

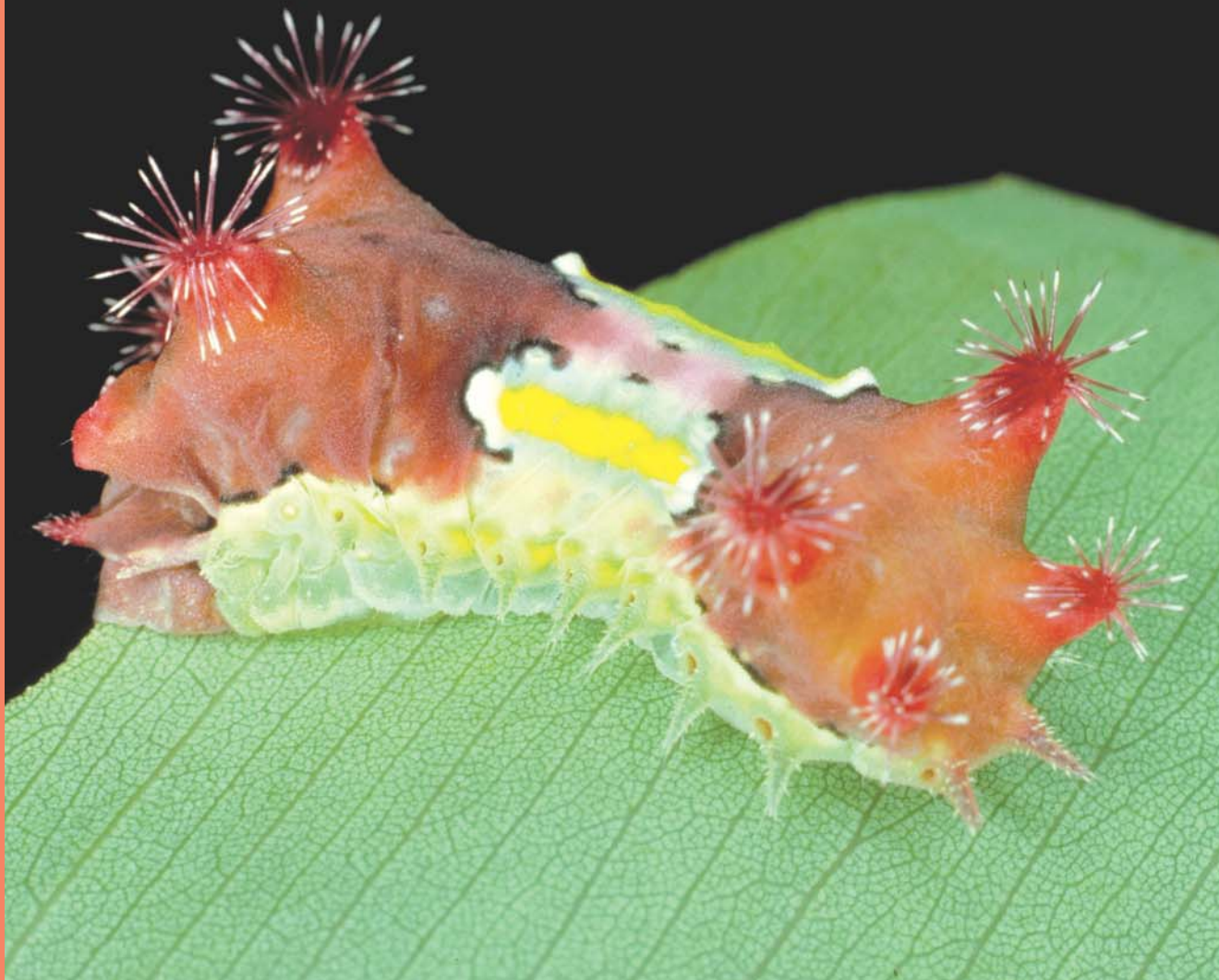
**Australian
Biological
Resources
Study**

Biologue

Biologue No.28 October 2003

A biannual newsletter providing information
on the progress of the ABRS Participatory
Program, Publications and other activities

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Graphic Design: Virginia Du Toit

Cover: *Cup moth larva on Eucalyptus Ptychocarpa*
Photographer M. Fagg © ANBG

Director's Report

Many readers will be aware that ABRS has experienced some significant restructuring and staff changes in recent times. Dr Patrick McCarthy is now responsible for a combined Algae/Fungi/Lower plants program. Dr Tony Orchard and Dr Cheryl Grgurinovic have recently left our team and all of us at ABRS thank them both very much for the many years of work they have put into ABRS and wish them the very best for the future.

The new director at ABRS is Ms Mary Colreavy, who commenced on 10 June. We also have a new business manager, Mr Stephen Dwight, whose major role is to manage the Participatory (Grants) Program and the ABRS budget, and provide secretariat services for the ABRS Advisory Committee. Two other new members of staff since the last edition of *Biologue* are Ms Robyn Lawrence, the Database Manager and Dr Muhammad Iqbal, the Information Officer. Unfortunately for us, Iqbal has accepted a temporary secondment to Approvals and Wildlife Division; his position will be filled by a temporary replacement.

Many thanks to Dr Alice Wells who held the reins as Acting Director for some months after Mr Ian Cresswell left and had to manage the complexities of budget bids in a particularly difficult budget year.

2003 Federal budget

ABRS was very pleased to learn in May this year that the Minister for the Environment and Heritage, the Hon. Dr David Kemp MP, committed \$12.4 million new funding over four years to maintain the Australian Biological Resources Study. The Australian Government pledged these funds to help protect Australia's biodiversity by furthering our knowledge of micro-organisms and other lesser-known groups, and to communicate knowledge to land managers and other clients, with an increasing emphasis on online delivery.

From this year's funds, the Minister has approved \$825,500 in new ABRS research grants and a further \$729,000 in renewals, as well as funding for four post-graduate scholarships, including the inaugural Ebbe Nielsen Postgraduate Scholarship. Letters have been sent to successful and unsuccessful grant applicants, and funds are being disbursed as the offers are signed and returned.

Collaborative projects

Many ABRS projects involve partnerships with other authors and institutions. A very pleasing development over the last year or so has involved ABRS securing external funding for several worthwhile collaborative projects. Among these are Natural Heritage Trust funds made available through the Marine Division of the

Department of the Environment and Heritage, for finalisation of a scholarly book on Australian Echinoderms; a Fisheries and Research Development Council grant for completion of the fish volumes of the *Zoological Catalogue of Australia*; and collaborative projects with Agriculture Fisheries and Forestry Australia (AFFA)/ Plant Health Australia and the Australian Heritage Commission, to share the production costs of mutually beneficial checklists for groups having biosecurity and heritage significance.

ABRS continues to participate in the development of Australia's Virtual Herbarium (AVH), an online botanical information resource accessible via the web.

An alliance of major State museums, CSIRO and ABRS has recently developed a 'proof of concept' project for Australia's fauna—an Online Zoological Collections of Australian Museums (OZCAM). The trial project, which has proved very successful, was jointly funded by the Australian Government and all State governments. The collections of these institutions total an estimated 36 million records, of which 25% are databased. The network aims to establish an integrated program of digitisation of the remaining records, and the information will be made available to stakeholders through complementary museum web-based initiatives.

ABRS is very pleased to have received confirmation of further NHT funding this coming year for continuing work on a set of projects aimed at making available information for better understanding and management of grasslands, waterways and coastal waters.

The Minister for the Environment and Heritage, Dr David Kemp MP, launched two important works on a significant but often neglected part of the Australian flora on Norfolk Island in November 2002. Bryophytes (mosses and liverworts) are primitive, green, mainly terrestrial plants. *Key to the Genera of Australian Mosses* was published as part of the Australian Government's *Flora of Australia Supplementary Series* (number 14). Written by William Buck (New York Botanical Garden), Dale Vitt (University of Illinois, Carbondale) and William Malcolm (Micro-Optics Press, New Zealand) and published by ABRS, this is the first illustrated identification guide to the 291 genera of mosses known from Australia and its island territories. Also published as part of the *Flora of Australia Supplementary series* (number 16) was *The Mosses of Norfolk Island*, written by the late Heinar Streimann. This volume outlines the history of bryological activity on Norfolk Island and includes identification keys, detailed descriptions of each of the 69 species and information on habitat preferences and local and global distribution.

Director's Report

On 2 May this year, at Mt. Coot-tha Botanic Gardens, Brisbane, the Federal Member for Ryan, Mr Michael Johnson MP, and the Hon. Dean Wells, Queensland Minister for the Environment, launched the *Flora of Australia—Poaceae 1 Introduction and Atlas* and *AusGrass: Grasses of Australia* (CD ROM). These projects involved the Australian Government and a range of State agencies and individuals, particularly the Queensland Herbarium, working together over some 11 years. ABRS managed the project and provided expert editorial advice and services. The States provided research staff, infrastructure and loans of research materials. Altogether, the Australian Government has contributed over \$800,000 in research grants to support the grasses project, and the Natural Heritage Trust (NHT), through its Bushcare program, has provided over \$200,000 of this amount. The grasses are the most important flowering plant family found in Australia, they are a key part of the inventory of Australia's biodiversity and are the mainstay of our farming and pastoral industry. These products were co-published by ABRS and CSIRO Publishing.

Science Week

ABRS staff had a great deal of fun recently developing a display and children's activity for Science Week. A simple identification key was developed and made into a game in which children followed clues to identify a "litter critter". The display consisted of posters and a set of Tullgren funnels that trapped the real "litter critters" that kids could observe. The activity was very popular with visiting school groups and will be used again for events and educational activities in the Australian National Botanic Gardens.

ABRS Advisory Committee

I am very pleased to announce that Dr Mark Harvey from the Western Australian Museum and Mr Peter Bostock from the Queensland Herbarium have both recently accepted appointment to the ABRS Advisory Committee. Dr Harvey is reappointed for a second term.

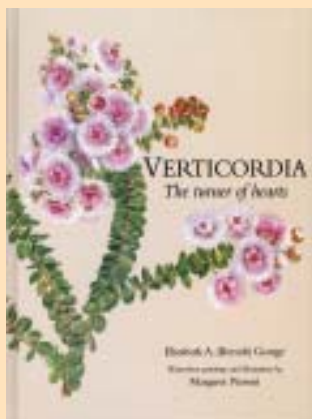
The Advisory Committee has met twice since the last *Biologue*. A meeting was held in April 2003 at which the Advisory Committee considered budget matters and a range of issues related to the Participatory Program. Considerable time was spent assessing grant applications and discussing ways to build links and partnerships with industry. In addition, the Committee commenced a major review of the forms and guidelines for ABRS research grants and scholarships and agreed to review research priorities at the next meeting.

At the more recent meeting of the Advisory Committee, held in August 2003, the Committee made substantial revisions to the ABRS Grant and Scholarship application forms and guidelines. It was agreed that from 2004/2005 the Participatory Program will fund two types of grants: **Research Project Grants** for which the primary aim is to undertake systematic research on the Australian biota and **Biodiversity Information Product Grants** for the development or design of a product that aids the dissemination of taxonomic information to the wider community. The Advisory Committee highlighted the need for grants to meet the Australian Government's National Research Priorities, and they have revised the ABRS criteria for applications accordingly. Further details on these criteria can be found elsewhere in this publication.

Other discussions at the August meeting concerned the development of partnerships, fund-raising and the promotion of ABRS activities. These issues will be pursued more vigorously over the next few months.

The Committee was very pleased to note substantial improvements made to the ABRS website in recent months, in particular the greatly improved look, web navigation and 'searchability' of ABRS databases. The Committee was also delighted to note that six volumes of the *Flora of Australia* series will soon be available on the ABIF-Flora website and that more data is being regularly added to the *Australian Faunal Directory* (AFD) database. Another recent innovation is *Species Bank*, an interactive site that provides descriptions and illustrations of many lesser-known species, and includes information on distribution, biology and interaction with humans under several headings. For some species, additional images, audio and video files may be viewed or played by clicking on the relevant thumbnail image or hyper link.

Awards



ABRS continues to win national recognition for the outstanding quality of its work: *Verticordia: Turner of Hearts*, by E. A. George & M. Pieroni, a joint publication between ABRS and UWA Press, has received The Australian Award for Excellence in Educational Publishing, 2003, Tertiary Education Scholarly Reference Category.

This attractive book of 422 pages provides detailed information on the origins, biology, conservation and cultivation of these magnificent plants. Full colour paintings by Margaret Pieroni for each of the species accompany detailed descriptions, distributional data and cultivation notes.

Whitley Award for 4 ABRS Zoological Catalogues

A 2003 Whitley Award, a Certificate of Commendation for Best Zoological Series, has been won by four ABRS *Zoological Catalogue of Australia* volumes. These volumes, published jointly by ABRS and CSIRO Publishing, are the products of partnerships between ABRS and authors and their institutions. ABRS funds supported the work, and ABRS staff provided advice, edited the database files from which the volumes were derived, and prepared the copy for publication. While all four volumes follow the standard format for the *Zoological Catalogue of Australia* series, presenting valid names of all species in the groups recorded from Australia, each has its own individual flavour. The databases from which each volume was derived will be made available on the ABRS website within 12 to 18 months.



A Record Year For Publications

An outstanding effort from staff resulted in a record number of publications being produced last year:

- Orchard, A.E. & Mallett, K. (eds) (2002)
Flora of Australia Vol. 43 *Poaceae 1, Introduction and Atlas*.
- Sharp, D. & Simon, B. (2002)
AusGrass, Grasses of Australia.
CD ROM interactive guide
- George, E.A. and Pieroni, M. co-published with ABRS and UWA Press, (2002)
Verticordia, Turner of Hearts.
- Grgurinovic, C.A. co-published with ABRS and Fungal Diversity Press (2003)
The Genus Mycena in South-Eastern Australia.
- Streimann, H. (2002)
The Mosses of Norfolk Island.
Flora of Australia Supplementary Series Number 16
- Streimann, H. & Klazenga, N. (2002)
Catalogue of Australian Mosses.
Flora of Australia Supplementary Series Number 17
- Womersley, H.B.S. (2003)
The Marine Benthic Flora of Southern Australia Part IIID.
Flora of Australia Supplementary Series Number 18
- McCarthy, P.M. (2003)
Catalogue of Australian Lichens.
Flora of Australia Supplementary Series Number 19
- J.Kirschner (*et al*) (2002)
Species Plantarum 7. Juncaceae 2. Juncus subg. *Juncus*.
- J.Kirschner (*et al*) (2002)
Species Plantarum 8. Juncaceae 3. Juncus subg. *Agathryon*.
- Houston, W.W.K. & Beesley, P. (eds) (2002)
Zoological Catalogue of Australia, Vol. 19.2A
Isopoda, etc
- Beesley, P. & Houston, W.W.K. (eds) (2003)
Zoological Catalogue of Australia, Vol. 19.2B
Amphipoda
- Houston, W.W.K. (eds) (2002)
Zoological Catalogue of Australia, Vol. 29.5
Buprestoidea (jewel beetles)
- Wells, A. & Houston, W.W.K. (eds) (2002)
Zoological Catalogue of Australia, Vol. 29.3B
Hemiptera: Heteroptera: Pentatomomorpha
(plant-sucking bugs)

Participatory Program

Grants Scheme—Call for 2004/2005 Applications

ABRS is now calling for applications for grants for the year 2004/2005.

The application forms, guidelines and other instructions are available from the ABRS website at www.deh.gov.au/biodiversity/abrs/admin/grants/

Types of Grants

Research Project Grants

Research Project Grants are aimed at developing taxonomic understanding of the Australian biota in areas commensurate with the Australian Government's National Research Priorities. Applications will be accepted on all groups of organisms including algae, bryophytes, fungi, invertebrates, lichens, protists, vascular plants and vertebrates. Funding will be considered for individual applicants as well as research teams that bring together complementary expertise and/or facilities.

Where appropriate, requests that include the training of students (at honours and postgraduate levels) and early career researchers (e.g. postdoctoral level) are strongly encouraged. Further, where complementary expertise exists, joint supervision by academic staff in universities, with researchers in museums, herbaria, CSIRO and other institutions where systematics research is undertaken, is also encouraged. Funding can be requested for a maximum of three years.

Biodiversity Information Product Grants

In recent years ABRS has expanded its role to deliver taxonomic information in a range of formats including interactive identification guides, web-based products, databases, CD products, books and monographs. Biodiversity Information Product Grants have been introduced specifically for projects that lead to the development of such publications and products.

These need to address National Research Priorities and can include projects to support ABRS publications:

- **electronically** through the World Wide Web (e.g. *Australian Biodiversity Information Facility*, *Species Bank*, the CD ROM identification series), and
- **book series** (e.g. *Flora of Australia*, *Algae of Australia*, *Fungi of Australia* and innovative projects on the Australian Fauna).

Normally applications for Biodiversity Information Product Grants will be for one or two years, and more rarely for a maximum of three years. Applicants planning to apply for this type of grant are strongly encouraged to contact ABRS staff to discuss the merits and scope of the intended project.

Priority areas for Research Grants for 2004/2005

Projects funded under the Participatory Program should support the Australian Government's National Research Priorities. In particular they should support the key area of *An Environmentally Sustainable Australia* however, in some cases, projects may also address the goals of two other areas of national research priority, namely *Promoting and Maintaining Good Health* and *Safeguarding Australia*. Before completing the application form, applicants are strongly advised to become familiar with information on the National Research Priorities, available at www.dest.gov.au/priorities/

Within the above National Research Priorities, the Committee has identified the following specific criteria for applications under the ABRS Grants Scheme:

- Documentation of Australia's biological diversity with particular emphasis on lesser-known groups, including micro-organisms.
- Rigorous taxonomic treatment mainly at species level.
- Contribution to regional or continental generic or higher-level systematics research.
- Groups of high conservation value.
- Groups of economic, health and/or social benefit.
- Innovative approaches for dealing with complex systematics problems.

Projects submitted for funding in 2004/2005 should aim to address one or more of these criteria within the relevant section of the application form, and relate these to the goals of one of the National Research Priorities. Further information regarding the ABRS criteria and National Research Priorities may be obtained from the Business Manager, phone (02) 6250 9554 or e-mail: abrs@deh.gov.au

Deadline

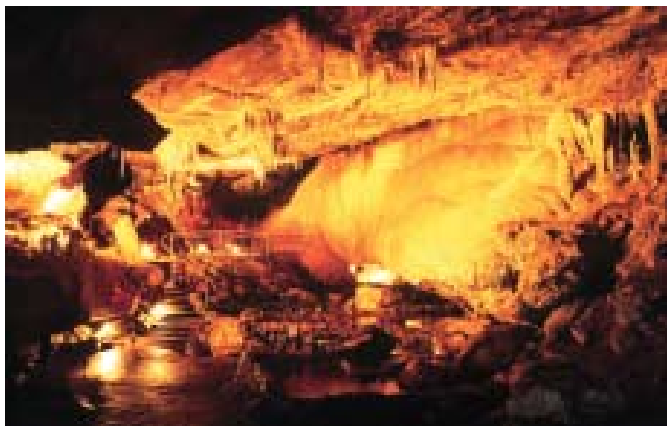
Applications must be received by 10 November 2003.

Article from an ABRS Bursary Recipient

“Glow-worm tourism has become a profitable industry in Australia. However, little research has focused on the insect around which this industry lies.”

From 5–12th May 2003 I attended the 15th Australasian Cave and Karst Management Conference in Chillagoe and Undara, North Queensland.

To assist with my travel and accommodation costs I received an ABRS Student Travel Bursary.



Marakoopa show cave, Mole Creek, Tasmanian Glow-worms are highlighted during tours of this cave.

This conference gave me a platform from which to present my work on identifying and managing glow-worms within Australia to many of the people managing the ecosystems in which the glow-worms live. Glow-worm tourism has become a profitable industry in Australia. However, little research has focused on the insect around which this industry lies.

My paper outlined the techniques I am using to describe the new species of glow-worm I have identified during my Ph.D. These techniques involve reproductive isolation experiments, genetic analysis and classical taxonomy. I stressed the importance of knowing exactly what you are dealing with when in a managerial role. Taxonomic study is a vital step in the research that must

be carried out, especially for management issues when competent species identification can add significant leverage to protection at a Government level.

Delegates at the conference included Australian and international cave managers, tour operators, researchers and National Parks personnel involved in cave and karst protection. The glow-worm research I have completed illustrates the importance of taxonomic research for natural resource management and related industry needs.

Apart from explaining my current research, the conference gave me the opportunity to make new contacts and has led to potential post doctoral possibilities on glow worms in New Zealand.

Thanks to ABRS once again for this opportunity!

*Bottom Photo: Southeast Queensland glow-worm (*Archnocampa flava*) life cycle: (from left) adult female (lives for 2 days), adult male (6 days), eggs (10 days), mature larva, pupa (7 days).*



Wild cave entrance, Chillagoe, North Queensland. ACKMA conference delegates enjoying the perks of attending a caving conference. The enthusiasm and expertise for cave protection within this group is inspirational.



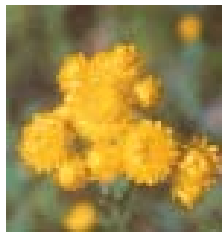
Article from an ABRS Scholarship Recipient

Molecular data and phylogenetic relationships in *Rhodanthe*

The Gnaphalieae (paper daisies or everlastings) are a group of sunflowers that have their greatest diversity in Australia, southern Africa, and South America (Bayer *et al.* 2001). Anderberg (1991), in his revision of this tribe, identified two problems that have prevented the establishment of a reliable classification of the group. The first of these is distinguishing the large and heterogeneous genera such as *Helichrysum* Mill. from their many small satellite genera, and the second, the absence of derived features shared consistently between groups (synapomorphies) enabling satisfactory generic delimitation. A third problem, the ubiquitous parallelisms and convergence in morphology, has made it difficult to find conservative, homogenetic characters that can be used reliably in phylogenetic reconstruction (Carlquist 1976). As a result of these difficulties, many existing genera in Gnaphalieae have been maintained despite being polyphyletic or unnatural assemblages. These genera are often hard to recognise, heterogeneous and extremely complex.

One such genus is *Rhodanthe* Lindl. This is one of the largest groups of everlasting daisies endemic to Australia (46 species). It is a commercially important group with several taxa used in the Australian cut-flower industry. Many of its species are extremely rare, being restricted to small and specialised habitats in Western Australia.

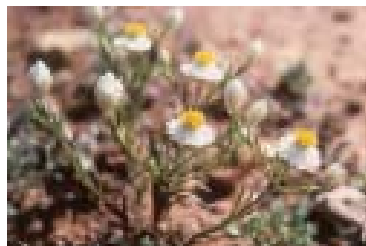
Rhodanthe is a highly variable group (Fig. 1), composed of the remainder of *Helipterum* DC. following the segregation of the more distinct groups of species as genera, e.g. *Hyalosperma* Steetz. and *Leucochrysum* (DC.) Paul G. Wilson.



Brilliant multi-seriate involucral bracts of *Rhodanthe citrina*



Sessile non-radiating heads in *Rhodanthe tietkensisii*



Terminal sessile heads in *Rhodanthe floribunda*

Figure 1: The great variation in morphology in *Rhodanthe*

Edward W. Cross
Post-graduate scholarship student
Australian National University
Canberra, ACT

Rather, they considered it to be an assemblage of distantly related species. Their studies failed to elucidate the generic and species relationships of the group which have thus remained enigmatic.

To accommodate the considerable variation in the group Wilson (1992a) defined 11 sections, several of which he claims are problematic and at least two, *Helichrysoides* and *Citrinae*, containing species purportedly more closely related to genera outside of *Rhodanthe*, including *Podotheca* Cass., *Chrysocephalum* Walp. and *Leucochrysum* (DC.) Paul G. Wilson.

In order to resolve the outstanding questions of generic delimitation, species and higher level relationships, a new dataset, independent of traditional morphological data and its problems, was required.

Since the mid 1980s, molecular data have been widely used in the reconstruction of evolutionary relationships between plant species (Hillis 1987). DNA sequence data derived from the chloroplast, nuclear and rarely the mitochondrial genomes have complemented existing morphological, cytological and biochemical data. One of the driving forces behind the growth of molecular systematics was the search for characters free of non-inheritable environmental variation that obscured true genetic relationships (Doyle 1992). Molecular data are nearly or completely free of such variation and have therefore been considered highly suitable for the reconstruction of phylogeny. As all the heritable information of an organism is encoded in DNA, the number of potential characters is extensive. Further, as different regions of DNA vary at different rates, sequences can be selected to resolve relationships at many phylogenetic levels (Clegg & Durbin 1990). The relative ease of determining the homology of nucleotide characters (Felsenstein 1988) and the rapid speed and relatively low cost per character have also contributed to the advancement of molecular systematics (Penny *et al.* 1990).

The use of molecular data is, however, not free of problems. A range of evolutionary processes including introgression, gene duplication (paralogy), deep gene coalescences and lineage sorting may lead to incongruence between the phylogeny of genes, genomes or contiguous blocks of nucleotides (gene trees) and the phylogeny of species (species trees; Pamilo Nei 1988; Doyle 1992, 1997).

In order to gain a credible estimate of the species tree, congruence between gene trees is sought, especially when the underlying sequence data are derived from different plant genomes. Similarities among independent gene trees is considered to reflect the underlying common species tree (Slowinski & Page 1999).

On this basis, molecular data from six regions were selected for analysis. Data from the Internal Transcribed Spacer region (ITS) and External Transcribed Spacer region (ETS; nuclear DNA spacers), *matK* and *trnK* (coding chloroplast DNA and adjacent spacer region), the *trnL* intron and the *trnL/F* intergenic spacer regions (non-coding chloroplast DNA) were included. In Asteraceae, variations in the ITS and ETS of nuclear rDNA have proven fruitful in reconstructing the phylogenetic relationships of closely allied genera and species (Baldwin *et al.* 1995). All four chloroplast DNA regions have been useful in resolving higher order generic and tribal relationships in the Asteraceae and in Gnaphalieae (Bayer & Starr 1998).

DNA sequences for 125 accessions across all six regions were assembled into a matrix and analysed. Of the 125 species included, 39 were from *Rhodanthe* and the remainder were representatives from 42 other genera in Gnaphalieae. This broad sampling was necessary to include all putative relatives of *Rhodanthe* and a wide range of the variation in Gnaphalieae.

Analyses of molecular data from these six regions support many existing generic concepts while recognising the need to re-circumscribe several others. Complex phylogenetic relationships in Australian Gnaphalieae have also been revealed. Some of these are as follows.

1. Phylogenetic relationships of *Rhodanthe* and allied genera

Rhodanthe is a polyphyletic or unnatural assemblage of at least six distinct lineages, variously placed within the tribe Gnaphalieae.



SEM (45X), Achene of *Cephalipterum* without a carpodium

One of the larger clades contains species from a number of different sections, and it appears that at least one of these sections is polyphyletic.



SEM (150X), Achene of *Rhodanthe ascendens* with well developed carpodium

Figure 2. Comparison of the achenes of *Cephalipterum* and *Rhodanthe ascendens*

Another of the segregate lineages includes representatives from the section *Synachyrum*. This sub-generic group was first described by Asa Gray in 1852, as a section in *Helipterum*. Molecular data support the addition of *Cephalipterum drummondii* A. Gray, a monotypic Western Australian genus to this section. Members of this group share an imbricate layer of oblong crystals covering the pericarp of the seed. Additionally, none of the taxa in this group has a carpodium (*fruit stalk*), unlike many *Rhodanthe* species in which the carpodium is well developed (Fig. 2).

2. Phylogenetic relationships of *Helichrysum* and allied genera

The molecular data consistently resolve a large, well-supported suprageneric '*Helichrysum*' clade including robust sub-clades of *Waitzia*, *Leucochrysum* and *Chrysocephalum*. This group broadly corresponds to the *Waitzia* group of Anderberg (1991) with the addition of Australian *Helichrysum*. Close generic relationships of *Chrysocephalum* with *Gratwickia* F. Muell. and *Anemocarpa* Paul G. Wilson with *Leucochrysum*, determined in the analyses, confirm morphological observations. *Gratwickia* differs from *Chrysocephalum* only in having smooth rather than papillose achenes and *Anemocarpa* shares many pappus (bristles are shed as separate cilia) and phyllary characters (hemispherical involucre, stipe-like stereome) with *Leucochrysum* (Haegi 1986; Anderberg 1991).

3. The inclusion of *Haptotrichion* in the 'Lawrencella' complex

The *Lawrencella* complex (Wilson 1992b) is shown to be paraphyletic, with strong support provided for the inclusion of *Haptotrichion* Paul G. Wilson in this group. The monophyly of each of the genera *Haptotrichion*, *Schoenia* Steetz. and *Lawrencella* Lindl. within is maintained.

4. Support for existing generic concepts

A range of currently recognised genera is shown to be monophyletic by all molecular data sets including *Erymophyllum* Paul G. Wilson, *Hyalosperma* and *Blennospora* A. Gray.

Conclusion

The use of molecular data from several nuclear and chloroplast regions has revealed unique insights into the evolution of many genera in the Australian Gnaphalieae.

Acknowledgements

My sincere appreciation is extended to ABRS and CSIRO Division of Plant Industry for generously supporting this project. The colour photographs were used with permission from the Australian Daisy Study Group. SEMs were taken by the author. (continued pg 9)

Article from an ABRS Grantee

A Marine Benthic Flora for Northwest Australia

Perhaps the last great frontier in Australia, phycologically speaking, is the remote north-west coast of Western Australia. The seaweed flora of the region is so poorly known that, up until a couple of years ago, the total number of species recorded for the entire coast was less than thirty.

Yet this is in a prime area of the Indo-West Pacific, a known hotspot for algal diversity. In fact, more is known about the flora of the remote subantarctic Macquarie Island than the entire north-west coast. Of course, no one was suggesting that this number of species reflected the true algal diversity of the region, it has simply not been the focus of intensive collecting (Huisman *et al.* 1998), and those collections that are available have not been published. The reasons for the former are many. The coastline from the North-West Cape area to the Western Australia/Northern Territory border could hardly be described as inviting to the phycologist.

Collecting marine algae presents special challenges even at the best of times. There are the inherent dangers of SCUBA diving, plus the problems of negotiating tides, currents and swell. Add to these the special problems associated with the north-west. As well as being a long way from home for most people, much of the region is often largely inaccessible (other than by expensive charters), has huge tidal amplitudes, strong currents, sometimes unpredictable weather, often murky waters, and to top it all, numerous large predators! One has to expect the occasional fright when diving in the northwest, my own have included shark sightings and face-to-face encounters with seasnakes. First-hand experience of the region's unpredictable weather left me stranded on an island off the coast near Onslow for a week, after sub-cyclonic winds broke the tether holding our boat, which then traveled a lone journey many hundreds of kilometres and ended up somewhere in Exmouth Gulf.

So it is not totally unexpected that the north-west has not shown its true phycological colours, but with the help of ABRS I am hoping to remedy the situation. In the past I have participated in several opportunistic visits to the region, either as a guest of the Western Australian Museum, or funded from various sources, including ABRS. These trips have resulted in a collection

John Huisman
Murdoch University, W.A.
(presently University of Hawaii)

of several thousand specimens. In addition, Di Walker of the University of Western Australia has a large collection of macroalgae from the Kimberley coast, again accumulated during Museum expeditions to the area. Michael Borowitzka of Murdoch University also has a large collection, this time from the Dampier Archipelago, made during surveys in the 1980s. Supplementing these are collections made by locals who have developed an interest in the marine flora, such as Brian Carter of the Dampier Peninsula north of Broome. These many and varied collections will form a solid base from which a flora can be written.

Some of the results of my work have already been published. Several of the species found in the north-west were included in my recent 'Marine Plants of Australia' (Huisman 2000), which included numerous underwater colour photographs. The species from the Dampier Archipelago have been compiled in an annotated species list, to be published in 2003 (Huisman & Borowitzka 2003). As an indication of how little is known about the region, the Dampier checklist includes 57 species that were newly recorded for Western Australia, and five that were newly recorded for Australia. In total 210 species were attributed to the archipelago, but this represents only a portion of the total flora, as many specimens could not be identified due to inadequate material (for accurate placement, fertile material is required for many red algae).



Patenocarpus paraphysiferus - a calcified red alga newly recorded for Australia, previously known only from Japan.



Caulerpa racemosa A common green alga found in tropical seas worldwide.

As well as the numerous records, the collections have yielded many new taxa. A new red algal genus *Echinophycus*, and species, were described (Huisman 2000) for specimens dredged from deep water in the Dampier Archipelago, fortuitously with all life history and reproductive phases represented. Several new species of *Liagora* and *Ganonema* have also been described (Huisman 2002).

One taxon encountered in the north-west is of particular interest. It is a small red algal endophyte, in the order of 100–300 μm in diameter, found growing in the cortical filaments of members of the Liagoraceae (Rhodophyta). Most people would overlook this entity, as it is only ever observable in microscope preparations of the host alga. This endophyte has been known for over 150 years and has been illustrated in several publications (the earliest being that of Kützing in 1858), but has never been formally described due to an almost complete lack of features by which comparisons could be made. The only reproductive structures known are monosporangia, and for many years the endophytes have been known as ‘monosporangial discs’. I have also encountered this species while in Hawaii and have collaborated on a DNA-sequence study, which involved extracting over 100 individuals from the host plant. Remember, these are about a quarter of a millimeter across! The product was a drop of water that had a slight red tint, but it was sufficient for DNA extraction. We were able to obtain complete 18S rRNA sequences and the analyses were impressive. The alga showed only a remote relationship to known taxa (the closest being *Ahnfeltia*, a large cartilaginous alga from cold temperate and polar regions). The DNA-sequences, morphology, and newly observed sexual reproduction were sufficiently distinctive that we are presently describing a new species, genus, family, and order to accommodate this entity.

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Molecular data and phylogenetic relationships in *Rhodanthe* (cont.)

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Article from an ABRs Grantee

Revision of Australian Dicranaceae (Bryophyta)

Bryophytes play an essential, but poorly recognised, role in many ecosystems, ranging from soil stabilisation in dry country to an important role in water capture in wet forests. Understanding this role and the measures needed, if any, for conservation of bryophytes, so they can continue to perform their vital role in the environment, has been severely hampered by a lack of information on virtually all species (Scott *et al.* 1997).

Even when specimen information from all Australian herbarium collections becomes easily accessible through the Australian Virtual Herbarium, this information will only be as good as the identifications of the specimens. Therefore, increased taxonomic knowledge is essential, even for a group in which most species have already been described, as is the case in mosses. Publication of the moss volumes of *Flora of Australia* will be a major factor in this. Treatment of the two largest moss families, Pottiaceae and Dicranaceae, is the main hurdle that still has to be overcome before completion of the moss volumes of *Flora of Australia*.



Dicranoloma menziesii © Heino Lepp

Dr Niels Klazenga
National Herbarium of Victoria
Royal Botanic Gardens
Melbourne, VIC

The current project aims to provide a *Flora of Australia* treatment of the family Dicranaceae. The Dicranaceae, with almost 1000 species recognised world-wide, is the second-largest family of mosses. Even within Australia, where it is relatively poorly represented with c. 100 currently recognised species, it is the second-largest family. Members of the Dicranaceae may be found everywhere in Australia in a wide variety of habitats. For instance, species of *Dicranoloma* are mainly found along Australia's east coast, where they form an important component of the moss flora of wet forests. On the other hand, *Campylopus* species are often found in dry country and in subalpine habitats.

Many of the genera in Dicranaceae are considered to be notoriously difficult taxonomically. The three genera with the largest number of Australian representatives, *Campylopus*, *Dicranoloma* and *Dicranella* belong to this group. The family has never been treated as a whole for Australia and many of the genera have never been critically revised.

Recent cladistic analyses, based on chloroplast sequences (La Farge *et al.* 2000, 2002), have led to significant changes in the circumscription of the Dicranaceae with, for instance, *Campylopus* transferred to Leucobryaceae and many other genera excluded from the order Dicranales altogether. The current project, however, will still include all genera that have been traditionally aligned with the Dicranaceae. Some cladistic work, with morphological and molecular markers, has been planned for this project too, but for now will take a back seat to the *Flora of Australia* treatment.

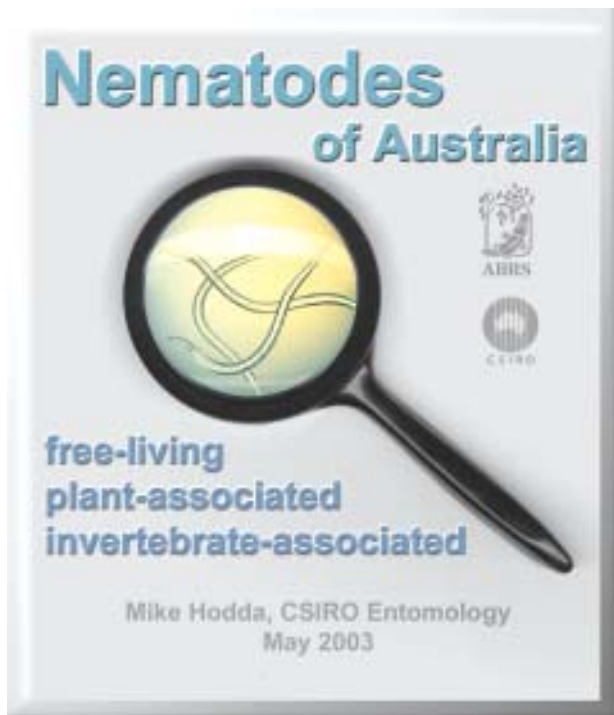
Revision of the genus *Dicranoloma* was completed just before the start of the project (Klazenga 2003). Currently the genus with most Australian representatives, *Campylopus*, is under revision. Although already the subject of two earlier revisions (Frahm 1987, 1994), having a closer look at *Campylopus* is a bit like opening Pandora's box, with many of the specimens studied so far not easily assigned to currently recognised species.

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Article from an ABRS Grantee

Australia's nematodes: hidden no more



ABRS sponsors an electronic interactive key to nematodes of Australia. This key started from a project on a generic overview of freshwater aquatic nematodes and has now expanded to include the Dorylaimida, a large and diverse order of terrestrial nematodes. A number of issues have arisen as the key has grown and developed from a key with a few fresh-water genera, the biome in which nematodes are probably least diverse, to the version which went on the web in May, including a substantial part of the most diverse order of terrestrial nematodes. This article looks at some of these issues.

Nematodes are generally small whitish worms that live in huge numbers in every conceivable habitat where liquid water exists—from the edges of the polar ice to the tropics, from the deepest ocean to high mountain peaks, and on or in almost every other organism, from algae, flowering plants, through earthworms and insects to vertebrates. Nematodes have even survived in outer space: some being taken into orbit for experiments survived the disintegration of the Columbia space shuttle early this year. The huge range of habitats is inhabited by a large number of species. The best estimates of nematode diversity put the world total at between 500,000 and 1,000,000 species, second only to the insects. Only about 2 to 5% have been described.

In Australia, the proportion of species described is even lower. Of an estimated 100,000 species, only about 1,000 have been described. There are currently only

Mike Hodda
CSIRO Entomology
Canberra, ACT

two people working on the description of the Australian nematode fauna.

It is no wonder that some have despaired of ever making significant inroads into taxonomic descriptions of this diverse, and ecologically important, fauna. One project currently under way in the UK has dispensed with conventional systematics and is purely using a procedure termed “molecular bar-coding”. Another speculative paper a few years ago used nematodes as an example of when molecular biologists may bypass the International Code of Zoological Nomenclature (the set of rules and recommendations that govern animal taxonomy) because of the perceived rigidities and slowness of the traditional system in the face of large numbers of new taxa. Organisms such as nematodes share many of the properties of micro-organisms, viz enormous numbers, enormous diversity, active and rapid evolution, often inaccessible systematics, few systematists, and a relatively well-known genome (courtesy of the nematode *Caenorhabditis elegans*). It is the taxonomists of micro-organisms who are leading the push towards less traditional systematics.

In the face of this seemingly overwhelming situation, has the key succeeded in improving knowledge and access to the Australian nematode fauna? If the number of hits on the web site is any indication the answer is hopefully “yes”. The key has had 600–800 hits per year since its launch in 2001. This does not surprise me given the ubiquity and abundance of nematodes, and the number of enquiries I get by telephone. Users who have contacted me revealed a range of interests and situations beyond what was originally envisaged.

An extension officer from Queensland Parks & Wildlife Service had been contacted by a lady from Roma who had small, strange, white worms in her drinking water tank. He used the key to find out whether the worms were pathogenic nematodes, then sent specimens for confirmation. Fortunately, they were not pathogenic, at least to humans; Fig. 1.

An example of the ease of use of the key was a school teacher who saw that it will not only identify nematodes, but what are NOT nematodes (some of the latter are included in the key). So students could both study the organisms in their local waterways, and also experience some of the larger microscopic organisms that would normally be inaccessible to people at this level.

Australia's nematodes: hidden no more



Figure 1.
An adult female Psammomermis sp. The adult females of this very large nematode are occasionally found in drinking water. Larvae parasitise insects, but the adults are free-living and do not feed. The small nematodes are Spiral Nematodes (Helicotylenchus dihystera), which are plant parasites.

At the other end of the spectrum was a plant pathologist experienced in nematodes trying to identify particular species of nematode plant pests, which are often difficult to differentiate. Because the range of characters in the key is much broader than that used in conventional keys, identifications could be performed with more certainty, especially with specimens that were not in ideal condition.

The use of the key is not confined to Australia. A Swedish limnology student, who needed to identify the fauna from freshwater samples, also contacted me. Even though the key includes only freshwater nematodes that have been found in Australia, there are few other comprehensive resources available to differentiate species of nematodes, especially if one does not read Russian or Italian. Many genera of nematodes are cosmopolitan, so the key is the best resource available.

A researcher in Nepal, with very limited laboratory facilities, who was studying the effects of deforestation on stream fauna used those features of the key designed for just such a situation: the ability to select and use only characters that are visible at low magnification. Likewise, users can elect to use only characters such as total length, or colour, which require no experience. If a specimen is damaged, only a portion of the body can be used. In many cases, these simplified character sets will yield a unique identification to some taxonomic rank.

Although the last examples are technically outside the remit of the ABRS, it shows that the key is internationally significant, and places Australia at a considerable advantage in studying its own freshwater aquatic ecosystems.

Does identification to species level matter? Some ecologists contend that it does not, and all that is needed is a functional classification of organisms. Thus all the tremendous species diversity of nematodes would be reduced to groups like “plant-feeders”, “microbivores” and “predators”. However, there is as yet no agreement on the best functional classification of nematodes, and identification to at least the level of genus is required to move between or compare different classifications. The project using “molecular bar-coding” cannot even achieve this level of ecological resolution.

When I am not studying nematode systematics, I study soil ecology. Indeed I was first driven to systematics because crude functional groups of nematodes do not provide much information on what is actually going on in the soil. After twenty years of studying nematodes from many different environments around the world, I hold that view even more strongly. More recently I have become involved in identification of pest species, particularly for quarantine, and this, too, definitely requires identification to species level. More importantly, it involves differentiation of exotic species—often described but not always—from native species which are almost always undescribed.



Figure 2. *Amphibelondira sp.*

It has been tempting to give up and work on easier groups, but being made of sterner stuff or just plain masochistic, I have continued. The end has been the electronic interactive key to nematodes of Australia. The key is an attempt to deal with a diverse fauna in an effective way combining systematic rigour and ecological pragmatism.

Thus the key includes taxa at species, subgenus, and genus ranks. The rank chosen depends on the amount of material and how well it fits the currently accepted taxa. The philosophy is that the diagnosis should not expand or change the definition of existing taxa, but that placing a description on the key can precede the elucidation of the full classification and phylogeny.

The key includes taxa not yet formally described, where there are only a few specimens and one cannot evaluate the similarities and differences from existing taxa conclusively, given an unknown amount of variation within each species. Right now, there are large numbers of specimens in Australia in this category. With the small number of systematists, it may be many years before more specimens of any particular taxon are found, and then it relies on personal records and memory to recognise the resemblance to the existing material. The philosophy is that it is better to have the characteristics of the existing material as widely advertised as possible (via the key), so that the chances of more material coming to light are maximised.

This is indeed happening. We have obtained specimens that would otherwise have been discarded as unidentifiable and not of interest, because of identification via the web. So the key is assisting to improve the national collection as well. An example identification is given in Figures 2 and 3.

Another way that production of the key is assisting the taxonomic effort on Australian nematodes is through the accumulation of rigorous data. For example, the many specimens of the Australian population of a species of Tobrilidae show continuous variation between what are currently recognised as distinct genera. The genera seem synonymous, and what were originally thought of as two genera are in fact the two ends of a continuous range of variation. The collection of specimens for the key has filled in the previous gap in the middle. By contrast, the separation of the genera *Monhystera* and *Eumonhystera* has been confirmed, and additional diagnostic characters identified.

In the latest version of the key the explanatory notes have also been expanded, and more ecological information included, e.g. not just where a species has been found, but the sediment and surrounding vegetation type, etc.

Production of the key has not only provided taxonomic information but also phylogenetic insights through the rigorous definition and coding of characters. For example, the currently accepted higher phylogeny places several groups that look superficially similar together, with the assumption that some characters have been modified and others secondarily lost. However, a cladistic analysis using all of the characters has suggested that other phylogenies may be more parsimonious. The hypothesis of secondary loss may be unlikely.

There are now over 800 characters and 1,400 taxa in the key, statistics which underline the diversity of form and the spectacular radiation of nematodes. As the basic structure has been laid down, addition of taxa has become faster. With updates to the key becoming available as soon as they are posted on the web, I believe that a modest effort by just one person (plus gratefully acknowledged technical support) can make a difference even on a very diverse, poorly known group such as nematodes. If the number of hits of the web site is an

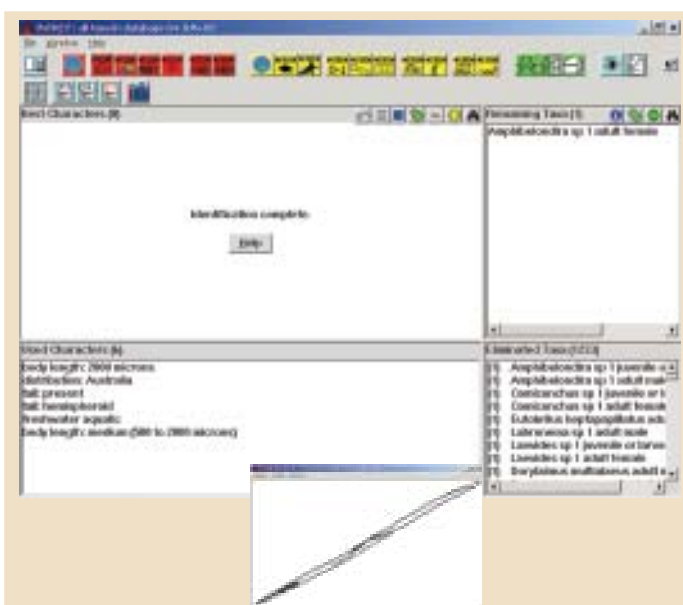


Figure 3. Example of identification using the electronic interactive key to nematodes of Australia. The freshwater aquatic nematode genus *Amphibelondira* can be identified from over 1000 other nematode taxa using only the characters: body length, geographic distribution, habitat and tail shape.

indication of utility, the key is hopefully succeeding from a practical viewpoint, as well as advancing nematode systematics, and maybe even more general phylogenetic science. If the exercise can succeed on all these levels, albeit in a way which may be different from many other approaches, then it will have achieved its purpose.

Research Ph.D. Scholarships

Call for 2004 applications

Aim and entitlements

The Australian Biological Resources Study (ABRS) awards Ph.D. scholarships to foster research training compatible with ABRS and National Research Priorities. ABRS funds systematics research on Australian flora and fauna and offers postgraduate awards to outstanding students wishing to pursue higher degrees within this discipline.

Stipends are paid at a rate equivalent to that of the Australian Postgraduate Award (Industry) as set by the Australian Research Council (ARC). The rate set in 2003 is \$23,294 per annum for three years. The stipend is tax exempt and is subject to indexation annually. An annual research support grant of \$2,500 is also provided to assist with research costs.

Eligibility

ABRS Ph.D. scholarships are open to Australian citizens or to those who have been granted permanent resident status. Candidates should hold a first or upper second class honours degree or equivalent in an appropriate discipline and be strongly motivated to undertake a project in systematic biology. Applicants must enroll as a full-time student. Applicants are also encouraged to take up a scholarship in a university different from that in which they undertook their first degree.

Obtaining applications

Application forms can be obtained from the ABRS web site:

www.deh.gov.au/biodiversity/abrs/admin/training/

or from:

The Business Manager
ABRS
Department of the Environment and Heritage
GPO Box 787
Canberra ACT 2601

Ph (02) 6250 9554 Fax (02) 6250 9555

E-mail abrs@deh.gov.au

Deadline

Applications must be received by 3 November 2004.

Bursaries

Call for 2004 applications

ABRS Bursaries for student travel awards

Each year ABRS offers financial support to post-graduate students in Australian institutions for travel to a national or international conference relevant to both the student's research program in systematics or taxonomy, and to the Aims and Objectives of ABRS. A maximum of \$1,000 is available for an international conference and \$500 for travel within Australia. In total up to \$10,000 is available each year for these awards.

Eligibility

1. ABRS Bursaries are open to permanent residents of Australia.
2. The student must be currently enrolled in a Ph.D. or Masters degree (including a research component) in the field of Systematics or Taxonomy.
3. The conference must be relevant to Systematics or Taxonomy.
4. The student must show that a poster or oral paper presentation has been submitted to the conference.
5. The student must demonstrate the benefits of the travel to their research, and to the aims and objectives of ABRS.
6. Preference may be given to applicants who receive matching funding from their home institution or other source.

Obtaining applications

Application forms can be obtained from the ABRS web site at

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or from:

The Business Manager
ABRS
Department of the Environment and Heritage
GPO Box 787
Canberra ACT 2601

Ph (02) 6250 9554 Fax (02) 6250 9555

E-mail abrs@deh.gov.au

Deadline

Applications must be received by 10 March 2004 or 10 September 2004.

Publications

The Genus Mycena in South-Eastern Australia

Dr C. Grgurinovic (2003)

The Genus Mycena in South-Eastern Australia is the first book to be published in Australia covering a single Australian mushroom genus. It is a co-publication of Fungal Diversity Press and ABRS.

The book covers 66 species of the mushroom genus *Mycena*, most of the species being from south-eastern Australia.

In addition to species' descriptions, the classification of the genus is discussed, as well as the history of the genus in Australia, previous Australian records, and the conservation status of species. The majority of species of *Mycena* included in this work proved to be both new to science and endemic to Australia.

Hard cover; B5; 350 pages. Purchase from Fungal Diversity Press

Fungi of Australia, Volume 2B, Catalogue and Bibliography of Australian Fungi 2

Dr T.W. May, J. Milne, S. Shingles & R.H. Jones (2003)

The second part of Volume 2 of the *Fungi of Australia, Catalogue and Bibliography of Australian Fungi 2. Basidiomycota* p.p. & *Myxomycota* p.p. has been published.

Volume 2B and Volume 2A, published in 1997, are essential in the preparation of modern taxonomic treatments of the Australian macrofungi. They provide a guide to the names that have been used in Australia for the mushrooms, toadstools, bracket fungi, puffballs and other taxa with large conspicuous fruiting bodies. For each name the catalogue provides place and date of publication, taxonomic synonyms, and a comprehensive list of all works in which the name has been used in an Australian context.

This volume contains all other groups of macrofungi in the Basidiomycota and Myxomycota. It covers approximately 3,000 accepted, synonymous and misapplied names.

Catalogue of Australian Mosses

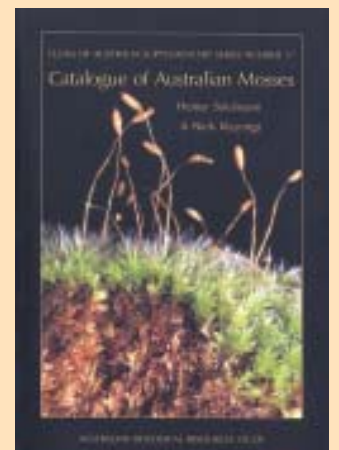
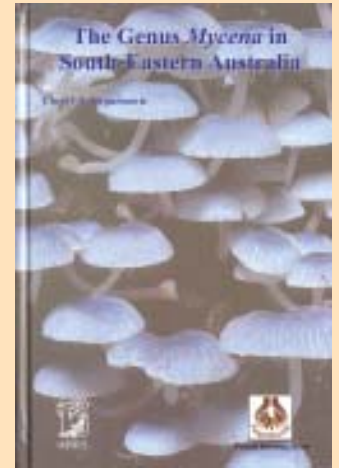
H. Streimann & N.H. Klazenga (2002)

Flora of Australia Supplementary Series No. 17

Numerous taxonomic revisions and a substantial amount of additional floristic information have become available since the publication of Streimann & Curnow's *Catalogue of Mosses of Australia and its External Territories* in 1989. Monographs of Australian families and genera have included descriptions of many new taxa and the reduction of an even larger number of names to synonymy. Moreover, many taxa have been newly reported from Australia, while other Australian records have proved to be based on misidentifications or could not otherwise be confirmed. Taxonomic revisions from other regions have also resulted in many name changes among Australian taxa, and floristic research has provided numerous new State and Territory records. This book documents the changes that have occurred between March 1987, the deadline for inclusion in the original Catalogue, and September 2002.

The new Catalogue includes an introduction, 1074 accepted names with their publication details, more than 3000 synonyms, distribution by Australian State and Territory, literature sources, notes on nomenclatural and distributional changes since 1987, and lists of excluded and doubtful names.

An essential tool for appreciating the diversity and distribution of Australian mosses, the Catalogue is already much in demand from professional bryologists in Australia and overseas, numerous interested amateurs and land managers.



Publications

The Mosses of Norfolk Island

H. Streimann (2002)

Flora of Australia Supplementary Series No. 16

This is a detailed taxonomic account of 69 species of moss known from subtropical Norfolk Island, an Australian territory in the south-western Pacific Ocean. Illustrated in colour and with numerous habit and anatomical drawings and distribution maps, it includes an introduction to the island and the history of bryological activity, identification keys to genera and species, detailed and synoptic species descriptions, specimen citations and information on habitat preferences and local and global distribution.

This authoritative guide to a comparatively discrete flora will be of interest to biodiversity professionals and amateur naturalists with an interest in the Australasian and Pacific floras.

The Marine Benthic Flora of Southern Australia Part IIID Ceramiales— Delessariaceae, Sarcomeniaceae, Rhodomelaceae

H.B.S. Womersley (2003)

Flora of Australia Supplementary Series No. 18

This book, jointly published by ABRS and the State Herbarium of South Australia, completes the account of the marine algae of this region. In format it is similar to earlier parts, with detailed species-level descriptions of the last three families of red algae. These descriptions are supplemented with copious line drawings of detailed cellular arrangements and lineages, and many excellent halftones of complete plants and sections of reproductive structures. Throughout, keys are provided to allow identification of taxa, and detailed synonymies and distributional data are provided. For each taxon the Type citation and location of specimens is indicated, and for many there are discussions of variation and relationships.

Catalogue of Australian Lichens

P.M. McCarthy (2003)

Flora of Australia Supplementary Series No. 19

This is a comprehensive list of all lichen taxa (accepted names, misapplied names and synonyms) known from Australia and its external territories.

The most recent paper *Checklist of Australian Lichens* was published in 1996. Since then, known diversity has increased from about 2,500 taxa to almost 3,150 (25%), and at least 1,000 additional State records have been reported in the literature. Although the checklist is now on-line, there is a clear demand for an updated paper version.

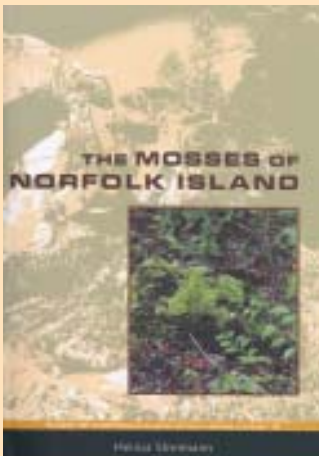
The new Catalogue includes an introduction, more than 3,100 accepted names with their publication details, more than 4,000 synonyms, distribution by Australian State and Territory, literature sources, lists of excluded and uncertain names, and a bibliography of more than 500 publications.

Field Guide to the Mosses and Allied Plants of Southern Australia

D. Meagher and B. Fuhrer (2003)

Flora of Australia Supplementary Series No. 20

A comprehensive, plain-English and richly illustrated identification guide to 500 mosses, liverworts and horn-worts in southern Australia. The book will include an introduction to bryophytes, information and hints on the collection, storage and identification of specimens, identification keys, descriptions, thumb-nail anatomical sketches and almost 300 superb colour photographs. A co-publication of ABRS and the Field Naturalists Club of Victoria.



Juncaceae Parts 1–3
J.Kirschner *et al.* (2002)

Species Plantarum—Flora of the World parts 6–8

These three books provide a global account of the important wetland family Juncaceae, providing keys, descriptions, maps and illustrations for over 500 species. For most countries, including Australia, they represent the first national account of Juncaceae in over a century. The coordinator, Dr Jan Kirschner, has achieved a publication which should stand as a model for international taxonomic cooperation, organising over 20 authors to produce the final text within 3 years. This publication provides compelling arguments as to why a global project such as SPP is important for the delivery of taxonomic information on a global, national and regional level. The authors coordinated taxonomic concepts across national boundaries, resolving many long-standing nomenclatural problems. More importantly, they were able to correlate their work with the IUCN Red List of rare and endangered species in Juncaceae worldwide. The Red List proved to be only 25% accurate, with many names on the list being synonyms of widespread species, and many rare and localised taxa being omitted. (See Kirschner & Kaplan, *Taxon* 51: 155–158, 2002, for details of the conservation outcomes of this project.) ABRS has taken a leading role in the development and delivery of the Species Plantarum Programme, one of its more important international roles, and a major potential Australian contribution to the Global Taxonomy Initiative of the Convention on Biological Diversity.

Zoological Catalogue of Australia, Volume 29.5,
Coleoptera: Buprestoidea

C.L. Bellamy (2003)

Published by ABRS & CSIRO Publishing

Cataloguing the 1,205 species of Jewel Beetles (buprestids) recorded for Australia, this volume is an invaluable tool for natural resource managers. Many Jewel Beetles are highly prized by collectors, some are on threatened species lists—many of the larvae are wood-borers in live or dead timber, and thus are at risk from clearing of native vegetation.

Zoological Catalogue of Australia, Volume 27.3B,
Hemiptera: Heteroptera (Pentatomomorpha)

G. Cassis & G.F. Gross (2002)

Published by ABRS & CSIRO Publishing

This second in the two part series of catalogues of Australian Hemiptera by these two Hemiptera workers provides far more than just standard catalogue fare. The authors give valuable syntheses of the fauna, and comparisons of classifications and of the composition of Australian v world fauna, comprehensive bibliographic information and details of hosts.

Zoological Catalogue of Australia, Volume 19.3B,
Crustacea: Malacostraca: Eucarida (Part 2): Decapoda - Anomura, Brachyura

P.J.F. Davie (2002)

Published by ABRS & CSIRO Publishing

This second volume on higher malacostracan crustacean complements Volume 19.3A, completing the Eucarida. It catalogues more than 1200 species of Australian crabs (Brachyura) and related groups such as hermit crabs, porcelain crabs, squat lobsters, mole crabs, and their ilk (Anomura). Full taxonomic information is provided, with the original literature as well as museum data on the original type specimens. For all species known to occur in the Australian fauna, broad distributions are indicated, both inside and outside Australian waters, and, where possible, a short summary of known ecological data is given. References are given to key works that can help identify the fauna at all taxonomic levels. Of special interest is the fact that all taxonomic groups down to families and subfamilies are fully diagnosed, and the latest literature discussing their status is reviewed and summarised, including genetic and larval studies if available. This volume is a must for all crustacean workers, and especially fisheries managers, environmental managers and consultants, and research workers.

Zoological Catalogue of Australia, Volume 19.2A,
Crustacea: Eumalacostraca: Syncarida, Peracarida: Isopoda, Tanaidacea, Mictacea, Thermosbaenacea, Spelaeogriphacea

G.C.B. Poore, N.L. Bruce, L.J. Cookson, Alison J. Green, B. Knott, P.S. Lake, H.M. Lew Ton, J.C. Markham, Jürgen Sieg & G.D.F. Wilson (2002)

Published by ABRS & CSIRO Publishing

AND

Zoological Catalogue of Australia, Volume 19.2B,
Crustacea: Eumalacostraca: Peracarida: Amphipoda, Cumacea, Mysidacea

J.K. Lowry, G.E. Fenton, J.E. Gates, S.J. Keable & H.S. Stoddart (2003)

Published by ABRS & CSIRO Publishing

Release of these two further volumes cataloguing Australia's Malacostracan crustaceans marks the end of an enormous project to catalogue close to 5,000 recorded species. Many species have commercial value, others form critical links in food chains. These two Catalogues and the two including the Eucarids (shrimps, crabs, crayfish, etc) can be purchased separately or in sets from CSIRO Publishing.

Forthcoming Publications

Flora of Australia volume 44B *Poaceae* 3

This is the second volume to be published in the *Flora of Australia* series on the grasses, and the first taxonomic volume. Vol. 44B will incorporate the subfamilies Arundinoideae, Danthonioideae, Aristidoideae, Micrairoideae and Chloridoideae. It is the culmination of many years work, and a collaboration of 12 authors and many artists and photographers. There will be about 460 species in the book, with several new taxa described, and every genus is illustrated. Distribution maps will have been updated from those published in volume 43.

Many of the taxa included are important endemic Australian genera, such as *Triodia*, the hummock grasses typical of arid Australia, and *Astrelba*, the Mitchell grasses, the mainstay of the pastoral industry in Queensland. The majority of the grasses in the volume come from more tropical or arid parts of Australia, and include large and important genera such as *Aristida* and *Eragrostis*, though the Danthonioideae have a more temperate distribution and include the Wallaby Grasses (*Danthonia s. lat.*). The volume also includes the endemic *Micraira*, resurrection grasses which regenerate from airdry specimens, and the largely endemic *Eriachne*.

Catalogue of Australian Liverworts and Hornworts

Patrick M. McCarthy

Flora of Australia Supplementary Series No. 21

Major taxonomic revisions and a substantial amount of additional floristic information have become available since the publication of Scott & Bradshaw's "Australian liverworts (Hepaticae): annotated list of binomials and checklist of published species with bibliography" in 1986. Monographs of Australian families and genera have included descriptions of many new taxa and the reduction of other names to synonymy. Moreover, many taxa have been newly reported from Australia, while other Australian records have proved to be based on misidentifications or could not otherwise be confirmed.

The Catalogue comprises an alphabetical listing of accepted genera and species, synonymy, distribution in the Australian States and mainland Territories, excluded names, names of uncertain application, *nomina nuda* and recent literature. Following the publication by ABRS of *Catalogue of Australian Mosses* (2002) and *Catalogue of Australian Lichens* (2003), this work completes an inventory of more than 5,000 Australian bryophyte and lichen taxa.

Publication: December 2003

Fabulous Flatworms, Interactive CD ROM

Fabulous Flatworms: the world of marine polyclads assembles for the first time a global representation of over 500 of these captivating and colourful sea animals. An innovative fast-track identification system is provided, based on body pattern and colour, and an enlightening introduction is given to the fascinating lives of these polyclad flatworms that are so often mistaken for sea slugs or nudibranchs.

Ebbe Nielsen Prize

Ebbe Nielsen Prize for Innovation in Combining Biosystematics and Biodiversity Informatics Research

The Australian Government invites nominations for the Global Biodiversity Information Facility (GBIF) 2004 Ebbe Nielsen Prize. The prize is offered in memory of Ebbe Nielsen who was a global advocate for the science of systematics and the emerging discipline area of biodiversity informatics.

The GBIF Governing Board awards this prize annually, to a promising researcher, normally within ten years of their entering the research field of biodiversity informatics. Candidates should be combining biodiversity informatics and biosystematic research in novel and exciting ways.

The Prize of US\$35,000 is awarded to allow the recipient to engage in such research in biodiversity outside his/her country of residence for a period of 3–6 months. However, the use of the funds will be at the discretion of the recipient.

The primary selection criterion is scientific excellence as evidenced by the nominee's research and publication record, and in particular, the innovation shown in combining biosystematics and biodiversity informatics research in their field of activity.

Nominations must be received by the GBIF Secretariat no later than 15th December 2003 and are to be submitted through the Australian GBIF delegation.

More detailed information on the Ebbe Nielsen Prize can be obtained at www.gbif.org/GBIF_org/prize/ or by contacting the ABRS Business Manager, via phone: 02 6250 9554 or e-mail: abrs@deh.gov.au.

Specimen Databasing Projects



Australian Biodiversity Information Facility—*Flora of Australia* online

The *Flora of Australia* online is part of the Australian Biodiversity Information Facility. Progress with the database development and online delivery of this work has been greatly facilitated by the appointment in late 2002 of Robyn Lawrence to the position of Database Manager with ABRS. Robyn works closely with Greg Whitbread, the Database Manager of the Australian National Botanic Gardens, and with other database staff in the Department of the Environment and Heritage.



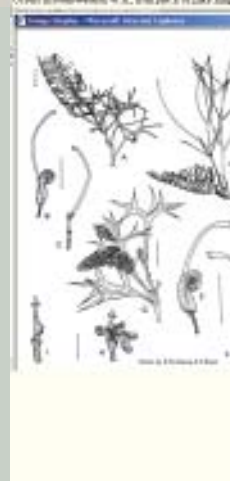
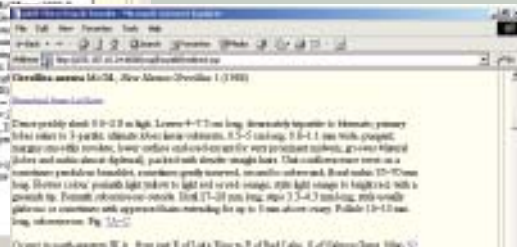
Data on over 1,810 vascular species recorded for the Australian flora are now available through *Flora of Australia* online at www.anbg.gov.au/abrs/abif/flora. This incorporates data from Volumes 16, 17a, 17b, 48, 49 and 50 of the *Flora of Australia*. The first four volumes cover the Elaeagnaceae, Proteaceae, ferns, fern allies, gymnosperms and cycads. Volumes 49 and 50 cover the oceanic islands and external territories of Australia.



Information available includes: name, author, protologue, typification, synonymy, descriptions, chromosome number, flowering & fruiting times, distribution, habitat, line drawings and identification keys. The search facility enables the user to customise their enquiry to return only specified information. A useful feature is the expanding hierarchical list of names: a similar feature is used in the Australian Faunal Directory.

ABRS has already collaborated in the funding and production of database projects such as the *Australian Marine Algal Name Index*, *Census of Freshwater Algae in Australia*, *Checklist of Australian Lichens* and the *Interactive Catalogue of Australian Fungi* which are currently available on the Internet and which will be linked to ABIF-Flora.

The taxonomic treatments of the *Fungi of Australia* and *Algae of Australia* will also be made available online through ABIF.



Specimen Databasing Projects

Australian Biodiversity Information Facility—*Australian Marine Algal Name Index online*

Australian Marine Algal Name Index online is a collaborative project between ABRS and Murdoch University, W.A. The database is currently being migrated over to a new platform and should be updated and online by late 2003. The database currently houses nomenclatural and distributional information on 6,509 records in the Chlorophyta, Phaeophyceae, Xanthophyceae, Rhodophyta and Cyanophyta.

Australian Biodiversity Information Facility—*Checklist of Australian Lichens online*

The Checklist of Australian Lichens online currently houses 3,075 accepted species names. It provides nomenclatural and distributional information. The data is currently online as static html pages and are being migrated to a relational database that should be online by mid to late 2003. At present the Checklist is online at www.anbg.gov.au/abrs/lichenlist/introduction.html

Australian Biodiversity Information Facility—*Australian Faunal Directory*

Data on around 38,000 species recorded for the Australian fauna are now available online in the *Australian Faunal Directory* at www.deh.gov.au/biodiversity/abrs/online-resources/abif/fauna/

The Directory now incorporates data from all but the latest published volumes of the *Zoological Catalogue of Australia*, with most data updated, as well as other checklists prepared especially for the online database.

This ambitious programme continues. We now have available the updated Amphibia (frog) catalogue, the checklist of Chilopoda (centipedes), a number of the aquatic beetle groups (Hydrophiloidea), the armoured scales (Diaspididae) and several more Hymenoptera groups (wasps). Updated versions of the Scarabaeoidea (e.g. dung beetles) families, Trichoptera (caddisflies) and several wasp groups have been re-loaded into the Directory.

By early 2004, we hope to have added to the online database all the data from the *Zoological Catalogues* published during 2002 (Malacostracans, Buprestids, and Hemiptera), and the updated data for Reptilia, further spider, wasp and mollusc groups, the soft scales (Coccoidea), lace-corals (Bryozoa), rotifers, and some of the coral and moth families. Importantly, we also hope to have improved accessibility to the data, making it available through standard Web search engines. To further improve accessibility, in a major drive over the next twelve months, we will add common names to the database where these are available.



OZCAM—Australia's Fauna—www.ozcam.gov.au

The 'proof of concept' stage of the *Online Zoological Collections of Australian Museums*, known as "OZCAM - Australia's Fauna" was completed on 30 June this year. It is possible to obtain specimen data, images or a map of the distribution of, for example, one or several mammal species plotted from label data harvested live from Australia's zoological collections.

OZCAM is not yet available for general users, and this prototype accesses data on only a limited set of animal groups - vertebrates and dung beetles.

The initial aim of the OZCAM project has been to demonstrate that web-based queries could be made on Australian faunal collections through a single website using a distributed dataset model. In this model, each institution holds its own data on a web accessible server and queries are sent from the central website out to each remote site. This gives data providers the ability to manage and update their datasets.

It will be invaluable as a research tool, and most importantly, as a natural resource management tool. The project is an initiative of CHAFC, the Council of Heads of Australia's Faunal Collections—all of Australia's major zoological collections are involved, as well as the Department of the Environment and Heritage, through ABRS.

Species Bank

Species Bank is a species information resource newly available on the ABRS web-site. It has proved to be robust and simple to use and diverse in its potential for disseminating information to the community.

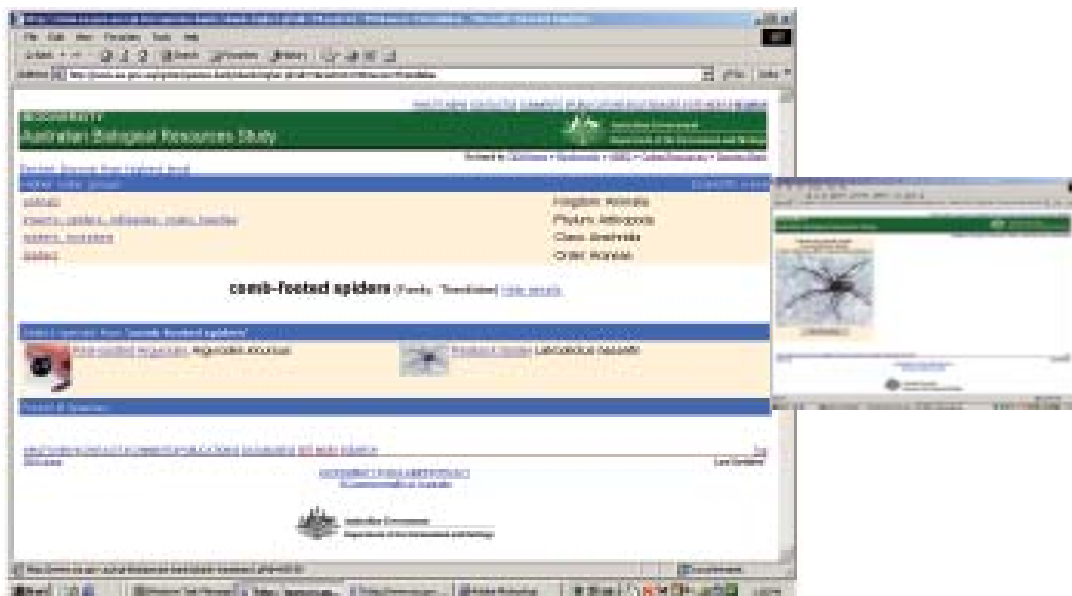
The aim of *Species Bank* is to provide information on species of interest and/or importance to the community. It covers a broad range of taxa at species level from animals, plants and fungi. Each treatment is about 350–500 words long, under a set of prescribed headings, and includes one or more distribution maps, and illustrations of the species. The headings for the *Species Bank* treatments include: Distribution, Features, Ecology/Way of Life, Interaction with Humans/Threats, Other Comments, Further Reading, Acknowledgements. Links to General Topics are provided to give useful information on aspects that are relevant but too detailed to be discussed within the specific texts themselves. *Species Bank* also caters for video and sound files, however, to date only video files have been included for some of the Squid and Octopus treatments.

Species Bank has Search pages in two formats: Easy Search and Advanced Search, that allow for the searching of species treatments. A Search Help explanation page details the methods for searching.

Alternatively the user can browse *Species Bank* by progressing down the Taxonomic hierarchy from Kingdom onwards. *Species Bank* has been set up to only show the higher order taxonomic entries that lead down to *Species Bank* treatments. The higher order taxonomic hierarchy has been simplified in some cases.

Each species treatment was kindly written for ABRS by an expert in the area. *Species Bank* acknowledges the work of each of these authors and seeks sponsorship to help contribute to the further development of this facility. A sponsors' page details those people and organisations that have already contributed towards the cost. If you are interested in becoming either an author or sponsoring some species treatments then please contact the director of ABRS, Mary Colreavy, on (02) 6250 9506 or contact us via the feedback link on the site www.deh.gov.au/biodiversity/abrs/online-resources/species-bank/

Presently there are over 220 species in the broad categories of Flowering Plants, Molluscs, Corals, Crustaceans, Sea Stars and Urchins and Spiders whose detailed treatments have been loaded into *Species Bank*. A number of species from different groups of animals and plants are currently being written and edited for loading.



International News

Global Taxonomy Initiative (GTI) workshop UNESCO, Paris, 12–14 February

Dr Tony Orchard and Miss Annette Wilson attended the Global Taxonomy Initiative workshop, sponsored by UNESCO, BioNet International and the Convention on Biological Diversity (CBD) Secretariat. The workshop produced a Plan of Work for the GTI, to be tabled at the Subsidiary Bodies (of the CBD) on Scientific, Technical and Technological Advice (SBSTTA) meeting in Montreal on 10 March, along with interventions to add taxonomic activities to the Mountain Biodiversity Plan of Work. They made two submissions, one on behalf of ABRS/Environment Australia, the other on behalf of Species Plantarum. There was also considerable discussion on the appointment of a half-time GTI officer to the CBD Secretariat (the meeting strongly believed it should be full-time) and on the problems that were being experienced in persuading the Global Environment Facility (GEF) to fund GTI activities.

Species Plantarum Steering Committee Paris, Jardin Botanique, 27 February to 1 March

Dr Tony Orchard and Miss Annette Wilson also attended the meeting of the Species Plantarum Steering Committee, where both were confirmed as Production Editors, responsible for final editing, formatting and publication. Dr Jan Kirschner (Czech Republic) will be Receiving Editor, responsible for organising refereeing and preliminary checking of all manuscripts received.

Species Plantarum first major work, the 3-volume *Juncaceae*, was enthusiastically received, and substantial progress was reported on the next major monograph, *Chrysobalanaceae*, of over 500 species. A welcome offer of sponsorship for publication of *Chrysobalanaceae* has been received, placing the whole project on a more sustainable footing.

International Symposium on Plant Diversity in Eastern Asia and Workshop on Botanical Gardens in Taiwan

Ms Helen Thompson (ABRS) attended the International Symposium on Plant Diversity in Eastern Asia and the Workshop on Botanical Gardens in Taiwan in March this year, giving two talks, one on research and management at ABRS, ANBG, and CPBR, and the other on the *Flora of Australia* online project and *Australia's Virtual Herbarium* (AVH).

Nereid polychaete project: ABRS lends a hand

Several international collaborative projects facilitated by ABRS have recently been negotiated successfully. One of these, the Pantropical Nereid project (PARTNER), is an international collaborative project to document and describe the diversity of the tropical nereid polychaete. This project, to be funded by the United States Geological Survey, will demonstrate the use of an internationally distributed database to link data from a variety of sources, making it readily available to the world community of users. The project will provide a demonstration of collaboration from around the Pacific to contribute taxonomic data towards several international initiatives, specifically the ITIS (Integrated Taxonomic Information System) and the Catalogue of Life Programme, and several regional projects currently ongoing in the western Pacific (Academic Sinica, Taiwan) and Brazil (BIOTA). The project will also contribute taxonomic data toward the *Census of Marine Life* (CoML), an international research subprogram of the Ocean Biogeographic Information System, coordinated by *Global Biodiversity Information Facility* at www.coreocean.org/

Nereids are a significant part of the marine invertebrate fauna, with species being important in the diet of shore birds, fishes and prawns; others are part of the fouling community of ports and harbours. The project will be coordinated by Dr Chris Glasby, of the Northern Territory Museum, and involve other investigators based in Australia, New Zealand, USA, Indonesia, Taiwan, and Brazil, all funded by their own institutions.

The outputs of this extensively networked project will be an online Information System comprising:

- i) a taxonomic database containing descriptive data, geocoded distributional data and habitat data;
- ii) distribution maps for each species;
- iii) an interactive key to identify genera and species.

Taxonomic data generated will be made available for taxonomic revisions of nereid genera currently underway. Other key features of the project will be promotion of systematic research among the less-well funded institutions in the Pantropics; training of postgraduates in polychaete taxonomy; and training in the use of DELTA.

Global Taxonomy Initiative (GTI)

ABRS has recently agreed to work with the Secretariat of the Convention on Biological Diversity (CBD), and the US National Biological Information Infrastructure (NBII) to prepare a joint publication of the GTI Programme of Work. ABRS will publish and distribute the publication, making it available for those who may not be able to access it over the internet. The GTI Programme of Work publication follows similar publications *The Darwin Declaration* and *The Global Taxonomy Initiative: Shortening The Distance Between Discovery And Delivery*—available on the ABRS website at www.deh.gov.au/biodiversity/abrs/publications/other

Fauna Subprogram

The Fauna Subprogram is managing a series of projects that are developing identification tools, guides and check-lists, to be delivered online, on CD and as published books.

Among these are several Natural Heritage Trust funded projects, one a guide to marine lace corals (Bryozoa), the other an online set of habitat characterisations for aquatic insect species that will aid interpretation of river monitoring results. Other projects include a beautifully illustrated CD guide to marine polyclad worms, *Fabulous Flatworms*, and a comprehensive book on Echinoderms, both nearing completion. Further online keys are being developed to Dorylaimida nematodes and Mysidacean crustaceans and we expect to finish documentation of the fishes of Australia in the last of the hardcopy volumes of the *Zoological Catalogue of Australia* series. In addition, further groups will be added to the *Australian Faunal Directory* (AFD) in the *Australian Biodiversity Information Facility* (in ABIF-Fauna).



Posters

There are still plenty of copies of the second fungi poster *Australian fungi and their kingdoms*.

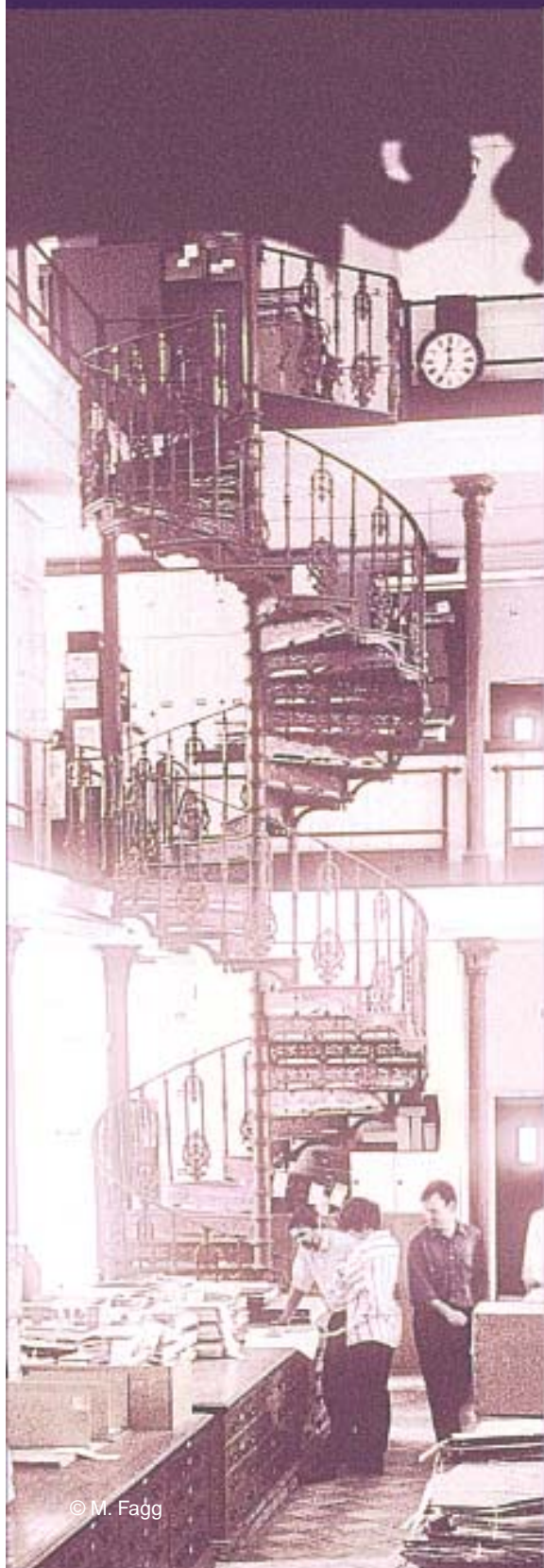
This and the earlier poster *Australian Fungi and the Environment* are available from the Community Information Unit, Department of the Environment and Heritage, Ground Floor John Gorton Building, Parkes ACT 2600, or order via e-mail: ciu@deh.gov.au, via Phone: 1800 803 772, or via Fax: (02) 6274 1970

The two posters have been used in an educational website which contains further information and illustrations on the topics introduced in both posters.

The website was launched on 14 November 2002 along with the Plant Underground exhibition by the Minister for the Environment and Heritage, The Hon. Dr David Kemp, MP.

Visit the website at www.deh.gov.au/biodiversity/abrs/publications/fungi/

Australian Botanical Liaison Officer (ABLO)



© M. Fagg

An Australian Botanical Liaison Officer (ABLO) has been appointed annually since the 1930s to work at the Herbarium, Royal Botanic Gardens at Kew in the United Kingdom. The ABLO services botanical enquiries from Australian and New Zealand sources, particularly from botanists working in State and Commonwealth herbaria, using the facilities at Kew, the Natural History Museum, London, and where necessary, other European herbaria.

The ABLO also assists staff members at those institutions in botanical matters relating to Australia, as well as pursuing personal scientific interests to enhance the collective knowledge of Australian flora. Experienced botanists are encouraged to nominate for the position. This is an excellent development opportunity for botanists wishing to further their career.

The current ABLO is Dr Roberta Cowan, a Research Fellow at Murdoch University in Western Australia, who took up the position in December 2002. Miss Annette Wilson from ABRS will replace Roberta in early December this year. Annette manages the ABRS vascular plants subprogram, and she will hold the ABLO position for 9 months. We are currently seeking Annette's replacement as ABLO for any period up to 12 months from September 2004.

Call For Applications for 2004/2005 Australian Botanical Liaison Officer

Applications extended until 14 November 2003

ABLO guidelines, selection criteria and tasks are available at:

www.deh.gov.au/biodiversity/abrs/admin/training/ablo/

Further information is available from: Business Manager, ABRS, GPO Box 787, Canberra ACT 2601.
Ph:(02) 6250 9554 or e-mail: abrs@deh.gov.au

List of grants 2003/2004

New grants for 2003/2004

Category	Project Title	Investigator	Located	Amount
Algae	Morphological and molecular insights into the taxonomy and phylogeny of symbiotic dinoflagellates (zooxanthellae) from the Great Barrier Reef	Dr D. Carter & Dr A. Salih	University of Sydney, NSW	\$15,000
	Taxonomy and ecology of deep-water Australian charophytes	Dr M.T. Casanova & Dr G.T. Kraft	Royal Botanic Gardens, Melbourne, VIC	\$10,000
	<i>Bulbochaete</i> C. Agardh and <i>Oedocladium</i> Stahl (Oedogoniales, Chlorophyta) in Australia	Dr T. Entwisle & Dr S. Skinner	Royal Botanic Gardens Sydney, NSW	\$37,000
	Marine Benthic Flora of North-Western Australia	Dr J. Huisman	Murdoch University, WA	\$69,300
	The taxonomy of marine brown and red algae of tropical and subtropical eastern Australia	Dr G.T. Kraft	University of Melbourne, VIC	\$10,000
Bryophytes	Revision of the Australian representatives of the Dicranaceae (Bryophyta) and related families	Dr N. Klazenga	Royal Botanic Gardens, Melbourne, VIC	\$69,300
Flora (Vascular Plants)	A systematic revision of the tribes Heliantheae and Eupatorieae (Asteraceae) in Australia	Dr R.J. Bayer	CSIRO, Plant Industry, Canberra, ACT	\$48,000
	Molecular phylogenetics and taxonomy of <i>Syzygium</i> (Myrtaceae) and allies, with emphasis on the relationships and taxonomic status of Australian and Papuan species groups	Dr L.A. Craven, Dr M.D. Crisp, Dr P.A. Gadek & Dr E. Biffin	Australian National Herbarium, CPBR, Canberra, ACT	\$9,900
	A revision of <i>Tetratheca</i> , <i>Platytheca</i> and <i>Tremandra</i> and assessment of the phylogeny and biogeography of Tremandraceae and Elaeocarpaceae	Dr D.M. Crayn & Dr M. Rossetto	Royal Botanic Gardens Sydney, NSW	\$25,000
	Evolution and radiation of Australian hopbushes (<i>Dodonaea</i> spp.) and allied genera	Dr P. Gadek, Dr C. Quinn & Dr J. West	James Cook University, Cairns, QLD	\$25,000
	Taxonomic Revision of <i>Rulingia</i> R.Br. and <i>Commersonia</i> J.R.Forst. & G.Forst. (Malvaceae s.l. or Sterculiaceae)	Dr C. Wilkins	University of Western Australia, WA	\$56,500
	Australian Botanical Liaison Officer at Royal Botanic Gardens Kew, United Kingdom	Miss A. Wilson	Australian Biological Resources Study, ACT	\$37,500
	A revision of the genus <i>Chrysocephalum</i> (Asteraceae: Gnaphalieae) with a concomitant treatment suited to the requirements of the Flora of Australia	Mr P. Wilson	Western Australian Herbarium, WA	\$20,000
	Fungi	Cercosporoid fungi on Australian native plants	Dr V. Beilharz	Institute for Horticultural Development, Knoxfield, VIC
	Revision of Australasian sequestrate Agaricaceae (Basidiomycota)	Dr T. Lebel	Royal Botanic Gardens Melbourne, VIC	\$15,000
	Smut fungi (Ustilaginomycetes) of Australia	Dr R. Shivas	Queensland Department of Primary Industries, Indooroopilly, QLD	\$49,900
	Taxonomy of <i>Fusarium</i> in Australia	Dr B. Summerell & Dr L. Burgess	Royal Botanic Gardens Sydney, NSW	\$30,900

New grants for 2003/2004

Category	Project Title	Investigator	Located	Amount
Fauna	Revision of the Tasmanian Mountain Shrimp genus <i>Anaspides</i> Thomson (Crustacea: Syncarida)	Dr S.T. Ahyong	Australian Museum, Sydney, NSW	\$42,300
	Development of an Interactive Identification Key to Australian Hymenoptera (wasps, ants, bees and sawflies)	Prof. A.D. Austin, Dr J.T. Jennings & Mr N. Stevens	The University of Adelaide, SA	\$5,000
	Taxonomy and phylogeny of doridoidean nudibranchs (Mollusca: Nudibranchia, Dorididae), with a focus on cryptic species from Australian coastal habitats	Dr G.D. Brodie & Dr H. Wägele	James Cook University, Townsville, QLD	\$19,900
	A Review of Australian Species of <i>Ecnomina</i> Kimmins (Trichoptera: Ecnomidae)	Dr D. Cartwright	Unattached Wandana Heights, VIC	\$4,000
	Taxonomy, biogeography and conservation genetics of phreatoicid isopods of Western Australia	Dr B. Cook	University of Western Australia, WA	\$33,300
	Generic delimitation and biodiversity of small genera in the Myrtaceae-feeding, gall-inducing eriococcid scale insect clade	Dr L.G. Cook & Dr P.J. Gullan	The Australian National University, ACT	\$15,600
	A revision of the Australian Freshwater Crabs (<i>Austrothelphusa</i> spp.), using morphological and molecular approaches	Dr P.J.F. Davie	Queensland Museum, QLD	\$21,900
	Towards the documentation of the subterranean freshwater fauna of inland Australia, especially diving beetles	Dr W.F. Humphreys & C.H.S. Watts	Western Australian Museum, Perth, WA	\$20,000
	Keys to genera, checklist of species and images of holotypes of Australian Tenebrionidae (Coleoptera)	Dr E.G. Matthews & Dr P. Bouchard	South Australian Museum, Adelaide, SA	\$1,200
	Revision of the Australian kangaroo beetles (Chrysomelidae: Sagrinae)	Dr C. Reid	Australian Museum, Sydney, NSW	\$24,400
	Crinoidea (Echinodermata) of Australia: Taxonomy, 'species' and illustrated guides	Dr G. Rouse & Prof. C. Messing	University of Adelaide, SA	\$31,000
	Interactive keys to the Australian Ladybird beetles (Insecta: Coleoptera: Coccinellidae). Part I	Dr A. Slipinski	CSIRO Entomology, Canberra, ACT	\$35,900
	Systematics of Australian agathidine wasps (Insecta: Hymenoptera: Braconidae); solitary endo-parasitoids of lepidopteran larvae	Mr N. Stevens	University of Adelaide, SA	\$3,600
	Biodiversity of the helminth fauna occurring in the rodent genera <i>Zyomys</i> and <i>Pseudomys</i> , from northern Australia	Dr L. Warner	Central Queensland University, Rockhampton, QLD	\$23,000

Renewed grants for 2003/2004

Category	Project Title	Investigator	Located	Amount
Algae	Taxonomic revision of the order Oedogoniales (Chlorophyta) in Australia	Dr T. Entwisle	Royal Botanic Gardens Sydney, NSW	\$15,000
	Diatom flora of tropical Australia	Dr J. John & Dr P. McBride	Curtin University of Technology, Perth, WA	\$20,000
	Benthic dinoflagellates of Australia: description and review of species of the Peridiniales, Prorocentrales and Gymnodiniaceae	Prof D. Patterson, Ms S. Murray, Dr R.A. Cowan & Assoc Prof P. Larsen	University of Sydney, Sydney, NSW	\$65,000
	Molecular phylogeny and morpho-taxonomy of the Bangiophyceae in Australia	Prof. J. West & Dr G.C. Zuccarello	University of Melbourne, VIC	\$45,000
Flora	Interactive Identification and Information System for Australian Orchid Genera	Dr D. Jones	Centre for Plant Biodiversity Research, Canberra, ACT	\$63,000
	A taxonomic revision of the Thelotremataceae in Australia	Dr T. Lumbsch & Prof J.A. Elix	The Field Musuem, USA	\$32,000
	Revision and Flora accounts of <i>Baeckea</i> and related genera	Dr B.L. Rye & Mr M.E. Trudgen	Western Australian Herbarium, Perth, WA	\$36,000
	A taxonomic review of <i>Senecio</i> (Asteraceae) and a treatment of taxa in tribes Senecioneae, Anthemideae and Lactuceae for <i>Flora of Australia</i>	Dr I.R. Thompson & Dr N.G. Walsh	University of Melbourne, VIC	\$20,000
	A taxonomic treatment of some perennial trigger plants (<i>Stylidium</i> ; Stylidiaceae) from south-west Western Australia	Dr J. Wege	Western Australian Herbarium, Perth, WA	\$72,000
	Defining generic limits within the <i>Chamelaucium</i> alliance (Myrtaceae)	Dr P. Wilson & Dr C.J. Quinn	Royal Botanic Gardens Sydney, NSW	\$40,000
Fungi	Sequestrate Cortinariaceae in Australia	Dr N. Bougher, Dr I. Tommerup & Dr P. O'Brien	CSIRO, Forestry and Forest Products, Perth, WA	\$30,000
	A taxonomic and systematic revision of the sequestrate Russulales of Australia and their allies, based on morphological and molecular characters	Dr T. Lebel	Royal Botanic Gardens, Melbourne, VIC	\$5,000
	A study of the fungal family Trichocomaceae in Australia, especially <i>Aspergillus</i> , <i>Penicillium</i> and their sexual stages	Dr J. Pitt, Dr A.D. Hocking & Dr D.A. Carter	Food Science Australia, CSIRO, Sydney, NSW	\$41,000
	Molecular phylogeny and taxonomy of <i>Hebeloma</i> and <i>Naucoria</i> in Australia	Dr B. Rees	School of Biological Earth and Environmental Science, University of NSW, Sydney, NSW	\$5,000
	Studies of Australian Myxomycetes	Dr S. Stephenson & Mr D.W. Mitchell	University of Arkansas, USA	\$12,000
Fauna	Australian Ant Spiders (Araneae, Zodariidae, Storiinae): Biodiversity of the Australian Fauna, taxonomy, systematics and phylogeny of the Australian Species	Dr B. Baehr	Queensland Museum, South Brisbane, QLD	\$20,000

Renewed grants for 2003/2004

Category	Project Title	Investigator	Located	Amount
Fauna	Cestode parasites of herbivorous marsupials	Dr I. Beveridge	University of Melbourne, VIC	\$12,000
	Biodiversity, biogeography, and phylogeny of Australian aquatic planarians (Platyhelminthes, Tricladida, Paludicola)	Dr D. Blair	School of Tropical Biology, James Cook University, Townsville, QLD	\$20,000
	Taxonomy and distribution of subterranean amphipods from calcrete aquifers in central Western Australia	Dr S. Cooper	South Australian Museum, Adelaide, SA	\$50,000
	New spiders (Araneae: Amaurobioidea) from Australian forests	Dr V.E. Davies	Queensland Museum, South Brisbane, QLD	\$5,000
	Revision of, and identification aids for, the Australian Cixiidae (Hemiptera: Fulgoromorpha)	Dr G. Gurr, Dr M.J. Fletcher & Dr M.C. Larivière	University of Sydney, NSW	\$22,600
	The systematics of the Australian wolf spiders (Araneae: Lycosidae)	Dr M. Harvey & Prof A.D. Austin	Western Australian Museum, Perth, WA	\$50,000
	Depressariid Genera of Australia	Dr R.J.B. Hoare	Landcare Research, Auckland, New Zealand	\$6,000
	Australia's Paramunnidae, marine Isopoda (Asellota, Janiroidea)	Dr J. Just	Queensland Museum, Brisbane, QLD	\$7,500
	Revision of the subfamily Candoninae (Crustacea, Ostracoda, Candonidae) with Web-presentation of the Australian subterranean fauna	Dr I. Karanovic	Western Australian Museum, Perth, WA	\$50,000
	Taxonomy of the Ascidiacea	Dr P. Mather	Queensland Museum, South Brisbane, QLD	\$35,000
	A revision of Galeommatoidea, one of the most species-rich and the least understood group of marine bivalves in Australia	Dr P. Middelfart	Australian Museum, Sydney, NSW	\$45,000
	Taxonomic review of oyster leeches (Platyhelminthes, Polycladida) from Australasian waters	Dr L. Newman	Southern Cross University, Lismore, NSW	\$35,000
	Deep-sea octopuses of the Australian continental slope and seamounts (>200 m): composition and affinities	Dr M. Norman & Dr E. Hochberg	Sciences Department, Museum Victoria, Melbourne, VIC	\$40,000
	A Monograph of, and Automated Identification Systems for, the Australasian Ground Spiders of the Family Prodidomidae (Araneae, Gnaphosoidea)	Dr N. Platnick & Dr C. Baehr	Queensland Museum, QLD	\$25,000
	Systematics of the Australasian Lymnaeidae and buliniform Planorbidae	Dr W. Ponder & Dr J.C. Walker	Australian Museum, Sydney, NSW	\$30,000
	Harpacticoida (Crustacea: Copepoda) from seagrasses and algae of southern Australia	Dr G. Walker-Smith	South Australian Museum, Adelaide, SA	\$50,000
	Interactive Key and Master Names List for the Families of Australian Diptera. Part 1: Interactive Key	Dr D. Yeates & Dr D.J. Bickel	CSIRO Entomology, Canberra, ACT and Australian Museum, Sydney, NSW	\$50,000
Protists	The characterisation of Actinobacteria biodiversity from Tasmanian cave microhabitats	Dr D. Nichols	School of Agricultural Science, University of Tasmania, Hobart, TAS	\$15,000

Australian Biological Resources Study
GPO Box 787
CANBERRA ACT 2601

General Inquiries:
Phone: (02) 6250 9554/9556
Facsimile: (02) 6250 9555

www.deh.gov.au/biodiversity/abrs

Doratifera sp on Eucalyptus fibrosa
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