

TAXONOMY AND DISTRIBUTION OF THE AUSTRALIAN TIGER SNAKES (*NOTECHIS*) AND COPPERHEADS (*AUSTRELAPS*) (SERPENTES, ELAPIDAE)

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RAWLINSON, P. A., 1991:12:31. The taxonomy of the Australian tiger snakes (*Notechis*) and copperheads (*Austrelaps*) (Serpentes, Elapidae). *Proceedings of the Royal Society of Victoria* 103 (2): 125–135. ISSN 0035-9211.

The taxonomic histories of species of the Australian snake genera *Notechis* and *Austrelaps* are reviewed. A lectotype is selected for *Hoplocephalus superbus* Günther, 1858 (type species of *Austrelaps*) and neotypes are proposed for the following species: *Alecto fasciolatus* Jan & Sordelli, 1873; *Alecto labialis* Jan, 1859; *Hoplocephalus fuscus* Steindachner, 1867; *Hoplocephalus ramsayi* Krefft, 1864; and *Naja (Hamadryas) scutata* Peters, 1861 (type species of *Notechis*). *Hoplocephalus bransbyi* Macleay, 1878 is a junior objective synonym of *H. ramsayi*. *Hoplocephalus fuscus* and *Alecto fasciolatus* are objective synonyms of each other and junior subjective synonyms of *Hoplocephalus ater*. *Austrelaps labialis* and *Austrelaps ramsayi* are formally removed from the synonymy of *Austrelaps superbus* and given full specific status.

THE SYSTEMATICS of Australian reptiles were poorly understood until recent times. A number of historical problems had contributed to this situation, often including many of the following: (1) type specimens lost or not allocated; (2) type specimens inaccurately or inadequately described; (3) type localities not given, too general or inaccurate; (4) early synonyms overlooked or more recent synonyms not quoted; (5) insufficient attention given to the variability of a species over its whole range; (6) lack of accurate data on morphology and biology, many authors simply repeating earlier accounts; and (7) generic changes of species without re-examination of type specimens.

The publication by Cogger et al. (1983) of a comprehensive catalogue of the Australian herpetofauna rectified many taxonomic errors and clarified the status of most taxa, but several nomenclatural problems remained unresolved. The present paper deals with two such problem taxa, the Australian tiger snakes (*Notechis* spp.) and copperheads (*Austrelaps* spp.).

Abbreviated prefixes of specimen numbers cited herein refer to the following institutions: Australian Museum, Sydney (AM); Natural History Museum, London (BMNH); Museum of Victoria, Melbourne (NMV); South Australian Museum, Adelaide (SAM); Zoologisches Museum, Museum für Naturkunde der Humboldt Universität zu Berlin (ZMB); Zoologisches Museum, Universität Hamburg (ZMH)

SYSTEMATICS

Austrelaps Worrell, 1963a

Type species. *Hoplocephalus superbus* Günther, 1858.

Remarks. *Austrelaps* was established for the two species *Hoplocephalus superbus* and *Alecto signata* Jan, 1859, but the latter is now assigned to *Hemiaspis* Fitzinger, 1860 (Cogger et al. 1983). The species *superbus* (first as *Denisonia superba* and later as *Austrelaps superbus*) has been recognised by all authors since Boulenger (1896), but Rawlinson (1969, 1971) stated that forms assigned to the species include two distinct morphological groups differing in distribution and ecology. These groups were referred to as the lowlands and highlands forms. A third group from the Mount Lofty Ranges and Kangaroo Island, South Australia, originally regarded by Rawlinson (1969) as an isolate of the highlands form, was recognised by Sutherland (1983) as the Adelaide Hills or pigmy copperhead. This group is referred to herein as the dwarf form. Shine (1987a) stated that the lowlands, highlands and dwarf forms correspond respectively to *A. superbus*, *A. ramsayi* (Krefft, 1864) and *A. labialis* (Jan, 1859). This view has been confirmed in the present study by examination of existing types and reference to original descriptions and illustrations.

Austrelaps superbis and *A. ramsayi* occupy similar habitats in southeastern Australia but *A. ramsayi* is restricted to higher altitudes and more northerly areas (Fig. 1). The distributions of the two species interdigitate and abut in eastern Victoria, particularly in the area south and

west of the Baw Baw Plateau, but the species have not been collected syntopically. *Austrelaps labialis* is known only from two disjunct areas, Kangaroo Island where it is widespread, and the Adelaide Hills roughly within the 1000 mm isohyet.

Key to species of *Austrelaps*

1. Supralabials boldly marked, anteroventral quarter cream, remainder dark brown, the two colours meeting at a sharp diagonal demarcation; lower anterior temporal usually in point contact with or failing to contact lower postocular 2
- Supralabials with weakly defined, narrow whitish anterior margins; lower anterior temporal usually in broad contact with lower postocular; ventrals 143–164 *Austrelaps superbis*
2. Ventrals 150 or more; eastern Victoria to New England region of New South Wales *Austrelaps ramsayi*
- Ventrals 148 or fewer; Kangaroo Island and high rainfall areas in the Mt Lofty Ranges, South Australia *Austrelaps labialis*

Austrelaps superbis (Günther, 1858)

Alecto curta.—Duméril et al. 1854: 1252–1254 (in part; non *Naja curta* Schlegel, 1837).

Hoplocephalus superbis Günther 1858: 181.

Alecto schmidtii Jan & Sordelli 1873: liv. 44, pl 1, fig. 4.

Denisonia superba.—Boulenger 1896: 353 (in part).

Austrelaps superbis.—Worrell 1963: 3 (in part).—Sutherland 1983: 50–52.—Cogger et al. 1983: 218 (in part).

Notechis superbis.—Storr 1982: 235 (in part).

Remarks. Günther (1858) described *Hoplocephalus superbis* on the basis of 15 specimens in the Natural History Museum, London. Six of these were later used by Günther (1863) to erect a new species, *Hoplocephalus minor*, subsequently referred to the new genus *Elapognathus* by Boulenger (1896); one of these six specimens was apparently exchanged to the Zoologisches Museum in Berlin (ZMB 4298) and is presumed lost. The remaining nine syntypes of *H. superbis* have been examined by the author (see Appendix 1) and all are referable to the lowlands form of *superbis*, to which form the species name is here restricted. Several of the syntypes are in poor condition, being soft and with peeling epidermis or damage to the head. The best preserved, BMNH 1946.1.20.37, from "Tasmania" (R. Gunn), is hereby designated the lectotype of *H. superbis*.

Alecto schmidtii Jan & Sordelli (1873, liv. 44, pl. 1, fig. 4) is in colour pattern and proportions a specimen of *Austrelaps superbis* as that species is recognised here. The holotype (ZMH 478),

which has been examined by the author, is in poor condition and bleached, and locality information accompanying it is limited to "1877 Australia".

Austrelaps labialis (Jan, 1859)

Alecto labialis Jan 1859a: 128.

Denisonia superba.—Boulenger 1896: 353 (in part).

Austrelaps superbis.—Cogger et al. 1983: 218 (in part).

Austrelaps labialis.—Shine 1987a: 22.

Remarks. The history of the name *Alecto labialis* has been discussed in part by Coventry & Rawlinson (1980). The species was stated by Jan (1863) to be based on a specimen from New Holland in the Zoologisches Museum at Göttingen, but unsuccessful searches of the collections there by the author and by others suggest that the holotype is lost. No illustration accompanied the initial description (Jan 1859a) but a reprint issued as a separate in the same year (Jan 1859b) included plates with illustrations of the type. Confusion arose when Jan & Sordelli (1873, liv. 44, pl. 1, fig. 1) depicted as *A. labialis* a specimen of a species now known as *Drysdalia coronoides* (Günther, 1858) (see Coventry & Rawlinson 1980).

The illustrations of *A. labialis* given by Jan (1859b) clearly show the boldly diagonally barred labials (described as "half yellow, half black"; see Appendix 2) and the lower anterior temporal well separated from the lower postocu-

lar, both features characteristic of the highlands and dwarf forms of the copperhead but not of the lowlands form. The dwarf form is shorter-bodied than the highlands form, having 135–148 ventrals (mean 141, $n = 30$; one specimen with 157), whereas the highlands form has ventral counts of 150–160 (mean 156.8, $n = 30$). The ventral count of 136 reported by Jan (1859) for *A. labialis* could therefore apply only to the dwarf form. Thus, in the absence of any other available name, the correct name for the dwarf form is *Austrelaps labialis* (Jan, 1859).

In order to stabilise the name, specimen SAM

R26414, a female, from Islet 477, Pelican Lagoon, Kangaroo Island, South Australia, is here designated as neotype. The neotype has the following taxonomically significant features. Midbody scale rows 15. Ventrals 139. Anal single. Subcaudals 43, entire, excepting the last three which are divided. Lower anterior temporal well separated from lower of two postoculars on each side. Supralabials 6/6. Colour very dark brown dorsally, the lateralmost scales grey-white with a dark trailing edge, the size and contrast of the pale area decreasing posteriorly and becoming uniformly dark by midbody. Venter

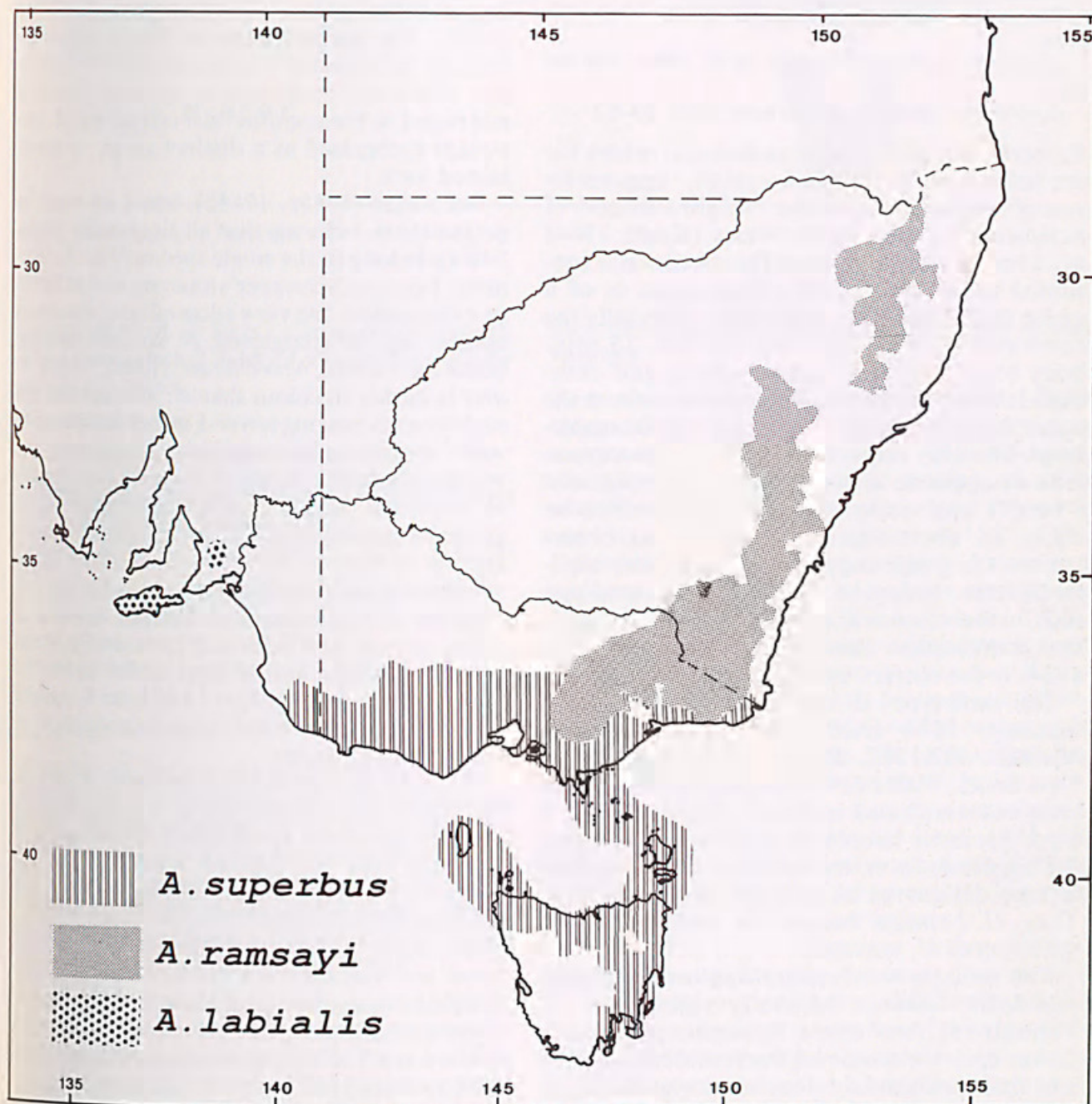


Fig. 1. Distribution of *Austrelaps*.

dark smoky grey, little differentiated from dorsal colour. Chin shields and infralabials cream mottled with medium grey. Rostral, nasals, prefrontals, preocular, lower anterior temporal and supralabial dark brown with a white anterior margin. Most supralabials have the pale colour extending posteroventrally, forming pale triangles. Snout-vent length 450 mm. Tail 104 mm.

***Austrelaps ramsayi* (Krefft, 1864)**

Hoplocephalus ramsayi Krefft 1864: 180.

Hoplocephalus bransbyi Macleay 1878: 52.

Denisonia superba.—Boulenger 1896: 353 (in part).

Austrelaps superbus.—Cogger et al. 1983: 218 (in part).

Austrelaps ramsayi.—Sutherland 1983: 50–52.

Remarks. Searches by the author and others for the holotype of *H. ramsayi*, a small, “apparently young” specimen from the “neighbourhood of Braidwood”, New South Wales (Krefft 1864) have been unsuccessful and the specimen is presumed to be lost. Krefft’s description is of a snake that in scalation and colour, especially the combination of a dark vertebral line, 15 mid-body scale rows and “upper labials and chin-shields whitish, marked with olive-brown in the upper corners”, could only be a juvenile copperhead. The only respect in which the description fails to apply to a copperhead is the divided (“bifid”) anal scale; this is considered to be either an aberration or an erroneous observation. Only one copperhead taxon, the highlands form, occurs in the Braidwood area and thus, in the absence of an earlier available name, the combination *Austrelaps ramsayi* (Krefft, 1864) is the correct name for this taxon.

The holotype of *Hoplocephalus bransbyi* Macleay, 1878 (AM R31922; ex Macleay Museum MR1362, R541), from Moss Vale, New South Wales (34° 33' S, 150° 23' E), has been examined and is also a typical highlands form specimen. In order to stabilise the name for the highlands form, the holotype of *H. bransbyi* is here designated as neotype of *H. ramsayi*. Thus, *H. bransbyi* becomes a junior objective synonym of *H. ramsayi*.

The neotype has the following taxonomically significant features: Midbody scale rows 15. Ventrals 151. Anal entire. Subcaudals 46, single. Lower anterior temporal inserted between fifth and sixth supralabials; not in contact with lower of two postoculars. Supralabials 6/6. Colour faded. Light brown dorsally. Narrow dark band

on neck, bordered posteriorly by a light band. Some dark “lines” along neck. Ventral surfaces light brown; anterior half of each ventral and subcaudal scale dark brown. Supralabials and lower anterior temporal dark brown with a sharply demarcated, triangular whitish antero-ventral corner. Snout-vent length 340 mm. Tail 72 mm.

***Notechis* Boulenger, 1896**

Type species. *Naja* (*Hamadryas*) *scutata* Peters, 1861.

Remarks. *Notechis* is closely related to *Austrelaps* and these genera were synonymised by Storr (1982). For several reasons, Storr’s expanded concept of *Notechis* is unsatisfactory (Hutchinson 1990) and traditional usage, with *Notechis* restricted to the *scutatus*–*ater* complex and *Austrelaps* recognised as a distinct genus, is maintained here.

Schwaner (1985a, 1985b), based on work in preparation, believes that all tiger snake populations belong to the single species *Notechis scutatus*. Pending Schwaner’s analysis, and to facilitate discussion, the view adopted here is that two species can be recognised, *N. scutatus* and the black tiger snake, *Notechis ater* (Krefft, 1866). *N. ater* is darker in colour than *N. scutatus* and has scale counts ranging lower. Further comparative work including biochemical analysis over the whole geographic range of *Notechis* is necessary to establish whether sufficient genetic divergence has occurred in the various disjunct populations to warrant the recognition of any of the subspecies listed in this paper. Also, the specific ranking of *N. ater* must be checked as Mitchell (pers. comm.) and Schwaner (pers. comm.) both report intermediacy of tiger snakes from the mouth of the Murray River and from Kangaroo Island, suggesting either local hybridisation or clinal intergradation.

Notechis is restricted to temperate Australia, the distribution shown in Fig. 2 being based on locality data from specimens in the Museum of Victoria and on selected references. In the author’s view, the present disjunct populations of *Notechis* originated from two parent populations. Since the last glacial period, the rise in sea level and the southern climatic shift has fragmented the southern and western population (*N. ater*) and allowed the northeastern population (*N. scutatus*) to migrate southwards and expand into southeastern Australia. Distributions for *N. scutatus* provided by Worrell (1963c) and Cogger (1986: 446) showed the species extending

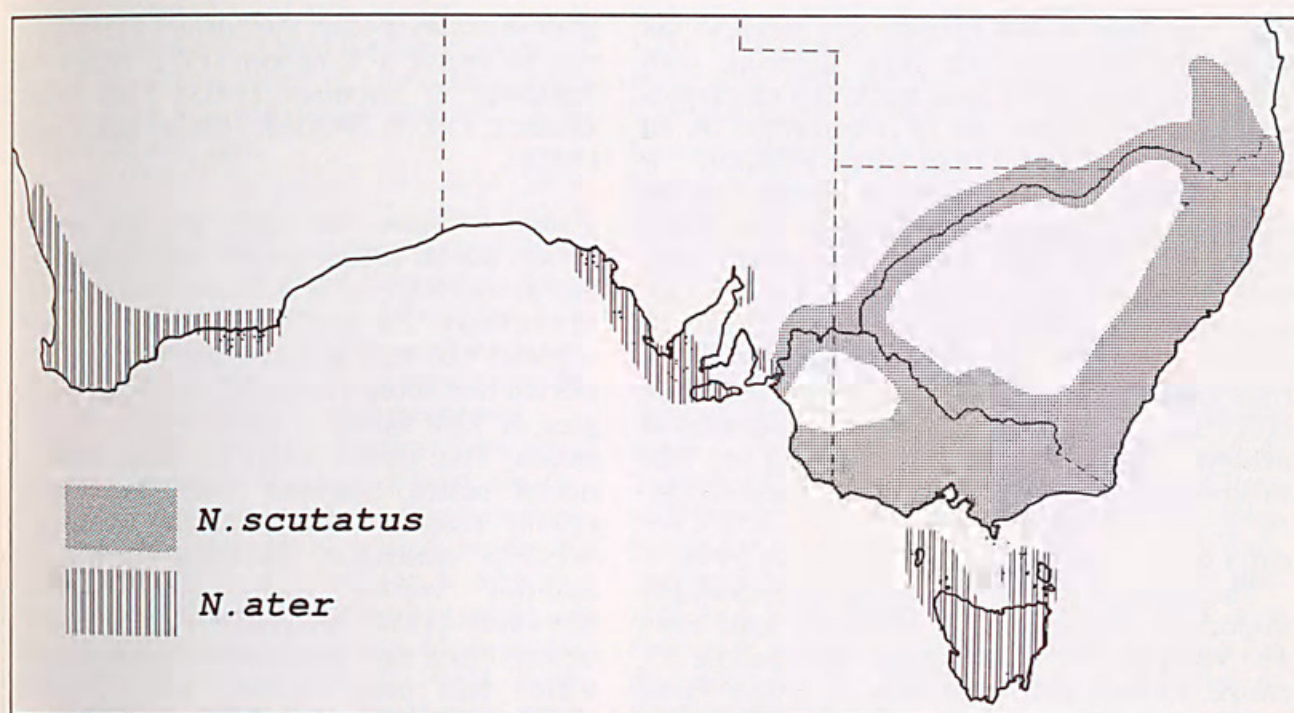


Fig. 2. Distribution of *Notechis*.

farther into the drier interior areas of New South Wales but excluded most of the Darling River and its tributaries.

Notechis scutatus (Peters, 1861)

Alecto curta.—Duméril et al. 1854: 1252–1254 (in part; non *Naja curta* Schlegel, 1837).

Hoplocephalus curtus.—Günther 1858: 216 (in part).

Naja (*Hamadryas*) *scutata* Peters 1861: 690.

Notechis scutatus.—Boulenger 1896: 351 (in part).—Rawlinson 1969: 122.

Notechis scutatus [*scutatus*].—Kinghorn 1956: 141–142.

Specimens examined. 67.

Scalation. Scales around midbody 17 (11), 19 (55), 21 (1). Ventral scales 158–185. Anal scale entire. Subcaudal scales 36–61, all single. The head and chin shields are similar to those of *N. ater* and there appear to be no consistent differences. As in *N. ater*, the head shields are subject to intraspecific variation. Figures can be found in Waite (1929) and Rawlinson (1965).

Colour. Very variable, green, grey-green or brown dorsal scales traversed by roughly 30 mm wide lighter or darker crossbands. There is also a morph with light brown dorsal scales and no crossbands (Rawlinson 1965, Worrell 1963d). Ventral scales lighter green, grey or brown,

sometimes yellow. Subcaudals the same as the ventrals.

Remarks. Peters (1861) described *Naja* (*Hamadryas*) *scutata* from a single specimen supposedly collected in Java. The holotype, ZMB 2815, cannot be located despite extensive searches by the author and others, and the specimen is presumed lost (Cogger et al. 1983: 229). Peters' description (see Appendix 2) does not apply to any Javanese or even Asian elapid (van Hoesel 1959, Tweedie 1983, Welch 1988), which do not have the lower anterior temporal penetrating deeply between the last two supralabials, and most of which have seven supralabials (six in *Calliophis melanurus*) and at least some subcaudals divided. *Bungarus* Daudin, 1803, the only Asian genus generally lacking divided subcaudals, has only a single anterior temporal (Smith 1943). *Calliophis* Gray, 1835 and *Maticora* Gray, 1835 are also ruled out by their midbody scale count of 15 or fewer. The type locality of Java is therefore in error.

Among the proteroglyphous snakes, Peters' description uniquely fits the Australian elapids in the deeply wedged lower anterior temporal (characteristic of the Australian elapids according to McDowell 1970) combined with entire anal and subcaudal scales. Only the tiger snakes combine these two features, plus 17 midbody scale rows and a transversely banded colour pat-

tern. The tiger snake maxilla has three to six tooth loci following the fang, agreeing with Peters' description of four teeth; the gap separating the last tooth can be interpreted as an empty alveolus rather than a true absence.

As Peters' description of the colour fits the tiger snakes of southern Queensland, New South Wales, Victoria and southeastern South Australia, it seems reasonable, and in view of the species' medical importance, highly desirable, to continue to apply the name *N. scutatus* to the tiger snakes of this area. Accordingly, specimen NMV D47618, a male, is hereby designated as neotype. The specimen was collected at "The Brothers", 10 km NE of Benambra, Victoria (36° 56' S, 147° 45' E) by P. A. Rawlinson, A. J. Coventry and P. B. Mather on 27 January 1976.

The neotype has the following taxonomically important characteristics. Midbody scale rows 19. Ventrals 172. Anal single. Subcaudals 57, entire. Frontal almost as wide as broad. Head uniform olive brown above. Neck and forebody olive brown with indistinct darker brown cross bands, more noticeable laterally than dorsally. Dark bands about 3 scales wide, the lighter interspaces about 2 scales wide. Posterior to this, the dark colour becomes predominant, and the lighter colour is confined to the edges of the scales of the interspaces of the banded pattern. Lower labials, throat and belly bright yellow, darkening to olive yellow posteriorly and to pale olive subcaudally. Snout-vent length 846 mm, tail 172 mm.

Notechis ater (Krefft, 1866)

Hoplocephalus ater Krefft 1866: 373.

Hoplocephalus fuscus Steindachner 1867: 82.

Alecto fasciolata Jan & Sordelli 1873: liv. 43, pl. 6, fig. 4.

Notechis scutatus.—Boulenger 1896: 351 (in part).

Notechis ater.—Kinghorn 1921: 143.—Rawlinson 1967: 215.—Cogger et al. 1983: 229.

Notechis scutatus niger Kinghorn 1921: 145.

Notechis scutatus ater.—Kellaway & Thomson 1932: 35–48.

Notechis scutatus occidentalis Glauert 1948: 139.—Storr 1982: 235.

Notechis ater ater.—Worrell 1963b: 130.

Notechis ater serventyi Worrell 1963c: 3.

Notechis ater humphreysi Worrell 1963c: 5.

Specimens examined. 74.

Scalation. Scales around midbody 15 (5), 17 (58), 19 (10), 21 (1). Ventral scales 135–184. Anal scale entire. Subcaudal scales 31–59, all single. The head shield is very similar to that of *N. scutatus* but intraspecific variation seems

greater in this species. Supralabials 6 (5). Figures can be found in Kinghorn (1921, 1929, 1956) Kellaway & Thomson (1932), Tubb (1938), Glauert (1957) Worrell (1963c) and Cogger (1986).

Colour. Variable, jet black, slate grey or dark brown dorsal scales, usually with lighter crossbands which are more visible on the anterior half of the body. The bands are narrower than in *N. scutatus* (20 mm or less). Sharland (1962) reported that some Tasmanian specimens are ash grey or light sandy in colour with no trace of bands. The ventral scales are lighter than the dorsal scales. Sharland (1962) and Glauert (1948) recorded that some Tasmanian and Western Australian specimens have yellow anterior ventral scales and crossbands. Schwaner (1984) has commented on reddish-bellied black tiger snakes from Kangaroo Island which had been confused with *Pseudechis porphyriacus* (Shaw, 1794). Subcaudals are usually darker than the ventrals.

Remarks. *Hoplocephalus ater*, described by Krefft (1866) on the basis of a single specimen (AM 6577) from the Flinders Ranges, South Australia, was placed in synonymy with *Notechis scutatus* by Boulenger (1896). Kinghorn (1921) reinstated Krefft's species, placing it in *Notechis* and redescribing the type specimen as the original description was inaccurate. Kinghorn also described a single specimen from Kangaroo Island, South Australia as a new subspecies, *Notechis scutatus niger*, which resembled *N. ater* but was distinguished by the presence of six instead of five supralabials. Kinghorn noted that in coloration and form, the new subspecies most closely resembled Tasmanian tiger snakes. Kellaway & Thomson (1932) identified a series of 49 snakes from Chappell Island in the Furneaux Group, Bass Strait as *N. scutatus niger*, describing and illustrating the variations in head and chin shields and supralabials, and stating that the variation overlapped Kinghorn's descriptions of *N. scutatus niger* and *N. ater*. They therefore reduced *N. ater* to subspecific ranking as *N. scutatus ater*.

Worrell (1963b) reported the discovery of three new specimens of *N. ater* in the Flinders Ranges, stating that, as all had six supralabials, the type was aberrant. He referred to this taxon as *N. ater ater* and listed Kinghorn's *N. scutatus niger* as a subspecies of *ater*. As Kinghorn's separation of *niger* from *ater* on the number of supralabials is invalid, and as Kellaway &

Thomson (1932) showed that variations in a single population overlapped the descriptions of *ater* and *niger*, there seems to be no reason for retaining *niger* as a subspecies and it is here synonymised with *ater*.

Worrell (1963c) described two new subspecies, *N. ater serventyi* from Chappell Island and *N. ater humphreysi* from New Year Island, both in Bass Strait. As these subspecies were based on venom and ecological differences, and as the comparative aspects of the work were not sufficiently comprehensive, there appears to be no reason for the retention of these names.

Glauert (1948) named the southwestern tiger snakes *N. scutatus occidentalis*, basing his description on 40 specimens in the Western Australian Museum, Perth. He compared these with Kinghorn's (1929) scale counts for *N. scutatus scutatus*, assuming these figures to be typical for southeastern Australian specimens. More recent work (Mitchell 1951, Rawlinson 1965), however, has demonstrated that Kinghorn's scale counts were inaccurate, probably being based on Boulenger's (1896) figures for *Brachyaspis curta*. Kinghorn (1956), apparently realising his error, deleted these scale counts from the second edition of his book but provided no alternatives; he also mentioned *N. scutatus occidentalis*, apparently not recognising it. Thus, although Glauert provided a valuable list of scale counts for southern Western Australian tiger snakes, he did not have accurate data on eastern populations for comparison. As Glauert's colour description and scale counts overlap descriptions of eastern populations referred to *N. ater*, this name has been applied to the Western Australian populations by Rawlinson (1974), though Storr et al. (1986) continued to use the combination *N. scutatus occidentalis*.

Two other names, *Hoplocephalus fuscus* Steindachner, 1867 and *Alecto fasciolata* Jan & Sordelli, 1873, have been included by Cogger et al. (1983) in the synonymy of *Notechis scutatus*. Despite searches by the author and others in European collections used by Steindachner and Jan & Sordelli, the type specimens of neither species can be located (Cogger et al. 1983) and are therefore presumed lost.

Most of Steindachner's description of *H. fuscus* (Appendix 2), especially the "vertical" (= frontal) shield that is almost as wide as long and the banded pattern, clearly indicates a tiger snake. All three type specimens, however, were said to have only 15 midbody scale rows, a statistically most unlikely result for mainland tiger snakes. One or both of the larger (unbanded)

specimens could have been copperheads, which have 15 midbody scale rows. However, 15 midbody scale rows are also found in a minority of Tasmanian tiger snakes which are frequently unbanded, and the ventral count given (ca 177) is higher than that recorded in any copperhead population but within the normal range for tiger snakes. It is therefore considered that *Hoplocephalus fuscus* Steindachner, 1867 is a junior subjective synonym of *Hoplocephalus ater*.

The name *Alecto fasciolata* first appeared as a *nomen nudum* in a list in Jan (1863), where the only identifying character noted was a midbody scale count of 17. The illustration in Jan & Sordelli (1873, liv. 43, pl. 6, fig. 4) shows a very well-banded tiger snake in which the pale cross-bands are markedly narrower than the very dark interspaces. Such a combination of colour pattern and scale count is more typical of *N. ater* than of *N. scutatus*. Therefore *Alecto fasciolata* is also regarded as a junior subjective synonym of *Hoplocephalus ater*.

In order to stabilise the status of *Hoplocephalus fuscus* and *Alecto fasciolata*, specimen SAM R14373, a male, from Diprose Lake, Tasmania (41°49'S, 147°22'E), collected by H. Ehmann in February 1973, is here designated neotype of both species. The neotype has the following taxonomically important characteristics. Midbody scale rows 17. Ventrals 173. Anal single. Subcaudals 53, entire (hemipenis reaches to fourteenth subcaudal). Frontal truncate anteriorly, about as wide as long. Head uniform dark brown above. Neck and forebody similar to head in base colour but with indistinct, narrow (about half a scale wide), pale cross-bands becoming more pronounced and broader (to one and a half scales wide) laterally. Dark interspaces about two to three scales wide. Banding disappears dorsally about mid-body and last traces of lateral bands disappear by the last third of the body. Lower labials, throat, and chin olive grey. Anterior ventrals dull yellow with irregular black edgings posteriorly and laterally. Ventral colour darkening to olive grey with less distinct dark edges by mid body, and to dark grey on the posterior belly and subcaudals. Snout-vent length 962 mm, tail 177 mm.

ACKNOWLEDGMENTS

The author thanks Dr H. G. Cogger and Mr R. Sadlier (Australian Museum, Sydney), Mr A. J. Coventry (Museum of Victoria, Melbourne), Mr R. Green (Queen Victoria Museum, Launceston), the late F. J. Mitchell, Dr T. D. Schwaner

and Dr M. N. Hutchinson (South Australian Museum, Adelaide), and Mr B. C. Mollison (Inland Fisheries Commission, Hobart) for the loan of specimens and for discussions resulting in this paper. Staff of the European museums visited in 1973-4 are also thanked for their hospitality and assistance. The receipt of a Commonwealth Postgraduate Research Award during the early stages of data gathering is gratefully acknowledged. This paper was compiled by A. J. Coventry and M. N. Hutchinson from Peter Rawlinson's unpublished notes and manuscripts; Mar-
 nie and Kate Rawlinson assisted in assembling the material.

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APPENDIX 1

Notes on the syntypes of *Hoplocephalus superbus*.

BMNH 1946.1.20.37. (Boulenger's specimen e; lectotype herein). Label on jar stating "1946.1.20.37–38, *Denisonia superba* (Types) Tasmania R. Gunn". Snout–vent length (SVL) 594 mm; tail length (T) 131 mm; midbody scale rows (MSR) 15; ventrals (V) 143; subcaudals (SC) 46, all single; anal scale (A) 1; upper labials (UL) 6 (3 and 4 suborbital); lower labials (LL) 7. Frontal 7 mm long by 3.8 mm wide. Rostral 4.5 mm wide by 4.0 mm high, in contact with first upper labial, nasal and internasal scales. Preocular single, in contact with third and fourth upper labials, nasal, prefrontal and supraocular scales. Postoculars 2, in contact with supraocular, parietal, upper anterior temporal, and fourth and fifth upper labials. Temporals 2 + 2. Upper lip colouration typical of *A. superbus* (s.s.), without [contrasting] dark patches. Specimen in reasonable condition, with some soft patches and peeling epidermis.

The remaining specimens conform to this description except where noted.

BMNH 1946.1.20.40. (Boulenger's specimen a). Label on jar stating "*Denisonia superba* (Type) Australasia 'Erebus & Terror' Expedition". SVL 848 mm; T 159 mm; MSR 15; V 153; SC 48, all single; A 1; UL 6 (3 and 4 suborbital); LL 7. [Nasal–preocular contact?]. Postoculars 2, in contact with upper[?] anterior temporal. Temporals 2 + 2. Upper lip colouration typical of *A. superbus* (s.s.). Specimen in poor condition, being soft and with scales peeling. (Note by AJC and MNH. The author's notes on the type series are very specific in all cases excepting this specimen where they state "Postoculars = 2; supraocular; parietal; temporal; 4 + 5 labial". We interpret this to mean that the lower postocular contacts only the upper anterior temporal. The presence or absence of a nasal–preocular contact is not explicitly stated.)

BMNH 1946.1.20.42. (Boulenger's specimen b). Label on jar stating "*Denisonia superba* (Type) Australasia 'Erebus & Terror' Expedition". SVL 582 mm; T 123 mm; MSR 15; V 150; SC 45, all single; A 1; UL 6 (3 and 4 suborbital); LL 7. Postoculars 2, in contact with both anterior temporals. Temporals 2 + 2. Upper lip colouration typical of *A. superbus* (s.s.). Specimen in poor condition, being soft and with head damage.

BMNH 1946.1.19.6. (Boulenger's specimen c). Label on jar stating "*Denisonia superba* (Type) Australasia

'Erebus & Terror' Expedition". SVL 677 mm; T 133 mm; MSR 15; V 148; SC 45 all single; A 1; UL 6 (3 and 4 suborbital); LL 6. Postoculars 2, in contact with both anterior temporals. Temporals 2 + 2. Upper lip colouration typical of *A. superbus* (s.s.). Specimen in poor condition, epidermis peeling, and with head damage.

BMNH 1946.1.19.5. (Boulenger's specimen d). Label on jar stating "*Denisonia superba* (Type) Tasmania A. J. Smith". SVL 552 mm; T 108; MSR 15; V 148; SC 41 all single; A 1; UL 6 (3 and 4 suborbital); LL 7. Postoculars 2, in contact with both anterior temporals. Temporals 2 + 2. Upper lip colouration typical of *A. superbus* (s.s.). Specimen in poor condition, epidermis peeling badly.

BMNH 1946.1.20.38. (Boulenger's specimen f). Label on jar stating "1946.1.20.37-38, *Denisonia superba* (Types) Tasmania R. Gunn". SVL 425 mm; T 99 mm; MSR 15; V 150; SC 46 all single; A 1; UL 6 (3 and 4 suborbital); LL 6. Postoculars 2, in contact with both anterior temporals. Temporals 2 + 2. Upper lip colouration typical of *A. superbus* (s.s.).

BMNH 1946.1.20.34. (Boulenger's specimen h). Label on jar stating "1946.1.20.34-36, *Denisonia superba* (Types) Australia". SVL 644 mm; T 140 mm; MSR 15; V 151; SC 49 all single; A 1; UL 6 (3 and 4 suborbital); LL 6. Postoculars 2, in contact with upper anterior temporal. Temporals 2 + 2. Upper lip colouration typical of *A. superbus* (s.s.). Specimen in reasonable condition, with some soft patches and peeling epidermis.

BMNH 1946.1.20.35. (Boulenger's specimen g). Label on jar stating "1946.1.20.34-36, *Denisonia superba* (Types) Australia". SVL 672 mm; T 140 mm; MSR 15; V 149; SC 47 all single; A 1; UL 6 (3 & 4 suborbital); LL 7. Postoculars 2, in contact with upper anterior temporal and with fourth and fifth upper labials. Temporals 2 + 3. Upper lip colouration typical of *A. superbus* (s.s.). Specimen in reasonable condition, with some soft patches and peeling epidermis.

BMNH 1946.1.20.36. (Boulenger's specimen i). Label on jar stating "1946.1.20.34-36, *Denisonia superba* (Types) Australia". SVL 154 mm; T 29 mm; MSR 15; V 150; SC 43 all single; A 1; UL 6 (3 and 4 suborbital); LL 7. Postoculars 2, in contact with both anterior temporals. Temporals 2 + 2. Upper lip colouration with dark patches typical of juvenile *A. superbus* (s.s.). Specimen in good condition, with some soft patches.

APPENDIX 2

Original descriptions of species for which original type specimens no longer exist.

Alecto labialis, from Jan 1859b: 21.

"This snake, with a steel-coloured body, is distinguished from its congeners by the labials, half yellow, half black; the lower part of the head [sic, read 'body'] is very dark coloured, except for the head

which is also variegated with yellow and black; tip of tail white; 15 scale rows; after the cloaca, 11. Ventrals, 136; anal single; [sub]caudals entire, 42; total length, 55"; tail 9". [Translated from French.]

Naja (Hamadryas) scutata, from Peters 1961: 690.

"One anterior preorbital shield much higher than long, 2 postorbitals. Only 6 supralabial shields, the 3rd and 4th abutting the eye; the first lower temporal shield is the same size as a supralabial and extends ventrally between the last two. Scale rows just behind the head 16, at the middle of the body 17. All subcaudals entire. Above olive-coloured, with light, distinct transverse bands on the second half of the body. Underside light greenish yellow, the belly and subcaudal scales with blackish bases. Ventral shields 173, the last (anal) entire, subcaudals 45. Behind the fang the upper jaw bears four solid, grooved teeth, which increase in size from first to last and on each side the first three follow closely after one another, [while] the last (fourth) is separated from them by a larger gap. - Total length 1.30 m; head 0.046 m; tail 0.168 m. - Java." [Translated from German.]

Hoplocephalus ramsayi, from Krefft 1864: 180.

"Scales in 15 rows. Anal bifid. Ventrals 164. Subcaudals 51. Total length 10½'; tail 2'. Body rather elongate and rounded; head scarcely distinct from neck, rather high and elongate, with obtuse muzzle; rostral just reaching to the surface of crown; anterior frontals moderate, rounded in front; posterior ones larger, bent down on the sides; one anterior, two posterior oculars, the lower forming about one-fourth of the orbit; vertical narrow, six-sided, much longer than broad; superciliaries nearly the same size as the vertical; occipitals moderate, not forked behind; six upper labials, the third and fourth forming the lower part of the orbit; no loreal, replaced by the elongate nasal, second and third upper labial, anterior ocular and bent down anterior frontal. One nasal, pierced by the nostril; scales moderate, rhomboid, in fifteen rows; tail rather short, scarcely distinct from trunk, tapering; eye moderate, pupil rounded; grooved fang in front, some smaller smooth teeth behind.

Dark olive-green above, each scale tipped with reddish, in particular those on the sides; crown and a narrow vertebral line, one scale wide, somewhat darker than the other parts; this line extends to the root of the tail; upper labials and chin shields whitish, marked with olive-brown in the upper corners. Beneath yellow, each ventral scale with a blackish margin; subcaudals nearly black.

Mr E. P. Ramsay discovered this new Snake in the neighbourhood of Braidwood, N. S. Wales; it is apparently a young specimen, its total length not exceeding 10½ inches."

Hoplocephalus fuscus, from Steindachner 1867: 82.

"Syn. *Hoplocephalus Cuvieri* Fitz. (excl. Syn. et Hopl. Cuvieri Fitz. Syst. Rept. p. 28), Ausb. p. 410.

The specimen from the old collection of the Vienna Museum referred to by Fitzinger in "Systema Reptilium" (1843, p. 28) as *Hoplocephalus Cuvieri* belongs to the *Hopl. curtus* species [of] Schlegel and has nineteen scale rows, while the three specimens bearing only fifteen longitudinal scale rows referred to by the same name by Fitzinger in *Cataloge der österr. Naturf.* (p. 410) perhaps belong to an as yet undescribed species, which, in my opinion, is very closely related to *Hopl. pallidiceps* Günth., if not identical.

Char. The head is elongate and tapers anteriorly, in cross-section it has a quadrangular appearance, the dorsal surface is quite flat, and the mid region of the head not widely bulging; the body is rounded, of thick-set appearance, the tail short with a pronounced taper to a point. The vertical shield is only slightly longer than broad. Of the six supralabials the third and fourth are situated below the eye; the second and third are developed dorsally rather as in *H. pallidiceps*, at times (that is to say among the three specimens on one or both sides of the head) acting as a substitute for the absent loreal shield; in the latter case the undivided nasal shield is abruptly truncated posteriorly, in the former it extends to a narrow point. Temporal shields 2 + 2. The upper temporal of the first series is elongate

[and] quadrangular, and contacts both postocular shields anteriorly; the lower, larger temporal shield of the same series is triangular with a dorsally curved broad base and rests with the tapering point of its anterior angle against the lower postocular. The upper temporal shield of the second series sometimes fuses with the scales margining it posteriorly, forming a single very large shield. The body scales diminish rapidly in size moving away from the edge of the belly. The dorsal surface of the head and back is dark brown, towards the edge of the belly the sides of the body are olive green. In the neck region of the smallest specimen of 26 inches [Zoll Länge] the outermost scale row bears a yellow-brown longitudinal band; ventral to this is a wider blackish band, which includes the lateral edge of the anterior ventral shields. In just this one specimen one observes on the back distinct traces of small light yellowish brown crossbands which become markedly broader towards the edge of the belly. The largest specimens of 36–38 inches however are quite uniformly coloured dorsally. The anterior and posterior edges of the ventral scales, or only their anterior edges, have blackish seams. – Subcaudal shields (entire) 48–51; ventral scales circa 177. Origin: New Holland." [Translated from German.]



Rawlinson, P A. 1991. "Taxonomy and distribution of the Australian tiger snakes (*Notechis*) and copperheads (*Austelaps*) (Serpentes, Elapidae)." *Proceedings of the Royal Society of Victoria. New series* 103(2), 125–135.

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