Chalson, J.M. and Martin, H.A. (2008). A 38,000 year history of the vegetation at Penrith Lakes, New South Wales. *Proceedings of the Linnean Society of New South Wales* **129**, 97-112.

Sediments in an abandoned river channel on the flood plain of the Nepean River at Penrith record about 38,000 calibrated years (38 k cal. yr BP) of deposition. Sections of sediments of a 860 cm core proved barren of pollen, but sufficient pollen was recovered from three sections aged about (1) 38-36 k cal. yr BP, middle glacial period, (2) 27-16 k cal. yr BP, middle-late glacial period, including the last glacial maximum and (3) 6 k cal. yr BP to present, late Holocene.

During the 38-36 k cal. yr BP period, the vegetation was an open sclerophyll forest with *Eucalyptus viminalis* and *Leptospermum polygalifolium* prominent. A 'spineless Asteraceae', thought to be *Cassinia arcuata* was prominent in the understorey. *E. viminalis* was the most common eucalypt and it is the most cold-tolerant of the suite of possible eucalypts. During the 27-16 k cal. yr BP period, a shrubland of *Cassinia arcuata* with some grasses was present. The lack of eucalypts during the height of the last glacial period suggests a cold, arid climate and agrees with estimates that the rainfall was about half that of today. In the period 6 k cal. yr BP to present, a *Eucalyptus tereticornis* and *Leptospermum juniperinum* woodland with a grassey understorey occupied the site.

When compared with other records in the Sydney Basin, the vegetation through the last glacial maximum at Penrith Lakes is the only one with a shrubland/grassland community.

Green, K. (2008). Fragmented Distribution of a rock climbing fish, the Mountain Galaxias *Galaxias olidus*, in the Snowy Mountains. *Proceedings of the Linnean Society of New South Wales* **129**, 175-182.

Fish were surveyed visually from 1,500 m elevation to the highest known altitude for Mountain Galaxias *Galaxias olidus* of 2,137 m on the slopes of Mt. Kosciuszko (2,228 m). Above 1,500 m, where the species is the only galaxiid and is physically isolated from all lowland populations, there was further isolation with 76 disjunct populations within the 1,400 km^2 area surveyed. Trout (Salmonidae) were the main cause of this isolation because they occupied 95.85 km of the major streams, generally in the main valleys at lower elevations but reaching up to 1,800 m in places, and leaving only the headwaters unoccupied. The distribution of *G. olidus* above 1,500 m was, therefore, determined largely by topographic and anthropogenic barriers to the movements of trout. Despite being recorded as absent from western drainages in the mountains, including two of the five glacial lakes, since as long ago as the 19th century, *G. olidus* moved into Australia's highest lake (Lake Cootapatamba) during the course of the survey with serious implications for biodiversity in this newly occupied lake.

Holmes, W.B.K. and Anderson, H.M. (2008). The Middle Triassic Megafossil Flora of the Basin Creek Formation, Nymboida Coal Measures, New South Wales, Australia. Part 7. Cycadophyta. *Proceedings of the Linnean Society of New South Wales* **129**, 113-150.

Cycadophyte fronds comprise c. 4% of the catalogued specimens in the Holmes' collections from two quarries in the middle Triassic Nymboida Coal Measures of the Nymboida sub-Basin in north-eastern New South Wales. The fronds are placed in fifteen taxa in the Cycadales and one in the Bennettitales. Eight new species are described; *Pseudoctenis nymboidensis*, *P. rigbyi*, *P. prolongata*, *P. cursanervia*, *P. grandis*, *P. nettiana*, *Moltenia sparsispinosa* and *Ctenis marniana*. *Halleyoctenis megapinnata* is nominated as a new genotype for *Halleyoctenis.*

Maloney, K.S. and Harris, J.M. (2008). Early natural history of the greater glider, *Petauroides volans* (Kerr, 1792). *Proceedings of the Linnean Society of New South Wales* **129**, 39-56.

Early accounts of the greater glider *Petauroides volans* (Marsupialia: Pseudocheiridae) are reviewed, starting with Arthur Phillips' 1789 account in *The Voyage of Governor Phillip to Botany Bay* and proceeding to the latest taxonomic works. This species has a quite complicated and confusing taxonomic history. It has been listed as a member of no fewer than 10 genera with about 23 different binomial names since its discovery. In this paper, we review some of this taxonomic complexity and early descriptions of the species' morphology, dentition, behaviour, distribution and abundance. We found that taxonomic descriptions of *P. volans* have been frequently confused with those of a number of other gliding possums, particularly the yellow-bellied glider *Petaurus australis*. Early descriptions of the morphology of *P. volans* were given only in broad general terms. More value can be placed on the early behavioural observations, and on the earliest records

of its occurrence. This paper examines some of the oldest accounts of *P. volans* and assesses their significance.

McAlpine, D.K. (2008). New extant species of ironic flies (Diptera: Ironomyiidae) with notes on ironomyiid morphology and relationships. *Proceedings of the Linnean Society of New South Wales* **129**, 17-38.

The Ironomyiidae or ironic flies (a family of lower Cyclorrhapha) are previously known from one Holocene Australian species and allegedly several Cretaceous or even Late Jurassic fossil species (Northern Hemisphere countries). Aspects of morphology are discussed, particularly that of the antenna and prelabrum ("clypeus" in error), and several alternatives as to possible phylogenetic relationships are mentioned. The Cretaceous genus *Lebambromyia* Grimaldi and Cumming is removed from the Ironomyiidae to incertae sedis (though possibly cyclorrhaphous), but the Jurassic-Cretaceous subfamily Sinolestinae is perhaps related to Ironomyiidae. A key to species of *Ironomyia* White is given. *Ironomyia francisi* sp. nov. and *I. whitei* sp. nov. are described from temperate eastern Australia.

Michael, D.R. and Lindenmayer, D.B. (2008). Records of the Inland Carpet Python, *Morelia spilota metcalfei* (Serpentes: Pythonidae), from the south-western slopes of New South Wales. *Proceedings of the Linnean Society of New South Wales* **129**, 253-262.

Location records of the Inland Carpet Python *Morelia spilota metcalfei* were collated from the south-western slopes of New South Wales from scientific literature, published reports, landholder questionnaires, public information sessions, informal conversations and field observations. Fifty-three records, encompassing a minimum of 95 observations were obtained. Twenty-nine records (58%) and 57 observations (69%) originated from granite outcrops. High priority conservation areas for this species in the SWS include; inselbergs such as Goombargana Hill, Gerogery Range and Nest Hill, the granite belt between Kyeamba and Wagga Wagga, large vegetated ranges such as Yambla Range and the Rock Nature Reserve and the riverine environment along the Murray and Murrumbidgee Rivers. Future conservation of *M. s. metcalfei* habitat in the SWS will require appropriate management of granite land forms with particular focus on strategic grazing, pest animal programs and fire control.

Percival, I.G., Zhen, Y.Y., Pogson, D.J. and Thomas, O.D. (2008). The Upper Ordovician Kenyu Formation in the Boorowa District, Southeastern New South Wales. *Proceedings of the Linnean Society of New South Wales* **129**, 197-206.

Conodonts obtained during mapping of the Boorowa 1:100 000 geological sheet indicate a late Gisbornian to earliest Eastonian age (Late Ordovician: late Sandbian to earliest Katian) for allochthonous limestone in the Kenyu Formation. This age is based on co-occurrence of *Belodina compressa*, *Phragmodus undatus* and *Yaoxianognathus wrighti*, associated with *Drepanoistodus suberectus*, *Panderodus gracilis*, *Periodon aculeatus*, *Protopanderodus liripipus*, *Scabbardella* sp. cf. *altipes* and *Yaoxianognathus* sp. The faunal association, including acrotretide, discinide and lingulide brachiopods in addition to the conodonts, indicates that the limestone was probably originally deposited on the shelf edge, prior to being dislodged down the flanks of a volcanic island in a mass flow. The late Gisbornian to earliest Eastonian age recognised for the Kenyu Formation provides an important constraint on the age and cessation of contemporaneous volcanism in the central Macquarie Arc, represented more extensively further north by the Walli Volcanics and Fairbridge Volcanics. No significant break intervened between the end of this volcanism and ensuing deposition of widespread limestones of Eastonian age on the Molong Volcanic Belt.

Power, D.M. and Gladstone, W. (2008). Habitat Preferences of Port Jackson Sharks, *Heterodontus portusjacksoni*, in the coastal waters of eastern Australia. *Proceedings of the Linnean Society of New South Wales* **129**, 151-166.

The habitat preferences of juvenile and adult *Heterodontus portusjacksoni* and ovipositing females were determined from three locations on the central and southern coast of New South Wales. Adults use shallow coastal rocky reefs in July-November for mating and oviposition, whilst

juveniles occupy a seagrass nursery in a large coastal embayment. The sand/reef interface on the lee side of reefs was preferred by both sexes, probably as a refuge against strong water movements. Adult females also preferred rocky gutters when available, possibly as a male avoidance strategy. Preferred oviposition sites were narrow, shallow crevices (single capsules) or deep, narrow crevices (multiple capsules) which afforded protection against mechanical dislocation and/or predation. Juveniles exhibited a strong preference for the seagrass bed edge within a shallow nursery area. The visual complexity of this habitat combined with the juvenile's disruptive colouration may provide a refuge from predation, whilst proximity to the seagrass may provide ease of access for foraging. At a large scale, juveniles preferred areas of moderate slope within the nursery that provided protection from strong water movement. This study highlights the need for quantitative studies addressing habitat preferences and a consideration of use-specific factors to fully understand the selection of habitat by elasmobranchs.

Stewardson, C.L., Prvan, T., Meÿer, M.A. and Ritchie, R.J. (2008). Age determination and growth in the male South African Fur Seal *Arctocephalus pusillus pusillus* (Pinnipedia: Otariidae) based upon skull material. *Proceedings of the Linnean Society of New South Wales* **129**, 207-252.

Skull remains are the most commonly found material of marine mammals and the most likely to be kept in natural history collections. Morphology, relative size and growth of the skull in 83 South African fur seals, *Arctocephalus pusillus pusillus*, from the coast of southern Africa are described. The South African or Cape fur seal is very closely related to the Australian fur seal (*Arctocephalus pusillus doriferus*). Age structure of populations is important in understanding the conservation status of an animal population and the impacts of human activity upon the survival of viable wild populations of animal species. Skull measurements (n = 32 variables) were examined in relation to standard body length (SBL - defined as the length from the nose to the tail in a straight line with the animal on its back), condylobasal length (CBL) and chronological age (y) using linear regression. Animals ranged from 10 months to $\geq$ 12 y (12^{+} y). Twenty four animals were of known-age, while 39 were aged from counts of incremental lines observed in the dentine of tooth sections. Morphological observations were generally consistent with earlier studies. Condylobasal length was highly, positively correlated with SBL and age. Overall, skull variables grew at a slower rate than SBL, apart from height of mandible at meatus and angularis to coronoideus, which expressed isometry relative to SBL. Condylobasal length continued to increase until at least 12 y, with no obvious growth spurt between 8–10 y, when social maturity (full reproductive capacity) is attained. Mean CBL was 19.4% of SBL in yearlings; 15.5% in subadults, and 13.7% in adults. Apart from the dentition, all variables of the facial skeleton followed a somatic growth trajectory. Most variables expressed positive allometry relative to CBL, with greatest growth occurring in the vertical part of the mandible. Mastoid breadth, and gnathion to middle of occipital crest, expressed a strong secondary growth spurt at 10 y. Breadth of brain case, and basion to bend of pterygoid, followed a neural growth trajectory, scaling with negative slope relative to CBL. Sutures of the brain case (i.e., basioccipito-basisphenoid, occipito-parietal, interparietal and coronal) closed before those of the facial skeleton. Condylobasal length was found to be a 'rough indicator' of SBL and age group (adult, subadult), but not of absolute age. Suture age was not a good indicator of absolute age or age group. A comparison is finally made between skull data on the South African fur seal (*A. pusillus pusillus*) with available data on the Australian fur seal (*A. pusillus doriferus*).

Thiem, J.D., Ebner, B.C. and Broadhurst, B.T. (2008). Diel activity of the endangered Trout Cod (*Maccullochella macquariensis*) in the Murrumbidgee River. *Proceedings of the Linnean Society of New South Wales* **129**, 167-174.

Diel movements and habitat use of most of Australia's large freshwater fish fauna remain unknown, despite conservation efforts for many of the threatened species, including re-stocking and habitat protection and restoration. We used radio-telemetry to monitor diel movements of the endangered trout cod (*Maccullochella macquariensis*: Percichthyidae) in a re-stocked population in the Murrumbidgee River, New South Wales, Australia. Both manual tracking and continuous remote telemetry identified that trout cod activity peaked in periods of low light; with linear ranges for individuals varying from 6–272 m. Trout cod had strong fidelity to outer river bends throughout diel periods and this has implications for targeted habitat rehabilitation efforts.

Timms, B.V. (2008). The Rockwell-Wombah Lakes, Paroo, Eastern Australia: a ten year window on five naturally salinised lakes. Proceedings of the Linnean Society of New South Wales **129**: 1-16.

Studies on salt lakes are mostly snapshots of their unique characteristics and relationships. Longer term studies provide different perspectives on variability in hydrology, salinity and biological communities. Such a study on five lakes near the Paroo River in the northwestern Murray-Darling Basin showed most hold water episodically for about 80% of the time, but each fluctuate over a characteristic salinity range : unnamed lake 0.6 – 19 gL^{-1}, Wombah 1.2 – 30 gL^{-1}, North Blue 0.3 – 31 gL^{-1}, Mid Blue 0.7 – 103 gL^{-1}, and Bulla 1.8 – 262 gL^{-1}. Generally, instantaneous biodiversity is low and not necessarily correlated with salinity, but unlike southern seasonal salt lakes, species accumulation lists are long, approaching 80 species of invertebrates, 50 bird species and a few fish species per lake. Diversity is promoted by salinity fluctuation and habitat heterogeneity. Most species reach peak abundance in any season as long as conditions are within their physiological salinity tolerances. Invertebrate fauna is of inland affinities, but with some localized substractions and additions explained by hydrology and/or salinity; waterbird numbers are influenced by events elsewhere in Australia as well as by local conditions. Like most naturally salinised lakes, production can be high, especially at low to moderate salinities and algal blooms occur naturally from time to time.

Wright, A.J. (2007). Emsian (Early Devonian) tetracorals (Cnidaria) from Grattai Creek, New South Wales. *Proceedings of the Linnean Society of New South Wales* **128**, 83-96.

The tetracoral species *Phillipsastrea scotti* sp. nov. and *Trapezophyllum grattaiensis* sp. nov. are described from strata assigned to the middle Emsian (*nothoperbonus* to *inversus* conodont zones: Early Devonian) part of the Cunningham Formation at Grattai Creek, west of Mudgee, N.S.W. For comparison with the former, *Phillipsastrea oculoides*, from the Early Devonian (late Pragian or early Emsian) Garra Formation in the Wellington area of N.S.W., is revised on the basis of the type material; new longitudinal thin sections show indisputable horseshoe dissepiments and trabecular fans in this species.

Zhen, Y.Y. and Pickett, J.W. (2008). Ordovician (Early Darriwilian) conodonts and sponges from west of Parkes, central New South Wales. *Proceedings of the Linnean Society of New South Wales* 129, 57-82.

A well preserved conodont fauna and an associated small sponge assemblage recovered from a limestone lens exposed on Kirkup Station, 15 km west of Parkes, New South Wales are described and illustrated. The conodont fauna is exceptionally rich by Australian standards, represented by nearly 4,000 specimens, but low in diversity including only six species: *Erraticodon balticus* Dzik, 1978, *Kirkupodus tricostatus* gen. et sp. nov., *Protopanderodus* cf. *varicostatus* (Sweet and Bergström, 1962), *Protopanderodus? nogamii* (Lee, 1975), *Juanognathus serpaglii* Stouge, 1984, and *Pseudooneotodus mitratus* (Moskalenko, 1973). The species definition of *E. balticus* is revised based on the current collection of over 1,700 specimens. Co-occurrence of *E. balticus*, *J. serpaglii* and *P.* cf. *varicostatus* suggests an early Darriwilian (Da2) age for the fauna, which is correlated with that from the basal Weemalla Formation exposed further east near Orange. Two anthaspidellid sponges occur in the assemblage. The stromatoporoid *Ianilamina kirkupensis* gen. et sp. nov. is the oldest stromatoporoid reported from Australia, and among the oldest known. A shallow-water, near-shore setting for the fauna is supported by the abundant occurrence of algal oncolites and certain sedimentary features in the limestone lens.

Zhou, Z.Y. and Zhen, Y.Y. (2008). Trilobite-constrained Ordovician biogeography of China with reference to faunal connections with Australia. *Proceedings of the Linnean Society of New South Wales* **129**, 183-196.

All the plates and most of the terranes in China exhibit close biogeographic links and may have formed part of eastern Peri-Gondwana during the Ordovician. Synthetic analysis based largely on the platform/inner shelf trilobite faunas suggests that the Chinese eastern Peri-Gondwanan plates and terranes may have belonged to a single biogeographic province during the Tremadocian (Tremadoc) and late Katian-Hirnantian (Ashgill), but may be separated into two sub-provinces during the Floian-early Katian (Arenig-Caradoc): one consists of South China, Tarim and

Annamia, and the other may include North China, Sibumasu, Southern Tibet, Tianshan-Beishan and possibly Hainan. However, the deep-water facies trilobites of the relevant Chinese geographic units had progressively become more unified from the mid Darriwilian to early Katian (Llanvirn to Caradoc) before the sub-provinces eventually broke down by the late Katian (Ashgill). Australian Ordovician trilobite faunas had close affinities with most of the Chinese eastern Peri-Gondwanan plates and terranes, but closest biogeographic links were in particular with North China and Middle Tianshan-Beishan.