtin UT) *Banksia Woodlands*

10 Sep, Greg Keighery (SID CALM) *The Pea Family*

APPROVED FOR PUBLICATION christinef@wood.sid

Here is a list of SID approved publications Jan-June 1995. I'll try to make this a regular feature as it is a partial guide to some of the work SID scientists do.

✓ Algar, D. and Sinagra, J. Methods of broadscale control of feral cats in WA

✓ Barrett, M. Identification of significant habitats occupied by the Western Petalura in s-w WA

Burbidge, A.A., Atkins, K.A., Brown, A.P. and Coates, D.J. Conservation of a megadiverse flora: problems and processes in south-Western Australia

Burbidge, A.H. Black honeyeaters and ash

Cochrane, A. Germination and storage of seed from rare and threatened plants of the south-west of Western Australia

Cochrane, A. and Kelly, A. Germination records for 28 rare and threatened West Australian Dryandras

Crombie, D.J. Water relations of Jarrah (*Eucalyptus Marginata*) regeneration from the seedling to the mature tree and of stump coppice

Edwards, J. and Harper, R. Site evaluation for *Eucalyptus Globulus* in south-WA for improved productivity and water uptake

Edwards, J. and Harper, R. Utility of simple soil classifications for predicting *Eucalyptus globulus* productivity

Friend, J.A. Implementation of the Numbat Recovery Plan

Friend, J.A. Eating termites and the private lives of numbats

Friend, J.A. and Scanlon, M.D. Assessment of the effect of fox control on populations of the Red-tailed Phascogale Phase 3 - Final Report

Friend, J.A. and Scanlon, M.D. Assessment of the effect of Fox control on populations of the Red-Tailed Phascogale - Phase 4

Halse, S.A. and Storey, A.N. Aquatic invertebrate surveys and water quality of Perth airport swamps

Hopkins, A., Coker, J., Beeston, G.R., Bowen, P. and Harvey, J.M. Conservation status of vegetation types throughout Western Australia

Keighery, G., Emex Australis in Western Australia; an amenity or conservation problem?

Keighery, G., Native, naturalised and cultivated Asparagaceae in Western Australia

Keighery, G. and Keighery, B. Biology, biogeography and conservation of Franklandia R.Br. (Proteaceae).

Lane, J.A.K., Jaensch, R.P. and Lynch, R. A directory of important wetlands in Australia: Western Australia

Lepschi, B.J. Leptomeria for *Flora of Victoria*

McCaw, W.L., Neal, J.E. and Smith R.H. Contribution of fuel reduction burning to the suppression of an intense wildfire in jarrah (*Eucalyptus marginata*) forest

McKenzie, N., Hopper, S., Wardell-Johnson, G. and Gibson, N. Assessing the conservation reserve system in the jarrah forest bioregion

Monks, L., Lamont, B.B. and Coates, D.J. Conservation biology of the gazetted rare *Banksia verticillata*

Pigott, J.P. A bibliography of bridal creeper (*Asparagus asparagoides* (L.) W. Wight), with particular reference to Western Australia.

Pigott, J.P. and Farrell, P. Factors affecting the distribution of bridal creeper (*Asparagus asparagoides*) in the lower southwest of Western Australia.

Pigott, J.P. and Lund, D.J. Improved mapping and useability of field data recorded with a GPS; distribution of bridal creeper (*Asparagus asparagoides*) in the Wickiepin Shire of Western Australia.

Pigott, J.P., Lamont, D.C. and Keighery, G.J. (Eds). Proceedings of the *Bridal Creeper Symposium* held at CALM, Perth, October 24 1995.

Rye, B.L. A synopsis of the genera Pomaderris, siegfriedia, spyridium and trymalium (Rhamnaceae) in WA

Rye, B.L. A taxonomic review of the genera Lachnostachys, Newcastleia and Physopsis (chloanthaceae) in WA

S. Osborne, and M. Williams Monitoring of Whale Shark tourism in Ningaloo Marine park by aerial survey

Shearer, B.L., Crane, C.E., Fairman, R.G. and Grant, M. Occurrence of *Armillaria luteobubalina* and pathogen mediated changes in coastal dune vegetation of South-western Australia

Start, A.N. ANZECC Network on Vertebrate Pests - Report of Activity in WA to March 96

Start, A.N. and McKenzie, N.L. Bat colonies in Hamersley Range asbestos mines

Strehlow, K.H., Friend, G.R., Davies, J.A. and Bradley, S.J. Impact of a high intensity autumn fire on ground-dwelling spiders inhabiting semi-arid shrublands in Western Australia

Ward, D. Nyungar burning - an important matter for conservation

Williams, A.A.E., Williams, M.R., Tomlinson, A.G. and Lundstrom, T.D. Records of butterflies from the central desert region and semi-arid areas of Western Australia

Williams, M.R. An extraordinary extralimital record of *A. a. andromacha* from WA

Williams, M.R. and Atkins, A.F. The life history of Waterhouse's Skipper

Williams, M.R. and K Faunt. Factors affecting the abundance of hollows in logs in the jarrah forest of s-w Australia

FEATURES

VOUCHERING OUR SCIENCE

A voucher can be defined as something "serving to confirm or prove something" (OED). In biology it usually refers to a preserved specimen lodged in a museum or herbarium collection which represents a sample of an organism or taxon which has been studied.

A prime role for SID's herbarium is to "voucher" our scientific observations and results. In effect, each of the 375,000 herbarium specimens is a voucher; each one represents a particular taxon at a specific locality and a particular habitat. This broad-scale vouchering role is why the herbarium actively seeks to increase its holdings of well annotated material which provides the basic data for SID's electronic information systems.

Any research which gathers field data on plants and habitats can be vouchered efficiently in the SID herbarium through its databasing system. It is, of course, essential to have a voucher herbarium specimen which needs to be a well chosen sample of a single taxon with adequate labelling and an indication of what research project is being vouchered.

The herbarium can curate collections related to a particular SPP, geographic area or particular project. Specimens may voucher photographs, bioprospecting

samples, the key plants of a particular animal habitat or a detailed botanical survey of a defined geographic area. In these cases plant specimens can be collected and processed for incorporation in the herbarium as vouchers for the particular research effort. Incidentally, it is imperative to build specimen processing costs into any grant application as detailed in the Staff Guidelines.

Vouchers add particular value to scientific publications where plant names are cited in relation to particular biological research. For example, vouchering of disease impacts on a species, fire responses, chromosome number determinations, conservation status or functional characters such as mode of perennation, age to first seed set, etc. It is usually mandatory for scientific reports and publications to include a note on which institution holds the vouchers. In any plant research in WA, vouchers should be lodged in the WA Herbarium which has the internationally recognised acronym PERTH. It is remarkable that many biological scientist/authors haven't vouchered their observations; there are some classic local examples where we do not know what species has been referred to in papers and books. Any publication referring to *Eucalyptus redunca* var. *elata* or *E. wandoo*, for example, could now refer to any of six taxa (see *Nuytsia* 8:1). The point is that our names are continually being revised and we have a management system to continually update these changes on voucher material.

If you are compiling a list of species for a particular purpose and each taxon name has a voucher in the herbarium where the special field "voucher for...." has been completed, then it is possible to obtain an updated list at the time of preparation of a paper or report. Not only will this list have up-to-date names but the spelling of the name and the authority will be standardised and according to current herbarium practice.

It is rarely accepted by most non-taxonomists that many plant identifications are only an "educated guess". In the case of the species rich WA flora there is great morphological variability which is still being documented and for this and other reasons, WA taxonomists do not have the knowledge base to identify many taxa with 100% certainty. In other words there is a high error rate with plant identifications.

Our knowledge of the flora is advancing very rapidly. CALM botanists are continually revising identifications of the specimens incorporated into the collections. If an incorporated specimen is incorrectly identified it will invariably be picked up and correctly determined, the corrected specimen then passes back through the databasing operation. When any published taxonomic account of WA flora appears any misnamed specimens are re-determined or new determinations are made on the specimen sheet and in the databases. If some of the re-determined material is a voucher for a particular project then it is easy to see how information can be updated and made available to the researcher.

One of the most productive benefits of the vouchering system is that any field herbarium or other reference collection of plants can be managed so that the names of each voucher are current. The databasing system has revolutionised the management of ancillary collections such as the one at CALM Manjimup. The reference collection there consists of a single collection for each species collected to date in the region. Every specimen is represented by a barcoded "parent specimen" which has been incorporated into PERTH and which can be scrutinised by herbarium users. In many cases because of the Australia-wide activity relating to the Flora of Australia project the specimen may be sent on loan for specialist study at another herbarium. Alternatively a visiting specialist botanist may visit PERTH to study herbarium material and will spend some time checking determinations and renaming specimens. The Manjimup duplicate specimen has a note of the unique PERTH barcode number and any name changes, name corrections, etc, initiated in PERTH can be sent to Manjimup and entered on the specimen. With this system botanical researchers can access material with current names. The protocols developed for Manjimup and for the Reference Herbarium in Como is being introduced by a number of field herbaria, Landcare Conservation Groups and others who need access to reliable names of WA flora.

Neville Marchant

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USER-FRIENDLY NUMBER CRUNCHING PROGRAMMING LANGUAGES

Have you ever wanted to do some calculations or statistics, but you were unable to do so because your existing software was inadequate? Have you ever wanted to do some simple modelling or simulations? Have you ever thought of applying computer-intensive statistics in your work?

In the early big-iron-dinosaur days (read mainframes), the first new zillion-dollar computer on campus caused much excitement. It was cool to sign up for computer course and to be seen at the computing centre. Almost everybody had a flirt with Fortran, but only the desperate persisted, as Fortran and the mainframe environment soon sorted out the dedicated from the boys & girls.

Fortunately the need to hang around computing centres and to learn Fortran or Basic was never an issue for me. Back in Canada at the Uni of Alberta, a new IBM (of course) 360 was purchased and each department could have a remote IBM Selectric terminal with a fantastic golf-ball printing head — real cutting edge stuff. There was a new mysterious language so strange and weird, it looked like it was a greek dialect. It was called APL — Δ Programming Language — great for crunching numbers.

APL was created by Ken Iverson, a mathematician who originally devised the language as a new system of math notation. IBM decided to implement his system as a computer language, and U of Alberta was one the first to support it on their shiny new blue mainframe.

The language required one to learn a new symbol set which was daunting and this requirement continues to scare people away from APL. But when I cleared this hurdle, the simplicity of the language was captivating. Every thing was an array or matrix; control structures for looping were seldom needed; execution was from right to left and data typing was minimal being either literal or numeric.

The mathematical similarities coupled with vector-matrix operations makes APL programs extraordinarily succinct. Programs in Basic that require 40 lines of code, can sometimes be done in 2 or 3 lines. Learning APL can also be damaging because once you use it, you are forever spoiled. To this day, I shudder when I look at a bloated Basic program; the mind rebels at the thought of learning another language for it seems such a backward step.

An endearing feature of APL comes from the fact that it is an interpreted language. This allows one to use APL as a powerful calculator. Thus, it is easy to translate

complex mathematical formulae into APL and get an immediate result.

APL is therefore great for statistics. Milliken & Johnson, authors of the two volume *Analysis of Messy Data* provide computational-intensive methods for dealing with incomplete data sets and the lack of replication. Standard stats packages do not fully support many of their procedures and the authors point to APL as a possible remedy.

APL has been ported to microcomputers for sometime now, and I have used two versions. They are powerful and complete implementations of APL, but my major complaint is the upgrade policies. The move to the 32 bit window environment is desirable, but the upgrade treadmill is prohibitively expensive, presumably because of the small niche market occupied by APL coupled with the philosophy that greed is good.

Fortunately, an inexpensive alternative to APL has emerged; Iverson and associates have produced a new dialect of APL which they call "J." Why J? "Because its easy to type" says one of the authors. Fair enough! J retains the flavour of APL with extensions that improve the language. The Greek symbols have gone having been replaced by standard ASCII characters thus removing a major learning obstacle.

J, Ver. 2.6 for Windows, can be purchased from an Australian Distributor for a mere \$85.00 plus the cost of manuals for about the same price. The manuals are not crash hot as the Iverson's style can be rather dense, but adequate nonetheless. A bonus stats pack/tutorial can be down-loaded on the net for free. Its about a Mbyte Postscript file which needs a special viewer.

Version 3.0 is under development; it is 32 bit and should be a enhanced screamer. If you enjoy an rewarding intellectual challenge then try J. It is a ultra-powerful, convenient, easily programmable language/calculator that produces hard copy, provides unlimited storage and talks to data sets held in spreadsheets and databases.(Sorry HP; put your toys away).

To sum up: there is no mucking about with J; the language gets down business right away. It even hooks into Visual Basic (ugh!). This allows one to put a pretty face on J. Needless to say, I haven't bothered to look in to this feature.

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(The above s/ware & tools can be downloaded from J homepage: <http://www.jssoftware.com/head.html> -Ed).

REPORT ON FIELD WORK AT ROEBUCK BAY (26 FEBRUARY TO MARCH 9 1996) or "A birdwatchers guide to the tyre depots of the north-west"

The 1996 North-West wader expedition began on March 2 1996 from the Broome Bird Observatory. It was arguably the largest group of wader enthusiasts and leading shorebird authorities from around the world to gather at Broome for an extended 8 week migratory wader catching and banding exercise. Woodvale Wetlands and Waterbird staff have been involved in some way in these projects since 1981. The main purpose of our involvement this year was to participate in the studies of the interaction of benthic invertebrates and shorebirds of Roebuck Bay led primarily by Dr. Theunis Piersma from the Netherlands Institute for Sea Research. Our presence was made possible by the contribution from training funds of a return air fare to Broome.

It was also important that there were participants in the expedition from Western Australia and specifically CALM to complement the many overseas and interstate participants. Amongst the total of 63 expeditioners there were likely to be two other Western Australians and no other participation from CALM. With the receipt of the funds from Training Branch Technical Officer Alan Clarke of the Wetlands Group was also able to participate at the end of the expedition and ensure the safe return of CALM equipment.

The Melbourne cannon netting equipment was transported free by Myer to their Cannington depot and transported, for the last time hopefully, to Broome with the CALM Toyota Diesel FourRunner (read "firebreathing blancmange") and the ancient but essential Wetlands tandem trailer. This magnificent combination trundled the tonne or so of cannon netting excrement along the great Northern highway at breath taking speeds often leaping into top gear on steep descents. The two new trailer spares were shuffled between axles to periodically share and reduce the pain experienced by the other four tyres. During the trip assistance with driving was received from a 200cm 150kg (estimates based on subjective assessment) South African ornithologist Tony Tree and a 100cm 50 kg German wader enthusiast, Gabriele Muller. Balancing the load in the fourrunner was almost as difficult as balancing the climate control. Gabriele spent most of the trip swathed in blankets and parkas in spite of the almost non-existent airconditioning and 40+C heat. The highlight of the journey was the very accurate measurement of the vehicles fuel capacity at 595.5 kms and warm friendships made with naked truck drivers doing the Hedland-Derby run who offered assistance with the bleeding process.

An important census of the waders and an assessment for suitable cannon net and mist net catching sites were carried out at Cargill Salt at Port Hedland. During this survey a flock of 2000 Banded Stilts was closely examined by telescope for leg flags with a positive result of 3 yellow leg flags. It was interesting to note that all three first year birds had half developed breast bands and about 60% of the flock also had at least some partial development of chestnut breast bands in spite of being in a non-breeding state. At the time this was the only confirmed sighting of flagged stilts in the Pilbara from the 1995 Lake Ballard/ Marmion nesting effort in the Eastern Goldfields.

At the Broome Bird Observatory preparations were made for the catching and banding program with the cleaning and setting up of cannon nets and equipment. A generator for use at 80 Mile Beach and boat and motor for the mud sampling were borrowed from the Broome CALM office. Many thanks Allen Grosse.

Cannon netting activities dominated the first three days at Broome. Theunis Piersma arrived and we discussed the possibilities for a monitoring program for benthic invertebrates. This would involve local Broome people, the CALM office and myself in a supervisory role. Danny Rogers, a wader enthusiast and member of the RAOU HANZAB team was approached by Theunis to consider a PhD project on wader food and feeding in Roebuck Bay. This project may well proceed with Allen Grosse offering to provide some of the operating costs, and the application for a salary through an ARC grant. During the ensuing week Theunis, Petra De Goej, Danny Rogers and I spent considerable time at the conclusion of cannon netting activities, assessing various sites for invertebrate populations and suitable monitoring sites. A number of samples were collected from four sites at Crab Creek, BBO, Fall Point and Quarry Beach. Theunis will provide identifications at the Netherlands Institute for Ocean Research at Texel NL for voucher specimens and arrange for the samples return.

The cannon netting resulted in a catch of about 2000 birds in total for the first five days in very hot and humid conditions. A few of the participants suffered heat exhaustion having had little time to acclimatise from the northern hemisphere winter.

The method employed to reduce the heat stress on captured waders included elaborate shading, removal of the top layer of sand before erecting keeping cages, provision for air flow beneath shade structures, rapid processing of birds and careful selection of species and numbers for data processing. The ability of the net firer to select small groups of birds for capture was paramount. Not only for the bird's safety but many of the participants in the early stages had no experience handling birds and needed time to adjust and develop skills before being thrust into a large catch with all the associated panic and confusion. At most times there was

a minimum of 25 participants to assist with removal of birds from the net.

The expedition was well organised and ultimately very successful. A total of nearly 9000 waders and terns were banded and flagged. About 90% of the birds captured were processed for biometric data. One recapture, a Terek Sandpiper, was reported from China during the expedition and appears to have flown the several thousand kms from Roebuck Bay in 7 days. The catch mortality was relatively low and well below acceptable limits. The involvement of two CALM personnel was valuable from a CALM perspective, enhancing the Departments reputation with the local and overseas participants.

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