

Newsletter

No. 6

March 2015

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www.entsocvic.org.au

Gippsland Lakes Bioscan Rivers, lakes and wetlands

27 February – 1 March 2015

By Patrick Honan

The Gippsland Lakes Bioscan is a four-part survey of the wildlife of the lake system, from the lakes' origins in the mountains to their outlet at the ocean. It is the biggest ever wildlife expedition of the Gippsland Lakes, supported by the Gippsland Lakes Ministerial Advisory Committee and the Victorian Government.

The survey focusses on four locations: the mountains (Mitchell River National Park), marine habitats (Eagle Point and Lakes Entrance), rivers and wetlands (Sale Common and Stratford) and forests (Lakes Entrance and Colquhoun Forest). The project is part wildlife survey, part community engagement – helping the locals to discover the amazing animals of their lakes, particularly invertebrates.

The most recent survey took in aquatic invertebrates but included many terrestrial species. Members of the Entomological Society of Victoria set up light sheets at Swallow Lagoon and Sale Common, adding considerably to the species records for these areas, most notably moth species. This area is of particular interest biogeographically for moths – an overlap of the characteristic Victorian fauna with a strong influence of Australian east coast (especially New South Wales) fauna.

This was a smaller-than-usual Bioscan, comprising only 18 participants in total, unlike the 100 or more participants of previous Bioscans. While Museum Victoria staff and volunteers concentrated on freshwater invertebrates, fish, frogs and reptiles, ESV members recorded more than 200 species of terrestrial insects and spiders.



A Bright Twist-wing Moth (*Parepisparis lutosaria*) at Swallow Lagoon

Three light sheets were set up at Swallow Lagoon on the first evening, a Redgum woodland reserve that was rich in moths, beetles and katydids. A few moth species were found that extended their geographical ranges, but the highlights were the Bright Twist-wing (*Parepisparis lutosaria*) and the Lycid Beetle-mimicking moth (*Snellenia* species).

Lycid Beetles (Family Lycidae), also called Net-winged Beetles, are generally considered toxic and bear the usual aposematic orange-black or red-black colouration of species keen to advertise their toxins. Mimics of these beetles appear in a number of insect orders and families, and having four specimens of this moth species come to the light sheet in one night was a special treat.



Lycid-mimicking moth (*Snellenia* species)

Zac Birmingham (ESV member) found many specimens of Craneflies, on which his current thesis is based, particularly the large and colourful *Leptotarsus clavatus*. And of course many specimens of the Orange Caterpillar Wasp (*Netelia producta*) and related Ichneumonids. One unusual feature of the light sheets was the number of Booklice, or Psocids, (Order Psocoptera) that appeared on the sheets. Katydidids such as the Common Garden Katydid (*Caedicia simplex*) and the Short-tailed Polichne (*Polichne parvicauda*) were also present, the latter in both the brown and green forms.

The grasslands around the Redgum forest was home to many Banded Orbweavers (*Argiope trifasciata*) (probably not its true name), and at least two species of dragonflies not usually seen closer to metropolitan areas: the Pygmy Shutwing (*Cordulephya pygmaea*) and the Black-headed Skimmer (*Crocothemis nigrifrons*).



The Black-headed Skimmer (*Crocothemis nigrifrons*)

Maik Fiedel (ESV Council member), collected five species of mantids over three short days in a remarkably small region: *Orthodera*, *Mantis*, *Tenodera*, *Pseudomantis* and *Paraoxyphilus*.

As part of the community engagement, marquees were set up at Sale Common and Stratford Apex Park, where hundreds of locals visited to view the animals collected during the survey, held temporarily in enclosures on display tables. Photographers and videographers were present to magnify the invertebrates and show them doing what comes naturally on video screens. The local community also took part in short tours of the surrounding habitat to discover and observe the animals in their original habitats.



Common Brown Cranefly (*Leptotarsus clavatus*)

The next stage of the Gippsland Lakes Bioscan takes place this weekend. A summary of the project will be published in a future edition of the Victorian Entomologist.

ESV members that took part in the Rivers section of the Bioscan were:

Ken Harris	David Mules
Wendy Moore	Zac Birmingham
Maik Fiedel	Patrick Honan

Forests

Saturday 14th March
Forest Wildlife Discovery,
Nyerimilang Heritage Park,
Kalimna
3.00-6.30pm
Join Museum Victoria scientists for walks, talks and discovery of the many creatures of our coastal forest, through sampling, photography and displays in the grounds of the historic Nyerimilang Homestead. Indigenous cultural display, light refreshments and much more.
Wildlife walks commence at 3pm, 5pm and 7pm.

Sunday 15th March
Forest Wildlife Discovery,
Log Crossing
(Colquhoun State Forest, off Princes Hwy, west of Lakes Entrance)
10am-2pm
Join Museum Victoria scientists in exploring the creatures of the Colquhoun forest, through sampling, photography, and displays.
Wildlife walks commence at 10am, 11am and 12pm.

All events are free! Great fun for all ages.
For further information:
Email: thelove@museum.vic.gov.au
Call: (03) 8341 7329
Details of events at www.loveourlakes.net.au

Gippsland Lakes Bioscan - Rivers and wetlands



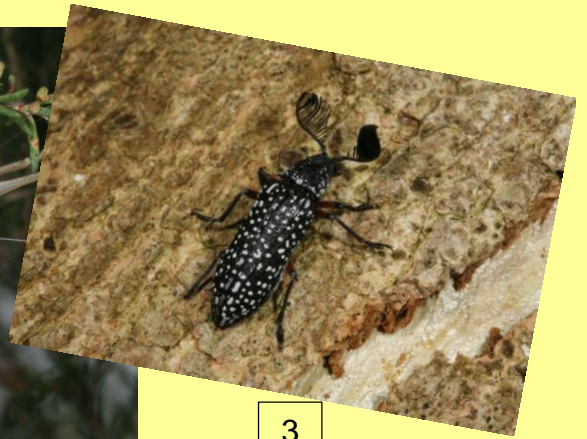
Gippsland Lakes Bioscan – Rivers and wetlands



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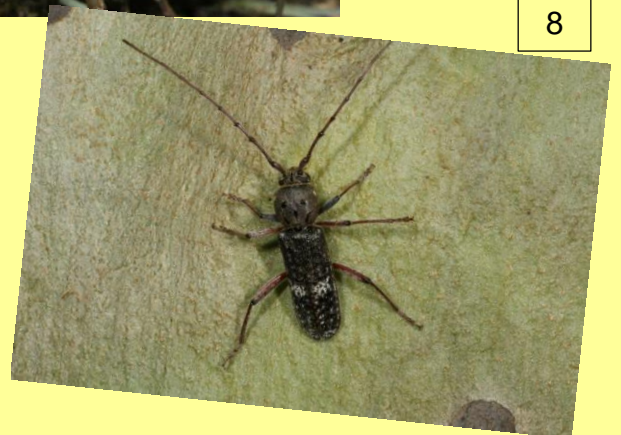
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8



- 1 – Large Spotted Ladybird (*Harmonia conformis*), feeding on Maiden's Lerp (*Eucalyptolyma maidenii*)
- 2 – Common Garden Katydid (*Caedicia simplex*), moulting
- 3 – Radar Beetle (*Rhipicera femoralis*)
- 4 – Pygmy Shutwing (*Cordulephya pygmaea*)
- 5 – Mottled Cup Moth caterpillar (*Doratifera vulnerans*)
- 6 – Slant-faced Katydid (*Acrida conica*)
- 7 – Two female Purple-winged Mantids (*Tenodera australasiae*)
- 8 – Longicorn (*Phacodes obscurus*)

ESV upcoming events

General meetings are held at the Melbourne Museum Discovery Centre Seminar Room, at 7.45pm, on the third Tuesday of every second month.

Members and guests are welcome to join us at Michelinos Trattoria Restaurant in Carlton at 6pm.

Tuesday 17 March 2015

Council meeting

Tuesday 21 April 2015

AGM and Julie Whitfield, Amaryllis Environmental – Butterfly conservation and the Eltham Copper

Tuesday 19 May 2015

Council meeting

Tuesday 16 June 2015

Members' night

Tuesday 21 July 2015

Council meeting

Tuesday 18 August 2015

ESV excursion

Tuesday 15 September 2015

Council meeting

Tuesday 20 October 2015

Members' night

Tuesday 17 November 2015

Council meeting

December 2015 (date TBA)

Christmas gathering

Around the societies

Entomological Society of Qld

Nine general meetings per year on the second Tuesday of the respective month.

Meetings are held at the Ecosciences Precinct, Boggo Road, Dutton Park, Qld
k.ebert@uq.edu.au

Vector Ecology & Vector Borne Disease Seminars

Co-sponsored by University of Queensland, CSIRO, Queensland Institute of Medical Research and the Entomological Society of Queensland
18 March 2015:

Seminar 1: 11:30-12:30pm. Phil Lounibos, University of Florida, USA: Competitive displacement mechanisms and ramifications for vector-borne disease ecology of the dengue mosquito *Aedes aegypti* with the arrival of the Asian tiger *A. albopictus*.

Seminar 2: 1:15-2:15pm. Alex Raikhel, University of California Riverside, USA: Insect regulatory molecules, hormones and microRNAs: from basic research to applications.

University of Queensland BioScience Precinct (IMB) BLDG 80 - Seminar Room Large 3.142 (public access)

APRIL 14: Michelle Gleeson, Director of BugsEd, Interactive Insect Workshops

MAY 12: Penny Mills & Yen-Po (Paul) Lin, TBA

JUNE 9: Notes and Exhibits, Student Award Presentation/ Notes & Exhibits

OCTOBER 13: Mark Schutze, TBA

NOVEMBER 10: David Yeates, Perkins Memorial Lecture: "New phylogenomic perspectives on insect evolution from transcriptome sequencing"

DECEMBER 8: Notes and Exhibits/Christmas BBQ

Society for Insect Studies

Meetings are held at 7.30pm on the second Tuesday of the month at the Australian Museum.
Upcoming meetings:

- David Emery on cicadas
- Allen Sundholm

Australian Entomological Society

Celebrating 50 years

Greeting cards by artists from Wildlife and Botanical Artists Inc.

Cards are \$5 each or set of 6 for \$25

Bright bugs coins for sale

Bright bugs set of 6 coins now available from the Australian mint.

<http://www.austentsoc.org.au/AES/Home>

Butterfly Conservation South Australia

Public Talks Program

First Tuesday of the month, March to November at 6.15pm for a 6.30pm start.

At the Clarence Park Community Centre
72-74 East Avenue, Black Forest.

Bus route W91/W90: stop 10.

Noarlunga Train service: Clarence Park Station.

Glenelg Tram: Forestville stop 4, 9min walk south.
Entry by donation (minimum of \$2).
Bring supper to share, tea/coffee will be supplied.
At the start of each meeting a ten minute presentation on a 'Butterfly of the Month' will be given by a BCSA committee member.

7th April: "South Australia's Climate-What's Happening and Why" Darren Ray, Senior Climatologist with the Bureau of Meteorology in S.A. looks at trends, changes and variability in climate from global to local levels and how climate impacts on ecological systems in SA and elsewhere.

5th May: "Restoring Wetlands in S.E. of S.A. and Western Victoria" Hear Mark Bachmann, Manager of Nature Glenelg Trust, his personal journey and motivation, the range of methods of restoration and examples of spectacular results including habitats for a range of important species, including butterflies.

3rd Nov: "Rain Moths" Mike Moore has had a lifelong interest in butterflies and moths. His talk will provide a fascinating insight into one of the largest moths, the Hepialids, commonly called rain moths.

Mount Pleasant Show

BCSA has a display at the Mount Pleasant Show on Saturday 21st March. We are seeking volunteers for the display across the 9.00am-3.00pm period.

Please contact Gerry Butler on gerry.butler@ozemail.com.au or 0407972149, including your address so that he can send you the complimentary entry ticket.
<http://www.mtleasantshow.com.au/map.htm>

Upcoming conferences

Society of Systematic Biology Conference

Location: Guarujá, Brazil

Date: 26-30 June 2015

Contact: <http://systbio.org/>

XVIII. International Plant Protection Congress (IPPC) 2015

Mission possible: food for all through appropriate plant protection

www.ippc2015.de

Free University Berlin

14195 Berlin-Dahlem/Germany

24-27 August 2015

Entomological Society of America

The ESA will co-locate their Annual Meeting with the American Society of Agronomy, the Crop Science Society of America, and the Soil Science Society of America in Minneapolis, Minnesota, November 15-18, 2015.

The XV Pacific Entomology Conference

Hosted by the Hawaiian Entomological Society on April 1-3, 2015 at the Hilton Waikiki Beach Hotel.
Contact: hientsoc@hawaii.edu

The First International Conference in Funerary Archaeoentomology

May 6, 2015 at the University of Huddersfield in West Yorkshire, UK. Contact: icfae2015@hud.ac.uk

The 4th International Forum for Surveillance and Control of Mosquitoes and Mosquito-borne Diseases

May 25-29, 2015 Place in Guangzhou, Guangdong, China. Contact Dr. Rudy Xuev at xueamcd@gmail.com or Dr. Tongyan Zhao at tongyanzhao@126.com.

The Patch Primary School Bioblitz on Youtube

ESV's December excursion last year to The Patch Primary School is now online, thanks to Simon Mustoe at Wild Diaries.

<https://www.youtube.com/watch?v=zJ3wM8PTecU&feature=youtu.be>



Can you help?

From Sean Ryan
University of Notre Dame, USA

I am a graduate student at the University of Notre Dame studying the impacts of climate change on insects (butterflies). Recently some colleagues and I launched citizen science project – Pieris Project – that enlists the public's help in collecting a globally invasive butterfly – the cabbage white (*Pieris rapae*) – from where they live (often their backyard), so we may create the most comprehensive collection of this species from across its entire range.

This collection will be incredibly powerful for exploring how butterflies adapt to new environments and how and why invasive species become so successful, but we will also look at where this butterfly originated from (it is believed to have come from Europe, but it is actually not known and could have come from one of many different countries). Since just June 2014, we have received over 1,000 butterflies, from over half the US states and 10 different countries, with more coming in each week!

However, we still have very few from Australia (actually we only have collections from one location, but would love to have them from all over the country). If you could consider helping us get the word out about our project or direct us towards those who might be able to help, we would be extremely grateful. We would also love to hear any questions, comments, or feedback you may have.

Sean Ryan, Pieris Project Director

Butterflies can be mailed to:
Pieris Project (attn: Sean Ryan), 186 Galvin Life Sciences Center, University of Notre Dame, Notre Dame IN, 46556, USA.

We just ask that people put them in crush-proof containers (e.g. Tupperware or a breath-mint container) so we can use them for morphology, not just genetics.

From Julie Whitfield
Convenor Friends of Kooyoora and lover of butterflies

Hello fellow butterfly lovers,

As some of you may be aware, the Friends Of Kooyoora are learning all things invert at the moment and we were fortunate to have received a large grant to enhance the local communities knowledge of Lepidoptera.

We are running field days, ID courses and pinning workshops etc.

We are also about to produce a butterfly tick sheet and field guide for the Kooyoora ranges.

I desperately need photographs of the species listed below to use in our guides. If you can offer photos please email them to me – we will make certain you are credited in the guide.

Hesperiidae	shouldered brown
Heath Ochre	solanders brown
Montane Ochre	bright eyed brown
Orange Ochre	varied sword grass brown
Barred Skipper	tailed emperor
Bright shield skipper	glasswing
montane sedge skipper	meadow argus
Spotted sedge skipper	aust painted lady
flame sedge skipper	yellow admiral
varied sedge skipper	lesser wanderer
yellow sedge skipper	monarch
silver sedge skipper	Lycaenidae
white banded grass dart	chequered copper
green grass dart	bronze ant blue
Papilionidae	fiery copper
Dainty swallowtail	bright copper
orchard swallowtail	moonlight jewel
chequered swallowtail	fiery jewel
Peiridae	broad margined azure
small grass yellow	satin azure
caper white	southern purple
imperial jezebel	amethyst hairstreak
spotted jezebel	varied dusky blue
cabbage white	blotched dusky blue
Nymphalidae	two spotted line blue
forest brown	wattle blue
silver xenica	saltbush blue
ringed xenica	fringed heath blue
marbled xenica	long tailed pea blue
common brown	common grass blue

The Plight of our Native Bees



Jess Baumann, University of Melbourne, is part of a team that has been conducting research into native bees at Blackburn Lake Sanctuary and other metropolitan parks around Melbourne, to find out how many species live in the city's east, what habitat they need and what you can do in your garden to help them.

Jess held a meeting at the Blackburn Lake Sanctuary in February to garner support and demonstrate good bee habitats.

Did you know?

- That bees blow bubbles;
- There are around 2000 species of native bees in Australia;
- There are 150 species of native bees across Melbourne.
- And they need your help.

Jess and her colleagues need residential gardeners to assist their research project investigating native bees and pollination in your backyard.

What's involved:

If you sign up as a resident citizen scientist your help will be needed between March-April and September-November 2015 to sample bees in your garden using coloured pan traps. You will also be given a 'bee hotel' to install, that native bees and other insects can nest in.

Gardeners will help scientists by monitoring, photographing and reporting back on the bees using the hotel.

Dr Caragh Threlfall is coordinating the project and can supply more information. There will be more about this project at future meetings of the ESV.
caragh.threlfall@unimelb.edu.au



From the archives

Entomological Society of Victoria, May 1972

GENERAL MEETING

The speaker for the evening was Mr N. Quick, who discussed various 'Butterfly food plants'. He explained that with the theory of Continental Drift, it appeared likely that India was at one time joined to the north-western section of Australia and that the western section of south-east Africa was joined to the west and south-west portion of Australia and the west coast of South America to the eastern Australian coast.

When these continents separated, both retained portions of similar vegetation and butterfly fauna. Mr Quick then went on to explain with slides and various native food plants from which native butterflies fed, and reasons why some plants were chosen by the butterfly in preference to others when egg-laying. It was a very interesting talk on a little-known subject.

Mr Quick has prepared a 'Check list of Australian butterflies', available now at \$1.50 per copy. Please order from the author.

WANTED

Living *Echidnaphaga gallinaceus* – Stick-fast Flea. Please contact the Hon. Miriam Rothschild, Ashton, Peterborough, England, before July 1st, or during the Entomological Congress.

NEW PUBLICATIONS

John Child, *Australian Insects*, Lansdowne Press, Melbourne, \$3.50.

D.F. McMichael, *A Treasury of Australian Wildlife*, Ure Smith, Sydney, \$1.95

CORRESPONDENCE

Teen International Entomological Group, USA, advising that their display for the International Congress of Entomology shall be left in Australia, and that the Society may make use of the exhibit if they wish.

TREASURER'S REPORT

The Treasurer reported a balance of \$63.15 with the present number of financial members standing at 40. There are still a number of members who have not paid their subscription for the year.

Recent articles of interest

Like a moth to the flame

*By Ann Jones
Off Track, ABC Radio National
February 2015*



The delicate process of pinning specimens occurs after a long day's trapping
Photo: Ann Jones

Former CSIRO entomologist Noel Starick is the owner of a collection of thousands of pinned insects.

It was just after dusk and the quiet had begun to descend.

The occasional zip of a tent could be heard along with the murmur of groups of scientists around a fire and others inside their quarters, sorting their collections from the day.

We were about 900 kilometres west of Brisbane at Carnarvon Station Reserve, a Bush Heritage Australia property in south-east central Queensland.

Taxonomically it's much easier to identify insects that you pin properly. Just sticking a pin through them and sticking them in a box isn't the way to go.

NOEL STARICK, ENTOMOLOGIST

We'd all spent the day netting and trapping and counting as part of a nationwide environmental survey program called Bush Blitz.

Naturalists and scientists on field trips always have a bit more in the tank if they think they have a chance of collecting just one more specimen, though.

At teatime, the entomologists decided to set up a light trap: essentially a white sheet hanging up with a spotlight pointed at it.

As the daylight dwindled away, the insects flocked to the bright square like, well, moths to a flame. You might've seen a similar thing happen to your porch lights in summer.

The light trap was set up behind the amenities block and when I got there I found a group of young volunteers pointing at things while an older gentleman named them like he was a living version of *What Insect is That?*

Starick began collecting insects when he was six years old and never stopped.

The ex-CSIRO entomologist now volunteers at the Queensland Museum when he's not tending to his own collection.

'I do collect moths, but mainly for visual purposes—they look nice. I've got a whole laboratory under the house of all my collections,' said Starick, who won't say just how big his collection is.

'How long is a piece of string? I've never counted them to be honest, but I think there'd be about three or four cabinets full. I reckon there's about 20 drawers in each.'

It's not complete yet, though. According to Starick, there are over 30,000 species of moth on Earth, and only 25 per cent are named.

He's was speaking to me but not looking at me. Instead, his eyes were steadily scanning each new arrival in the light trap.

'This one interests me, I'd grab that one I think. This is another interesting one, but it's damaged, so I wouldn't bother with that one.

'For my own personal collection I like to have proper specimens that aren't damaged,' he said, leaving the unluckily damaged, but luckily still alive geometric moth to lopsidedly fly off into the night.

Starick is just as rigorous about display and storage. He insists that his insects must be pinned three quarters of the way up the pin, with wings spread at certain angles and legs and antennae spread for easy identification.

'I get very upset when I see insects pinned, when all the standards aren't followed,' he told me. 'Taxonomically it's much easier to identify insects

that you pin properly. Just sticking a pin through them and sticking them in a box isn't the way to go.



'For instance, if you put the pin through the wrong area it's possible to damage areas underneath the specimen that are useful for identification. For instance there may be setae, which are little hairs underneath the thorax that are important to know what that specimen actually is.'

Starick's collection will probably never be 'finished', and completion isn't necessarily the only drive: he has an insatiable eagerness for the new and previously undescribed.

Hence his rapt attention to the light trap. '[I'm standing here now] just in case. I don't want anyone else to pinch it.'

IMp: The customizable LEGO® Pinned Insect Manipulator

*ZooKeys 481: 131-138 (04 Feb 2015)
doi: 10.3897/zookeys.481.8788*

*Seen Dupont †, Benjamin Price ‡, and
Vladimir Blagoderov §*

Abstract

We present a pinned insect manipulator (IMp) constructed of LEGO® building bricks with two axes of movement and two axes of rotation. In addition we present three variants of the IMp to emphasise the modular design, which facilitates resizing to meet the full range of pinned insect specimens, is fully customizable, collapsible, affordable and does not require specialist tools or knowledge to assemble.

Introduction

Natural history collections are one of the most fundamentally important institutions in science,

where voucher specimens are housed in perpetuity, embodying the research of generations of scientists. Within entomology collections insects were historically preserved by drying on an appropriately sized pin. Today insect groups are preserved in ethanol, mounted on microscope slides or in paper or plastic envelopes, but the dry pinned method has not changed for the majority of insect orders since its development in the early 18th century. This has resulted in millions of pinned insect specimens housed in natural history collections globally, for example the pinned insect collection of the Natural History Museum (NHM) in London comprises 136500 drawers and is estimated to contain 27 million pinned specimens.

Although pinned specimens preserve well they become fragile with age and are prone to damage when handled. This has become especially apparent in the digital age where there is an increased focus on mobilizing the vast amounts of biodiversity data stored in the collections through digitization activities. Institutions are now able to provide images of specimens on request (termed a "digital loan" at the NHM), when researchers cannot view the specimens directly and they are too fragile to ship. In addition some institutions do not loan primary type material, compounding the need to image specimens in order to examine them remotely. The net result of improving access to collections through digitization efforts is that the specimens are made available without the need of excessive handling. This goal however can only be achieved when there are images of multiple taxonomically meaningful views available, as required for accurate remote examination.

Most commonly, pinned insect specimens are observed through stereo microscopes at the 10-80× range of magnification. Under magnification specimens can become difficult to handle as minute movements are amplified. In order to provide stabilization specimens are often pinned to a flexible material such as cork, plastazote foam or putty when the desired angle is found or alternatively the specimen is mounted into a specimen manipulator that enables repositioning during observation.

With the rapid increase in collections digitization, museum specimens are handled to a much larger extent than ever before. Positioning and repositioning of specimens during digitization is often required for the majority of specimen

handling in a collection. As handling of pinned specimens carries the most immediate risk of damage, especially to the fragile extremities (e.g. legs, antenna and wings) specimen manipulators are of great value to the overall preservation of a functioning pinned natural history collection.

A good insect specimen manipulator requires the following properties: (i) Foremost the manipulator should allow for easy positioning and repositioning of specimens especially if used for imaging at multiple views or comparing structures at different angles; (ii) Stability to prevent the specimen moving once in the correct position; (iii) Capability of fine scale adjustment to enable positioning the specimen under magnification and (iv) Open design to allow for both specimen placement/removal and adequate illumination of the specimen to be examined.

There are several good designs available from commercial and amateur DIY websites such as the Universal Stage (<http://extreme-macro.co.uk/universal-stage/>), Rose Entomology (http://www.roseentomology.com/Pinned_Specimen_Manipulator.htm), BioQuip Microscope Stages 6186 and 6188 (<http://www.bioquip.com/search/DispProduct.asp?pid=6186>; <http://www.bioquip.com/search/DispProduct.asp?pid=6188>) and the Watkins & Doncaster Insect Examination Stage (http://www.watdon.co.uk/acatalog/Microscope_Accessories.html). In addition there are variants of the steel / brass ball & ring stage combination (Ento / Ergo Ball: details available on request).

Previous authors have provided custom designs for insect specimen manipulators (Köppen 1966, Oliver 1969, Lobanov and Kotjurgin 1975, Boyadzhiev and Bozhinova 2006, Boyadzhiev et al. 2012), however most commercial examples are of a fixed standard size while DIY manipulators are custom-made from materials and tools that are not readily available to everyone. Furthermore most DIY setups are specifically designed for a particular group of insects and may not be of an appropriate size for other insect groups. We believe that the design presented here is a solution to an insect specimen manipulator that is (a) universally applicable, (b) readily available, (c) cost effective, (d) portable and (e) fully customizable.

Material and methods

The idea of a holding mechanism for pinned specimens is as old as the pinned specimen itself. The design of these particular models were inspired by the daily grind of comparative morphology and the association to mass digitization and digital loans that the first author has had at the natural history museums of Denmark and London. Although the LEGO® brick has always been a working tool it has served more as a means of prototyping ideas, but in this case the authors found the plastic bricks to have the right properties for the product presented here. It is in fact the simple nature of the LEGO® bricks, their availability and ease of use that we feel make these models so customizable, user friendly, affordable and hassle free.

The Insect specimen manipulator (IMp) and subsequent size/design variants were built and designed using both the LEGO® building blocks and the LEGO® Digital designer software version 4.3.8 (<http://ldd.lego.com/en-gb/>) using beams, beam connectors, connecting pins, an 8 tooth spur gear and a worm gear. For a complete parts list and assembly manual for all IMp models see the supplementary information (<http://dx.doi.org/10.5519/0036449>).

Data resources

The data underpinning the analysis reported in this paper are deposited in the NHM Data Portal at <http://dx.doi.org/10.5519/0036449>.

Results and discussion

Etymology. IMp is an abbreviation of Insect Manipulator and references the attendant imp of folklore that is usually cast as the small, mischievous helper, associated with witches and warlocks, the academics of mythology.

Initially a single enclosed IMp design was conceived (Figures 1b, 2), capable of accommodating insect specimens up to 50 mm in length, with 5 mm clearance on either side of the specimen. Three subsequent models were then designed to facilitate the examination of insects of varying sizes, and to display the customizable nature of the IMp base design, the relative size of each can be seen in Figure 1. The design of the IMp model on which all subsequent variants are based, and the axes of movement and rotation, are shown in more detail in Figure 2 and the Suppl. material 2. The original IMp and the Giant-IMp models are encased with support beams,

adding stability to the design and physical protection for the specimens, whereas the Micro-IMP and Open-IMP models are of an open design that allows for a smaller working distance between the specimen and the stereo microscope. The size and cost (excluding shipping) of each model is summarized in Table 1.

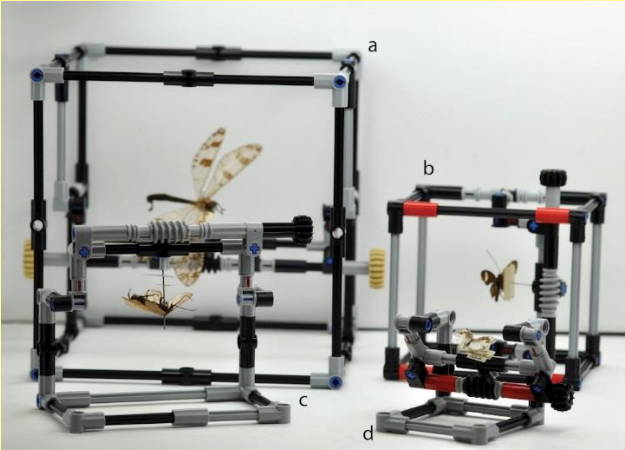


Figure 1. The four different sized manipulators shown for comparison: **a** Giant-IMP **b** IMP models with encasing support beams **c** Open-IMP **d** Micro-IMP models that are not encased. The specimens in the manipulators are: **a** *Nosa tristis* (Hagen, 1853) – Neuroptera: Myrmeleontidae **b** *Perissoneura paradoxa* McLachlan, 1871 – Trichoptera: Odontoceridae **c** *Pteronarcys californica* Newport, 1848 – Plecoptera: Pteronarcyidae and **d** *Psychopsis coelivaga* (Walker, 1853) – Neuroptera: Psychopsidae.

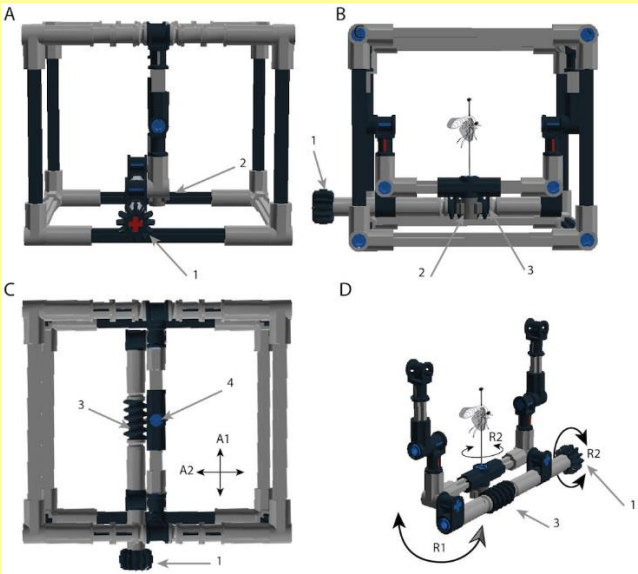


Figure 2. The IMP model shown from a side view (**A**), front view (**B**), top view (**C**) and without the stabilizing case exposing the pivot arm wherein the specimen is placed (**D**). Figure labels and abbreviations: pivot handle (**1**), 8 tooth gear (**2**), worm gear (**3**), connector peg that holds and rotates the specimen

(**4**), axis of movement 1 (**A1**), axis of movement 2 (**A2**), axis of rotation 1 (**R1**) and axis of rotation 2 (**R2**).

Table 1. Summary of the features of each of the IMP models.

Model name	Maximum specimen size ¹ (mm)	Cost ² (£)	Design ³
IMP	50	9	closed ⁴
Micro-	30	7	open
Open-	60	8	open
Giant-	110	15	closed ⁴

¹ allowing 5 mm clearance on either side;
² cost (rounded to nearest pound) at time of publication and excluding shipping;
³ open design facilitates a closer working distance, while the closed design includes the supporting cube structure for stability and additional specimen protection;
⁴ supports can be removed if a closer working distance is required.

The bricks for all models can be bought directly from the LEGO® websites' Pick a Brick (<http://shop.lego.com/en-GB/Pick-A-Brick-ByTheme>) and the Bricks and Pieces selection (<https://service.lego.com/en-gb/replacementparts#BasicInfo>). Besides the LEGO® bricks the models each require a small plastazote foam / cork plug or other material that will allow for the pin to be held in place (Figure 3). The models presented here all use a 3 mm × 10 mm plastic tube with nylon toothbrush bristles in the center. This allows for any size pin to be held firmly in place while allowing repeated use without the degradation that is common when repeatedly pinning into foam or cork inserts over time. Except for the Giant-IMP the smaller versions are small enough to fit under a standard stereo microscope (Figure 4). The Giant-IMP however was designed for use with large specimens that are usually imaged using a standard DSLR setup with a much larger working distance.

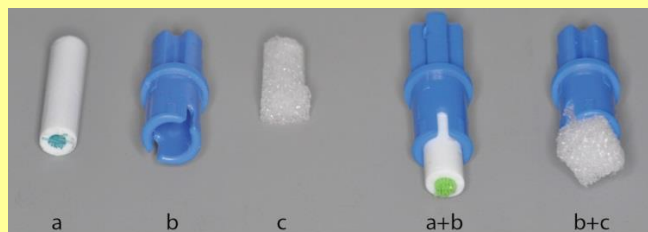


Figure 3. Two options for the modification to the connector pegs (**b**) to allow for insertion of the specimen pin: a 3 mm diameter tube with 0.1 mm nylon fibers (**a+b**); or a small plastazote plug (**b+c**).



Figure 4. The IMp models being used with the micro-IMp holding a specimen positioned for viewing.

We believe the insect specimen manipulators presented here are a valuable addition to any entomologist's toolbox and that the use of any insect manipulator is in the interest of anyone dealing with valuable specimens as the actual handling of the specimen is reduced to a minimum during examination. In case of the original IMp and Giant-IMp models the specimens are further protected from accidental contact during examination by the supporting cube structure. These LEGO® based manipulators benefit from their modular design as they are inexpensive and made from readily available components. Furthermore, even the largest of the models can be disassembled for travel. The open design further allows for the addition of portable lighting solutions (such as LEDs) and an endless amount of customization which makes them ideal for specimen imaging. Future modifications of the IMp models may include the addition of motorized control, using Arduino controllers or native

LEGO® motors and software from the LEGO® mindstorms range.

The authors welcome correspondence on ideas for the next generation of IMps, and although the current models are easy to assemble the authors are happy to assist if no children can be sourced locally.

Acknowledgments

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References

- Boyadzhiev PS, Bozhinova RN (2006) New mechanical manipulator for studies of mounted insects using stereo microscopes. *InFocus Magazine* 41: 28–34.
- Boyadzhiev PS, Gechev TS, Donev AD (2012) A universal microscope manipulator. *Revista Brasileira de Entomologia* 56(1): 125–129. doi: 10.1590/S0085-56262012005000016
- Köppen H (1966) Ein praktisches Hilfsmittel für die Untersuchung genadelter Insekten unter dem Binokular. *Beiträge zur Entomologie* 16: 321–325.
- Lobanov A, Kotjurgin V (1975) Manipulator for studies of insects under binocular microscope. *Entomologicheskoe obozrenie* 44: 923–925.
- Oliver HA (1969) A new remote control manipulating microscope stage, for the examination of small entomological specimens. *Proceedings of the Royal Microscopical Society* 4: 5–7.

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Inside the lifecycle of Australian cicadas

By Ann Jones
Off Track, ABC Radio National
February 2015



The Greengrocer is one of the most common species of cicada in Australia.
(Aaron Booth, Flickr.com/CCC/by-nc/2.0)

*The screaming cries of cicadas are an unavoidable and occasionally deafening soundtrack to summer. Yet as much as we can't avoid hearing these loud little insects, few of us ever see them. **Ann Jones** takes a look at some of the 800 species of cicada who are thought to call Australia home.*

It's the sound of heat. It's quintessentially summer, and it's deafening. The cicadas are calling.

There are between 700 and 1000 species of these throbbing lotharios in Australia, though less than 300 species have been officially named.

In my memory, the sound is usually accompanied by an Icy Pole and the feeling of a soft drift of droplets hitting my arms from the trees above.

Had I known I was being peed on by thousands of cicadas, I might not have committed the rosy memory to the nostalgia bank, but you live and learn.

Toilet activities that affect innocent bystanders are not the only disturbing things about cicadas.

They can be unnerving creatures. Their piercing calls and their monstrous looks would already be enough to get the horror-meter to a moderate setting, but the way they rip apart the shell of their teenage years as they bloom into adulthood really gets the stomach churning, especially when it's watched at close distance.

The greengrocer (*Cyclochila australasiae*) is the cicada that you're most likely to have heard, as its

range overlaps the densely human populated eastern states. This emerald beauty has a complex lifecycle.

After some months in an egg stationed in a zip-like cut up a tree, a nymphal cicada hatches out and makes its way down to the ground. It generally does this by leaping. It's so small it does so with impunity. Then it then starts to burrow, digging a tunnel to a tree root, where it latches on to feed on sap.

I would say that they feed 'like a child to the breast', but really it's more gruesome than that. The nymphs have a rostrum through which they feed. It's a special proboscis—a thick, needle-like protrusion that penetrates the root's flesh and sucks the xylem from within.

As it progresses through its nymphal stages, the greengrocer becomes fat, brown and hunched over. Its front two legs become much larger than the others—like Popeye's forearms with yabby claws on the end.

The insect has the air of an aging butler or the hunch-backed assistant to Dr Frankenstein, as if it would grovel along and say 'yes, master' when addressed.

Cicada nymphs are simply not made for life above ground. They're made for the subterranean world, and they stay under there for years at a time.

Just how many years the greengrocer stays underground is still open for scientific discussion.

'Some of the early published observation suggested six to seven years underground before they emerge,' says Dr Lindsey Popple, one of a handful of cicada researchers in Australia.

'That's been a bit debated recently. Dave Britton from the Australian Museum has been saying around four years. My colleague Dave Emery from [the University of] Sydney also, he found that there was a very large emergence at Bundanoon south of Sydney and then 10 years later another very large emergence.'

So, is it four or six, seven or 10 years? It seems like it would be an easy thing for scientists to find out, but they are hampered by factors both natural and manmade.

First of all, every year some greengrocers emerge. Some years the brood is bigger, and others it is smaller, but the consistent emergence of some individuals confounds scientists trying to pick a pattern.

Secondly, you can't just put a cicada nymph in a bucket of dirt and wait for them to emerge. They need to feed on live tree sap throughout their lifecycle.

While these problems are not insurmountable, the final issue is research funding. In Australia most cicada research is undertaken either voluntarily or as a PhD project.

The shortest estimate of the greengrocer's nymphal lifespan is about four years.

'[There is] more and more pressure for PhDs to finish in three years, so if you have a three or a nine year, or like the US cicadas a 17-year lifecycle, you've got to be pretty patient with them,' says Dr Popple.

The nymphs patiently stay under ground for years, but they're not hibernating while they're down there, they're actually quite active.

'I have actually put a cicada nymph in a terrarium to see what it did around the plant roots, and they're really amazing,' says Dr Popple. 'You pull them out of the ground and they're all bent over and they're sort of hopeless, they stumble around and you look at them and think "That thing, how does it survive?" But underground, they're in their domain, they backfill their burrows [and] they can do flips in these tunnels underground.'

When the time is right, sometime after rain between September and November, they dig themselves out. First they raise a turret before emerging, sometimes in their thousands. They climb up trees and latch on for dear life.

They'll need it, because the final moulting process is horrifying to watch.

The Igor-like nymph freezes in place and then a split appears in lengthways down its back: an escape-hatch through the exoskeleton.

From within the head, appears *another head*, pushing up out of the nymph shell like that dome-headed extraterrestrial that emerges from John Hurt's stomach in *Alien*.

It's grotesque. The adult cicada has essentially been wearing the nymph's skin as a costume for the last couple of days of its life.

It pushes and pulls and the gaping chasm across the shell's back gets wider and wider.

At some stage, the cicada pulls back out of the shell with its rear still stuck inside, and for a split

second it looks like the much bigger adult insect is riding the nymph like a pony while swinging a lasso.

Then, it emerges: moist, soft and complete.

Its wings are magically inflated with fluid and shortly after, they harden. The wings are slightly longer than the body and delicate looking, as if they're made out of vein-laced rice paper.

After a short time for rest and recuperation, the adults spend a few weeks dedicated to eating their fill, attending cicada rock concerts and hopefully having sex.

On the eating front, they again deploy their straw like protuberance to suck sap from the tree, and if alarmed have been known to fly off, leaving it embedded in the tree's flesh.

'I have, on a couple of occasions, allowed the cicada to think I'm a tree, because they normally sink their rostrum into the tree to suck the sap,' says Dr Popple. '[It felt like] an enormous mosquito.'

You don't have to worry about that though, they're not venomous and you're unlikely to want to get too close once they're singing.

The males are the ones that sing. They're doing it to try to attract a mate, just as one does at the karaoke bar.

The sounds they produce might not be your idea of a sweet serenade, but then, you're not a female cicada. (Unless you are a female cicada, in which case, please comment on your musical tastes and requirements below).

They don't all perform the same pulsing rhythm you might've heard the greengrocer drumming out. Each species has its own sound.

The golden emperor does his best to attract a mate by whipping in a quick yodel in the middle of his pulsing song. The double drummer performs around 220 screaming pulses a second, and each pulse is two little pushes of sound squashed together. It's almost obscene—the noise is dense, unrelenting and truly deafening. It can arrive at 120 db and is painful to the human sensibilities.

There are between 700 and 1000 species of these throbbing lotharios in Australia, though less than 300 species have been officially named, according to Dr Popple. The entomologists certainly do have a good time with the names, though.

Some of the names are based on the sounds the cicadas make, such as the fishing reel buzzer and the sprinkler squeaker. Others are named for their looks, like the greengrocer, the yellow Monday, the tiger prince, the floury baker and the masked devil.

We are truly blessed in the cicada area in Australia. The superfamily *Cicadoidea* is divided into two groups: *Tettigarctidae* (q.v.) and *Cicadidae*.



With names like the whiskey drinker, the fishing reel and the water sprinkler, find out more about the cicada at *Off Track*.

Almost all cicadas fall into the second grouping, but both the known living species of *Tettigarctidae* are in Australia.

They're otherwise known as 'hairy cicadas'. Hairy cicada males don't make any airborne sound as other cicadas do, so you can't hear them. Instead, males and females communicate by making vibrations through the substrate. Cicadas in general have a broad flat forehead with googly eyes spread so far apart that they almost look like a hammerhead shark. They have delicate wings, pointy legs and a large abdomen shaped like a tear drop, where the pointy bit is the bottom.

Really, though, you might never notice them at all if it weren't for their pulsating song: the call for cicada saucy-times that forms the soundtrack of summer the world over.

Newly discovered primitive moth 'a living dinosaur'

By Bridie Smith
The Age



It is less than 10mm long, but the aptly named enigma moth was recently discovered on Kangaroo Island.

Photo: Leigh Henningham

A newly discovered species of moth that is so primitive it is being described as a living dinosaur has prompted scientists to redraw the insect's family tree.

Only found on Kangaroo Island in South Australia, the tiny 'enigma' moth represents an entire new family of primitive moths, which has helped entomologists better understand the world of moth and butterfly evolution.

Published in the journal *Systematic Entomology*, results of DNA analysis of the enigma moth conducted in Europe suggests that moth and butterfly evolution is far more complex than previously thought.

For a start CSIRO honorary fellow and moth specialist Ted Edwards said the results showed that tongues evolved in moths and butterflies more than once. Although this primitive moth doesn't have a tongue, its earlier ancestors did.

"This moth demonstrated that the development of the musculature in the tongue of moths didn't just happen once, it happened independently twice," Dr Edwards said.

He said the enigma moth retained many other structural features associated with primitive moth species which lived 40 to 50 million years ago, including the wing mechanism.

"It's really quite remarkable because it means that that ancestral line has continued right through without changing a lot of its basic structures," he said.

It's the first time since the 1970s that a new family of primitive moths has been identified.

The moth was first found on Kangaroo Island in 2009 by local scientist Richard Glatz but it was a few years before he contacted Dr Edwards for advice.

Dr Edwards said he knew straight away that he was looking at something "totally exceptional".

Dr Glanz said he found the moths on cypress pine trees in a remote river valley near sand dunes. More specimens were collected in 2012 and 2013 before the moth could be confirmed as a new species.

With a wingspan no larger than a five cent piece the enigma moth is small – with a lifespan to match. Its wings shine gold and purple and have delicate fringed edges.

The adult moths are short-lived. In just one day they emerge from their cocoons, mate, females lay their eggs, and then die.

The moth has been named *Aenigmatinea glatzella* – in honour of Dr Glatz.

The name appeals to Dr Edwards, who pointed out that in German 'Glatze' means bald. One of the features of the moth is that its head is sparsely covered by scales.

Conservative estimates suggest Australia is home to about 22,000 species of moths and butterflies, only half of which have been named.

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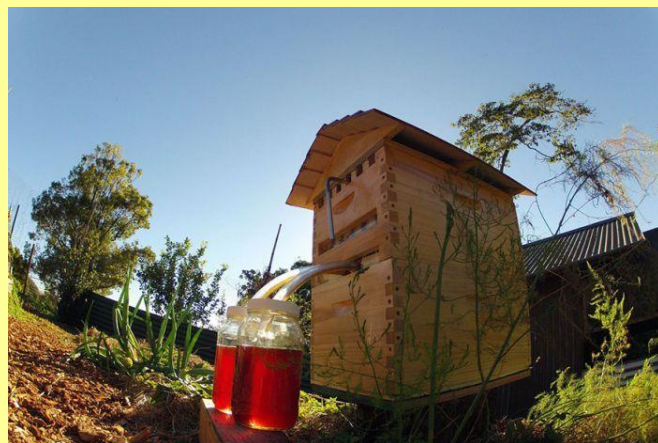
Since ESA's 2016 Annual Meeting will be held in conjunction with ICE 2016, all symposia will be held under one roof – and all symposia will come through one submission process.

There are 30 identified scientific sections for you to choose from, with co-conveners ready and willing to assist you with your topic and title. Symposia will be 3-4 hours in length and will feature 15-minute presentations.

The world of entomology will convene at ICE 2016. *Will you be there?*

Revolutionary Australian beehive invention raises millions

*By Jeremy Story Carter
ABC Radio National, Afternoons
February 2015*



The concept of the Flow Hive has attracted interest from around the world.

Photo: Honeyflow

Two New South Wales beekeepers have raised over a million dollars and attracted the attention of world's beekeeping community with a breakthrough innovation.

A revolutionary Australian-designed beehive invention could change the face of beekeeping the world over.

If you know your bees, you can sit there in shorts and a t-shirt and it's safe, because you're not opening the hive and you're not banging around disturbing the bees.

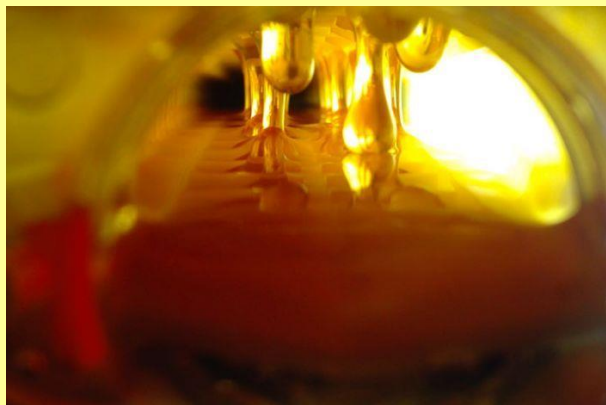
STUART ANDERSON, BEEKEEPER.

Stuart Anderson and his son Cedar's method of collecting honey does not disturb the hive, but allows the honey to flow out through a channel system straight out of a tap.

The New South Wales duo launched a crowdfunding campaign project today with the aim of raising \$70,000.

At the time of writing, they had smashed that mark by more than 20 times, reaching a total of more than \$1,400,000.

'I can't quite believe it myself,' chuckles Stuart.



The cells of the honeycomb fracture during the process allowing the honey to flow down, but don't actually break.

Photo: Honeyflow

The system is based around a plastic, moveable frame, which the bees use to build up their wax honeycomb on.

A lever is slotted into the hive and twisted to flex the honeycomb slightly.

'That changes the honeycomb from being a cell shape to a channel shape,' says Anderson.

'The cells sort of split, the honey falls down that channel to the bottom of the frame and out through a pipe to the back of the hive.'



After a lever is turned, honey flows through a channel out the back of the hive.

Photo: Honeyflow

Once the honey is drained out of the hive, the lever is twisted back and the cells are returned to their fully-formed position.

'You can see slight fissures occur in the capping of the honeycomb, but basically it stays intact,' he says.

'The bees don't seem to start scurrying, they just keep going about business as usual.'

After the honey has been drained, the bees begin to repair the cells and fill the hive with honey once again.

Anderson says the design appeals to those who find the process of beekeeping too difficult.



Honeybees on top of the plastic hive.

Photo: Honeyflow

'Suddenly the world of bees is open to them again and they're really, really excited.

'If you know your bees, you can sit there in shorts and a t-shirt and it's safe, because you're not opening the hive and you're not banging around disturbing the bees.'

The father and son team sent the structure for testing to beekeepers around the world.

One of the design's benefits, which hadn't occurred to the Andersons until it was raised by a tester in the US, was the appeal of the hive to urban beekeepers.

'I hadn't thought about the neighbour aspect,' says Stuart.

'So many people are keeping bees in urban situations where if you go and pull the beehive apart and the bees get pissed off, well it's your neighbours who are also likely to get stung.'

Honey-on-tap beehive a crowd-funding success for father and son team

*By Jane Holroyd
Goodfood.com.au: Food News
February 2015*



A father and son duo from northern NSW who invented a backyard beehive system to deliver honey on-tap have raised US\$1million in less than three hours via a crowd-sourcing website to fund their first production run.

Cedar Anderson and his father, Stuart, hoped to raise \$US70,000 (\$89,265) in 42 days, but within 10 minutes of their campaign going live on indiegogo.com this morning they had more than doubled the target. Within 30 minutes the pair had raised almost \$US500,000 and have since topped \$US1 million.

An option for 200 investors to get in early and purchase the first production run of the full kit of the Flow beehive system - priced at \$US350 - sold out almost immediately. They have since had to add more than 1000 extra kits to the campaign to accommodate demand.



The Andersons and their Honeyflow beekeeping system.
Photo: Elizabeth Milne

The Andersons' ingenious invention aims to take the sting - so to speak - out of beekeeping by

allowing beekeepers to collect honey without disturbing the bees inside the hive.

The pair invented a system of frames that fit inside standard bee boxes and which, unlike traditional frames, slope and allow the beekeeper to turn a handle and release honey once the honeycomb cells are full. The system means traditional and more dangerous methods of relinquishing bees of their honey, such as by smoking the bees or dismantling hives, are not required.

Speaking from Canberra, an audibly incredulous Stuart Anderson said he was blown away by this morning's response. It took the pair 10 years to perfect their design.

"It's gone nuts, I can't keep up," said Anderson. "Clearly we underestimated the interest," he added.

Anderson said the bulk of online pledges had come from North America, although there had also been "good support from Australia".

Asked what the unbelievable response and backing meant for him and Cedar, Anderson laughed and said he and his son would be "working extremely hard for the next few months ... it means we will be in a much stronger position to negotiate with manufacturers".

Anderson, who left his job in the community sector three years ago to work with his son on the Flow frames said he would now probably have to describe himself as "an inventor and a business person".

When goodfood.com.au last checked, the Indiegogo.com campaign had received pledges worth more than \$US 2million.



Contributions to the ESV newsletter are always welcome.

Contact the President, Patrick Honan, at phonan@museum.vic.gov.au

A world without butterflies

By Ann Jones
Off Track, ABC Radio National
October 2014



Black Jezebel Butterfly (*Delias nigrina*) photographed in the Booderee National Park.

Photo: David Cook, Flickr.com/cc/by-nc/2.0)

Butterflies are some of the world's most beautiful and fascinating creatures, but thanks in part to highly specific habitats and reproductive habits, many species are now under threat.

A woman stands stooped over, surrounded by granite boulders.

She's searching for tiny Australian native orchids, their little green leaves slipping out of the earth. It's backbreaking work, scaling the rocks, peering into crevices.

She stands and stretches her back.

A butterfly circles her once, twice, four times.

All I can think of is, can you imagine what a world without butterflies would be like?

JULIE WHITFIELD, ECOLOGIST

'He made it perfectly known that he was there, and he was the most beautiful crystal clear blue I've ever seen,' says ecologist Julie Whitfield.

'I remember feeling that at that moment, that I was being privileged, and I was seeing something that most people don't get to see, and that it was something that was worth preserving. All I can think of is, can you imagine what a world without butterflies would be like?'

I meet Whitfield in a small valley of moist old forest near Trentham in Victoria. The place is flapping with the silent beating of butterfly wings.

As the morning warms into the day, more and more zoom past us with startling speed.

Whitfield looks around the area, pointing to the wattle, the mistletoe and the grasses that serve as host plants to some of the 400 or so species of Australian butterfly larvae.

'They're quite specific about their needs,' says Whitfield of butterfly caterpillars, which range from generalist feeders to incredibly picky eaters.

'They might require particular sorts of host plants and sometimes they are so specific that the adult will only lay her eggs on a specific species of plant.'

'As an adult they'll in general feed on any nectar-producing flowers, but it's the larvae that require the very specific species of plant for them to eat as a caterpillar.'

'Something that I was thinking about this morning is a particular children's book that we all know, about a caterpillar who goes off and feeds on numerous things that are probably not really what his diet would let him tolerate,' says Whitfield, laughing.

It's a shame that the popular book doesn't give a more accurate portrayal of the real life of a caterpillar, which is more amazing than fiction.

For example, a tiny egg, laid carefully onto vegetation by the female butterfly, will hatch into a tiny caterpillar, which is then looked after by caterpillar-sitting ants.

Yes: ants acting as nannies. 'When we're talking about the ant-butterfly relationships we're talking about the *Lycanidae* family, which are the blues and coppers. About 80 per cent of the *Lycanidae* family actually have some kind of mutualistic relationship with an ant species,' says Whitfield.

'In terms of the Eltham copper butterfly, which is a species that I am quite passionate about and have done a lot of work on in the past, this particular species will only lay its eggs on the host plant, sweet bursaria, which is a beautiful fragrant white flowering plant, native obviously.'

'Then the ants will meet and greet the caterpillars when they hatch and shepherd them down into their nests. The ants and the caterpillars are nocturnal, and so they'll come back up out of the ants' nest every evening once it warms up, usually around the back end of September through to March.'

'The ant will then bring or shepherd the caterpillar back up to the top of the plants where the soft young growth is, and the caterpillars will feed

through the night and then get taken back down and put back to bed in the nest of the ants every morning.'

'There they will get protected and looked after until they pupate and then their ready to become a butterfly.'

Notoncus ants sometimes form satellite nests around the base of the sweet bursaria to accommodate this behaviour.

'The caterpillars actually secrete a sort of honey dew, or an amino acid, which is nice and sweet and the ants feed on that. It's pretty amazing when you think about it.'



Populations of the ant and plant together occur in a much wider distribution than the butterfly, which has lead entomologists to believe that the current areas in which the butterfly occurs are but fragments of a previous whole.

Thought to have become extinct in the 1950s, the rediscovery of the Eltham copper butterfly in 1986 (in Eltham of course) was a joyful shock for lepidopterists. The butterfly is now listed as 'threatened' in the state of Victoria.

'The state government has put funds towards butterfly conservation in the past,' says Whitfield.

'The Eltham copper butterfly, for example, was the first invertebrate listed under the *Flora and Fauna Guarantee Act* and has had more than 20 years of conservation efforts put into it.'

In fact, the Eltham copper butterfly has been noted as a 'flagship taxon' for the conservation of butterflies in Australia.

Some of the previous funding went toward mapping the habitat and looking for populations so that ecologists could be armed with the correct information.

'I guess you can't protect and preserve something if you don't know where it is,' says Whitfield.

In fact, it was Whitfield who found a new population of the butterfly in Bendigo one day while she was dropping her kids off at school.

The butterfly now has known colonies in Eltham, Kiata (near Horsham), Castlemaine and Bendigo.

'In a small timeframe we ended up recording 10 sites across the Bendigo region and Castlemaine region—so that was from two [sites] to 10 in a matter of about three years.'

It is particularly important to map exactly where colonies are occurring because, as with most threatened species, it is habitat destruction that is one of the major causes of their perilous status.

The *Action Plan for Australian Butterflies* listed a case where neighbours of one section of habitat built a cubby house for their children and in the process of doing so removed a number of the specific plants which are crucial to the survival of the butterfly.

It is ironic that by encouraging in their children an appreciation of the outdoors, the neighbours had unknowingly endangered a whole butterfly colony, but Whitfield says there is definitely an ignorance of butterfly ecology in Australia.

'There are these intricate, amazing relationships taking place all the time in the natural world, and if anyone has seen any David Attenborough documentaries they'll know, but what they don't realise is that most of the time that is taking place directly under our noses and we tend to not know about it or not pay it too much attention.'

In terms of butterfly conservation, it seems that Australia has room to improve.

Julie Whitfield recently travelled to the USA as a part of a Winston Churchill Fellowship to study butterfly conservation success stories overseas. She attended the large butterfly festivals which are held to celebrate migratory monarchs and spent time in the UK, observing the work of the national body, Butterfly Conservation, including its management of 34 butterfly reserves.

Australia has no such conservancy group (the last national action plan was in 2002), and the butterfly conservation that does occur is on a state by state basis.

Returning to Australia with information and a new fire for butterfly conservation, Whitfield has been

talking with groups throughout Victoria and is looking to form a broader coalition for butterflies. Both the festivals and butterfly reserves she has studied elsewhere could be options here, she says.

'I think what we don't have [in Australia] is enough education out there, we don't have enough information for people to know this stuff so that they can get passionate about learning that little bit more.'

'Could you imagine a world without butterflies? When you're having a bad day or things aren't working too well for you, if you step outside and you feel the sunshine on your face. Seeing a butterfly fly by or hearing a bird in a tree is what keeps us going, it's what keeps us connected with our environment.'

'We have a responsibility to protect the things that don't have a voice.'

Julie Whitfield will be guest speaker at the Entomological Society of Victoria Annual General Meeting in April.

Recent publications

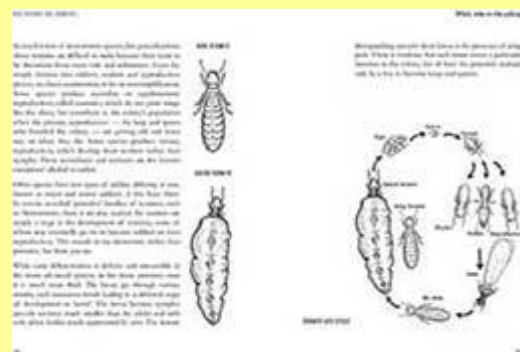
Our Friends the Termites

By Pat Lowe
Backroom Press



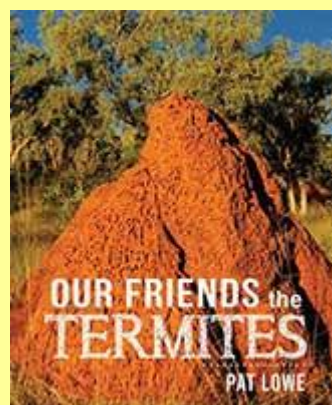
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Praise for this publication

Reading Our Friends the Termites is like walking with Pat Lowe through the bush – she artfully reveals the unexpected, you wonder at tiny marvels, and discover larger truths. You'll never walk past a termite mound again without getting down close to check out their weird headgear, complex society, and recycling enterprise."

Mark Horstman is a science journalist with the Catalyst program on ABC-TV.

It is a masterly amalgam of fact, culture, biology and history."

Dr Geoff Monteith, formerly Senior Curator of Insects at the Queensland Museum.