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**FIRST RECORD OF *UPERODON GLOBULOSUS*
(GÜNTHER, 1864) (ANURA: MICROHYLIDAE)
FROM ANDHRA PRADESH, INDIA**

(with one text-figure)

Uperodon globulosus (Günther, 1864) was originally described from Russelkonda, Orissa, in eastern India. This species has been sporadically collected from isolated localities in India, including Arunachal Pradesh (Bordoloi et al. 2000; Borah and Bordoloi, 2001), Assam (Bhaduri and Saha, 1980; Chanda, 1994; Choudhury et al. 1999), Bihar (Dutta, 1997; Molur and Walker, 1998), Goa (Molur and Walker, 1998), Gujarat (Daniel and Shull, 1963), Karnataka (Daniels, 1992), Kerala (George and Leelamma, 1995), Chattisgarh (then in Madhya Pradesh, now a separate district) (Abdulali and Daniel, 1954), Maharashtra (Abdulali and Daniel, 1954; Bhaduri and Daniel, 1956; Daniel, 1963; Daniels, 1992; Padhye and Ghate, 2002; Padhye et al., 2002), Orissa (Thurston, 1888; Boulenger, 1890; Satyamurti, 1967; Dutta, 1997) and West Bengal (Bhaduri, 1945; Bhaduri and Basu, 1956; Bhaduri and Saha, 1980; Sarkar, et al., 1992; Deuti and Bharathi Goswami, 1995), and from Bangladesh (Khan, 1982).

During a faunistic survey in the Nallamala Hills (14° 26'–16° 31'N; 78° 30'–80° 10'E), Eastern Ghats, Andhra Pradesh, between 3-16 June 2003, we recorded its occurrence from two different localities. On 14 June 2003, an adult female (Fig. 1) was collected between Mananur and Farahabad (16° 19'N; 78° 44'E) on the Amrabad Plateau, Nagarjunasagar Srisailem Tiger Reserve. This specimen was collected at ca. 2125 h while it was crossing the road during a heavy downpour. This constitutes the first record of the species from Andhra Pradesh. The voucher specimen (FBS/ZSI/N/1138) is deposited in the Freshwater Biology Station, Zoological Survey of India, Hyderabad. Subsequently on the same night, three male specimens were also encountered near Shikaram (16° 02'N; 78° 55'E), ca. 79 km s of the location from where

the voucher was collected. These were not collected as they were badly damaged by vehicular traffic.

Description of voucher collected.— Abbreviations used – SVL (snout to vent length), HW (head width), HL (head length), MN (mandible to nasal opening length), MFE (mandible to front of eye length), MBE (mandible to back of eye length), SL (distance between front of the eye to tip of the snout), EL (horizontal diameter of eye), IUE (maximum distance between upper eyelids), UEW (maximum width of inter upper eyelid), IN (distance between the nasal opening), IFE (distance between front of the eyes), IBE (distance between back of the eyes), EN (distance between front of the eye and the nostril), SN (distance between tip of the snout and the nostril), FLL (forelimb length), HAL (hand length), TFL (length of the third finger), TL (length of the tibia), TW (width of the tibia), FL (femur length), FOL (foot length), IMT (length of the inner metatarsal tubercle), OMT (length of the outer metatarsal tubercle), and ITL (inner toe length)]

A.] Size: Specimen of medium size (SVL 75.6 mm; males were between 55.1 – 62.0 mm), body stout and globular.

B.] Head: Head small, wider (HW 16.3 mm) than long (HL 13.7 mm; MN 9.8 mm; MFE 8.1 mm; MBE 7.9 mm), convex. Snout rounded, not protruding, its length (SL 6.5 mm) almost equal to the horizontal diameter of eye (EL 6.6 mm). Canthus rostralis distinct, loreal region obtuse. Interorbital space convex, broader (IUE 11.4 mm) than upper eyelid (UEW 4.84 mm) and internasal distance (IN 7.3 mm). Distance between the front of the eyes (IFE 12.3 mm) about three fourth the distance between the back of the eyes (IBE 16.2 mm). Nostrils round, closer to the eye (EN 3.1 mm) than to snout (SN 4.1 mm). Pupil vertical. Tympanum indistinct. Maxillary and vomerine teeth absent. Choanae large with movable integumentary flap. Tongue oval, free behind.

C.] Forelimbs: Arm shorter (FLL 15.1 mm) than hand (HAL 19.3 mm), not enlarged. Fingers long (TFL 10.0 mm), stout. Relative length of fingers, shortest to longest: IV < I < II < III.

Fingers free, tips not dilated, without dermal fringe or webbing. Subarticular tubercles indistinct.

D.] Hind limbs: Shank about two times longer (TL 18.1 mm) than wide (TL 10.0 mm), smaller than thigh (FL 27.3 mm) and also smaller than the distance from the base of inner metatarsal tubercle to the tip of toe IV (FOL 29.1 mm). Relative length of toes, shortest to longest: I < II < V < III < IV. Tips of toes rounded, dermal fringe absent, webbing rudimentary. Subarticular tubercles indistinct. Inner metatarsal tubercle prominent, shovel-shaped, its length (IMT 6.3 mm) more than one and a half times in length of the outer metatarsal tubercle (OMT 4.1 mm) and the length of the toe I (ITL 4.0 mm). Supernumerary tubercles and tarsal tubercle absent.

E.] Skin: Dorsal skin smooth throughout excepting near vent where it is granular. Ventral surface smooth. Dorsolateral folds absent. Occipital fold rather prominent.

F.] Colouration: Dorsal parts of head and dorsum brown with olive tinge, with black on snout, between the nasal openings and between the shoulders. Upper and lower flanks on either side, dorsal and lateral parts of the limbs spotted dark brown to black. Ventral parts of head, body and limbs pale with yellowish tinge. Vocal sac subgular and black.

All four specimens encountered were from well-wooded tracts of the Reserve. Owing to their fossorial habits, these frogs are seldom encountered and have been recorded sporadically. As all the males encountered had well-developed black vocal sac, we presume that their breeding in the Nallamala Hills, Eastern Ghats also com-



Figure 1. *Uperodon globulosus* (Günther, 1864) from Nagarjunasagar Srisaillam Tiger Reserve, Andhra Pradesh, southern India.

mences from June with the onset of monsoon as reported earlier (Chanda, 2002).

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**ON TWO REMARKABLE COLOUR VARIANTS IN
BOIGA DENDROPHILA MELANOTA (BOULENGER,
1896) (SERPENTES: COLUBRIDAE)**

(with five text–figures)

A multitude of articles deal with colour variants of snakes (e.g., Clark, 1997; Love, 1997, 2003; Vosjoli, 1997; Northcott, 1999), and entire books have covered this subject (e.g., Bechtel, 1995; Broghammer, 1999; Bartlett and Bartlett,



Figure 1. *Boiga dendrophila melanota*, a nearly melanotic male from Pattalung, with white dots instead of yellow bands.



Figure 2. *Boiga dendrophila melanota*, a nearly melanotic male from Pattalung, with white dots instead of yellow bands.



Figure 3. *Boiga dendrophila melanota*, a nearly melanotic male from Pattalung, with white dots instead of yellow bands. Close up of head.



Figure 4. Female of *Boiga dendrophila melanota* from Nakhon Sri Tammarat, with stripes instead of bands.



Figure 5. Female of *Boiga dendrophila melanota* from Nakhon Sri Tammarat, with stripes instead of bands.

2002), that deal mainly with variants resulting from offspring, especially bred for this purpose, or occasionally obtained as a result of inbreeding in captivity. Most of them concern albinos, leucistic animals or other unusual developments of the chromophores. Presumably, a majority of these animals would not be able to survive for a

long time in nature. On the other hand, aberrant colour varieties of snakes found in the wild are rarely reported.

Colouration is of importance for systematics within *Boiga dendrophila* (Boie, 1827). Nine subspecies are currently known (Gaulke et al., 2003 [2005]), and the differences between these depend primarily on colouration (Brongersma, 1934; Vogel, 2000). Adults are black, with yellow bands for all but two forms. The taxon from

Sulawesi has silver rings for periods of its life and turns unpatterned black with maturity (Vogel, 2000; Lang and Vogel, in prep.). Juvenile specimens are more vividly coloured than the adults and sometimes tend to be a shade of red in colouration. However, there appears to be no literature on abnormal colouration within a subspecies.

Boiga dendrophila melanota (Boulenger, 1896) inhabits West Malaysia and Thailand. The northern limit of its distribution is not precisely known, as there are reports from Vietnam that need to be confirmed (Campden-Main, 1970; Nguyen and Ho, 1996; Szyndlar and Nguyen, 1996). This is a common species, widely collected for the leather industry. Nevertheless, the major standard works do not mention any variations in the colouration beside the number of the rings (e.g., Tweedie, 1983; Taylor, 1965; Cox, 1991; Manthey and Grossmann, 1997). Brongersma (1934) examined 40 specimens and found a consistent pattern in all of them.

Figures 1–5 depict photos of two unpreserved specimens of *Boiga dendrophila melanota*. Both animals were collected for trade, but the animals can be traced back to their province of origin. They are both adults.

Description of specimen 1: An adult male, collected in the Province of Pattalung, Thailand, in 2001. The upper side of the body is totally black. On the lowest dorsal row, there are white dots expanding to the ventrals. These white dots replace the yellow bands of the more typical colour morph. They are also present on the tail. The head is black. The upper labials are white with black posterior margins. The underside of the head is white.

Description of specimen 2: An adult female, collected in the Province of Nakhon Sri Thammarat, Thailand, in 2000. This specimen has a striped, instead of a banded pattern. The body is black, on each side there is a bright yellow stripe dorsolaterally. This is no lateral stripe. Dorsolateral stripe about one dorsal row wide. A part of the streak is straight but a smaller part is wavy and interrupted. The tail is banded, as is usual for this subspecies. The head is black, the white upper labials have small black margins; this is also typical for the subspecies.

The first of these two remarkable specimens is a nearly melanotic animal. This is not the astonishing fact, but the remainder of the bands are white instead of yellow. This leads to the hypothetical question: whether this animal had white bands when it was a juvenile, as animals of this species tend to get darker with age and the bands tend to get reduced to dots.

There is one report of specimens of *Boiga dendrophila* with white instead of yellow bands (Vogel, 2000). These animals were members of the nominate form, supposedly originating from Java or an adjacent island, and belong to a population with the offspring being white and black, with no exception. Vogel (2000) noted that *Boiga dendrophila melanota* and *Boiga dendrophila dendrophila* (Boie, 1827) are closely related, resulting in hybridisation at Vanicek (1993) (see Vogel, 2000, for an explanation). Only from these two subspecies are white, instead of yellow, banded specimens known so far. Gaulke et al. (2003 [2005]) showed a nearly melanotic animal from Sumatra (1997), but in this specimen, the reduced bands were yellow.

We do not think that this animal is a member of a white population. A population with this colouration cannot be unnoticed by snake catchers and traders in this country. It is obviously an individual variant showing an axanthic mutation and melanistic tendencies.

The second specimen has a striped instead of a banded pattern. This is not really a rare phenomenon with banded snakes. A well known example is *Lampropeltis getula californica* (Blainville, 1835), with a banded and a striped phase. This case has been thoroughly discussed in the past (Klauber, 1936, 1944; Smith, 1943; Mayr, 1944; Dunn, 1944). A striped pattern is also known for *Pituophis melanoleucus* (Daudin, 1803). In contrast to *Lampropeltis getula*, it is rarely found in this species, but it is also a regular component of some populations (Riemer, 1958). In *Boiga dendrophila*, this colouration was not noted before and is not a phase. There is another example of a banded snake with aberrant striped specimens. Whitaker (1968) and Kuch (1991; 1993) reported on several specimens of striped *Bungarus fasciatus* (Schneider, 1801) from two widely separated localities (India and Java). In the specimen of *B. fasciatus*

reported by Whitaker (1968), there were, beside the stripes, two bands across the tail. This snake was a gravid female. All neonates had a striped pattern, similar to the female. The parallelism in colouration is obvious.

Broghammer (1999) called this pattern mutation "striped mutation" and associated it with low incubation temperatures or a dominant or recessive genetic deposition. As this animal was wild caught, a genetic defect seems to be likely.

It is a mystery that such conspicuous colour variants has remained unnoticed for such a long time in a common species such as *Boiga dendrophila*. This is another example of the limited knowledge we have of the tropical fauna.

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UROPELTIS MACROLEPIS IN THE DIET OF CALLIOPHIS NIGRESCENS

On 25 September 2004 at 1900 h, a specimen of *Calliophis nigrescens* (Günther, 1862) was collected from the leaf litter under a shrub on the Surla Plateau in the northern part of the Madhei Wildlife Sanctuary, Goa, India. The Sanctuary is located in the Western Ghats of north Goa and is contiguous with the Amboli forests in Maharashtra to the north, Bhimgad forests of Karnataka to the east and the Bhagwan Mahaveer (Mollem) Wildlife Sanctuary to the south. It covers an area of 208.48 km².

Probably due to stress of capture, handling or transport, the specimen regurgitated a freshly ingested snake. Although parts of the head of this snake were partially digested, based on other scalation data, it was identified as *Uropeltis macrolepis* (Peters, 1861). The identity was also

confirmed by comparing with a live conspecific specimen captured at this locality.

Oriental coral snakes are included in three genera: *Calliophis*, *Hemibungarus* and *Sinomocricurus* by Slowinski et al. (2001). There is little information on their ecology and most published information on these species is based on anecdotal observations (e.g., Takahashi and Kawamura, 1982; Anon., 1988; Mori and Hikida, 1991; Nobusaka et al., 1995; Cox, 2000). These snakes are known to primarily prey on fossorial snakes (Smith, 1943, Mattison, 1995), and in some cases, are also known to consume skinks, lizards and amphibians (Cox, 1991). Apart from this, there is a report of captive specimens of *Calliophis melanurus* being fed on *Ramphotyphlops braminus* in captivity (Vyas and Vyas, 1981). The present observation of *Uropeltis macrolepis* in the diet of *Calliophis nigrescens* is first prey record for *Calliophis nigrescens*.

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**TWINNING IN PYTHON MOLURUS
MOLURUS IN CAPTIVITY**

The Indian rock python, *Python molurus molurus*, is one of several reptiles to have been successfully bred at the Arignar Anna Zoological Park, Chennai, India. There are several reports on management, captive breeding, gestation, clutch size, incubation, feeding and growth rates in this species (e.g., Acharjyo and Misra, 1976; Paulraj and Thiruthalinathan, 1983; Kalaiarasan and Rathinasabapathy, 1991; Sekar and Rao, 1995; Baskar et al., 1999). The first report on twinning in *Python molurus bivittatus* was reported by Clark and Tytle (1983). The present study reports observation on twinning in *Python molurus molurus* for the first time in captivity.

The animals are housed in a custom-built enclosure, measuring 6.2 x 3.3 x 1.8 m. The three side of the enclosure are concrete walls and the side of the viewing gallery is covered with 8 mm glass of dimensions 3.72 x 1.26 m above the viewing glass. Perforated aluminium sheet is provided for ventilation. The door towards the service path has perforated iron sheet for cross ventilation. A cement trough of dimensions 0.92 x 0.58 m is provided inside the enclosure at ground level to provide water, and dried leaves, few logs, stones, sands are provided to facilitate moulting and to landscape the enclosure. A total of three adult female pythons, inclusive of the incubating female, are maintained in the enclosure.

The incubating female python was continuously monitored and the hatchlings measured and weighed. The twins were isolated and maintained in separate ventilated boxes to study their growth.

Mating was not observed, but on 11 April 2001, muscular contractions of the body were noticed in the gravid female, who was found in a corner of the enclosure laying eggs in the leaf litter. The clutch was left alone for natural incubation and the eggs were not manipulated. On 23 May, the female abandoned the clutch and swallowed a 1.5 kg chicken. It then resumed the position of coiling around the clutch. During this feeding interval, 30 eggs were counted. On the afternoon of 5 June, the first hatching was observed. A total of three pipped eggs were found, including one that contained the two hatchlings with a single yolk mass. The other two eggs contained a single hatchling each. The calculated incubation period was 56 days, inclusive of the hatchling day. On 6 June 2001, the remaining 25 eggs were examined and proved to be fertile. However, there were 30 to start with and three were removed on 5 June. The remaining two infertile eggs contained well developed but dead embryos. The mother abandoned the clutch and the young ones were observed emerging from the respective eggs on the 58th day. Of 30 eggs, 29 hatchlings were produced.

The python babies were released into a ca. 1 x 0.3 m plastic tray, covered with newspaper and the twin python babies were separated from

the single yolk. Later liquid Wocadine™ was applied on the cut portion as an antiseptic. The hatchlings were found to be active and agile.

On 15 June 2001, the twins were measured and weighed. The length and weight were 55 cm and 48 gm, respectively. The length of the other hatchlings varied from 55–70, mean 61.08 cm (n = 25), and weight 78–130, mean 111.56 gm (n = 25). The twins were marked and kept separately and are being monitored.

The two siblings born at a time for a mother (twins) are due to multiple pregnancy. There are three types of twins: identical twins, fraternal twins and Siamese twins. Identical twins are extremely similar in their characters, they are developed from a single zygote and called monozygotic twins. During cleavage, the zygote divides into two blastomers, the blastomer separate and each blastomere develop into a sibling (Meyyan, 1988). Fraternal twins are like ordinary brother and sisters, they develop from two independent zygotes (dizygitic twins) or (non-identical twins). Siamese twins are similar to identical twins, they develop from a single egg (monozygotic twins) and they are joined together physically.

From the above references it indicates that the python hatchlings are identical twins. Interestingly, the length and weight were similar. The sex of the twins has not been identified. This is the first report of the twins in captivity observed in this species. The literature survey revealed the rarity of identical twins in *Python molurus molurus*, and there are no published reports.

Our earlier studies revealed that while incubating, the female never abandoned the clutch (n = 6) for feeding. In the present study we observed that on the 43rd day, the female abandoned the clutch for feeding. Murthy (1990) reported that female pythons display a remarkable maternal instinct by remaining coiled around the clutch till hatchling.

Yadav (1967) observed that incubation period was 53 days, Paulraj and Thiruthalinathan (1989) noted the incubation period of 55 days at Arignar Anna Zoological Park, and Basker et al. (1999) reported 57 days at Arignar Anna Zoological Park. In present study, the incubation period was 56 days for 25 remaining eggs closely coincide with the above findings.

The clutch size varies from 8 to 100 (Daniel, 1983), Murthy (1990) reported that clutch size of python were 100 to 107. In the present study, the clutch size was 30 eggs with hatching percentage of 93.33.

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**EVIDENCE FOR THE HISTORIC OCCURRENCE
OF *CROCODYLUS POROSUS* SCHNEIDER,
1801 IN TONLE SAP, CAMBODIA**

(with one text-figure)

Two species of crocodiles are known from Cambodia: the Siamese crocodile (*Crocodylus siamensis*) and estuarine crocodile (*C. porosus*) (Thorbjarnarson, 1992). The Siamese crocodile formerly occurred in freshwater wetlands throughout the country (Campbell, 1860; Smith, 1931; Kimura, 1969; Thuok and Tana, 1994; Thuok, 1998; Platt et al., in press), but populations are now much reduced due to habitat destruction, unrestricted hunting, and over-collecting to stock crocodile farms (Platt et al., in press). Extant populations in Cambodia are restricted to the Cardamom Mountains (Daltry and Chheang, 2000; Barr, 2002), Sre Ambel River and floodplain wetlands (Platt et al., 2003), and parts of the Tonle Sap (Platt et al., in press). In contrast to *C. siamensis*, little is known regarding the past or present distribution of *C. porosus* in Cambodia. Tirant (1885) stated that *C. porosus* was widespread in Cambodia and responsible for more human fatalities than tigers (*Panthera tigris*), but provided little specific locality data. Kimura (1969) noted that *C. porosus* occurred in Kampong Som Bay near Sihanoukville, and according to Thuok and Tana (1994), *C. porosus* was present, albeit rare in coastal habitats of Koh Kong Province. Two large adult *C. porosus* on display in the Government-owned Siem Reap Crocodile Farm (S. Platt, pers. obs.) were reportedly captured in the latter region during the early 1980's (Nao Thuok, pers. comm.).

The situation regarding *Crocodylus porosus* in Tonle Sap is equivocal; anecdotal evidence suggests that estuarine crocodiles may have formerly occurred in the lake, but verified records

are apparently lacking. A Chinese diplomat living in Angkor during the 13th century mentions exceptionally large crocodiles inhabiting Tonle Sap (Chou, 1987), and Thorbjarnarson (2001) notes that Bas-reliefs at the Angkor ruins depict crocodiles attacking and eating humans, a behaviour more likely attributable to *C. porosus* (Platt et al., 2001 and references therein) than *C. siamensis*. Indeed, confirmed reports of anthropophagy by *C. siamensis* are extremely rare (Smith, 1931; S. Platt, unpubl. data). In another likely reference to *C. porosus*, villagers living on the lake described a large, aggressive crocodile known locally as *krapear* (sea crocodile) that once occurred in Tonle Sap, but disappeared 30 to 50 years ago (Platt et al., in press). Furthermore, *C. porosus* was present in the lower Mekong River and delta until recently (Cao and Jenkins, 1998; Stuart et al., 2002), and occasional upstream dispersal to the Tonle Sap is likely, especially given that transoceanic movements of over 1000 km have been reported in this species (Allen, 1974; Bustard and Choudhury, 1980). Likewise, other estuarine reptiles, such as the river terrapin (*Batagur baska*) and file snake (*Acrochordus granulatus*) are known to have historically occurred in the Mekong River system as far upstream as Tonle Sap (Saint Girons, 1972; Platt et al., 2003). Herein we provide physical evidence for the past occurrence of *C. porosus* in Tonle Sap.

Tonle Sap (Great Lake), located in the central plain of Cambodia, is the largest permanent freshwater lake in south-east Asia, and linked to the Mekong River system by the Tonle Sap River near Phnom Penh (Scott, 1989; Giesen, 1998). The areal extent of Tonle Sap varies widely depending on the season; during the dry months (December to mid-May) it covers 250,000 to 300,000 ha, expanding to 1.3 million ha at the height of the wet season when floodwaters from the Mekong River fill the lake (Scott, 1989; Giesen, 1998). Extensive seasonally flooded wetlands consisting of swamp forest, wet shrub lands, and open marshland surround the lake (MacDonald et al., 1997). The Tonle Sap ecosystem is described elsewhere in greater detail (Scott, 1989; MacDonald et al., 1997; Platt et al., in press).



Figure 1. Left crocodile mandible found by a villager in swamp forest surrounding Tonle Sap in Cambodia. The mandibular length (86.0 cm) indicates this bone is from a large, adult estuarine crocodile (*Crocodylus porosus*).

In May 2004, we obtained the left mandible of an adult crocodile from a local villager (Fig. 1). The mandible was found by the villager during April 2004 in swamp forest near Koh Ray (ca. 13°15'N; 103° 48'W), a remote hamlet on the northern shore of Tonle Sap approximately 6 km E of Port Choeng Khneas. This specimen is currently on display in the natural history collection of the GECKO (Greater Environment of Choeng Khneas Organization) Environment Center in Choeng Khneas. Based on the weathered appearance of the bone, we estimate the mandible to be 25 to 50 years old. However, in the absence of detailed information on how taphonomic processes (Behrensmeyer, 1978) affect crocodile bone, our estimate should be regarded as wholly subjective and we lack the means to make a more accurate determination at this time.

The straight-line mandibular length (ML) of the Tonle Sap specimen measures 86.0 cm. To our knowledge, *Crocodylus porosus* and *C. siamensis* cannot be distinguished solely on the basis of mandibular characteristics, but the ML suggests this mandible is that of a large adult *C. porosus*. Regression equations that relate ML to skull length (SL), head length (HL), snout-vent length (SVL), or total length (TL) are unavailable for either *C. siamensis* or *C. porosus*. However, the ratio of SL to ML in four large *C. porosus* skulls from Australia ranged from 0.76 to 0.80 (Grahame J. W. Webb, unpubl. data). Using the median value of 0.78, the SL of the

Tonle Sap specimen is estimated to be 67.0 cm. Because SL is generally 4 to 5% less than HL owing to tissue loss (Webb and Messel, 1978), the latter was calculated by adding 3.0 cm to SL, yielding a value of 70.0 cm. Webb and Messel (1978) found that HL predicted SVL of adult *C. porosus* by the equation $SVL = 3.60 (HL) - 4.30$; using a value of 70.0 cm for HL gives an estimated SVL of 247.7 cm. The TL of the Tonle Sap specimen can then be calculated by solving the equation $SVL = 0.49 (TL) - 0.72$ (Webb and Messel, 1978) yielding a value of 506 cm.

This value should be considered a conservative estimate of the TL of the Tonle Sap crocodile. The regression equations of Webb and Messel (1978) were derived from a sample of 1354 crocodiles ranging in TL from 25 to 425 cm; in larger *C. porosus*, HL is proportionally shorter in relation to TL and the equation relating HL to TL appears to considerably underestimate TL (Montague, 1983). Using these equations Montague (1983) found that a 620 cm *C. porosus* which he measured in New Guinea had a predicted TL of only 520 cm. Thus, it is likely that the actual TL of the Tonle Sap specimen was somewhat larger than indicated by our estimate.

Although *C. porosus* cannot be distinguished from *C. siamensis* on the basis of mandibular characteristics, the estimated TL of the Tonle Sap crocodile is consistent with the body size of *C. porosus* and considerably exceeds the maximum TL reported for *C. siamensis*. The former commonly attain total lengths of 3 to 4 m and specimens as long as 6 to 7 m are known (Daniel and Hussain, 1973; Greer, 1974; Webb and Messel, 1978; Montague, 1983). In contrast, while adult male *C. siamensis* occasionally reach 4 m (Brazaitis, 1973), most individuals do not exceed 3 m (Smith, 1931; Thorbjarnarson, 1992).

This report constitutes the first physical evidence that *C. porosus* formerly inhabited the Tonle Sap ecosystem in sympatry with *C. siamensis*. This is not unexpected; although the ecological relationship between *C. porosus* and *C. siamensis* is unknown, elsewhere (Australia, India, New Guinea, Philippines, Sri Lanka) in its extensive distribution, *C. porosus* inhabits inland freshwater wetlands with a congener (Thorbjarnarson, 1992). Unlike *C. siamensis*,

of which small numbers persist in remote, inaccessible wetlands surrounding Tonle Sap, recent survey data indicate that *C. porosus* was extirpated from the lake 30 to 50 years ago (Platt et al., in press). We posit that large body size and aggressive behaviour rendered *C. porosus* especially vulnerable to over-hunting and hastened its local demise.

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**FIRST RECORD OF *HEMIDACTYLUS PERSICUS*
ANDERSON, 1872 (SQAMATA: SAURIA:
GEKKONIDAE) FROM THE REPUBLIC OF INDIA,
WITH NOTES ON ITS DISTRIBUTION**

The Persian gecko, *Hemidactylus persicus*, is widely distributed, from eastern Arabia to southern Iran, and in the east, it reaches Sindh and Waziristan in Pakistan (Smith, 1935; Anderson, 1999). In Pakistan, Minton (1966) did not record the species east of the Indus River. The species is a member of a chiefly arid zone clade of *Hemidactylus*, which also includes the widespread Mediterranean form *H. turcicus* (Carranza and Arnold, 2005). It prefers xeric habitats, especially rocky deserts, flood plains and thorny *Euphorbia* forests, and it is occasionally observed in edificarian situations (Smith, 1935).

During the study of the reptilian fauna of Gujarat State, one of the authors (RV) collected specimens of an unusual gecko in and around the Jassore Wildlife Sanctuary, Gujarat State, India. After examination it was identified as *Hemidactylus persicus* Anderson, 1872.

The Jassore Wildlife Sanctuary (JWS) is in Banaskantha District, Gujarat State, and is one of the prime habitats of the Sloth Bear, *Melursus ursinus*. The sanctuary lies between 24° 20' and 24° 31'N; 72° 23' and 72° 37'E, and encompasses an area 180.66 km². The area is in the most south-westerly part of the Aravalli

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Hills and the habitat continues into the adjacent portion of Rajasthan State. Champion and Seth (1968) classified the area as a dry deciduous mixed with dry arid and grasslands. The dominant tree species in the area are *Acacia catech* (Khair), *Acacia nilolica* (Baval), *Zizyphus sp.* (Bor), *Butea monosperma* (Khakharo) *Anogeisus latifolia* (Dhav), *Wrightia tinctoria* (Dudhalo), *Boswellia serrata* (Saledi) and *Prosopis juliflora*.

Recent survey result shows that the sanctuary harbours 12 species of amphibians and 35 species of reptiles (Vyas, 2005). Four adult specimens of *Hemidactylus persicus* were collected in and around the JWS as voucher. All were deposited in the museum of Bombay Natural History Society (BNHS 1710 to 1713), Mumbai. Measurements and pholidosis of these specimens are provided in Table 1.

This species is locally uncommon and found in and around areas used by humans, including under rocks and tree logs, on large boulders and in ruined houses along with two other congeners, *H. flaviviridis* and *H. brookii*. It is active from early to late evening, emerging from diurnal retreats to forage shortly after sunset. At present, the species has been recorded at three localities: Balundra village, Forest Guest House and the campus of the Kedarnath Shrine; the last two localities lie within the protected area.

If this species is naturally distributed in and around the tropical deciduous forest of Jassore, it is possible that *Hemidactylus persicus* is distributed in other parts of the state from Kachchh to northern Gujarat and most probably adjacent areas of Rajasthan State, which share similar habitats. Therefore, a survey is needed to determine the actual distributional range of the species, especially in two protected areas, namely Balaram-Ambaji Wildlife Sanctuary, Gujarat and Abu Wildlife Sanctuary, Rajasthan, that provide environments similar to that at Jassore. Further, survey in such protected areas, relatively free of human disturbance, would help to rule out the possibilities that *H. persicus* has become established in India through human agency as have several of its congeners in other parts of the world.

The present localities of JWS and its environs in the Banaskantha District of Gujarat State are

east of Indus River at an approximate airline distance of 600 km from Karachi, Pakistan, previously the most south-easterly recorded locality for the species. *Hemidactylus persicus* has not previously been recorded from Gujarat (Gayen, 1999; Vyas, 2000; Sharma, 2000), nor from the Republic of India (Murthy, 1990; Tikader and Sharma, 1992; Sharma, 2002), thus, the records presented here represent not only a significant eastern range extension for the species, but also new state and national records.

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LEPIDODACTYLUS (SQUAMATA: GEKKONIDAE) IN ISLANDS ASIA: A *L. AUREOLINEATUS* FROM SULAWESI

Lepidodactylus geckos are modestly abundant lizards in many Oceania herpetofaunas but become increasingly uncommon to rare in the faunas of the larger islands and island groups of the Pacific Rim, and even more uncommon in Islands Asia. This rarity has no current explanation, nor am I aware that anyone has attempted to explain it. Thus, a specimen of *Lepidodactylus* from Sulawesi in the Naturalis collection was unexpected.

Presently, four species of *Lepidodactylus* are reported from Islands Asia. *L. lugubris* is the most widespread of these four and occurs in Cu Lao (Vietnam), Borneo, Sulawesi, Ambon, Halmahera, Ternate, Komodo, and Lombok in this

area (Ineich, 1999). Because of its occurrence also throughout the Pacific and coastally from other Asian islands and mainland (de Rooij, 1915), *L. lugubris* must be considered an exotic species, probably beginning its human-mediated dispersal within the last five centuries through European shipping. Its hybrid origin lies in eastern Micronesia and is relatively recent (Radtkey et al., 1996). The other species are older island residents, arriving and differentiating presumably well before the arrival of humans in Asia. These species have limited distributions: *L. lombocensis*, Lombok; *L. intermedius*, Komodo and Rintja Islands.; *L. ranauensis*, Borneo (Sabah). Another species, *L. listeri*, occurs to the west on Christmas Island in the Indian Ocean.

The preceding five taxa represent the three phenetic groups (Brown and Parker, 1977) of *Lepidodactylus*. *L. lugubris* is a Group III member, *L. intermedius* and *L. lombocensis* Group II, *L. listeri* Group I, and *L. ranauensis* intermediate between Group I and II (Ota and Hikida, 1988; Bauer, 1994; Ota et al., 2000). Group III appears to be most derived “clade” of *Lepidodactylus*, and with the exception of *L. lugubris*, Group III members occur on Pacific islands with the greatest diversity in the Philippines. The Naturalis specimen (RMNH 7341, Groot Sanghis, e/o [=vicinity of] Soemalata) from the north coast of Sulawesi was hidden under the *lugubris* epithet but a close examination revealed its misidentification and dissection revealed that it was a mature male. My initial assumption was that this specimen represented a new species, but further examination revealed it to be a *L. aureolineatus* and a likely introduction from the Philippines.

Brown and Alcalá (1994:78–101) provide a thorough overview of the Philippine *Lepidodactylus*. They recognize two sections of Group III *Lepidodactylus*. Section A geckos have 4ToeL (see Zug et al., 2003 for character abbreviations and definitions) greater than 12, tail only moderately depressed and no lateral skin flange, and combined femoral-precloacal pores greater than 26. RMNH 7341 has 13 4ToeLm, moderately depressed tail without flange, and 29 FemPor + PreclPor. Additionally, it has 115 Midb, which differentiates it from *L. herrei*, the other section A *Lepidodactylus*. In summary, RMNH 7341 is an adult male with large testes and epididymi-

des, 35.7 mm SVL, 15.7 mm TrunkL, 42 mm TailL (regenerated tip), 9.4 mm HeadL, 6.5 mm HeadW, 9 Suplab, 8 Inflab, 3 CircNa, 31 IntorbS, 2 CloacS, 16 PreclP, and 8 4FingLm.

The northern peninsula of Sulawesi is ca. 400 km from southern Mindanao and linked by an arc of islands (Kepulauan Sangihe). This arc might have permitted natural dispersal; however, regular boat traffic occurs between these two coasts (C. A. Ross, pers. comm. Sept. 2005). As a regular resident of coconut palms and aerial ferns, individuals of *Lepidodactylus aureolineatus* might commonly be transported to Sulawesi. Fortunately, a single individual was captured and preserved by a Dutch biologist in the late 1930s.

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