

A New Species of Large *Eutropis* (Scincidae) from Sulawesi, Indonesia

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ABSTRACT.—A new species of *Eutropis* (Sauria: Scincidae) is described from the island of Sulawesi, Indonesia, distinguished from all congeneric species, with the exception of *Eutropis longicaudis*, by its large size and low number of midbody scale rows. It has two primary temporal scales, whereas *E. longicaudis* from Borneo has only one. This new species is diurnal, partially arboreal, and inhabits rain forest from below 100 m to at least 600 m elevation.

The genus *Mabuya* consists of at least 100 species (Greer and Broadley, 2000) and is widely distributed from Southeast Asia, through southern Asia, the Seychelles, Africa and into South and Central America. A recent systematic revision based upon molecular analysis (Mausfeld et al., 2002) has split *Mabuya* to reflect evolutionary lineages: *Mabuya* is reserved for species from South America; *Euprepis* is proposed for Afro-Malagasy and Middle East taxa; *Eutropis* (revalidated from Fitzinger, 1843) for the Asian taxa; and *Chioninia* for the Cape Verde islands taxa. Nomenclature used here follows Mausfeld et al. (2002).

There are presently 31 species of *Eutropis* (Mausfeld and Böhme, 2002), ranging from India (including many smaller Indian ocean islands), east across continental Asia, and southeast through Indonesia and the Philippines, as far as Papua New Guinea. The relationships within the genus *Eutropis* are poorly resolved and, until recently, have received little attention. Molecular studies (Honda et al., 1999, 2000; Mausfeld et al., 2000) have begun to elucidate some of the relationships, but relatively poor sampling across the Asian region means there are likely to be more species identified.

Previously 12 *Eutropis* were recognized in the Southeast Asian archipelago (Indonesia, Philippines, Thailand, and Malaysia), two of which (*Eutropis multifasciatus* and *Eutropis rudis*) have been recorded from Sulawesi. Iskandar and Tjan (1996) also list *E. multicaarinatus* from Sulawesi; however, no confirmed specimens exist, and this species may be restricted to the Philippines.

Recent studies of the herpetofauna of Sulawesi, Indonesia, have revealed several undescribed reptile taxa in the region (Gillespie et al., 2005; Howard and Gillespie 2007). In this paper, we describe one of these; a new distinctive species of *Eutropis*. In addition, we present further morphological data previously not available on other species of *Eutropis* from Sulawesi.

MATERIALS AND METHODS

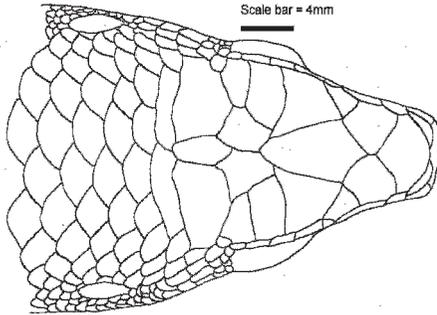
Specimens were collected during general herpetofaunal surveys and inventories across Sulawesi and associated offshore islands between 1998 and 2004. Latitudes and longitudes were recorded to the nearest 1" when determined by GPS and to the nearest 1' when estimated from maps. Specimens were euthanized by injection of chlorobutanol, preserved in 10% formalin, then stored in 75% ethanol, and lodged at the Museum Zoologicum Bogoriense, Juanda 3, Kebun Raya, Bogor, Java, Indonesia (MZB). The ultimate destinations of six specimens collected are yet to be determined but will be housed at either Museum Zoologicum Bogoriense, Indonesia, or the Museum of Vertebrate Zoology (MVZ), University of California, Berkeley. These specimens are referred to by their field numbers. Institutional abbreviations follow Leviton et al. (1985). All linear measurements were recorded on preserved specimens by GG and AR using dial callipers to the nearest 0.1 mm. Illustrations of the holotype were prepared by SH using a camera lucida.

Eutropis grandis sp. nov.
Figures 1–2

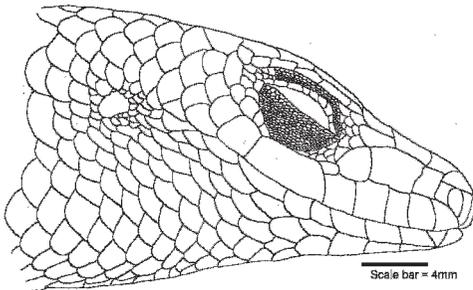
Holotype.—MZB 4862, mature male collected on 25 June 2002, Lambusango Reserve, Buton

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a.



b.



c.

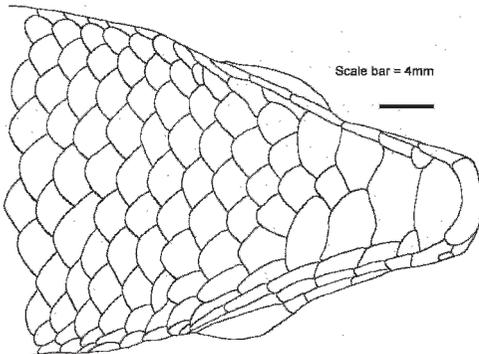


FIG. 1. Head scalation of the holotype (MZB 4862) of *Eutropis grandis*. (a) dorsal; (b) lateral; (c) ventral.

Island, Southeast Sulawesi, Indonesia, 5°12'59"S, 122°52'10"E, 400 m elevation by Sam Howard and Graeme Gillespie.

Paratypes.—MZB 4310, 4311, 4314, 4315, 4318, 4322, 3873, 3874, June through October 2001 and June through October 2002, Lambusango Reserve, Buton Island, Southeast Sulawesi, 5°12'S, 122°52'E, 300–440 m elevation; MZB 4308, 4309, 4312, 4313, 4316, 4317, 4319, 4320, 4321, 3869, 3870, 3871, 3872, June through October 2001 and June through October 2002, Kakenauwe Reserve, Buton Island, Southeast Sulawesi, 5°10'S, 122°53'E, 100–200 m elevation; MZB 2258, 9 June 1998, Mount Tompotika, Central Sulawesi, 0°45'S, 123°6'E.

Additional referred material.—BSI270, 9 October 2004, Tankoko Nature Reserve, North Sulawesi, 1°33'8"S, 125°10'24"E, 96 m elevation; BSI 327, 10 October 2004, Tankoko Nature Reserve, 1°33'29"S, 125°10'24"E, 24 m; BSI553–554, 18 October 2004, Desa Bubode, North Sulawesi, 0°51'43"S, 122°58'32"E, 60 m; BSI641, 19 October 2004, Desa Tudi, North Sulawesi, 0°51'15"S, 122°44'8"E, 36 m; BSI882, 20 October 2004, Desa Lombongo, North Sulawesi, 0°33'8"S, 123°57'34"E, 34 m.

Diagnosis.—A large species, snout-vent length (SVL) 105.3–135.5 mm for mature females ($N = 10$) and 116.9–142.6 mm for mature males ($N = 8$); snout tapered, rounded at tip, snout length 43–54% head length and 49–69% head breadth; head breadth 68–86% head length and 14–18% SVL; eye diameter 43–64% snout length and 28–38% head breadth (Table 1). Rostral contacts frontonasal; supranasals separated; prefrontals contact at midline or narrowly separated; frontal slightly tapered, twice length of frontoparietal or equal to frontoparietal and interparietal combined; frontal contacts second supraocular (rarely narrow contact with first supraocular); four large supraoculars; frontoparietals distinct; interparietal large, separating parietals, and depth equal to that of parietals; anterior loreal square in shape and half length of posterior loreal; supralabials 8 (rarely 7 or 9), sixth beneath eye (subocular); infralabials 8 (rarely 9 or 10); mental as broad as postmental; tympanum 25–30% eye diameter, deeply sunk, small and lacking lobules; dorsal and lateral scales with three prominent and two (sometimes three) secondary keels; head shields embossed; midbody scale rows 25–27; paravertebrals 32–40; preanal scales 6, rarely enlarged; limbs well developed, adpressed hind limb 96–130% axilla-groin distance and 41–63% SVL; fourth finger length 25–27% forelimb length; fourth toe length 32–34% hind-limb length; toes rank 4,3,5,2,1 longest to shortest; subdigital lamellae on fourth toe 20–24.

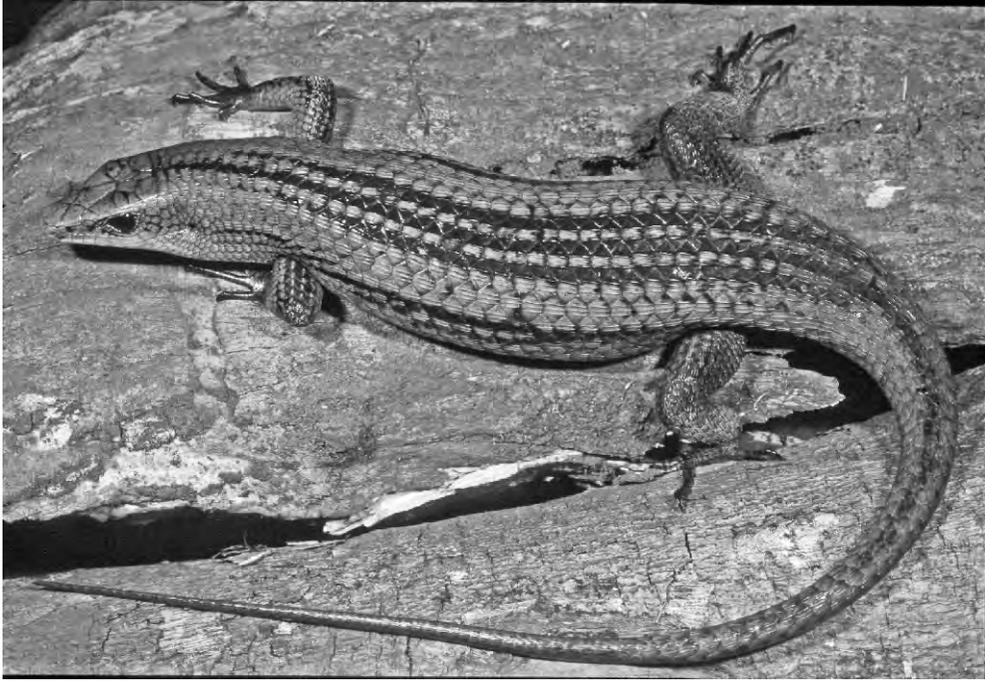


FIG. 2. *Eutropis grandis* in life (photograph by G. Gillespie 2002).

Description of holotype.—Male with complete tail; SVL 136.13 mm; tail length 218.91 mm; frontonasal contacts rostral; supranasals separated by frontonasal; postnasal 1; loreals 2; preoculars 2; presubocular 1; supralabials 8, sixth largest (subocular); infralabials 8; prefrontals in narrow contact, separating frontal and frontonasal; frontoparietals 2; parietals large and entire, separated by interparietal; nuchals 1 pair, overlapping middorsally behind interparietal; interparietal without parietal eye evident; supraoculars 4, second largest, second only and fully contacts the frontal; second supraocular in contact with prefrontal; supracillaries 5; eyelid moveable, scaly and lacking transparent window. Primary temporal scales 2 with 2 secondary temporals, widely separated by a tertiary temporal scale (2 + 2 separated; see Greer and Broadley, 2000); upper secondary temporal overlaps parietal; pretemporal scales 2; ear opening small, near spherical and approximately one quarter of eye diameter; rostral and mental scale of comparable width; a single large postmental followed by two large chin shields in contact, followed by several large separated scales which grade into ventrals; preanal scales 8; with the exception of head shields, all scales are carinate with 3 prominent and 2 secondary keels per scale; with the exception of the head shields and base of feet, all scales imbricate and lack

apical pits; midbody scales 26; paravertebral scales 36.

Coloration of holotype.—Dorsal: head copper brown, rufus/olive brown over shoulders and rest of dorsum. Three black mid-dorsal stripes approximately two-thirds of scale width, commencing at shoulder, extending to pelvis. Midstripe down middorsal line covering one-third of each paravertebral scale, lateral dorsal stripes covering outer one-third of paravertebrals and one-third of adjacent scale, continuing as broken line onto base of skull and base of tail. Black corners on other dorsal scales form two additional flanking faint dorsal lines.

Lateral flanks pale olive-brown with black flecking. Black bar $3/2$ -scale width runs dorso-laterally between limbs. Limbs pale olive-brown with black-tipped scale edges forming dark longitudinal lines. Head uniform brown, labial scales faint orange-cream. Ventral; cream, becoming pale blue on throat, chin predominantly pale blue; soles of feet cream.

Neonates with distinctively metallic-brass head coloration, merges into dark brown dorsally and laterally; metallic olive-green scales along top and side of the neck. Longitudinal stripes absent. Every second scale along body rows with black posterior edge forming reticulated transverse broken bars from neck region down tail. Limbs black dorsally, dark grey ventrally. Chin white, becoming pale

TABLE 1. Diagnostic characteristics of *Eutropis* spp. from Sulawesi. Min-max (mean). Tail lengths only presented for specimens with complete tails.

Measurements (mm)	Sex	<i>E. grandis</i>	N	<i>E. rudis</i>	N	<i>E. multifasciatus</i>	N
Snout-vent length	m	78.7–142.6 (127.7)	11	75.9–81.6 (77.9)	4	92.5–115.6 (101.2)	3
	f	105.3–135.5 (122.4)	11	67.7–68.7 (68.1)	3	89.5–108.1 (98.8)	3
Tail length	m	169.0–233.1 (195.6)	5	-	0	-	0
	f	142.5–248.5 (212.1)	10	119.5–26.9 (123.2)	2	137.4	1
Head width	m	12.6–24.0 (20.0)	11	13.8–15.1 (14.3)	4	15.7–19.1 (17.0)	3
	f	11.6–19.9 (17.5)	11	11.6–12.9 (12.2)	3	13.3–18.2 (15.8)	2
Head depth	m	10.6–19.8 (6.0)	11	10.9–12.1 (11.4)	4	12.1–14.7 (13.1)	3
	f	11.7–16.5 (15.1)	11	8.7–9.9 (9.1)	3	14.1–14.2 (14.2)	2
Eye-ear distance	m	5.8–13.7 (8.8)	11	6.1–6.5 (5.5)	4	7.5–7.8 (7.6)	3
	f	6.4–9.4 (8.2)	11	5.3–5.5 (5.3)	3	6.2–7.6 (6.9)	2
Frontal length	m	5.4–10.6 (8.8)	11	5.8–6.0 (5.6)	4	5.6–6.6 (6.1)	3
	f	7.0–9.5 (8.1)	11	5.3–5.4 (5.3)	3	5.2–6.1 (5.6)	2
Forelimb length	m	37.3–47.8 (43.6)	11	24.6–30.8 (27.4)	4	30.0–39.5 (33.3)	3
	f	35.3–46.5 (40.7)	11	24.5–26.5 (25.3)	3	28.0–37.1 (32.6)	2
Hind-limb length	m	58.5–68.5 (64.2)	11	40.5–45.2 (42.7)	4	41.4–46.4 (44.2)	3
	f	36.4–68.9 (59.7)	11	36.3–42.7 (38.9)	3	39.7–41.2 (40.4)	2
4th finger length	m	7.8–12.6 (10.5)	11	5.9–6.9 (6.5)	4	5.7–8.8 (7.0)	3
	f	9.4–12.8 (10.9)	11	5.3–6.3 (5.7)	3	5.7–8.4 (7.1)	2
4th toe length	m	13.2–22.7 (20.6)	11	12.1–13.0 (12.5)	4	10.8–17.1 (13.1)	3
	f	17.2–22.2 (20.2)	11	11.0–11.6 (11.3)	3	10.7–16.1 (13.4)	2
Midbody scale rows	m	25–26	11	28–30	4	32	3
	f	25–27	11	29–31	3	32	2
Paravertebral scale rows	m	36–39	11	35	4	44–45	3
	f	33–38	11	34–35	3	43–45	2
Dorsal keels	m	3–6	11	3	4	3	3
	f	3–5	11	3	3	3	2

olive/green across neck. Ventral progressively darker from neck towards posterior; tail black. Subadults intermediate in color pattern between neonates and adults. Lateral stripes discontinuous; forming black reticulated pattern across dorsum and limbs.

Variation.—Varying degrees of contact exist between certain scales. In most cases, the first supraocular and frontal were narrowly separated, but, in two specimens, they were in contact. Approximately half the adults examined from Buton Island had complete separation of prefrontals by the frontal, whereas other specimens, including all from the mainland, had narrow contact. Several specimens had asymmetrical scale counts for certain characters; supralabials ($N = 1$); infralabials ($N = 5$); superciliaries ($N = 4$). In all individuals where bilateral scale counts differed, one count always corresponded to the modal value. Variation also existed in coloration: ten specimens had one dorsolateral stripe, whereas two had two and four none at all. Seventeen specimens had three vertebral lines, whereas three had five and two had none. Most specimens typically had three prominent keels on dorsal body scales with two (rarely three) minor keels.

Distribution.—This species is known only from Sulawesi and the associated offshore island of Buton (Fig. 3).

Etymology.—The specific name “*grandis*” meaning “large.”

Observations.—Eleven specimens were collected at altitudes ranging from sea level to 500 m elevation. Individuals were also observed at elevations up to 600 m on Buton Island. Habitat ranged from undisturbed forest remote from human settlement to moderately disturbed forest near settled areas. *Eutropis rudis* occurred sympatrically in these habitats with *E. grandis*. In contrast to *E. rudis* and *E. multifasciatus*, *E. grandis* was never detected in secondary forest, plantations or other human-made habitats.

Adults of *E. grandis* were infrequently observed foraging or basking on the forest floor and on logs, usually in proximity to forest canopy gaps. They were highly alert, retreating rapidly if approached, and would readily climb trees to heights in excess of 5 m to evade capture. Neonates and juveniles were only captured infrequently in pitfall traps. One juvenile was observed climbing and foraging on a tree trunk up to 20 m above ground. These observations, coupled with their long limbs, digits, and claws, suggest that juveniles may be predominantly arboreal.

Reproduction.—No gravid females were collected, but neonates were captured between June and July on Buton Island, suggesting that breeding occurred prior to the study period,

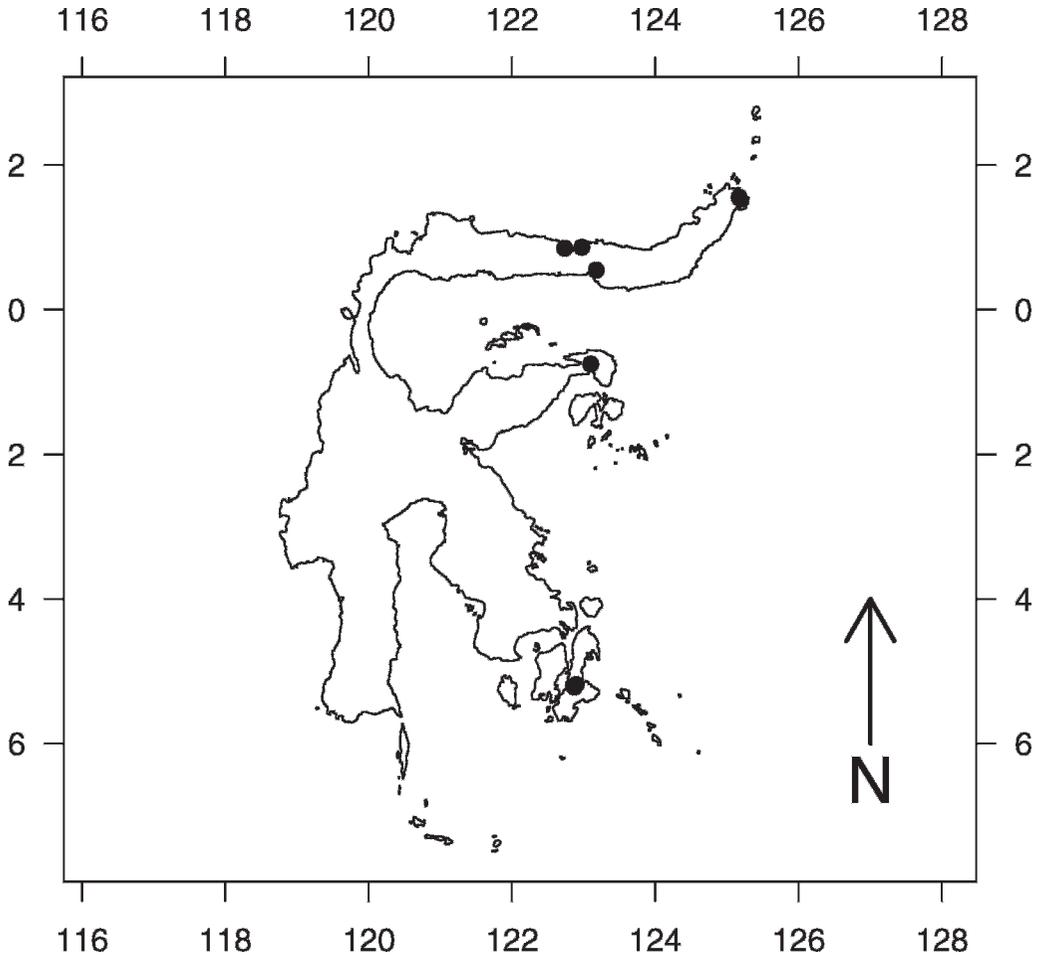


FIG. 3. Collection localities for *Eutropis grandis* in Sulawesi.

coinciding with the end of the wet season in that region.

Comparison.—*Eutropis grandis* is readily distinguished from the other *Eutropis* species currently known from Sulawesi by the possession of only 25–27 midbody scale rows, whereas *E. rudis* possesses 28–32 and *E. multifasciatus* possesses 30–34 (Brown and Alcala, 1980:table 1). *Eutropis multifasciatus* can be further distinguished by its higher paravertebral scale count (43–45) when compared to *E. grandis* (33–40). Five juveniles of *E. grandis* were recorded, these can be confidently ascribed to this species because they match the scale counts of the adults and are sufficiently distinct in coloration (see above) from other *Eutropis* in the area.

Eutropis multicarinatus occurs in the Philippines (Brown and Alcala, 1980) and has been reported as occurring in Sulawesi (Iskander and Tjan, 1996). This species is morphologically most similar to *E. rudis* and can be distinguished from *E. grandis* by having 28–32 midbody scale

rows and a maximum SVL of 80 mm (Brown and Alcala, 1980), whereas *E. grandis* possesses typically 25–26 midbody scale rows (maximum 27) and a maximum SVL of 143 mm.

The low number of midbody scale rows on *E. grandis* distinguishes it from most other *Eutropis* currently described. It can be distinguished from all Philippines species, which have upward of 28 midbody scale rows (Brown and Alcala, 1980). Three Sunda Shelf species have midbody scale row ranges that overlap with that of *E. grandis*: *Eutropis longicaudatus* (26–30), *Eutropis macularia* (26–30), and *Eutropis rugiferus* (24–28). *Eutropis macularia* and *E. rugiferus* are small species, with maximum SVLs of only 65 mm (Boulenger, 1887). *Eutropis macularia* only has 12–17 subdigital lamellae on the fourth toe (Boulenger, 1887), whereas *E. grandis* has 20–24. Boulenger (1887) recorded *E. rugiferus* as having broad contact between the frontonasal and frontal, whereas *E. grandis* has, at most narrow, often no contact between frontonasal

and frontal. *Eutropis longicaudatus* and *E. rugiferus* possess only one primary temporal scale (Greer and Broadley, 2000), whereas *E. grandis* has two primary temporal scales.

DISCUSSION

Several characters of taxonomic importance have been identified for the genus *Eutropis* (Greer and Broadley, 2000; Greer and Nussbaum, 2000) and these characters, where appropriate, have been recorded in the description of the holotype specimen. The reduced size of the first supraocular, not in contact with the frontal, is seen in all *Eutropis* species currently described and is considered partially diagnostic of the genus. The arrangement of the upper secondary temporal scale in relation to the parietal has been identified as a character of systematic and taxonomic importance. The parietal overlaps the upper secondary temporal in the *Mabuya*, *Euprepis*, and *Chioninia* genera, whereas the upper secondary temporal overlaps the parietal in all specimens of *Eutropis*. The arrangement of the temporals is also shown to be partially diagnostic, with the majority of *Eutropis* species having a 2 + 2 separated pattern (Greer and Broadley, 2000) and some having a 1 + 2 separated pattern, such as *E. rugiferus*.

Eutropis grandis described in this paper conforms to the known biogeographical distribution of scalation characters for *Eutropis* species (Greer and Broadley, 2000; Greer and Nussbaum, 2000), hence confirming it to this revaluated genus (Mausfeld et al., 2002). Further characters of importance (Greer and Broadley, 2000) are not applicable to this species because it lacks the lower eyelid window required for diagnosis.

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LIPI (Museum). We thank R. Brown and J. McGuire for discussions on the herpetofauna of Sulawesi and access to specimens collected by them. We also thank T. Coles, S. Olliver, Mr. Ben, Bonny, and Dedy for logistical support, and the community of Labundobundo for their field assistance. We thank Boeadi, Ibu Umpuni, and the Museum Zoologicum Bogoriense for access to specimens; D. Bray; Melbourne Museum, for use of their camera lucida; and M. Scroggie for Figure 3. We thank A. Greer for invaluable advice and comments on early drafts of this manuscript, along with two anonymous reviewers.

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APPENDIX 1

Material Examined

Eutropis grandis

Holotype: MZB 4862.

Paratypes: MZB 4317, 4309, 4312, 4308, 4310, 4311, 3869, 3873, 3872, 3871, 4321, 4318, 4314, 4320, 4313, 4315, 4319, 4316, 3870, 3874, 4322, 4862, 2258,

Additional referred material.—The ultimate destinations of these specimens are yet to be determined, (either Museum Zoologicum Bogoriense, Indonesia (MZB) or the Museum of Vertebrate Zoology (MVZ), University of California, Berkeley), and they are referred to by their field numbers. BSI270, BSI327, BSI553, BSI554, BSI641, BSI882.

Eutropis rudis

Sulawesi; MZB 3858, 3859, 3860, 3861, 3862, 3863, 3864, 4307, 4720, 4306.

Eutropis multifasciatus

Sulawesi; MZB 4724, 4725, 1657, 4590, 4574, 4577.