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A new species of *Proablepharus* (Squamata: Scincidae) from the Northern Territory of Australia

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ABSTRACT

Proablepharus naranjicaudus sp. nov. (Squamata: Scincidae), is distinguished from all its known congeners in having supraoculars four, first two contacting frontal; frontoparietals and interparietal fused into a single scale; supraciliaries usually six; upper preocular small or absent; postsupralabials usually one, and subdigital lamellae of pes tri-mucronate. Juveniles have striking pale and dark stripes through the centre of each dorsal scale and a orange tail; both pattern elements may become muted in adults. The species is apparently endemic to areas of cracking-clay soils in the Ord-Victoria region of the north-western part of the Northern Territory. A key to the species in the genus is provided.

KEYWORDS: Northern Territory, *Proablepharus*, Scincidae, skink, taxonomy.

INTRODUCTION

There are currently two undescribed species of skinks from northern Australia that are similar to *Proablepharus kinghorni* (Copland, 1947) from the interior of north-eastern Australia. One of these undescribed species occurs in the north-western part of the Northern Territory and the other occurs in a small area of north-eastern inland Queensland. In this paper, we describe the species from the Northern Territory.

We describe the species in the genus *Proablepharus* on the basis of its overall similarity to *Proablepharus kinghorni*. However, both the Northern Territory species and the one from Queensland have the frontoparietals and interparietal fused into a single scale. This condition is unique in *Proablepharus* and calls into question the difference between this genus and the closely related *Morethia*, a group that also has the frontoparietals and interparietal fused into a single scale. A preliminary cladistic analysis of all the species in both genera raised the possibility, but not the certainty, that neither group is monophyletic. Because the morphological data are currently insufficient to resolve the problem, we leave it to the future and use the existing taxonomy to describe the new species. It should be noted that in the standard keys that might be used to identify specimens of either the Northern Territory or Queensland species (Horner 1991; Storr *et al.* 1999; Cogger 2000), both would key to the genus *Morethia* due to their fused frontoparietals and interparietal.

METHODS

A detailed morphometric and meristic analysis was made of the 19 specimens available of the undescribed species of *Proablepharus* from the Northern Territory. Snout-vent length, front and rear limb length (limb extended at right angle to body axis) and tail length were measured to the nearest 0.5 mm by adpressing the measured part against a steel ruler. Head length was measured to the nearest 0.1 mm between the tip of the snout and the centre of the external ear opening with digital vernier callipers. The relevant head scales are labelled in Figure 2. Subdigital lamellae on the fourth digit of the pes were counted distally from the first transverse scale at the base of the ventral side of the digit. Details of the postcranial skeleton were assessed from radiographs.

Counts on the midline, or one side of a bilateral feature, are reported as the number of specimens or 'n', while counts for both sides of a bilateral feature

are reported as the number of cases. Bilateral counts are reported as left/right. An apparent under-reporting of 'n' or cases is due to an inability to make the observation on all specimens. Statistical analysis was carried out using Systat 9 software. Logarithmic transformations were to base 10.

The following abbreviations are used in the text: AM, Australian Museum; NTM, Museum and Art Gallery of the Northern Territory; QM, Queensland Museum, and WAM, Western Australian Museum.

SYSTEMATICS

Proablepharus Fuhn, 1969

Proablepharus naranjicaudus sp. nov.

Figs 1–6

Material examined. HOLOTYPE – NTM R.26028, 8 km south-west of Cattle Creek Homestead, Cattle Creek Station, Northern Territory, Australia, 17° 37.82'S, 131° 26.09'E, collected by H. Puckey and C. Brock, 14 September 1999, from *Astrebla* grassland. PARATYPES – NTM R.18733, Kidman Springs, 16° 04.70'S 130° 59.45'E, collected by J. Woinarski, 24 October 1997, from *Bauhinia* open woodland; NTM R.18734 and R.18743, Victoria River Downs Station, 16° 22.07'S 131° 08.77'E, collected by J. Woinarski, 11 November 1997; NTM R.18744, Victoria River Downs Station, 16° 18.48'S 131° 10.19'E, collected by J. Woinarski, 8 November 1997; NTM R.21538, Kirkimbie Station, 17° 51.78'S 129° 07.56'E, collected by A. Fisher, 8 June 1995, from *Astrebla* grassland on cracking-clay plain; NTM R.21539-21540, Kirkimbie Station, 17° 52.79'S 129° 08.04'E, collected by A. Fisher, 9 June 1995, from *Astrebla* grassland on cracking-clay plain ; NTM R.22799-22800, Kirkimbie Station, 17° 49.49'S 129° 08.47'E, collected by A. Fisher, 1 October 1996; NTM R.23241, R.23245-23246, Mount Sanford Station, 17° 11.80'S 130° 53.64'E, collected by A. Fisher, 6–7 December 1996; NTM R.23650-23652, Mount Sanford Station, 17° 06.61'S 130° 52.62'E, collected by A. Fisher, 20 November 1997; NTM R.26017, 23 km south-southwest of Willeroo Homestead, Willeroo Station, 15° 27.09'S 131° 36.00'E, collected by H. Puckey, 28 September 1999; NTM R.26372, Spirit Hills Station, Keep River Flats, 15° 21.29'S 129° 09.05'E, collected by G. Wallace, 19 October 1996; WAM R145998, 2.6 km east of bed of Keep River on Legune Station road, 15° 23.88'S 129° 05.12'E.

Diagnosis. *Proablepharus naranjicaudus* sp. nov. can be distinguished from all other species in the genus by the following combination of characters:

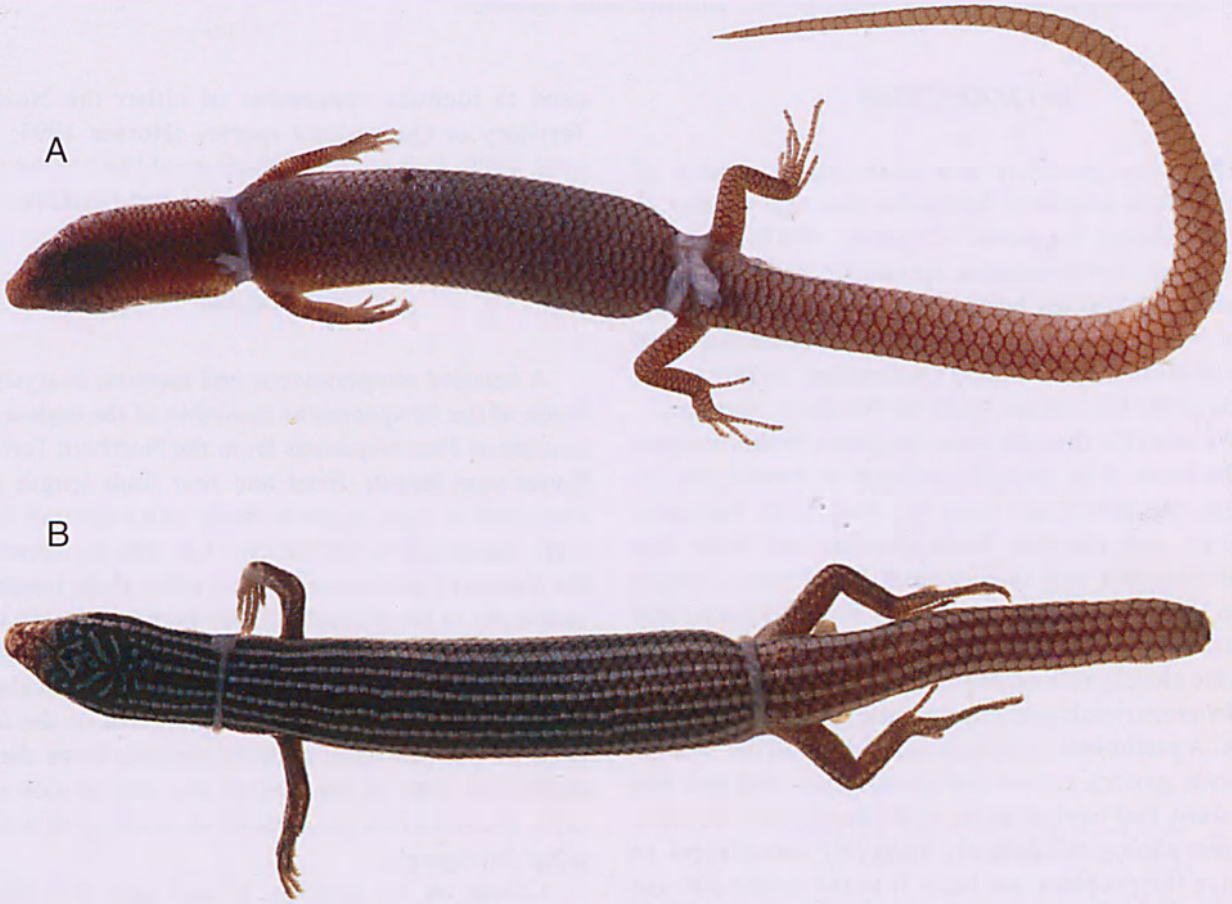

Fig. 1. Colour pattern extremes in *Proablepharus naranjicaudus* sp. nov.: **A**, uniform (NTM R.21539 paratype); **B**, distinctly striped (NTM R.26028 holotype).

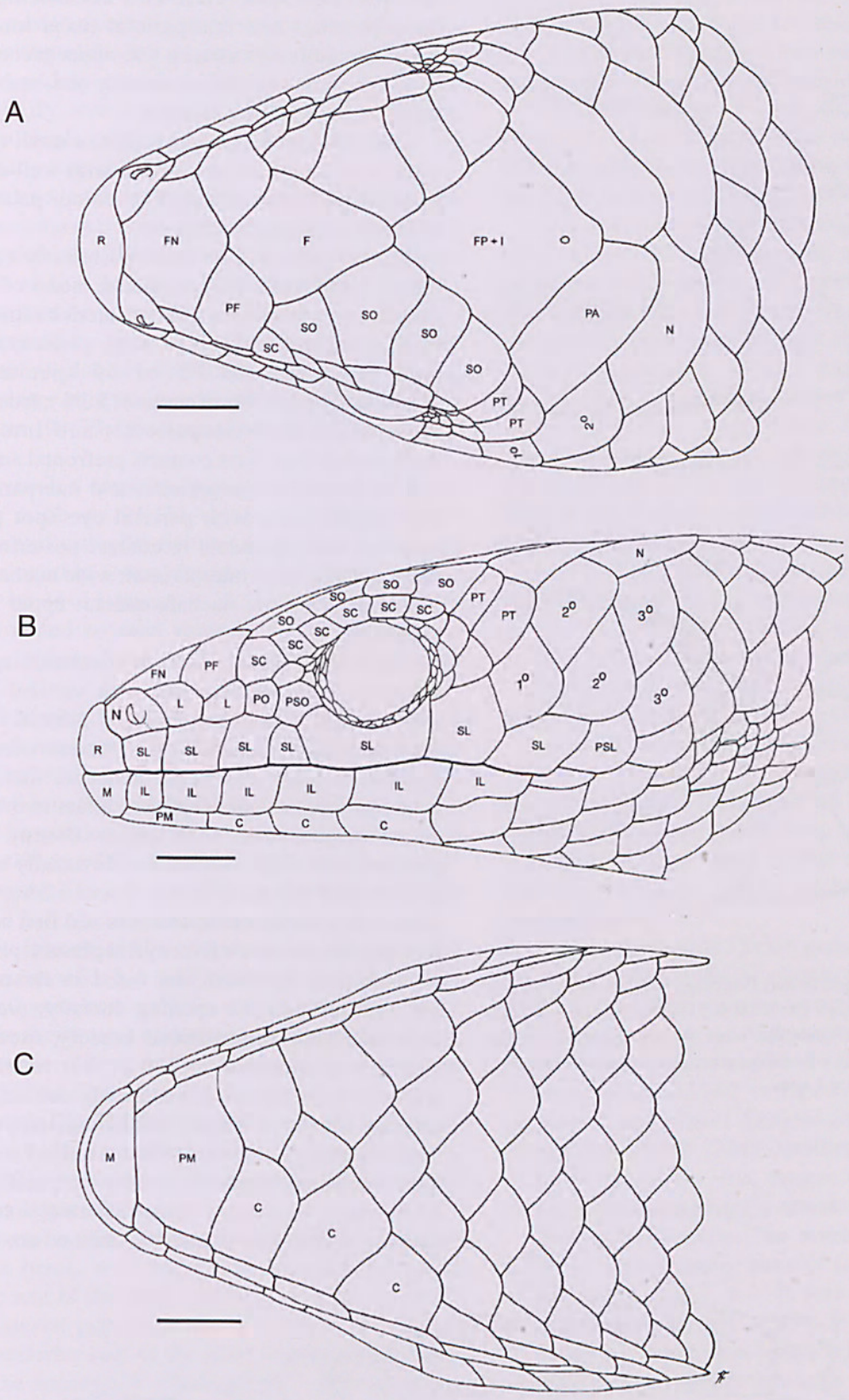

Fig. 2. Head of the holotype of *Proablepharus naranjicaudus* sp. nov. (NTM R.26028): **A**, dorsal view; **B**, lateral view; **C**, ventral view. Abbreviations: C - chin scale; F - frontal; FN - frontonasal; FP - frontoparietal; I - interparietal; IL - infralabial; L - loreal; M - mental; N - nuchal; PA - parietal; PF - prefrontal; PM - postmental; PO - preocular; PSL - postsupralabial; PSO - presubocular; PT - pretemporal; SC - supraciliary; SL - supralabial; SO - supraocular; R - rostral; 1° - primary temporal; 2° - secondary temporal; 3° - tertiary temporal. Scale bar = 1 mm.

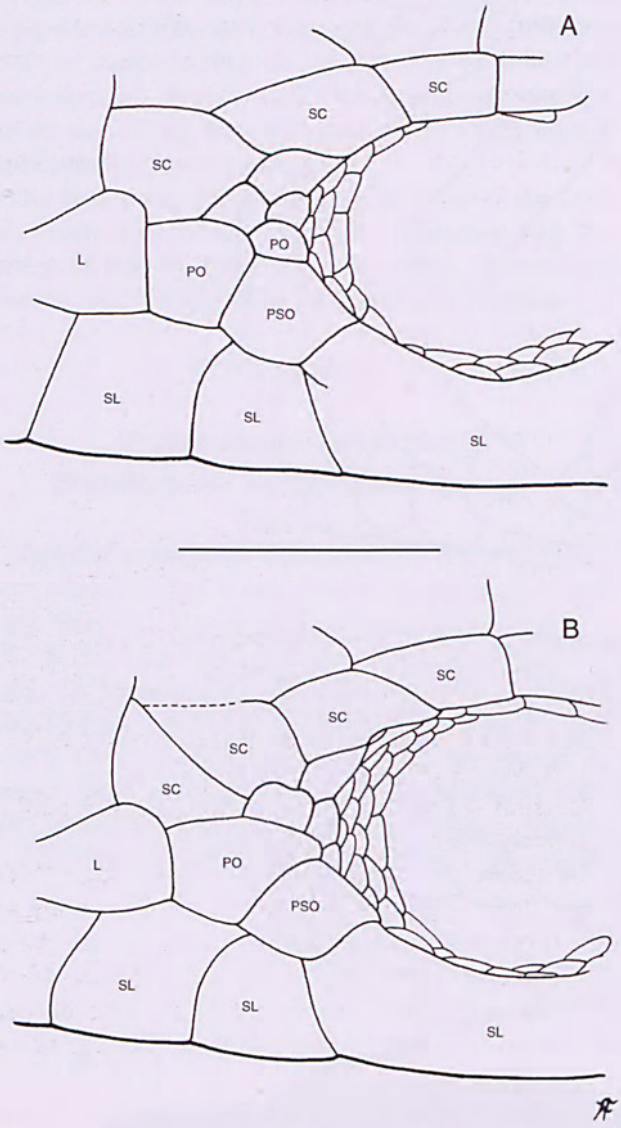

Fig. 3. Preocular region in two *Proablepharus naranjicaudus* sp. nov. showing the presence (A; NTM R.21540) or absence (B; NTM R.26017) of the upper preocular scale. Abbreviations: L - loreal; PO - preocular; PSO - presubocular; SC - supraciliary; SL - supralabial. Scale bar = 1 mm.

supraoculars four, first two contacting frontal; frontoparietals and interparietal fused into a single scale; supraciliaries usually six; upper preocular small or absent; postsupralabials usually one, and subdigital lamellae of pes tri-mucronate.

Description. In general aspect, a small (maximum snout-vent length 46 mm) skink with well-developed, pentadactyl limbs and usually a colour pattern of thin light and dark stripes (Fig. 1).

Medial lobe of the rostral posteriorly convex and lateral lobes vertically truncated, none of the lobes extending posteriorly to level of anterior edge of nostril; frontonasal just wider than long; prefrontals usually well separated (94.7% of 19 specimens) but occasionally narrowly in contact (5.3%); frontal shorter than length of frontoparietals and interparietal; supraoculars four, first contacts prefrontal and first two contact frontal; frontoparietals and interparietal fused into single scale, with parietal eye spot present in posterior lobe; parietals in contact posterior to fused frontoparietals and interparietal; wide nuchals 1/1 (n = 18) or 2/1 (n = 1); nuchals contact upper secondary temporal.

Nasal rhomboidal, with dorsoanterior apices well separated from midline and with vertical postnarial groove that could represent a primitive sutural separation between nasal and postnasal; nostril central in nasal; loreals two, anterior deeper than long and posterior longer than deep; preoculars two with upper small or just one with upper absent (Fig. 3); presubocular single; supraciliaries usually six (83.8% of 37 cases) but occasionally five (16.2%), first three contact first supraocular when six and first two contact first supraocular when five; eyelid pre-ablepharine, that is, with clear spectacle and fused in closed position but with residual slit opening dorsally; pretemporals two, both contacting parietal broadly, except on one side in one specimen (NTM 21539) in which more posterior pretemporal just narrowly contacts parietal; primary temporal single; secondary temporals two, upper secondary temporal contacts nuchal and overlaps lower secondary temporal; tertiary temporals in contact with lower secondary temporal two; external ear opening round, approximately three to six times size

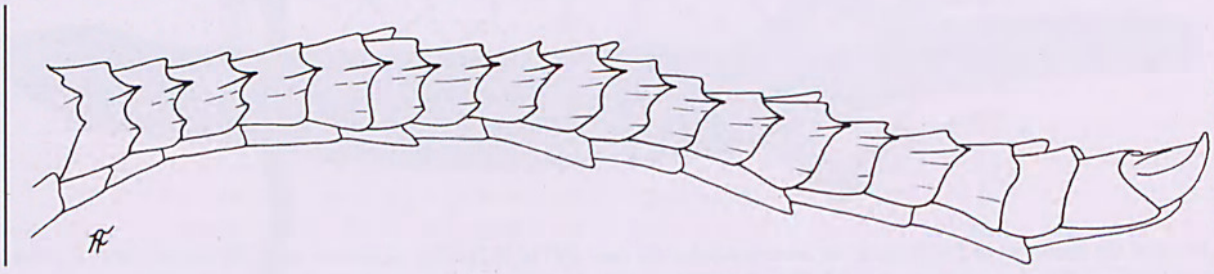

Fig. 4. Ventral surface of the fourth digit of the pes in *Proablepharus naranjicaudus* sp. nov. showing the keeled, tri-mucronate subdigital lamellae (NTM R.21539). Scale bar = 1 mm.

of nostril, without lobules; supralabials seven, fifth subocular and contacting small scales of eyelid; most posterior supralabial, i.e., seventh usually overlaps lower secondary temporal (89.5% of 38 cases) but occasionally overlapped by this scale (10.5%); postsupralabials usually one (89.5% of 38 cases) but occasionally two (10.5%).

Mental wider than long, its posterior edge straight to gently concave posteriorly; postmental contacts first two infralabials; three pairs of large chin scales, members of first pair in contact, members of second pair separated by one scale row, and members of third pair separated by three scale rows; large chin scales flush with infralabials, that is, genials do not encroach between large chin scales and infralabials; infralabials usually six (94.7% of 19 specimens) but rarely seven (5.3%).

Body scales smooth, cycloid; longitudinal scale rows at midbody 21–24 (mean = 22.3, n = 19); paravertebral scales 58–64 (mean = 60.2, n = 19); outer preanals overlap inner; fourth digit of pes covered dorsally by 11–14 (mean = 12.5, n = 19) scales in a single row and covered ventrally by 15–23 (mean = 19.3, n = 19) lamellae, which are mostly tri-mucronate (Fig. 4).

Head length 5.9 to 8.5 mm; snout-vent length 28.5–48.5 mm; snout-vent length/head length ratio 4.8–5.9 (n = 18); limbs well-developed, pentadactyl; front limb length 6–11 mm; rear limb length 9–14.5 mm; as proportion of snout-vent length, front limb 20.5–26.0% (n =19), rear limb 29.3–35.4% (n =18), and complete tail > 182.8% (n=1; only a single specimen had a nearly complete tail).

Ceratobranchial II present; presacral vertebrae 30–33 (mean = 31.2; n = 17); cervical vertebrae eight; postsacral vertebrae > 55 (n = 1); sternal ribs three; mesosternal ribs two; complete inscriptional chevrons 1-2 (mean = 1.4; n = 7); phalanges in manus/pes 2.3.4.5.3/2.3.4.5.4.

Colour in life. The colour pattern of *P. naranjicaudus* sp. nov. closely resembles that of *P. kinghorni*, with considerable variation in the intensity of colour and pattern in larger adults.

In juveniles, the dorsum of the body is very dark brown to black, with bone-white longitudinal stripes from the rear of the head extending past the hindlimbs to the anterior portion of the tail. The colour pattern on the posterior half of the head is also well defined, giving the impression of two white stripes extending diagonally forward from the midline. The tip of the snout is pale orange-brown. The tail is bright orange (both dorsally and ventrally), with the orange colour extending onto the hindlimbs.

In some adults, the striped pattern remains distinct, with a medium brown background colour and pale straw longitudinal stripes. In others, the ground colour is a pale greyish brown and there is virtually no evidence of striping, particularly on the head. The colour of the tail in adults also fades to a very pale orange, or a pale straw colour in the plainest individuals.

It is possible that colour and pattern becomes progressively less intense on all individuals with age, although observation of specimens throughout their life would be necessary to confirm this.

Colour in preservative. In specimens with striping, head pale brown dorsally with pigment tending to concentrate on posterior half of posterior scales, snout paler. Lower sides of head (from ventral third of supralabials) and venter of head immaculate.

Dorsum and sides of body dark brown with pale, nearly white, longitudinal stripes through centres of scales rows one, two, lower edge of three and sometimes upper edge of four, and lower edge of five and upper edge of six, the two uppermost pale stripes thinner than the lower two. In terms of the dark stripes between the pale stripes, the upper lateral dark stripe, especially on the neck and shoulder, is the widest. The ground colour is darker and hence the overall dorsal pattern more contrasting in small specimens (e.g. NTM 21538). Venter of body immaculate.

Dorsum and side of tail becoming pale straw colour posteriorly. Venter of tail immaculate.

In nearly uniformly coloured specimens (NTM 18734, 21539 and 23245), dorsum of head, body and tail uniformly pale greyish brown with slightly darker edging to dorsal and lateral body scales. Sides of body with faint trace of upper lateral dark stripe on neck and anterior body. Venter of head, body and tail immaculate.

There is no apparent broad geographic or ecological difference between the two colour patterns. Specimens with the two colour patterns occur together at the same general locality, e.g., at Victoria River Downs Station: NTM 18743 (striped) and 18734 (uniform), Kirkimbie Station: NTM 21540 (striped) and NTM 21539 (uniform), and Mount Sanford Station: NTM 23246 (striped) and NTM 23245 (uniform).

In all specimens, iris, tongue and lungs pale, and parietal peritoneum lightly streaked with brown.

Sexual dimorphism. The number of paravertebral scales is significantly greater in females (range = 61–64, mean = 62.7, n = 4) than in males (58–61, n =12) (Mann-Whitney U = 1.50, $P < 0.006$).

Allometry. Snout-vent length is in positive allometry relative to head length (ie. with increasing size the species becomes more elongate. The allometric equation is log (snout-vent length) = 0.37 + 1.40 (log head length) ($r^2 = 0.91$, $P < 0.0001$, n = 18), the slope of the regression being significantly greater than one (95% confidence interval of slope = $\pm$ 0.22).

Details of holotype. The holotype (NTM 26028) is male with snout-vent length 39 mm; tail autotomised,

its remaining length 7.6 mm; front limb length 8 mm; rear limb length 12.5 mm; prefrontals separated; supraciliaries 6/6; upper preocular relatively large for species; most posterior supralabial, i.e., seventh, overlaps lower secondary temporal on both sides; postsupralabials 1/1; longitudinal scale rows at midbody 22, paravertebral scales 58; scales in longitudinal row on dorsal part of fourth digit of pes 11/11; subdigital lamellae on fourth digit of pes 18/20; presacral vertebrae 31.

Etymology. The species name *naranjicaudus* is from the Arabic for "orange" and the Latin for "tail".

Distribution. The species is known only from the Ord-Victoria region in the north-west of the Northern Territory (Figs 5–6). The majority of records of this species have come from the central and southern portions of the Victoria River region (Woinarski *et al.* 1999; Fisher 2001; Fisher unpubl. data), with two specimens from the Keep River catchment (NTM 26372 (Kinhill 2000), as '*Morethia* sp. nov.' and WAM R145998).

Habitat. All specimens have come from grey and brown cracking-clay soils (vertosols) that occur extensively on elevated plains, undulating downs and alluvial plains of the Inverway, Wave Hill and Ivanhoe land systems (Stewart *et al.* 1970). These soils generally support a perennial tussock grass layer with dominant species including *Astrebla* spp., *Dicanthium fecundum*, *Chrysopogon fallax* and *Aristida latifolia*, although forbs and annual grasses (such as *Iseilema* spp., *Sorghum* spp.) may also dominate. Such areas can be treeless or have a sparse tree layer of species including *Terminalia arostrata*, *T. volucris* and *Bauhinia cunninghamii*. A number of reptile species in northern Australia are confined to these cracking-clay grasslands, including *Ctenotus rimacola* (Horner and Fisher 1998), which has a virtually identical distribution to *Proablepharus naranjicaudus* sp. nov.

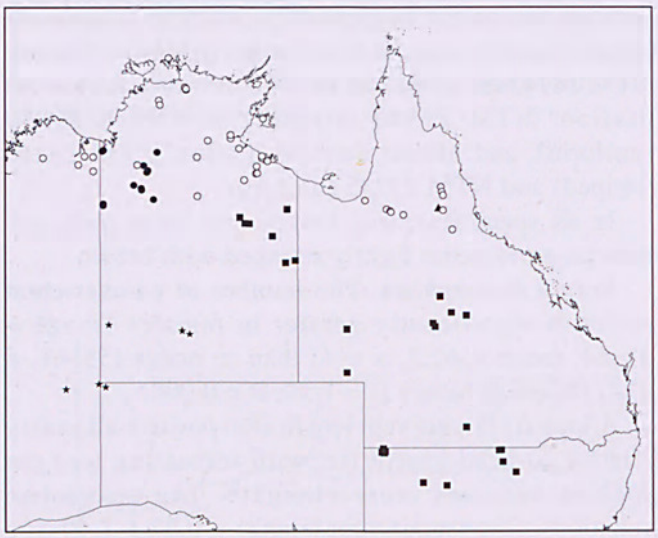

Fig. 5. Northern, central and north-eastern Australia showing the distribution of the five species of *Proablepharus* in this area. *P. kinghorni*, squares; *P. naranjicaudus*, dots; *P. reginae*, stars; *P. tenuis*, circles; undescribed Queensland species, triangles. Data based on specimens examined in the AM, QM, NTM and WAM.

Habits. Timing of capture of this species in pit-traps suggest that it is diurnal, although most active in the early- to mid- morning and late afternoon. It is not conspicuously active on the ground surface, apparently using the many large cracks in the clay soil, perennial grass tussocks and patches of plant litter for shelter.

Reproduction. The only clearly reproductively active specimens among the available specimens are two females, one (NTM 18744) collected on 8 November and measuring 45.5 mm in snout-vent length and the other (NTM 18743) collected on 11 November and measuring 44.5 mm. Each female contains two yolking follicles. These observations suggest that females are yolking follicles at the beginning of the wet season and that the brood size is two.

Conservation status. This species is confined to a well-defined habitat within a relatively restricted geographic range. There is an extensive area of cracking-clay soil habitat within the Ord-Victoria Rivers region (c. 25 000 km^2; Fig. 6) and recent fauna surveys suggest that *P. naranjicaudus* is relatively common in the southern and central Victoria River region. However, only two records of *P. naranjicaudus* have come from the Ord/Keep Rivers region, despite significant sample effort in suitable habitat, and the species may be uncommon in the northwest of its range. The typical habitat for *P. naranjicaudus* is poorly represented in conservation reserves in northwestern Australia and falls almost entirely under pastoral land use. The effects of pastoral use on *P. naranjicaudus* are unknown, but Fisher (2001) found that, in similar environments in eastern Northern Territory, *P. kinghorni* was less abundant in areas of higher grazing pressure. Large areas of suitable habitat in the lower Ord/Keep Rivers systems are slated for agricultural development (Kinhill 2000).

COMPARISON WITH SIMILAR SPECIES

Proablepharus naranjicaudus is most similar to *P. kinghorni* among described species in having a colour pattern consisting of pale stripes on a dark ground colour and the upper preocular reduced or absent, but it differs from this species in having supraciliaries usually six instead of five, the interparietal fused to the fused frontoparietals instead of distinct, postsupralabials usually one instead of two, usually more supradigital scales on fourth digit of pes (11–14, mean = 12.5, n = 19 vs 11–12, mean = 11.2, n = 13; Mann-Whitney U = 225.5, P < 0.0001), usually more subdigital lamellae of fourth digit of pes (15–23, mean = 19.3, n = 19 vs 16–20, mean = 18.2, n = 34;

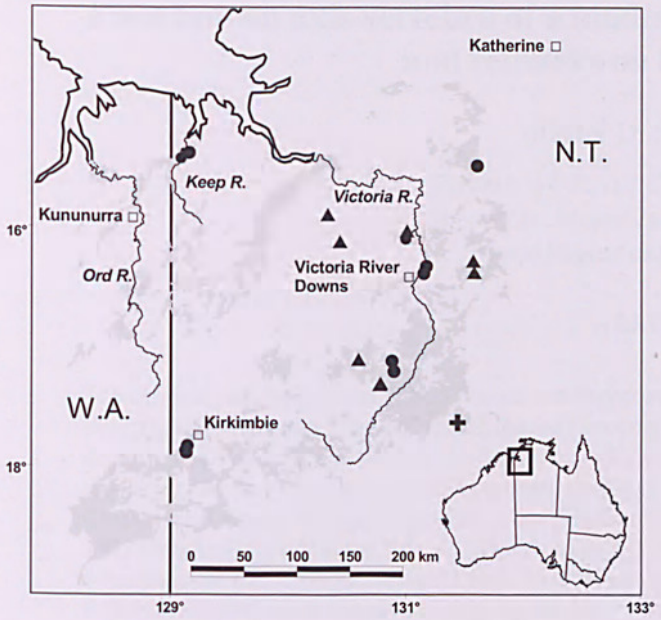

Fig. 6. Ord-Victoria region in northwestern Australia, showing location of records of *P. naranjicaudus* (cross, holotype; circles, other museum specimens; triangles, other survey records). Shaded area indicates the distribution of cracking clay soils in the region (Stewart *et al.* 1970).

Mann-Whitney U = 457, P < 0.02) and tri-mucronate (pre- and postaxial and midline) instead of uni-mucronate (midline).

Proablepharus naranjicaudus is also similar to the undescribed species from northern Queensland in having a colour pattern consisting of pale stripes on a dark ground colour and the interparietal fused to the fused frontoparietals, but it differs from this species in having supraciliaries generally six instead of five, palpebral slit large enough to be often conspicuous instead of short and inconspicuous, upper preocular reduced or absent instead of well developed, postsupralabials usually one instead of usually two, subdigital lamellae of pes tri-mucronate instead of smoothly rounded and usually fewer presacrals (30–33, mean = 31.2, n = 17 vs 32–36, mean = 33.5, n = 29; Mann-Whitney U = 25.0, P < 0.0001). It is our understanding that this species is to be described by government researchers in Queensland.

Key to the species of *Proablepharus*

1a. Supraoculars four, first two contact frontal 2
1b. Supraoculars three, first contacts frontal .... *P. tenuis* (Broom)
2a. Frontoparietals distinct; dark pigment in centre of dorsal body scales .....*P. reginae* (Glauert)
2b. Frontoparietals fused; dark pigment at edges of dorsal body scales 3
3a. Interparietal distinct ..... *P. kinghorni* (Copland)
3b. Interparietal fused to fused frontoparietals 4
4a. Supraciliaries usually six; upper preocular minute or absent; postsupralabials usually one; subdigital lamellae of pes tri-mucronate..... ..... *P. naranjicaudus* sp. nov.
4b. Supraciliaries usually five; upper preocular well developed; postsupralabials usually two; subdigital lamellae of pes smooth .... undescribed Qld sp.

ACKNOWLEDGMENTS

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