

From lineages to webs: a history of the Australian Society of Herpetologists

Glenn M. Shea

Faculty of Veterinary Science B01, University of Sydney, Sydney, NSW 2006, Australia.
Email: glenn.shea@sydney.edu.au

Abstract. The foundation of the Australian Society of Herpetologists in 1964 occurred at a time of change in Australian herpetology, as university-based herpetological studies began to spread, both within and between institutions, and a new generation of museum researchers was employed. The Society's foundation can be traced to a single lineage of anuran research at the University of Western Australia, which flowered in the 1950s with the stimulus of new techniques and technology introduced to Australia by John Alexander Moore and then spread to the University of Melbourne and Monash University as former students established new research groups. This stimulus coincided with new zoology staff appointments, particularly of New Zealand herpetologists, at the University of Sydney and the Australian National University, all of whom began to support students working on herpetological topics. The spreading of herpetology across institutions and scientific disciplines necessitated increasing communication, provided by the Society through its newsletters and meetings, and the Society has continued to expand over the half a century of its existence, and in turn encouraged the diversification of Australian herpetological research and the training of new generations of herpetological students.

Received 3 November 2014, accepted 19 December 2014, published online 16 February 2015

Introduction

The Australian Society of Herpetologists came into existence 50 years ago, formalised at a meeting of the foundation members at Canberra High School on 21 January 1964. Since then, the Society has grown, and also stimulated growth in herpetology, both in Australia and New Zealand. Its formation coincided with generational changes in direction in Australian herpetology, part of a broader change in Australian biological science, yet was largely initiated from a single source. This paper explores these themes.

Preformation

Prior to the formation of the Society, study of the Australian reptile and amphibian fauna was largely the province of museums and amateur natural historians, gradually taking over the role from researchers at European and American institutions. A review of the literature on Australian herpetology from 1920 to 1952 by Stephen John Copland (Copland 1953), an amateur herpetological taxonomist (who was formally employed as a *Sydney Morning Herald* crime reporter, but who was in that year President of the Linnean Society of New South Wales), listed 380 publications. Excluding some that were listed for the sake of their relevance to herpetology rather than being herpetological in nature, of the remaining 347 publications, 28% ($n=97$) were authored by museum scientists in Australia, 21% ($n=72$) by researchers outside of Australia who had not visited the country and were

working mostly with material supplied by Australian collectors, and 28% ($n=96$) were by amateur naturalists and reptile keepers in Australia. The small number of other papers was dominated by a series of papers on snake venom (9%, $n=31$), Copland's own mostly taxonomic work (2%, $n=9$), a series of pioneering studies on reptile placentation by Hazel Claire Weekes (1903–90) from the University of Sydney (2%, $n=8$), parasitological taxonomic studies (2%, $n=7$), and a tiny residue of scattered physiological and anatomical studies by researchers from the University of Western Australia, University of Adelaide, and University of Sydney (3%, $n=10$). Copland concluded his review with a summary of the perceived deficiencies in knowledge of the Australian herpetofauna:

'The fields of ecological preferences, reproduction, breeding migrations, courtship patterns, variation, habits, temperature tolerance, food, frog calls, hibernation and aestivation, responses to rainfall and moisture, anatomy and genetics have scarcely been touched in Australia. Lack of records of maximum, minimum and average sizes and weights, size at which sexual maturity is reached, and life spans by no means exhausts the list of our omissions. No complete book on the anatomy of any Australian chelonian, snake, lizard or frog has been published.' (Copland 1953: xxvii–xxviii)

The work by museum-based scientists was constrained by limited funds for field research and difficult access to much of the continent. The Australian Museum only acquired its first

field vehicle in 1932 (Strahan 1979), donated by the 1930–31 Harvard University expedition to Australia. In 1939, a single Australian Museum scientist, Harold Fletcher, had joined Cecil Madigan's expedition across the Simpson Desert by camel as the sole 'biologist', and in 1952 the first significant land-based Australian Museum expedition for many years (using two vehicles!) was away for four months travelling from Sydney to the Kimberley region of Western Australia (Cogger 1979a). By 1960 and after over a century of accumulation, the Australian Museum herpetological collection, the largest in the country at the time, had reached only 15 000 specimens, a tiny fraction of the 170 000 herpetological specimens present by 2010. Much of the collection before 1960 had been received by public donations.

The research coming through the universities was largely anatomical, physiological and parasitological, with reptiles and amphibians largely being studied as part of broader comparative research, or as hosts for parasites or unusual structure and function. The research emerging from the university sector can be not only estimated by the output of the staff, but also by the growth in number of research students and the breadth of their project topics.

According to a compilation of Australian theses on herpetological topics compiled by Shea (1993), with some additional titles listed by Anon (1969), just seven theses had been produced by 1950: a 1912 D.Sc. on trematodes of frogs by Stephen Jason Johnston (1873–1925), who would become Professor of Zoology at Sydney University between 1918 and 1925, but who did no further work on amphibians; a 1919 Sydney D.Sc. on comparative osteology by Hereward Leighton Kesteven (1881–1964), who would continue work on this theme over the next several decades; Claire Weekes' 1930 Sydney D.Sc. on reptile placentation; a 1935 Adelaide M.Sc. by Elizabeth Robson Cleland on the anatomy of frog trematodes; a 1939 Adelaide M.D. thesis by Richard Joseph O'Connor on the embryology of the anuran nephric system; a 1944 Sydney B.Sc. (Hons) thesis by Pauline Gladys Larcombe on metamorphosis in frogs, and Stephen Copland's 1949 Sydney M.Sc. on varanid vascular anatomy.

The following decade saw an increase in the number of theses on herpetological topics, with 16 being produced. Eleven of these were on the traditional topics of parasitology (John Leslie Hickman, 1952 B.Sc.(Hons), Tasmania; David Edwin McAlpine, 1954 B.Sc.(Hons), Sydney), anatomy and physiology (John Henry Elliott, 1951 B.Sc.(Hons), Sydney; John Ronald Simons, 1953 M.Sc., Sydney; Gray Woolley, 1953 Year 4 Thesis, Western Australia; Mollie Elizabeth Holman, 1954 Ph.D., Melbourne; Lynnette Anne Holder, 1957 B.Sc.(Hons), Sydney; Elizabeth Robin Phillis, 1958 B.Sc.(Hons), Sydney; Ruth C. Moore, 1958 M.Sc., Melbourne; L. M. Saunders, 1958 B.Sc. (Hons), Western Australia), and relative growth (Lionel Winston Charles Filewood, 1957 B.Sc.(Hons), Sydney).

A lineage evolves

The remaining five theses saw the development of a new theme at the University of Western Australia. In 1951, Mary Eileen Finch had studied the ontogeny and morphology of the local frogs of the genus *Crinia* for her M.Sc. thesis, followed in the next year by Helen Gibb Maitland's B.A.(Hons) thesis on the life

history of *Crinia* (under Finch's supervision). In 1955, Albert Russell Main completed his Ph.D. on the evolution and speciation of *Crinia*, and supervised two B.Sc.(Hons) students: Murray John Littlejohn, who began to apply acoustic technology to the problem of characterising frog calls, and Anthony Kingston Lee, who looked at the biology of the frog genus *Heleioporus*. In 1956, Lindsay Ernest Sedgwick completed his B.Sc.(Hons) thesis under Main, looking at the inheritance of morphological variation in *Crinia*. Then in 1957, Littlejohn, having developed the equipment, explored the role of the male call in *Crinia* as a premating isolating mechanism for his Ph.D.

This sudden abundance of field-based studies of frog biology at the University of Western Australia was the flowering of an earlier lineage of such studies by staff of that institution. Herpetological, and more specifically anuran, studies had begun there with their first Professor of Biology, William John Dakin (1883–1950). Dakin was at University of Western Australia (UWA) from 1913 to 1920 and, while his research was mostly on marine biology and onychophorans, he did produce one herpetological paper shortly before leaving UWA, on the breeding biology of *Heleioporus eyrei* (as *H. albopunctatus*) (Dakin 1920). His successor, George Edward Nicholls (1877–1954 (Waring 1953)), came to the University in 1922 with anuran interests, having previously written three papers on frog anatomy (Nicholls 1915a, 1915b, 1916). Whilst his publications during his time as Professor of Biology (ending with his retirement in 1947) were mostly on amphipods and isopods, he retained his interest in frogs and reptiles, making collections that he passed on to researchers outside Australia, reported on by Loveridge (1933), Taylor (1935) and Parker (1940), who named the skink *Rhodona* (now *Lerista*) *nichollsi* and the frog *Notaden nichollsi* for him. He also assisted Launcelot Harrison (Professor of Zoology at the University of Sydney) with his work on the natural history and systematics of frogs when Harrison visited Western Australia for the 1926 ANZAAS meeting (Harrison 1927). The description of the frog *Pseudophryne nichollsi* was one of the results. Nicholls also encouraged the histological research of Geoffrey Howard Bourne (1909–88) at UWA. Bourne contributed two herpetological papers, on the caudal glands of the gecko *Strophurus* and their secretions (Bourne 1934), and on thyroid morphology of the skink *Egernia kingii* (Bourne 1935), before he left to take up positions at Oxford and London. There he would become an authority on adrenal structure and, still later in America, a renowned primatologist.

Nicholls was succeeded by Horace (Harry) Waring (1910–80), Professor of Zoology from 1947 to 1975 (Main 1980, 2002). Like Nicholls before him, Waring had previously worked on amphibian biology, exploring the physiology of colour change and ovulation in frogs (Waring 1936; Waring and Landgrebe 1941; Waring *et al.* 1941). He would return to this topic later in his career to produce the book 'Colour Change Mechanisms of Cold-Blooded Vertebrates' (Waring 1963), although he was better known for his work on reproductive and nutritional physiology of marsupials.

Waring's arrival at UWA coincided with that of Albert Russell (Bert) Main (1919–2009) as an undergraduate student, newly matriculated following a prolonged recovery from the privations of the War. Main obtained a Fulbright Scholarship in

1951 while working on his Honours project on lamprey physiology under Waring's supervision. He spent three semesters at the University of Chicago, working in Sewell Wright's laboratory and being influenced by Theodosius Dobzhansky and George Gaylord Simpson, with some time at Oxford, before returning to UWA to complete writing his Honours thesis and take up a lectureship in zoology (Bradshaw 2011). Main was fascinated by evolution and ecology following his childhood natural history experiences. With those interests fanned by his experiences in the USA, he began to work with frogs, both to study their adaptations to aridity and to resolve, with a field-based approach, the taxonomy and evolutionary relationships of the local fauna, having found that the conclusions of the previous morphological studies, based on limited samples of discolored specimens in distant museum collections, did not correspond to his own field knowledge (Main 1995).

Main's interest in the south-western Australian frogs as models for evolution and speciation, which would become his Ph.D. topic and would guide much his work and the work of his own students, was stimulated by reading the work of John Alexander Moore on embryology and evolution of North American frogs (Moore 1946, 1949a, 1949b). When Moore arrived in Australia in 1952 to spend a sabbatical period at the University of Sydney (funded by a Fulbright Grant), he visited Main in Perth, and the two worked together in the field in September–October 1952. His interactions with Moore in 1952 encouraged Main and resolved any doubts he had about the validity of his approach (Main 1995). Moore's visit was arranged by Waring, who had met Moore at the ANZAAS meetings in Sydney in that year (Moore had presented a paper on embryological studies on frog hybrids, and Waring had presented

some of his work on the melanophore-expanding hormone of the pituitary resulting from his studies on frogs before arriving in Australia). While in Western Australia, Moore gave some lectures on his work to undergraduate students, attended by Murray Littlejohn and Tony Lee. Stimulated by Moore's 1952 lectures and Main's work, and with those interests further stoked by campfire discussions with Main during a two-week excursion to the Stirling Ranges in 1953, Littlejohn and Lee (together with Sedgwick, who had also been on the Stirling Ranges trip) began Honours projects with Main (Littlejohn 1993).

On completion of their Honours theses, both Littlejohn and Lee (Figs 1, 2) would continue with Ph.D. studies under Main's supervision (on *Crinia* and *Heleioporus* respectively). While Littlejohn rapidly completed his thesis, Lee became sidetracked. In 1953–54, the UWA research group was visited by the ecophysiologicalist George Adelbert Bartholomew (1919–2006), and Lee changed research direction and institution to work in Bartholomew's laboratory at UCLA, completing a Ph.D. on temperature regulation in packrats (*Neosoma*) in 1960 (Littlejohn 1993) – Main would also work in Bartholomew's laboratory in 1958 (Bradshaw 2011). Lee would eventually complete his earlier work on *Heleioporus* for a second Ph.D. (1966) through UWA.

Meanwhile, Littlejohn had also transferred to the USA, with a postdoctoral fellowship at the University of Texas, to continue his work on bioacoustics of frogs with William Franklin (Frank) Blair (1912–84). (Blair and Littlejohn were also visited by Main in 1958.) In 1959, Littlejohn returned to Australia to take up a lectureship in the Department of Zoology at the University of Melbourne, while Lee returned in late 1960 to take up a lectureship at the University of Queensland, where he would



Fig. 1. Members at the second AGM of the Australian Society of Herpetologists, Monash University, 1967. Back row (left to right): unknown, Fiona Clyne, Dick Barwick, Tony Lee, John Mitchell, David Woodruff, Ian Straughan, Angus Martin, Ian Crick, Bruce McIntosh, John Coventry, Pat Stephenson, Roy Swain, Neville Stephenson. Front row (left to right): Kerry Wilson, Hal Heatwole, John Hickman, Judy Goldman, Lance Hill, Peter Rawlinson (photograph courtesy ASH archives).



Fig. 2. Members at the third AGM of the Australian Society of Herpetologists, Australian National University, 1968. Back row (left to right): Hal Cogger, Dick Barwick, Jasper Loftus-Hills, David Woodruff, Lance Hill, Bruce McIntosh, Judy Caughley (formerly Goldman, nee Badham), Ross Pengilly. Front row (left to right): Carina Clarke, John Hickman, Peter Rawlinson, Murray Littlejohn (photograph by the late Carina Clarke, courtesy Murray Littlejohn).

collaborate on reptile ecophysiology with Bartholomew, who visited University of Queensland on sabbatical in 1962 (Littlejohn 1993; Dawson 2011). While at University of Queensland, Lee would begin supervising a Ph.D. project by Ian Rothwell Straughan (Fig. 1) on the systematics of Queensland frogs, using the principles of reproductive isolation and species recognition developed by Main and his students, and earlier by Moore. This project was eventually completed in 1967, as was an M.Sc. project by Jennifer Mary Arnold on the systematics of the skinks of Queensland. Three years later, in 1963, Lee would take up a lectureship at the newly established Monash University, reuniting Lee and Littlejohn in Melbourne. Lee's move to Monash was unplanned and fortuitous – he had applied for a lectureship at the Australian National University (ANU) and had asked Alan John (Jock) Marshall (1911–67), foundation Professor of Zoology and Comparative Physiology at Monash, for a reference. ANU lost his application and Marshall instead offered him a lectureship at Monash! There, Lee joined James Wolfe Warren, appointed in 1962, who had come to Australia from UCLA as he finished writing up his Ph.D. on growth zones in the skeleton of recent and fossil vertebrates (Warren 1963).

Dispersal across the Tasman

At this time, four New Zealand biologists with herpetological interests had recently been employed by universities in Canberra and Sydney. Richard Essex (Dick) Barwick (1929–2012) (Figs 1,

2) had completed his M.Sc. in 1955 at Victorian University College in Wellington, working on the life history of a local skink species, *Leiopisma zelandica* (now in the genus *Oligosoma*) (Barwick 1955) (the population studied may include *Oligosoma polychroma*: D. Chapple, pers. comm.). In 1959 he was appointed as one of three foundation lecturers in the Department of Zoology of the Canberra University College (which would become the School of General Studies) (Cooper 2014) and would commence work on his Ph.D. project on the ecology of *Egernia cunninghami*, completed in 1966, while simultaneously taking on his first cohort of students. These were Ross Pengilly (M.Sc. 1966) and Robert Bustard (who would complete his Ph.D. in 1968, and was cosupervised by Richard Douglas Hughes). Another student, Noel Tait, was working on an M.Sc. (1963) on opalinid parasites of frogs under the supervision of James Desmond Smyth (1917–99). Pengilly (Fig. 2) would continue his work with Barwick, producing a ground-breaking and frequently cited, but sadly, still-unpublished Ph.D. on the systematics and natural history of south-eastern Australian skinks (1972), and Barwick would supervise several other herpetological students before his retirement in 1992: Rick Shine (Hons 1971), Philippa Carron (Hons 1975), Pamela Beesley (Hons 1980), Brian Weavers (Ph.D. 1983), Eva-Marie Bugledich (Hons 1984), Will Osborne (GradDipSci 1985, Ph.D. 1990), Michael Lau (Hons 1986), Rod Kennett (Hons 1987, cosupervised by Arthur Georges), Klaus Henle (Ph.D. 1988), Dean Ward (Hons 1988) and David Carter (Ph.D. 1992),

although his own main research interest had changed to palaeontology (particularly dipnoan fish).

Neville George Stephenson and his wife Elsie Muriel (Pat) Stephenson (Fig. 1), who, in addition to their herpetological researches were the parents of the comedian Pamela Stephenson, had met on fieldwork in New Zealand, and moved to Australia in 1953 following a period of research in London. Their initial research interests were on the anatomy, embryology and life history of the endemic New Zealand frogs (*Leiopelma*) and geckos. However, on their arrival in Australia (Neville to the University of Sydney and Pat to the University of New South Wales), they expanded their work to include cell culture and karyology (Pat would publish the first karyotypes of Australian frogs: Robinson and Stephenson 1967; Stephenson and Stephenson 1970), with forays into wombats and fossil mammals by Neville. William Henry Ivo (Bill) Dawbin (1921–98) came to the University of Sydney in 1956 as a senior lecturer (and later reader) with research interests in cetaceans (his winter research) and tuataras (his summer interest) (Bannister *et al.* 1998). While Dawbin would concentrate on his cetacean research, gaining a D.Sc. from the University in 1966 for this work (Dawbin 1965), his students would mostly work on reptiles.

Between them, Dawbin and Neville Stephenson had supervised most of the few herpetological projects at Sydney in the late 1950s (Filewood by Dawbin; Holder and Phillis by Stephenson). They would go on to supervise a larger group of Honours students in the 1960s (Stephenson: Melody Madeleine Boxall, 1960; John Kingsley Noel Tomkins, 1963; Alison Anne Howie, 1963; Graham Thomas Rossiter, 1967; Dawbin: Carina Jane Clarke, 1961 (Fig. 2); David Anthony Pollard, 1962; Jeannette Helen Partridge, 1963; Lance George Hill, 1965 (Figs 1, 2; Hill would become Professor of Biology at the University of Papua New Guinea); Phillip John Hughes, 1967; Kevin Garrick, 1969; and Julian Geoffrey Nicholson Pepperell, 1969. Several of Dawbin's students would work with a colony of tuataras held by him at the University of Sydney. Stephenson would also supervise the 1973 Ph.D. by Lyn Holder (by then Lyn Moffat), and Dawbin would go on to supervise Ph.D.s by Clarke (1969) and Hill (1970), as well as a Ph.D. by Judy Badham (1972) and an M.Sc. by David Charles Drummond (1967). Pat Stephenson supervised at least one herpetological student at the University of New South Wales (Dianne King, Hons 1961).

Punctuated equilibrium in the museums

In addition to these changes in staffing at Australian universities, the early 1960s marked major changes in the herpetological staff in the museum sector. The long reign of James Roy Kinghorn (1891–1983) as Curator of Herpetology and Ornithology at the Australian Museum, since 1918 (he had first been employed at the Museum as a cadet in 1907), ended in 1956 (Cogger 1979b) although the bulk of his research had occurred over 20 years before. He was replaced from 1957 by James Allen Keast (1922–2009), Kinghorn's former assistant curator, whose interests were primarily ornithological. At the Western Australian Museum, Ludwig Glauert (1879–1963) also retired as Director in 1956 after 46 years at that institution – his last herpetological papers were in 1962 (Adler 1989). The

Queensland Museum had not produced any significant herpetological research since the retirement of Albert Heber Longman (1880–1954) as Director in 1945. Charles Walter Brazenor (1897–1979), who had produced just a handful of herpetological papers at the National Museum of Victoria during a career primarily in mammalogy, retired in 1961. In Tasmania, the small number of herpetological contributions from Clive Errol Lord (1889–1933) and Eric Oswald Gale Scott (1899–1986) had ceased by 1942. Only Francis John Mitchell (1929–70) (Fig. 1) of this earlier generation of museum-based herpetological researchers had continued on into the 1960s and, by 1964, he had changed his research direction from systematics to ecology, working on the Lake Eyre dragon (*Ctenophorus maculosus*) (Tyler 1970; Adler 1989) that he had first discovered in 1948.

The new generation of museum-based herpetological research began in the early 1960s with Harold George (Hal) Cogger (b. 1935) at the Australian Museum (Fig. 2), Glen Milton Storr (1921–90) at the Western Australian Museum, and Albert John Coventry (1936–2007) at the then National Museum of Victoria (Fig. 1).

Storr, another of Bert Main's students, had completed his Ph.D. on the nutritional ecology of macropods in 1960, but had also been collecting reptiles during his fieldwork program, bringing 5000 of them with him to the Western Australian Museum in 1962, as his 'dowry'. He was to begin a research program on the systematics of the Western Australian herpetofauna that would last for the next three decades and result in over 120 papers and the description of 172 species (Johnstone 1990; Adler 2007).

Coventry had an earlier start, employed by the Museum of Victoria as the museum's field officer in 1954, and then assistant in herpetology under Joan Maureen Dixon, before becoming officer-in-charge of herpetology in 1974 and curator in 1985 (Adler 2012).

Cogger, an early junior member of the Australian Reptile Club, a local amateur group founded by Roy David Mackay in Sydney in 1948, was first employed by the Australian Museum in 1952 as a cadet preparator under Mackay's supervision, but transferred to a scientific traineeship in 1955. He was appointed as Keast's assistant (assistant curator) in 1959 and, on completion of his M.Sc. on agamid lizard osteology under the supervision of Neville Stephenson in 1961, was appointed as curator of reptiles and amphibians in 1962 (Cogger 1979b; Shea 1993).

Hence, all three museum people had extensive field experience and Cogger and Storr both had university training in zoology, something few of the previous generation of museum workers had had. In addition to these three herpetologists, Robert Geoffrey Hewitt (Bob) Green was appointed as Curator at the Queen Victoria Museum in Launceston in 1962, and would remain there until 1990. While Green's interests were wide-ranging, they included herpetology (e.g. Green 1965).

Synthesis and birth

The period from the 1950s to the early 1960s had also seen the first Australian herpetological field guides and summary works for many years: Moore's monographic synthesis of knowledge

on the frogs of south-eastern Australia (Moore 1961), Main's 'Key to the Frogs of South Western Australia' (Main 1954), revised and expanded as 'Frogs of Southern Western Australia' (Main 1966), Glauert's two guides, 'A Handbook of the Snakes of Western Australia' (Glauert 1950, revised edition Glauert 1957) and 'Handbook to the Lizards of Western Australia' (Glauert 1961), Cogger's 'The Frogs of New South Wales' (Cogger 1960), a new edition of Kinghorn's 'Snakes of Australia', first published in 1929 (Kinghorn 1956), and the first attempt at an Australia-wide volume on Australian reptiles, the two editions of Eric Worrell's 'Reptiles of Australia' (Worrell 1963, 1964). This last work, written by a non-institutional herpetologist, continued to illustrate the contributions to herpetology by the amateur/non-institutional community that was evident from the earlier decades. All of these works revealed the lack of knowledge of the Australian herpetofauna to date, despite almost a century of research since the publication of the first Australian-published herpetological book, Krefft's (1869) 'Snakes of Australia'. For example, in Worrell's book, the majority of the accounts for lizard species are fewer than eight lines long, consisting of a simple statement of distribution and a brief description.

Hence, at the time of foundation of the Australian Society of Herpetologists in 1964, institutional herpetology was beginning to flower. A new group of university-based researchers, supporting an increasing number of research students, overlapped with new museum staff, all eager to begin cross-institutional communication and recognising the potential for expanding knowledge of the Australian herpetofauna, particularly with evolutionary and ecological perspectives. However, at the time, the only major national scientific meeting was ANZAAS. In the period since the Second World War, ANZAAS had grown enormously. The first 20 ANZAAS/AAAS meetings, between 1888 and 1930, generally had fewer than 1000 delegates; the next seven meetings (1932–49) had attendances between 1200 and 1650, and between 1952 and 1961 attendances were between 1987 and 3500. For the next two meetings (Sydney, 1962; Canberra, 1964), attendances were 3600 and 3860 respectively (MacLeod 1988). Such meetings were becoming too large and unwieldy for smaller groups (and particularly students) to present their research. The only alternative meetings for researchers from multiple employment bases were the monthly meetings of the various Royal Societies, the Linnean Society of New South Wales, and the various Field Naturalist groups, all state-based.

Taxonomically and discipline-based national societies had begun to form during the 1950s and early 1960s (Malacological Society of Australia, 1956; Australian Mammal Society, 1958; Ecological Society of Australia, 1960; Australian Society for Limnology, 1961: Gillbank 1988), and in May 1963, Lee and Warren at Monash University began to discuss the possibility of forming an Australian Society of Herpetologists, rapidly including Littlejohn at the University of Melbourne in their discussions (Littlejohn 1993). A circular was sent out to prospective members, suggesting aims, canvassing membership, and advising of an inaugural meeting to coincide with the ANZAAS meeting in Canberra in January 1964. The 25 respondees to the circular consisted of six people from the University of Melbourne and Monash University (Lee, Littlejohn

and Warren, together with three students, Roger Frankenberg, Angus Martin and Peter Rawlinson), along with two of Lee's students still at University of Queensland (Ian Straughan and Kerry Wilson – the latter was still an undergraduate student at the time, but was about to transfer to Lee's laboratory at Monash for his Ph.D.), six from New South Wales (Neville Stephenson from Sydney University, together with Dawbin's student David Drummond, John de Bavay from the University of New England, Hal Cogger from the Australian Museum, and two non-institutional herpetologists, Stephen Copland and Eric Worrell), four staff and students at ANU (Barwick, Bustard, Pengilley and Tait), three staff and students at UWA (Arnold, Main and Don Bradshaw, another of Main's doctoral students, working on ecophysiology of agamid lizards) plus Storr at the Western Australian Museum, and three South Australians (John Mitchell at the South Australian Museum, Michael R. Warburg (1931–2014), who was visiting the University of Adelaide from Tel Aviv University for two years, and Michael Tyler, employed by the University of Adelaide although conducting his research through the South Australian Museum). This response reflected the burgeoning of herpetological research taking place in universities (19 of the 25 respondees) and museums (4 of the respondees).

Of these, 13 attended the inaugural meeting in Canberra, a meeting predictably heavily weighted towards the ANU group (Barwick, Bustard, Pengilley) and the two Melbourne groups (Lee, Littlejohn, Warren, Frankenberg, Martin, Rawlinson, Straughan, Wilson). Cogger and Drummond made up the complement. Littlejohn became convener of the foundation committee, Lee was editor (producing six newsletters over the next three years), and the rest of the committee consisted of state representatives (Barwick, ACT; Warren, Vic.; Cogger, NSW; Mitchell, SA; Storr, WA and Straughan, Qld). The initial two primary aims of the Society, as expressed at this meeting, were to disseminate information and ideas among members by a newsletter, and to hold a semiannual meeting. To these was added (by Barwick) conservation of the Australian herpetofauna. The long history of significant amateur contributions to Australian herpetology was recognised by the inclusion of scientifically interested amateurs as eligible for membership, additional to institutionally based researchers and students.

At the time of the first AGM, in August 1965, these had become the three objectives in the constitution:

- (1) The Society shall promote the scientific study of amphibians and reptiles.
- (2) The Society shall provide opportunities for discussion and the dissemination of information among its members by any appropriate means, including meetings and publications.
- (3) The Society shall take an active interest in the conservation of amphibians and reptiles.

The decision to base the society on a taxon rather than a discipline allowed for an enormous diversity of membership, bringing together researchers with a variety of perspectives and technological expertise. Amongst its members, the Australian Society of Herpetologists (ASH) has included ecologists, evolutionary biologists, anatomists, functional morphologists, physiologists, biochemists, parasitologists, microbiologists, systematists, palaeontologists, ethologists, geneticists, population biologists, biogeographers, developmental

biologists, immunologists, endocrinologists and toxinologists, as well as from the zoo industry and wildlife managers and fauna surveyors, both from government agencies and the private sector. As a taxon-based society, ASH also represents a greater taxonomic diversity than other tetrapod groups, with Reptilia being paraphyletic with respect to parts of Amniota, and the grouping of amphibians with reptiles continuing a tradition from the Linnean era. The result is that ASH has been, since its inception, a crucible for exchange of knowledge among diverse researchers on an equally diverse group of organisms.

Growth

Initially, this exchange was the province of the newsletter, which contained details of the activities of members, lists of members, abstracts of papers presented at ASH meetings, and lists of publications in herpetology. At first, the latter were not confined to papers written by members, but attempted to compile all papers relating to Australian herpetology, together with lists of potentially relevant papers from non-Australian journals, listed by year or journal issue. As this became progressively more time-consuming, various approaches were taken to obtain this information, including lists of papers compiled by BIOSIS and by the Australian National Library under contract, neither of which fully served the Society's needs. A Society reprint library was envisaged as a way of allowing access to the literature in the predigital age, although this did not come to fruition. Eventually, the main listings evolved to lists of publications (including theses) at the end of regional research reports by state or institution, compiled by an ever-changing network of regional reporters, to whom must be owed the everlasting gratitude of the Society. Equally critical was the role of Editor, who not only had to compile the newsletter, but also keep pleading with the regional representatives to supply reports. The most successful of these was Richard Craig (Ric) Longmore (Editor, 1983–99). Ric joined the Society in 1974, and kept the newsletter running through 15 issues (#25–39) over 16 years.

There were discussions at various times (notably in 1986–87) about publication of a society journal or other society publications, but the feeling was initially that the membership was too small for such a venture, and subsequently, that the expanding range of journals, including numerous non-Australian specialist herpetological journals, rendered this unnecessary. At the present time, the only Australian herpetological journal remains 'Herpetofauna', published by the Australasian Affiliation of Herpetological Societies, an umbrella organisation representing the various state-based and local amateur groups, but which now mostly has papers by students, semiprofessional and professional herpetologists.

Of the Society's founding group, Jim Warren would take little further part in the Society, his research focusing on vertebrate palaeontology (including some work on fossil turtles, and a brief foray into the sensory pits of pythons (Warren and Proske 1968); the latter work would involve one student – Alan Baxter, Hons 1969) and with an increased administrative load (Professor from 1968). Lee's work, likewise, would veer back towards mammal ecophysiology, although he supervised several herpetological students at University of Queensland and Monash University, including Straughan and Arnold at

University of Queensland, and Fiona Clyne (M.Sc. 1968) (Fig. 1), Kerry Wilson (Ph.D. 1971) (Fig. 1), Graeme MacLean (Hons 1971 – note, MacLean's final thesis did not include the herpetological aspect of his study, which was published separately (MacLean *et al.* 1973, 1975)) and Helen Robinson (Hons 1976, cosupervised by Harvey Lillywhite and John Baldwin) at Monash. Arnold (d. 1988) would take up a position as demonstrator at UWA, joining Main there, before following him to the Environmental Protection Agency in Western Australia.

Littlejohn, on the other hand, would develop a large laboratory with a herpetological focus at the University of Melbourne over the next four decades, with he and his coworkers supervising some 35 Honours students, 6 Masters students and 11 Ph.D. students on herpetological topics (Table 1). Littlejohn also supervised two Ph.D. students at ANU: Robert Humphries (1979) and Jeremy Robertson (1982). Three of his early students, in particular, would contribute significantly to the development of Australian institutional herpetology and ASH.

Colonisation

The first of these, Peter Alan Rawlinson (1942–91) (Figs 1, 2), completed his Honours degree under Littlejohn's supervision (1964) and commenced a Ph.D., but then took up a lectureship at LaTrobe University in its first year of teaching (1967). Rawlinson never completed his Ph.D., but would go on to supervise La Trobe students working on several herpetological projects over the next 24 years (Table 2), before his tragic death on Krakatoa during fieldwork there. Rawlinson's own herpetological studies, initially concentrating on reptile biogeography and systematics, were hampered by the development of a severe reaction to alcohol, preventing him from working with preserved specimens, and he was later assisted in this work by John Coventry and his former student Mark Hutchinson, who brought some of Rawlinson's systematics projects to completion after his death (e.g. Coventry and Rawlinson 1980; Rawlinson 1991; Hutchinson and Rawlinson 1995). Rawlinson's later work was with the burgeoning conservation movement, particularly the Australian Conservation Foundation.

Angus Anderson Martin (Fig. 1) was the first of Littlejohn's Ph.D. students to complete, submitting his thesis in 1968. He would continue to have strong links with Littlejohn's laboratory, being co-supervisor or supervisor of several students in that laboratory between 1968 and 1995. Graeme Field Watson was the last of the first flowering of Ph.D. graduates from Littlejohn's laboratory, completing his thesis in 1974, and like Martin, would continue to work with Littlejohn's group, supervising students between 1974 and 2004. (The Ph.D. graduates between Martin and Watson were Jasper James Loftus-Hills, David Scott Woodruff and Don Forsyth Gartside–Loftus-Hills (1946–1974) (Fig. 2) was tragically killed by a hit-and-run driver while in the field in Texas just three years after completing his dissertation, but Woodruff (Figs 1, 2) and Gartside would go on to prestigious careers in biology – Woodruff at Harvard, Purdue and University of California San Diego, Gartside at Southern Cross University.)

Table 1. Herpetological theses produced by Murray Littlejohn's group and its successors at the University of Melbourne

Key: +, Murray Littlejohn (co-supervisor); *, Angus Martin; †, Graeme Watson; ^, Peter Harrison (co-supervisor); #, Gerry Marantelli (co-supervisor); &, David Reznick (co-supervisor); @, Josh van Buskirk; all other students supervised by Littlejohn alone

Year	Honours	M.Sc.	Ph.D.
1964	Peter Rawlinson		
1966	Barbara Smith		
1967	Robert Evans		
1968			Angus Martin
1968	Megan Williams*		
1969	Christine Blood		
1969	Alan Cooper*		
1970	Susan Hawe*		
1971			Jasper Loftus-Hills
1971		Anthony Blake	
1972			David Woodruff
1972	Linda McDonnell		
1972	Suzanne Monk		
1973			Don Gartside
1974			Graeme Watson
1974	Janys Hayes†		
1975	William Sherwin		
1976		Linda McDonnell	
1976	Peter Harrison		
1976	Suzanna Olsson*		
1976	Timothy Owen		
1976	Bruce Rigby†		
1976	Peter Robertson*		
1977	Ralph MacNally		
1978			Gordon Friend
1979	Joanne Moss†		
1982			Ralph MacNally
1982		Timothy Owen	
1982	Anthony Gorman		
1984			William Sherwin
1984	Andrea Miles+^		
1984	Timothy Strofeldt+†		
1985	Nick Nikolakopoulos		
1986	Peter Jackson+†		
1987		Peter Harrison	
1989		Arthur Brook	
1989	Sidney Larwill		
1990		Simone Dennington	
1991	Richard Retallick		
1992	Nicholas Harrison		
1993	Juliette Halliday*		
1993	Michael Scroggie+†		
1994	Ewen McGilp+*		
1995	Marion Howell†		
1995	Keir Jarvis+#		
1995	Libby Ward*		
1998	Sharada Ramamurthy+†&		
1999	Suzanne Sadedin		
2001			Graeme Gillespie+†
2002			Michael Scroggie
2004			Greg Hollis†
2004	Kim Nguyen@+		

Table 2. Herpetological students supervised by Peter Rawlinson at La Trobe University

Year	Honours	M.Sc.	Ph.D.
1970	Ken Norris		
1971			Ian Spellerberg
1971	D. J. Thomas		
1972	Greg Hunt		
1977	Mark Hutchinson		
1977	Geoff Brown		
1978		Peter Mather (M.Sc. prelim.)	
1982			Graham Ambrose
1982	I. L. Gray		
1983			Mark Hutchinson
1983			Geoff Brown
1985			Sue Tilley
1987			Peter Mather
1988	Andrew Hoogenraad		
1988	Simon Hudson		
1989	Boyd Simpson ^A		

^ACo-supervised: Rawlinson and Hutchinson.

Many of the foundation members of ASH would continue to nurture the society for many years, serving on the committee on multiple occasions. Littlejohn, the initial convenor, would be president (1965–69), vice-president (1971–72) and ordinary member (1973–74, 1976–77). Tony Lee, the first editor (1964–67), would follow Littlejohn as president (1969–70). Dick Barwick was vice-president during 1967–69, and would return as president in 1987–88, then vice-president in 1988–91, while Neville Stephenson was vice-president in 1965–67 and ordinary member in 1969–70.

The first crop of students of the ASH founders, like their supervisors, would continue to play important roles in the development of ASH, serving on the committee in a variety of roles. Of Murray Littlejohn's students, Angus Martin has been secretary/treasurer (1965–67), editor (1967–73), ordinary member (1978–80), president (1981–82) and vice-president (1982–83), Graeme Watson has been secretary/treasurer (1967–72), president (1979–81) and vice-president (1981–82) (Graeme also designed the society logo), Loftus-Hills and Gartside were assistant secretary/treasurers in 1969–70 and 1971–72 successively, and Rawlinson was ordinary member in 1971–72. Kerry Wilson (Tony Lee's Ph.D. student), was assistant secretary/treasurer between 1965–69. The secretary/treasurer position transferred to two of the Sydney graduates after Watson: Lyn Moffat (Neville Stephenson's ex-student) in 1973–75, then Judy Caughley (nee Badham; Bill Dawbin's ex-student) in 1975–76.

Hal Cogger, representing the museum sector, would fill most of the remaining roles in those early years: ordinary member (1967), vice-president (1969–70, 1974) and president (1971–73).

At the same time as Rawlinson was founding herpetological studies at La Trobe, two other universities had appointed staff with herpetological interests. The University of New England, founded in 1938 as the New England University College of Sydney University, had as one of its earliest zoological staff

Harrold Fosbery Consett Davis (1913–44) (Kenneally 1993) who, while primarily known for his ecological and entomological work, strongly influenced the herpetological taxonomic work of Stephen Copland, beginning in the mid-1940s (Copland would name two taxa, *Hemiergus decreasiensis davisi* and *Ablepharus davisi*, both sadly now considered synonyms, after his mentor). When the University College was given independence from the University of Sydney in 1954, John Merson de Bavay had been appointed to the zoology staff. He had been associated with a few third-year student projects in herpetology (Ross Pengilly,

1960; B. K. Hall, 1962), and Gary Myers had begun an M.Sc. project on skink systematics, discontinued in 1958. However, herpetological research at the University of New England began anew in 1966, when Harold Heatwole from the University of Puerto Rico was appointed as Senior Lecturer in Zoology. Heatwole (Fig. 1) immediately began supervising students on herpetological projects, and would mentor 41 students before his departure in 1991 (Table 3), with the main themes being respiratory and cardiac physiology, sea snake biology and reptile ecology. Heatwole's group was assisted by de Bavay, who would

Table 3. Herpetological students supervised by Hal Heatwole at the University of New England

Year	Honours	M.Sc.	Ph.D.	Others
1967	Kelland Hardingham			
1968		John Veron		
1968		David Horton		
1968	Bruce Firth			
1969	Robert Newby			
1969	Grahame Webb			
1969	Geoff Witten			
1971		Barbara Saylor (M.Sc. prelim.)		
1971	Malcolm McKinnon			
1971	John Parmenter			
1972			Grahame Webb	
1972		Geoff Witten		
1973			David Horton	
1973		Barbara Saylor		
1973	Michael Julien			
1974			Bruce Firth	
1974	Sue Wilson			
1975			Rick Shine	
1975	Wayne Chaffey			
1976			John Parmenter	
1977	Caroline Belmont			
1979	E. G. Ramsay (Cert. Equiv. Hons)			
1980		Ingrid Belan (M.Sc. prelim.)		
1980	Steve Phillips			
1981	David Berman			
1981	Bronwyn Crome			
1982			Jeff Miller	
1983		Eric Gibson (M.Sc. prelim.)		
1983	Menna Jones			
1984			Glen Burns	
1984			Chris Daniels	
1984			Janet Taylor	
1984	Daryl Houston			Michelle Archinal (B.Nat.Res.)
1985			Sharon Fraser	
1985			Malumo Simbotwe	
1985		Shantay Zimmerman (M.Sc. prelim.)		
1987				Greg Hollis (B.Nat.Res.)
1991			Ken Zimmerman	
1991			Shantay Zimmerman	
1991	Peter King (BA)			

continue his own work on frog embryology and functional morphology and, with Heatwole and his students, would build up extensive collections of reptiles and amphibians from the New England area, eventually published as a survey of the New England Tableland (Heatwole *et al.* 1995, 2003). A few additional students would work on various research projects in Natural Resources, supervised by Andrew Smith, between 1982 and 1986. Independent of the work of his students, Heatwole produced an extensive body of herpetological ecology studies, gathered for the award of a D.Sc. through the University of New England in 1981.

The University of Adelaide also began to produce herpetological graduates in the late 1960s and early 1970s. Two Ph.D. theses on the ecology of varanid lizards (Brian Green, 1969; Dennis King, 1973) were produced under the supervision of the renowned but controversial ecologist Herbert George Andrewartha (1907–92), but it was the appointment of Michael Ewers Bayne Smyth (1939–74) to the staff in 1968 that kick-started herpetological research at that institution. Smyth, born in South Australia, returned to Adelaide from his Ph.D. at Oxford (1964) and a postdoctoral fellowship at UCLA, and began to work on the distribution of reptile ticks, discovering the existence of parapatric boundaries between species (Smyth 1973) and working on the systematics and life histories of the local skink species, partly in collaboration with Meredith J. Smith (e.g. Smyth and Smith 1968). A couple of Honours students worked on the skink projects in the early 1970s (M. Aistrophe, 1970; J. Francis, 1971), and then Smyth began to supervise a chain of Ph.D. students (Mike Braysher, 1972; Bob Henzell, 1973; Dale Roberts, 1976; Bob Sharrad, 1979; John Gibbons, 1979). Smyth's untimely death from cancer in 1974 left the latter three to complete their work under alternate supervision. However, the gap created by Smyth's loss was rapidly filled by the appointment of Michael John (Mike) Tyler as Lecturer in Zoology. Tyler had arrived at the University of Adelaide in 1961, but until 1974 was employed by the Department of Human Physiology and Pharmacology as a member of the laboratory staff. This did not affect his herpetological research, as he worked on frog systematics through the South Australian Museum during this era, producing several taxonomic revisions that included a monographic treatment of the hylid frogs of New Guinea (Tyler 1968). In 1975, with the completion in the previous year of his M.Sc. thesis on the mandibular musculature and vocal sac of frogs, he was given a lectureship in zoology, where he rapidly joined forces with Margaret Davies to develop a laboratory concentrating on the biology and evolution of Australian frogs, from which emerged several research students (Table 4). Davies would herself obtain a Ph.D. in 1987, and Tyler a D.Sc. in 2002. Tyler would later direct his research towards frog palaeontology, frogs as indicators of environmental health, and, revisiting his previous work in pharmacology, develop several collaborations exploring the pharmacological properties of skin secretions from Australian frogs.

The University of Adelaide had several other herpetological researchers during the 1970s. Roger Scott Seymour, another of Bartholomew's Ph.D. students from UCLA, moved to Australia to work at Monash, then to the University of Adelaide in 1975, working on reptile physiology, particularly respiratory and egg physiology, and would supervise several students over the next

Table 4. Herpetological students supervised by Mike Tyler at the University of Adelaide

Year	Honours	M.Sc.	Ph.D.
1976	Graeme Crook		
1977	Philippa Horton		
1977	Mike Thompson		
1978	David Carter		
1979	Janet Brooks		
1980	Ulrick John		
1981	Jane Moller		
1982	Robyn Delaney		
1982	Jillian Sanders		
1983			Tom Burton
1983	Peter Goonan		
1986			Philippa Horton
1986		Mike Cappo	
1986	Sandy McAulay		
1987			Margaret Davies
1988		Philip Stott	
1991	Simon Bryars		
1991	Louise Quincey		
2002			Rachel Norris

few decades (David Papps, Hons 1977; Paul Rosenzweig, Hons 1981; Jamie Morrison, Hons 1982; Mike Thompson, Ph.D. 1984; Peter Whitehead, M.Sc. 1987; Nicky Mitchell, Ph.D. 2001). Bruce T. Firth, who had completed his Ph.D. at University of New England under Heatwole, came to the Department of Anatomy and Histology in the mid-1970s, bringing interests in reptile pineal function with him. Max King gained his Ph.D. from the Department of Genetics in 1976, and would go to ANU, and then to the Northern Territory Museum, while Anthony Roger (Tony) Bourne (1944–89) gained his Ph.D. in 1973 under the supervision of Robert F. (Bob) Seamark, and would move to Deakin University to spend many years working on skink endocrinology.

Less than a decade after its foundation in 1966, Flinders University would also become a host to herpetology when it appointed Christopher Michael (Mike) Bull as a lecturer in 1974. Bull was another graduate from the Main laboratory at UWA, completing his Ph.D. in 1973 on the interactions between two of the species of *Crinia* that had earlier been discovered and studied by Moore, Main and Littlejohn. Earlier, he had completed his Honours project ('Towards an understanding of the distribution of three tick species in South Australia', a title overlooked by Shea (Shea 1993)) with Mike Smyth at the University of Adelaide in 1969, shortly after Smyth returned to Australia, research that would contribute to Smyth's demonstration of parapatric boundaries between reptile tick species despite host continuity across the boundaries. This background in reptile ticks on sleepy lizards (*Tiliqua rugosa*) and frogs would guide much of his research over the next four decades, with Bull and his students initially working on tadpole ecology and behaviour, and on the factors maintaining the reptile tick boundaries. The latter work evolved naturally into studies of the natural history of the sleepy lizard host of the ticks, which led to the discovery of the long-term pair bonds in this species (Bull 1987, 1988). Exploring the latter in turn led to studies on

Table 5. Herpetological students supervised by Mike Bull at Flinders University

Year	Honours	M.Sc.	Ph.D.
1975	David Wiltshire		
1978	Anthony Edwards		
1979	Steve Shearer		
1980	John Popper		
1981	Ray Nias		
1981		Rojchai Satrawaha	
1982	Katie Nicholls		
1982			Francois Odendaal
1982			Trevor Petney
1983			Ross Andrews
1987			George Dubas
1987	David Brennan		
1987	Louise Wheeler		
1988	Stephen Richards (B.A.)		
1988			Ian Williamson
1989			Ingrid Belan
1989			Neil Chilton
1989			Elizabeth Yeatman
1989	Dean Newman		
1990	Brigitte Schulz (B.A.)		
1991	Andrew Peterson (B.A.)		
1992	Lana Schultze		
1993	Glen Duffield		
1994	Adam Main		
1996			Michael Freake
1997			Yvonne Pamula
1997			Greg Johnston
1998			Cathy Smallridge
1998			Adam Main
1998	Matthew Bonnett		
1999			Tim Milne
2000			Jurgen Stein
2000			Mike Gardner
2000	Robyn Bellamy		
2000	Sarah Cockerell		
2001			Elvira Lanham
2001			Travis How
2001	Kris Murray		
2003			Genaya Misso
2003	Chantelle Derez		
2003	Gary Hallas		
2004			Radika Michniewicz
2004			Nick Souter
2004		Evi Arida	
2004	Stephanie Godfrey		
2004	Aaron Fenner		
2004	Corinne Mensforth		
2005	Melissa Pettigrew		
2005	Kat Payne		
2005	Wayne Lawrence		
2005	Zonnie Auburn		
2006			Greg Kerr
2006	Annabel Smith		
2007			Claire Griffin
2007		Catherine Brown (M.Biodiv.)	
2007	Holly Fellows		
2007	Joel Williams		

(continued next column)

Table 5. (continued)

Year	Honours	M.Sc.	Ph.D.
2007	Caroline Wohfield		
2008			Sandra Parsons
2008	Holly Phillips		
2009			Jaro Guzinski
2009			Stephanie Godfrey
2009			Aaron Fenner
2009	Kelly Pelgrim		
2010			Stephanie Lau
2011			Julie Hagen
2011		Pradip Gyawali (M.Biodiv.)	
2011	Eli Staugas		
2011	Jordan de Jong		
2012			Melissa Pettigrew
2012			Anabel Smith
2012	Trish Wright		
2013	Peter Majoros		
2013	Mel Abela		

the ecology of related species showing social interactions and pair bonding, including other species of *Tiliqua* (enhanced by the rediscovery of the Adelaide pygmy bluetongue (*Tiliqua adelaidensis*), which rapidly became a focus of study for conservation management) and *Egernia* and *Liopholis* species, and then, returning to the parasite work, the influence of blood parasites on the ecology of their lizard hosts. This continually evolving research provided ample scope for student projects with Bull supervising 74 herpetological and parasitological students over four decades (Table 5), with no sign of any slowing down to the present day.

Herpetological interests at the University of Tasmania were also in place in the early days of the ASH, with three members (Figs 1, 2) in the first published membership list in 1967: John Hickman (1926–2007) had followed up his earlier Honours project on cestodes with a 1963 Ph.D. on the same topic, and contributed a paper on the ecology of *Liopholis whitii* in between (Hickman 1960), Bruce S. McIntosh had interests in the natural history and thermal biology of skinks, and Roy Swain had come to the University in 1966 with a Ph.D. on the pineal complex of lizards from Birmingham (Swain 1966). Hickman's and McIntosh's interests would transfer to other areas, but Swain would supervise a few herpetological Honours students over the next 15 years (P. Clinton, 1971; P. D. Dredge, 1981; J. P. Stanny, 1982; S. Medlock, 1983), before returning to a more intensive and focussed herpetological research program in the early 1990s, collaborating with Sue Jones on the endocrinology and ecology of reproduction of Tasmanian skinks, and supporting several students. Since Roy's retirement in 2003 this research team has expanded further with the involvement of Eric Wapstra and Ashley Edwards, past students in the group and now staff members, and has now supervised a large number of research students.

The year 1968 saw the arrival of Gordon Clifford Grigg at the University of Sydney as a Queen Elizabeth II Fellow, working on fish respiratory physiology with Geoffrey Harold Satchell

(1921–2000). Within two years he had been appointed to a lectureship, and corrupted to work on frog biology by interaction with John Barker, a technical officer in Biological Sciences with an interest in frogs. In 1972, his first herpetological students began work in his laboratory: Gillian Courtice (who would later be a leader in herpetological research at the University of New South Wales) on the systematics of the bell frogs (*Litoria aurea* complex), and Jenny Alchin on crocodile thermal physiology. Much of the rest of his time at Sydney involved research on reptile and amphibian ecophysiology, particularly with the crocodile research group being established by Harry Messel (Courtice *et al.* 2010). By the time he left the University of Sydney in 1989 to take up the chair at the University of Queensland (and direct his research more to mammalian physiology), he had supervised 10 Honours, one M.Sc. and eight Ph.D. students on herpetological topics (Table 6). With Dawbin's retirement in 1978 and Neville Stephenson's in 1980, Grigg became the mainstay of herpetological research at Sydney until joined by Rick Shine (1980) and Mike Thompson (1989) over the next decade.

Hence, by the end of the 1970s, there were active herpetological research groups, represented in the membership and committee of ASH, at the Universities of Adelaide, Melbourne, New England, Sydney, Tasmania, and Western Australia, and at Flinders, La Trobe and Monash Universities and the Australian National University. Within the museum sector, Cogger and Storr were still active at the Australian Museum and Western Australian Museum respectively, and Cogger had been joined by Allen Eddy Greer at the Australian Museum. Coventry was still at the Museum of Victoria and working with Peter Rawlinson, although his time was largely taken up with collection management. In 1970, John Mitchell at the South Australian Museum had died, but was replaced by Terry Houston, whose herpetological research interests were mostly on agamid lizard systematics. At the Queensland Museum, herpetological research

had started anew with the appointment of Jeanette Adelaide Covacevich as Assistant Curator of Reptiles and Amphibians in 1967, one year after her initial employment as a Museum Cadet. She was joined there a few years later by Glen Joseph Ingram as Curator of Amphibians. At the Museum and Art Gallery of the Northern Territory, Graeme Francis Gow (1940–2005) had been appointed Curator of Reptiles in 1974, and hence for the first time, there were herpetological staff at all the mainland state museums.

The membership of ASH at the end of the 1970s reflected this spread of herpetology, with a list published in Newsletter 19 representing membership at the beginning of 1980 comprising 141 people. Of these, 117 were Australian-based, and of these, 68 (58%) were in universities or other research institutes or colleges, 16 (14%) were at museums, 16 (14%) were in various governmental conservation agencies, 11 (9%) were non-institutional amateurs, 4 (3%) were from the zoo sector, and two others were past research students now working as environmental consultants. The society has continued to grow and spread. Institutionally, most Australian universities now have laboratories, or at least individual staff or students, working on herpetological projects. The first herpetological theses from these additional universities were in 1970 (Macquarie), 1974 (James Cook), 1975 (Curtin University of Technology), 1979 (Murdoch), 1982 (Griffith), 1984 (Wollongong), 1989 (Canberra, Deakin), 1992 (Charles Darwin, Western Sydney), 1994 (Central Queensland), 1995 (Southern Cross), 1997 (Charles Sturt), 1998 (Newcastle) and 2008 (Federation).

Causation or correlation?

ASH has certainly benefitted from this growth, but has it stimulated and nurtured the growth? The key to answering this question is consideration of the two initial primary aims of ASH: the issuing of a newsletter and the holding of meetings. Both reflect a single more general theme: communication among herpetologists. As noted above, herpetology in Australia is a very broad field. Prior to the formation of a national society, that field was dispersed, with researchers working in isolation. With the formation of ASH in 1964, not only was there a progressive increase in the number and diversity of researchers and research topics, but those workers began to collaborate. Even from the earliest days of ASH, such interinstitutional collaborations had begun. Main worked with Lee's student, Ian Straughan, at University of Queensland in 1965, extending his previous studies of south-western *Crinia* to Queensland (Straughan and Main 1966). In 1971, the Society lobbied the Select Committee on Wildlife Conservation on the need for a comprehensive survey of the frogs of northern Australia, and reptiles throughout Australia, including ecological studies. While not directly successful, within five years, Tyler and Davies at the University of Adelaide, and Martin (and later Watson) from Littlejohn's laboratory in Melbourne, would join forces for the first of several major expeditions to the Kimberley region to begin surveys of that neglected area, a collaboration that would lead to many publications (e.g. Tyler *et al.* 1977, 1981, 1987; Martin and Tyler 1978; Martin *et al.* 1980) and would also extend across the Northern Territory to the Barkly Tableland (e.g. Davies *et al.* 1983; Tyler *et al.* 1983).

Table 6. Herpetological students supervised by Gordon Grigg at the University of Sydney

Year	Honours	M.Sc.	Ph.D.
1972	Jenny Alchin		
1972	Gillian Courtice		
1974	Elizabeth Marshall		
1975	John Boland		
1978			Norbert Dankers
1978			Jane Thompson
1978			Janet Taylor
1979			Gillian Courtice
1979			Eric van Beurden
1980	Robyn Hinchliffe		
1981	John Hunt		
1982			Laurie Taplin
1982	Georgia Svejkar		
1983	Maddi King		
1983	Jane Bennett		
1985	Alaric Fisher		
1986			David Kirschner
1986			Jon Wright
1991		Frank Lemckert	

Collaborations among the reptile researchers were also commencing. In 1974, Heatwole at University of New England was collaborating with Roger Seymour (then at Monash) on respiratory physiology of marine snakes (Heatwole and Seymour 1975), and Heatwole and Cogger would also collaborate on a major survey of the herpetofauna of the islands of Torres Strait in 1975. The importance of studies of the biogeography of the herpetofauna of this region, representing potential flow between New Guinea and Australia, had been earlier emphasised by Tyler (1972), who had contributed to a 1971 symposium on the biogeography of Torres Strait held at ANU. Heatwole's students were also involved in collaborations, though closer to home. Rick Shine provided access to elapid blood that was studied by Philip Board and Nihal Agar (Board *et al.* 1977a, 1977b; Agar *et al.* 1977), and both Grahame Webb and Bruce Firth, along with Heatwole, would collaborate on physiological studies with Clifford Ray Johnston when he was at University of New England in 1972–73 (e.g. Firth *et al.* 1972; Webb *et al.* 1972) after moving there from University of Queensland (1969–71), and before Johnston returned to the USA.

The increase in collaboration amongst Australian herpetologists is also apparent in the authorship on papers (Table 7). In Copland's (1953) compilation of Australian herpetological literature, single-authored papers were the norm (93%), with very few publications having three or more authors. While they continued to be the most common category during the first few decades of the Society's existence, they were far less dominant. A rapid change occurred about the turn of the century, with a dominance of publications between 2000 and 2003 having three or more authors, and in a more recent sample from 2011–14, publications with three or more authors contribute 73% of the total, and single-authored publications are now a rarity.

This increase in collaboration both within and between institutions, while also obvious in other biological disciplines, has been facilitated and encouraged by the Society's newsletters and meetings. ASH, in particular, has always prided itself on the collegiate and encouraging nature of its meetings, with large amounts of time allocated for social interaction.

The first seven meetings following the Society's foundation were held at universities and museums, reflecting the Society's early membership: at the University of Melbourne, Monash University, the Australian National University, the University of Sydney's field station close to Sydney, the Australian Museum, the South Australian Museum, and the University of New England (Table 8), and were more formal affairs (Figs 1, 2), often linked to ANZAAS meetings in those cities. However, with the arrival of Gordon Grigg the Society's meetings changed. At the seventh AGM, at the University of New England, Grigg, at

the time the Society's newsletter editor, proposed holding the next meeting at a more remote location – Olive Downs in Sturt National Park in the far north-west corner of New South Wales. As a comment in the next newsletter stated:

'Accommodation: Details are still uncertain, we may all have to bring sleeping bags. Apparently it is likely that we will have the use of shearers quarters for sleeping . . . There is no question of getting away from it, this is a somewhat 'outdoorsy' meeting . . .'

After having suggested the timing of the meeting, Grigg realised that this overlapped with fieldwork in northern Australia, and had to leave the organisation of the meeting to his students, flying in himself on the first morning (Courtice *et al.* 2010). The success of the informality of this meeting, with papers presented in the shearing shed, led to a strong preference for following meetings to also be held at more remote venues away from large population centres, and this has become an ASH tradition. Between 1996 and 2007, the Society's meetings spread even further, with meetings held for the first time in Western Australia, north Queensland, the Northern Territory and Tasmania, and continued to grow in size (Fig. 3). In addition to the Society's own meetings, herpetology in Australia grew in the 1980s to the point where additional herpetological meetings outside the Society's umbrella were being organised. The first of these, the Melbourne Herpetological Symposium, was coordinated by Society members Chris Banks and Angus Martin in 1980, and the results published in the following year (Banks and Martin 1981). Four years later a symposium 'Biology of Australasian Frogs and Reptiles' was organised by Grigg, Shine and Arthur White (and later Harald Ehmann), again all Society members, at the University of Sydney, the results again published (Grigg *et al.* 1985). After another four years, and coinciding with Australia's bicentenary, the Queensland Museum hosted a Bicentenary Herpetological Symposium, the results of which were published as a special issue of the *Memoirs of the Queensland Museum* (Ingram 1990). A longer delay ensued before Adelaide would host an even bigger meeting, the Second World Congress in Herpetology, over the New Year period 1993–94 (while no formal proceedings are issued from World Congresses, the Royal Zoological Society of New South Wales issued a special herpetology-themed volume to celebrate the Adelaide Congress: Lunney and Ayers 1993). The existence of some of these larger non-ASH meetings (including subsequent World Congresses) and the need to fit the timing of some meetings to seasonal aspects of the venues, led to ASH meetings often not being annual, and to some annual general meetings having to be short, purely business meetings needed to fulfil the legislative requirements of the Society's

Table 7. Changing patterns of authorship of Australian herpetological publications

Period	1 author	2 authors	≥3 authors	Total <i>n</i>	Source
1919–1952	325 (93%)	21 (6%)	3 (1%)	349	Copland (1953)
1981–1984	127 (42%)	96 (32%)	81 (27%)	304	Newsletters 21–25 (Jul. 81 – Nov. 84)
1991–1993	179 (44%)	133 (33%)	97 (24%)	409	Newsletters 33–35 (1991–1993)
2000–2003	69 (19%)	114 (31%)	183 (50%)	366	Newsletter 41 (2000–2003)
2011–2014	33 (7%)	98 (20%)	351 (73%)	482	Newsletters 46 (2011) and 48 (2014)

Table 8. Australian Society of Herpetologists meetings

AGM, Annual General Meeting (business); Scientific, research papers presented; Extraordinary, general meeting held between some AGMs for the purpose of approving by the membership the minutes of a previous more limited AGM held for fulfilling the requirement of the Society's Incorporation

Year	Type	Venue
1964	Foundation	Canberra High School, ACT
1965	AGM/Scientific	University of Melbourne, Vic.
1967	AGM/Scientific	Monash University, Vic.
1968	AGM/Scientific	Australian National University, ACT
1969	AGM/Scientific	South Australian Museum, Adelaide, SA
1970	AGM/Scientific	University of Sydney Field Station, Pearl Beach, NSW
1972	AGM/Scientific	Australian Museum, Sydney, NSW
1974	AGM/Scientific	University of New England, Armidale, NSW
1975	AGM/Scientific	Olive Downs, Sturt National Park, NSW
1976	AGM/Scientific	Canberra CAE field station, Jervis Bay, ACT
1978	AGM/Scientific	Martindale Hall, Mintaro, SA
1979	AGM/Scientific	Kinchega National Park, NSW
1981	AGM/Scientific	Anglesea, Vic
1982	AGM/Scientific	Birrigai, ACT
1983	AGM/Scientific	Frahn's Farm, SA
1984	AGM/Scientific	St Columba's Seminary, Springwood, NSW
1986	AGM/Scientific	Charlotte's Pass, NSW
1987	AGM/Scientific	Edrom Lodge, Eden, NSW
1988	AGM	Queensland Museum, Brisbane, Qld
1990	AGM/Scientific	Gemini Downs, SA
1991	AGM/Scientific	University of New England, Armidale, NSW
1992	AGM/Scientific	Nepean Hall, Camden, NSW
1993	AGM	Australian National Wildlife Collection, Gungahlin, ACT
1994	Extraordinary	Second World Congress of Herpetology, Adelaide, SA
1994	AGM	Australian National Wildlife Collection, Gungahlin, ACT
1995	Extraordinary/Scientific	Laurel Hill, NSW
1995	AGM	Australian National Wildlife Collection, Gungahlin, ACT
1996	AGM/Scientific	Wellington Mills, WA
1998	AGM/Scientific	Yungaburra, Qld
1999	AGM/Scientific	Ross River, NT
2001	AGM/Scientific	'Gumleaves', Freycinet Peninsula, Tas
2002	AGM/Scientific	Birrigai, ACT
2003	AGM/Scientific	Mary River, NT
2005	AGM/Scientific	Springbrook, Qld
2006	AGM/Scientific	Healesville, Vic.
2007	AGM/Scientific	Albany, WA
2009	AGM/Scientific	Massey University, Auckland, NZ
2010	AGM/Scientific	Barmera, SA
2011	AGM/Scientific	Paluma, Qld
2012	AGM	Seventh World Congress of Herpetology, Vancouver, Canada
2013	AGM/Scientific	Pt Wollstonecraft, NSW
2014	AGM/Scientific	Greenhills, ACT

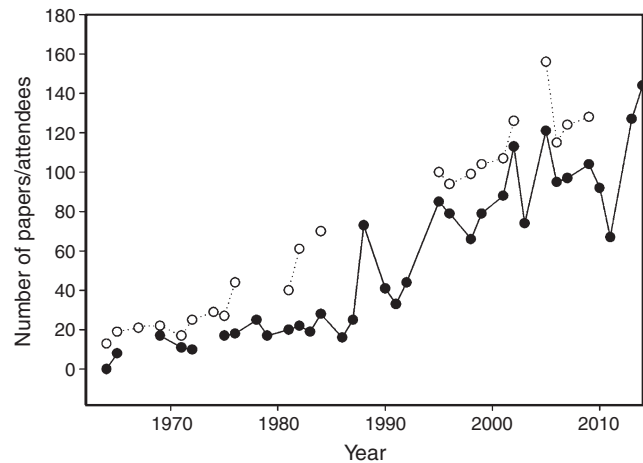


Fig. 3. Growth in numbers of papers presented and registrations at ASH meetings. Open circles, registrants; filled circles, papers. Gaps indicate an absence of records for some meetings.

incorporation. A few of the intervening meetings, being between AGMs, technically became 'Extraordinary General Meetings' in the Society's records (Table 8).

The 1975 Olive Downs meeting also marked the introduction of awards for the best student paper, with Rick Shine the inaugural winner. At the Camden meeting in 1992, the prize was renamed the Peter Rawlinson Prize, and its award constrained to the best paper by a Ph.D. student, with a second prize awarded for the best presentation by an Honours/Masters student. At the following meeting (Laurel Hill, 1995), the Honours prize was renamed the Murray Littlejohn Prize, and in 2001, a student poster prize was inaugurated, formally named as the Ric Longmore Prize in 2002. (Parenthetically, I note that herpetologists who died unexpectedly young, like Rawlinson, are heavily represented among institutional awards, grants and prizes, with Rawlinson's name also being attached to the Peter Rawlinson Awards of the Australian Conservation Foundation, and of La Trobe University, and the existence of the Jasper Loftus-Hills Award at the University of Melbourne, the Jasper Loftus-Hills Young Investigator Award of the American Society of Naturalists, the Peter Rankin Trust Fund for Herpetology, administered by the Australian Museum, the Jennifer Mary Arnold Memorial Research Award at the University of Western Australia, the Michael Smyth Memorial Prize at the University of Adelaide, and the Carina Clarke Memorial Staff Prize for Environmental Science of the University of Technology, Sydney.)

In addition to holding meetings where students can present papers and posters, ASH has also, particularly in recent years, more directly facilitated student training. At the 1999 Ross River meeting a student workshop was initiated by Scott Keogh, and such workshops have consistently been part of the meeting program since then. An improving financial state has also led to the society beginning to provide small grants-in-aid to students, including both research grants and travel grants to attend ASH meetings.

With an increasing range of herpetological research groups, ASH has also encouraged the movement of students, with



Fig. 4. Delegates at the 31st AGM of the Australian Society of Herpetologists, Springbrook, Queensland (2005) – joint meeting with the Society for Research on Amphibians and Reptiles of New Zealand (SRARNZ) and the Fijian Society of Herpetologists (FiSH) (photograph courtesy Jacquie Herbert).

recommendations that Honours students should be encouraged to do their postgraduate training with other groups (Shine 1997).

Full circle

The Society also encouraged the growth of herpetology outside of Australia. In 1986 Mike Thompson, at the time on a postdoctoral fellowship at Victoria University of Wellington from whence Barwick had come, provided a research report on herpetological research at that institution for the ASH Newsletter. Less than 12 months later, a New Zealand society was formed, the Society for Research on Amphibians and Reptiles in New Zealand (SRARNZ). For the next decade, the ASH Newsletters provided space for inclusion of a SRARNZ report in the absence of a distinct newsletter by that organisation, and in 2005, ASH hosted a joint meeting with SRARNZ (and a nascent Fijian Society of Herpetologists: FiSH) at Springwood in Queensland (Fig. 4), repaying the debt owed to New Zealand for the seeding of Australian university herpetological research with Barwick, the Stephensons and Dawbin at the time of foundation of ASH. New Zealand reciprocated by hosting a joint meeting at Massey University in 2009, and such joint meetings are likely to continue.

The growth of ASH, and of Australian herpetological research, continues. After half a century, the Society has grown to the point where its meetings are becoming difficult to maintain in their traditional informal form, becoming a victim of their own success. Parallel symposia, five-minute speed papers, and an increased emphasis on posters have been successfully

implemented to balance this, and the meetings continue to grow to the point where remote venues with sufficient accommodation are becoming difficult to find. ASH meetings may be forced to closer proximity to the cities, but hopefully the dynamic interactions among its members, through the meetings and newsletters, will continue to evolve into ever-expanding networks.

Acknowledgements

This report draws heavily on the recollections of the Society's founding convenor, Murray Littlejohn, for its description of the events of the Society's foundation. Additional information was supplied by Gus Martin, Tony Lee, Hal Heatwole, Gordon Grigg, Roger Seymour, Mike Thompson, Mike Bull, Mark Hutchinson, Paul Cooper, Patrick Couper, Simon Blomberg and Dave Chapple, all of whom are gratefully thanked for their responses to my numerous queries. However, any residual errors are mine alone!

References¹

- Adler, K. (1989). Herpetologists of the Past, Part 1. In 'Contributions to the History of Herpetology. Volume 1'. (Ed. K. Adler.) pp. 1–163. (Society for the Study of Amphibians and Reptiles: Ithaca, NY.)
- Adler, K. (2007). Herpetologists of the Past, Part 2. In 'Contributions to the History of Herpetology. Volume 2'. (Ed. K. Adler.) pp. 3–273. (Society for the Study of Amphibians and Reptiles: Saint Louis, MO.)
- Adler, K. (2012). Herpetologists of the Past, Part 3. In 'Contributions to the History of Herpetology. Volume 3'. (Ed. K. Adler.) pp. 3–386. (Society for the Study of Amphibians and Reptiles: Vancouver.)
- Agar, N. S., Board, P. G., Gruca, M. A., and Shine, R. (1977). Studies on the blood of Australian elapid snakes. II. Red cell enzymes and glycolytic intermediates. *Comparative Biochemistry and Physiology* **56B**, 357–360.

¹Note: full references to theses are provided only where these were not included in the list by Shea (1993).

- Anon., (1969). Herpetological theses and reports in Australian university libraries. *Australian Society of Herpetologists Newsletter* **10**, 14–17.
- Banks, C. B., and Martin, A. A. (1981). 'Proceedings of the Melbourne Herpetological Symposium.' (Zoological Board of Victoria: Melbourne.)
- Bannister, J., Barwick, D., Best, P., Brown, S., Cato, D., Cawthorn, M., Chittleborough, G., Gambell, R., Gill, P., Patterson, R., and Warnecke, B. (1998). William H. Dawbin 1921–1998. *Marine Mammal Science* **14**, 904–907. doi:10.1111/j.1748-7692.1998.tb00778.x
- Barwick, R. E. (1955). Studies on the scincid lizard *Leiopisma zelandica* (Grant, 1843) with notes on *Leiopisma aeneum* (Girard, 1857). M.Sc. Thesis, Victoria University of Wellington, Wellington.
- Board, P. G., Roberts, J., and Shine, R. (1977a). Studies on the blood of Australian elapid snakes. I. morphology and composition. *Comparative Biochemistry and Physiology* **56B**, 353–356.
- Board, P. G., Agar, N. S., Gruca, M., and Shine, R. (1977b). Methaemoglobin and its reduction in nucleated erythrocytes from reptiles and birds. *Comparative Biochemistry and Physiology* **57B**, 165–167.
- Bourne, G. (1934). The origin of the liquid appearing from the soft spines and the tail of the lizard *Diplodactylus spinigerus* Gray. *Journal of the Royal Society of Western Australia* **19**, 9–11.
- Bourne, G. (1935). An unusual thyroid gland in a race of lizards (*Egernia kingii*) from Eclipse Island, Western Australia. *Journal of Anatomy* **69**, 515–519.
- Bradshaw, S. D. (2011). Albert Russell ('Bert') Main 1919–2009. *Historical Records of Australian Science* **22**, 104–125. doi:10.1071/HR10013
- Bull, C. M. (1987). A population study of the viviparous Australian lizard *Trachydosaurus rugosus* (Scincidae). *Copeia* **1987**, 749–757. doi:10.2307/1445669
- Bull, C. M. (1988). Mate fidelity in an Australian lizard *Trachydosaurus rugosus*. *Behavioral Ecology and Sociobiology* **23**, 45–49. doi:10.1007/BF00303057
- Cogger, H. G. (1960). 'The Frogs of New South Wales.' (Australian Museum: Sydney.)
- Cogger, H. G. (1979a). A beautiful collection of Australian curiosities. In 'Rare and Curious Specimens. An Illustrated History of the Australian Museum 1827–1979'. (Ed. R. Strahan.) pp. 133–140. (Australian Museum: Sydney.)
- Cogger, H. G. (1979b). Type specimens of reptiles and amphibians in the Australian Museum. *Records of the Australian Museum* **32**, 163–210. doi:10.3853/j.0067-1975.32.1979.455
- Cooper, P. (2014). Evolution and adaptation: a tribute to Richard Essex Barwick. *Australian Journal of Zoology* **62**, 1–2. doi:10.1071/ZOv62n1_IN
- Copland, S. J. (1953). Recent Australian herpetology. *Proceedings of the Linnean Society of New South Wales* **78**, v–xxxvii.
- Courtice, G. P., Thompson, J. F., and van Beurden, E. (2010). Adaptation and survival of early Ph.D. students in the Paleozoic era at the University of Sydney. *Australian Zoologist* **35**, 166–182. doi:10.7882/AZ.2010.005
- Coventry, A. J., and Rawlinson, P. A. (1980). Taxonomic revision of the elapid snake genus *Drysdalia* Worrell 1961. *Memoirs of the National Museum of Victoria* **41**, 65–78.
- Dakin, W. J. (1920). Notes on the habits and reproduction of the Great Western Australian burrowing frog *Heleioporus albopunctatus*. *Australian Zoologist* **1**, 241–244.
- Davies, M., Martin, A. A., and Watson, G. F. (1983). Redefinition of the *Litoria latopalmata* species group (Anura: Hylidae). *Transactions of the Royal Society of South Australia* **107**, 87–108.
- Dawbin, W. H. I. (1965). Humpback whale studies and other papers. D.Sc. Thesis, University of Sydney.
- Dawson, W. R. (2011). George A. Bartholomew June 1, 1919 – October 2, 2006. Biographical Memoirs of the National Academy of Sciences, Washington. 34pp.
- Firth, B. T., Webb, G. J. W., and Johnson, C. R. (1972). Effect of time of day and photoperiod on heart rate in the scincid lizard, *Tiliqua scincoides*. *Comparative Biochemistry and Physiology A: Comparative Physiology* **43**, 805–808. doi:10.1016/0300-9629(72)90150-8
- Gillbank, L. (1988). The life sciences: collections to conservation. In 'The Commonwealth of Science. ANZAAS and the Scientific Enterprise in Australia 1888–1988'. (Ed. R. MacLeod.) pp. 99–129. (Oxford University Press: Melbourne.)
- Glauert, L. (1950). 'A Handbook of the Snakes of Western Australia.' 1st edn. (Western Australian Naturalists' Club: Perth.)
- Glauert, L. (1957). 'A Handbook of the Snakes of Western Australia.' Rev. edn. (Western Australian Naturalists' Club: Perth.)
- Glauert, L. (1961). 'Handbook to the Lizards of Western Australia.' (Western Australian Naturalists' Club: Perth.)
- Green, R. H. (1965). Two skink lizards newly recorded from Tasmania. *Records of the Queen Victoria Museum Launceston* **19**, 1–4. (n.s.)
- Grigg, G., Shine, R., and Ehmann, H. (1985). 'Biology of Australasian Frogs and Reptiles.' (Surrey Beatty: Sydney.)
- Harrison, L. (1927). Notes on some Western Australian frogs, with descriptions of new species. *Records of the Australian Museum* **15**, 277–288. doi:10.3853/j.0067-1975.15.1927.815
- Heatwole, H., and Seymour, R. (1975). Pulmonary and cutaneous oxygen uptake in sea snakes and a file snake. *Comparative Biochemistry and Physiology A: Comparative Physiology* **51**, 399–405. doi:10.1016/0300-9629(75)90387-4
- Heatwole, H., de Bavay, J., Webber, P., and Webb, G. (1995). Faunal survey of New England IV. The frogs. *Memoirs of the Queensland Museum* **38**, 229–249.
- Heatwole, H., de Bavay, J., and Webber, P. (2003). Faunal survey of New England V. The lizards and snakes. *Memoirs of the Queensland Museum* **49**, 299–325.
- Hickman, J. L. (1960). Observations on the skink lizard *Egernia whitii* (Lacépède). *Papers and Proceedings of the Royal Society of Tasmania* **94**, 111–118.
- Hutchinson, M. N., and Rawlinson, P. A. (1995). The water skinks (Lacertilia: *Eulamprus*) of Victoria and South Australia. *Records of the South Australian Museum* **28**, 185–207.
- Ingram, G. J. (1990). Proceedings of the Australian Bicentennial Herpetological Society. *Memoirs of the Queensland Museum* **29**, 299–540.
- Johnstone, R. E. (1990). Dr. G. M. Storr. *Western Australian Naturalist* **18**, 139–147.
- Kenneally, K. F. (1993). Consett Davis: scientist, soldier, Kimberley collector and casualty of war. *Western Australian Naturalist* **19**, 74–83.
- Kinghorn, J. R. (1956). 'The Snakes of Australia.' 2nd edn. (Angus & Robertson: Sydney.)
- Kreffit, G. (1869). 'The Snakes of Australia.' (T. Richards, Government Printer: Sydney.)
- Littlejohn, M. (1993). 40 years on: tangled threads. *Australian Society of Herpetologists Newsletter* **35**, 12–17.
- Loveridge, A. (1933). New scincid lizards of the genera *Sphenomorphus*, *Rhodona* and *Lygosoma* from Australia. *Occasional Papers of the Boston Society of Natural History* **8**, 95–100.
- Lunney, D., and Ayers, D. (1993). 'Herpetology in Australia: a Diverse Discipline.' (Royal Zoological Society of New South Wales: Sydney.)
- MacLean, G. S., Lee, A. K., and Wilson, K. J. (1973). A simple method of obtaining blood from lizards. *Copeia* **1973**, 338–339. doi:10.2307/1442973
- MacLean, G. S., Lee, A. K., and Withers, P. C. (1975). Haematological adjustments with diurnal changes in body temperature in a lizard and a mouse. *Comparative Biochemistry and Physiology A: Comparative Physiology* **51**, 241–249. doi:10.1016/0300-9629(75)90443-0

- MacLeod, R. (1988). 'The Commonwealth of Science. ANZAAS and the Scientific Enterprise in Australia 1888–1988.' (Oxford University Press: Melbourne.)
- Main, A. R. (1954). 'Key to the Frogs of South Western Australia.' (Western Australian Naturalists' Club: Perth.)
- Main, A. R. (1966). 'Frogs of Southern Western Australia.' (Western Australian Naturalists' Club: Perth.)
- Main, A. R. (1980). Horace Waring 1910–1980. *Historical Records of Australian Science* **5**, 116–121. doi:10.1071/HR9810520116
- Main, A. R. (1995). The Royal Society of Western Australia Medallist Lecture, 1995. The study of nature – a seamless tapestry. *Journal of the Royal Society of Western Australia* **78**, 91–98.
- Main, A. R. (2002). Waring, Horace (1910–1980). In 'Australian Dictionary of Biography. Volume 16 1940–1980 Pik – Z.' (Ed. J. Ritchie.) pp. 492–493. (National Centre of Biography, Australian National University: Canberra.)
- Martin, A. A., and Tyler, M. J. (1978). The introduction into Western Australia of the frog *Limnodynastes tasmaniensis*. *Australian Zoologist* **19**, 320–324.
- Martin, A. A., Tyler, M. J., and Davies, M. (1980). A new species of *Ranidella* (Anura: Leptodactylidae) from northwestern Australia. *Copeia* **1980**, 93–99. doi:10.2307/1444137
- Moore, J. A. (1946). Incipient isolating mechanisms in *Rana pipiens*. *Genetics* **31**, 304–326.
- Moore, J. A. (1949a). Geographic variation of adaptive characters in *Rana pipiens* Schreber. *Evolution* **3**, 1–24. doi:10.2307/2405448
- Moore, J. A. (1949b). Patterns of evolution in the genus *Rana*. In 'Genetics, Paleontology, and Evolution.' (Eds G. L. Jepsen, G. G. Simpson, and E. Mayr.) pp. 315–338. (Princeton University Press: Princeton.)
- Moore, J. A. (1961). The frogs of eastern New South Wales. *Bulletin of the American Museum of Natural History* **121**, 149–386.
- Nicholls, G. E. (1915a). A note on the urostyle (os coccygeum) of the Anurous Amphibia. *Proceedings of the Zoological Society of London* **1915**, 239–242.
- Nicholls, G. E. (1915b). Some notes upon the anatomy of *Rana tigrina*. *Proceedings of the Zoological Society of London* **1915**, 603–609.
- Nicholls, G. E. (1916). The structure of the vertebral column in the Anura Phaneroglossa and its importance as a basis of classification. *Proceedings of the Linnean Society* **128**, 80–92. doi:10.1111/j.1095-8312.1916.tb00038.x
- Parker, H. W. (1940). The Australasian frogs of the family Leptodactylidae. *Novitates Zoologicae* **42**, 1–106.
- Rawlinson, P. A. (1991). The taxonomy of the Australian tiger snakes (*Notechis*) and copperheads (*Austrelaps*) (Serpentes: Elapidae). *Proceedings of the Royal Society of Victoria* **103**, 125–135.
- Robinson, E. S., and Stephenson, E. M. (1967). A karyological study of cultured cells of *Limnodynastes peronii* (Anura: Leptodactylidae). *Cytologia* **32**, 200–207. doi:10.1508/cytologia.32.200
- Shea, G. M. (1993). Hidden herpetology: a list of theses in Australian universities to mid-1993. In 'Herpetology in Australia. A Diverse Discipline'. (Eds D. Lunney and D. Ayers.) pp. 1–15. (Royal Zoological Society of New South Wales: Sydney.)
- Shine, R. (1997). A simple suggestion to enhance the quality of herpetological research in Australia. *Australian Society of Herpetologists Newsletter* **38**, 67.
- Smyth, M. (1973). The distribution of three species of reptile ticks, *Aponomma hydrosauri* (Denny), *Amblyomma albolimbatum* Neumann, and *Amb. limbatum* Neumann. I. Distribution and hosts. *Australian Journal of Zoology* **21**, 91–101. doi:10.1071/ZO9730091
- Smyth, M., and Smith, M. J. (1968). Obligatory sperm storage in the skink *Hemiergis peroni*. *Science* **161**, 575–576. doi:10.1126/science.161.3841.575
- Stephenson, E. M., and Stephenson, N. G. (1970). Karyotypes of two Australian hylids. *Chromosoma* **30**, 38–50. doi:10.1007/BF00293908
- Strahan, R. (1979). Drifting 1921–1954. In 'Rare and Curious Specimens. An Illustrated History of the Australian Museum 1827–1979'. (Ed. R. Strahan.) pp. 61–74. (Australian Museum: Sydney.)
- Straughan, I. R., and Main, A. R. (1966). Speciation and polymorphism in the genus *Crinia* Tschudi (Anura: Leptodactylidae) in Queensland. *Proceedings of the Royal Society of Queensland* **78**, 11–28.
- Swain, R. (1966). Studies on the structure and function of the parietal complex in Lacertilia. Ph.D. Thesis, University of Birmingham, Birmingham.
- Taylor, E. H. (1935). Notes on a small herpetological collection from Western Australia. *Transactions of the Kansas Academy of Science* **38**, 341–344. doi:10.2307/3624857
- Tyler, M. J. (1968). Papuan hylid frogs of the genus *Hyla*. *Zoologische Verhandlungen* **96**, 1–203 + pl. 1–4.
- Tyler, M. J. (1970). Obituary: Francis John Mitchell, 1929–1970. *Transactions of the Royal Society of South Australia* **94**, 249.
- Tyler, M. J. (1972). An analysis of the lower vertebrate faunal relationships of Australia and New Guinea. In 'Bridge and Barrier: the Natural and Cultural History of Torres Strait'. (Ed. D. Walker.) pp. 231–256. (Research School of Pacific Studies, Australian National University: Canberra.)
- Tyler, M. J., Davies, M., and Martin, A. A. (1977). A new species of large green tree frog from northern Western Australia. *Transactions of the Royal Society of South Australia* **101**, 133–138.
- Tyler, M. J., Davies, M., and Martin, A. A. (1981). New and rediscovered species of frogs from the Derby–Broome area of Western Australia. *Records of the Western Australian Museum* **9**, 147–172.
- Tyler, M. J., Davies, M., and Martin, A. A. (1983). The frog fauna of the Barkly Tableland, Northern Territory. *Transactions of the Royal Society of South Australia* **107**, 237–242.
- Tyler, M. J., Davies, M., and Watson, G. F. (1987). Frogs of the Gibb River Road, Kimberley Division, Western Australia. *Records of the Western Australian Museum* **13**, 541–552.
- Waring, H. (1936). A preliminary study of the melanophore-expanding potency of the pituitary gland in the frog and dogfish. *Transactions of the Liverpool Biological Society* **49**, 65–90.
- Waring, H. (1953). George Edward Nicholls. *Australian Journal of Science* **16**, 56–57.
- Waring, H. (1963). 'Colour Change Mechanisms of Cold-blooded Vertebrates.' (Academic Press: London.)
- Waring, H., and Landgrebe, F. W. (1941). On chromatic effector speed in *Xenopus* and *Anguilla* and the level of melanophore expanding hormone in eel blood. *The Journal of Experimental Biology* **18**, 80–97.
- Waring, H., Landgrebe, F. W., and Neill, R. M. (1941). Ovulation and oviposition in Anura. *The Journal of Experimental Biology* **18**, 11–25.
- Warren, J. W. (1963). Growth zones in the skeleton of recent and fossil vertebrates. Ph.D. Thesis, University of California at Los Angeles.
- Warren, J. W., and Proske, U. (1968). Infrared receptors in the facial pits of the Australian python *Morelia spilota*. *Science* **159**, 439–441. doi:10.1126/science.159.3813.439
- Webb, G. J. W., Johnson, C. R., and Firth, B. T. (1972). Head–body temperature differences in lizards. *Physiological Zoology* **45**, 130–142.
- Worrell, E. (1963). 'Reptiles of Australia.' 1st edn. (Angus and Robertson: Sydney.)
- Worrell, E. (1964). 'Reptiles of Australia.' Reprint with additions and revisions. (Angus and Robertson: Sydney.)

Handling Editor: Paul Cooper