"This field identification guide was prepared under a collaborative research programme between Fauna & Flora International, Smithsonian Institution, the Myanmar Forest Department and several local scientists. It is intended to aid the identification of high conservation species and sites for development planning, environmental impact assessments, academic research – and for personal interest.

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FAUNA & FLORA INTERNATIONAL

IDENTIFICATION GUIDE

Amphibians & Reptiles of South Tanintharyi

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A guide prepared for the Fauna & Flora International-Myanmar Programme

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DEUTSCHE ZUSAMMENARBEIT

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Preface

Beginning in 2014, Dan Mulcahy (DGM) joined the Fauna & Flora International-Myanmar Programme's biological assessment teams to survey the amphibians and reptiles of the proposed Tanintharyi National Park. Based on nearly twenty years of working on the herpetofauna of Myanmar, George Zug prepared a tentative guide and checklist to amphibians and reptiles that might be encountered. Sections of the guide were revised prior to Mulcahy's subsequent 2015 and 2016 assessment surveys to the proposed protected areas further south and to the Myeik Archipelago in 2017. These herpetofaunal surveys and specifically the molecular genetics work and specimen vouchers thereof began to add significantly to the knowledge of the diversity of southern Tanintharyi. Before these surveys, our information on the components of this herpetofauna was little advanced over the random vertebrate surveys by British naturalists of the latter half of the 19th century.

More recent surveys by Zug and colleagues over the past two decades focused in other areas of Myanmar, with only four recent surveys in Tanintharyi in the area northeast of Dawei (2009, 2010) and near Kawthaung (2003), areas not visited by Mulcahy. What we could predict would occur on the western face [forest] of the Tanintharyi Mountain range was derived from those surveys and surveys of the Keang Krachan National Park and Phetchaburi Province, Thailand, which lie east of our Burmese survey areas.

The present guide is specifically directed to the areas recently surveyed by FFI teams in the southern Tanintharyi Mountains, specifically the proposed Tanintharyi National Park and the proposed Lenya NP including its extension, and the adjacent lowlands. For that reason, we have defined South Tanintharyi as the area of Myanmar south of latitude 13°N [approximately from the town of Palaw southward]. We also note that 13°N represents approximately the beginning of the Malay Peninsula of Southeast Asia (Fig. 1). The guide includes descriptions of 50 amphibians (2 caecilians, 48 frogs) and 121 reptiles (45 lizards, 59 snakes, 14 turtles, 3 crocodilians).

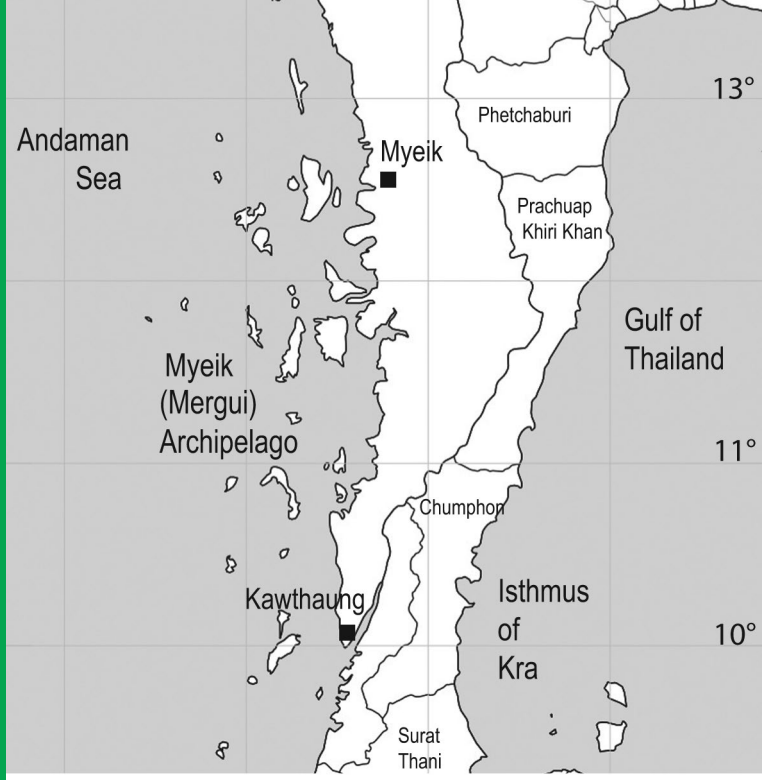


Fig.1 Outline map of South Tanintharyi.

The basis for the included species are all amphibian and reptile species vouchered by the FFI teams and the species that we anticipate occurring there based on our surveys and the additional sources mentioned above. We have included some, but not all species reported to occur in the abutting provinces of Thailand (Phetchaburi, Prachuap Khiri Khan, Champhon, Ranong). Biologically, this area is important as it represents the transition area from the Malayan to the mainland Southeast Asian fauna and flora as it is just north of the Isthmus of Kra and is the base of the Malay Peninsula. We have purposefully excluded marine species, thus seaturtles (Cheloniidae, Dermochelyidae), seasnakes (Hydrophis), seakraits (Laticauda), and most rear-fanged mudsnakes (Homalopsidae) are not included owing to the absence of surveys where these groups would live. The marine herpetofauna is even more poorly surveyed in this area than the terrestrial herpetofauna. Comments in this guide provide additional information regarding natural history, geography, taxonomy, and miscellaneous observations of the authors.

Introduction

The guide is organized by taxonomic groups and the subgroups therein. Sequentially, we offer a brief introduction to the biology and composition of each of the major groups: caecilians; frogs; lizards; snakes; turtles, and crocodilians. Keys are provided to identify the families within each of these groups. Each family account usually begins with a key to genera that occur in South Tanintharyi. At this stage, we do not provide keys to the species in each genus, rather we offer a set of diagnostic feature and brief comments on the biology for each species. For many of the species, particularly anurans, identifications were confirmed with genetics, as many of them remain cryptic and require rigorous morphological analyses for discernment. Our species accounts are based on adults and where sample size is adequate on specimens from southern Tanintharyi. Although our use of diagnostic features may cause users a little more work in identifying a specimen "in hand" to species, we believe that these descriptions increase the user's familiarity with all South Tanintharyi species within a genus thereby increasing the reliability of the species identification of the specimen in hand.

The diagnostic features or traits will always include a set of body measurements and often proportions. The measurements vary among the different taxonomic groups because different measurements are used to characterize species within different groups. The traits are defined within each group's accounts. However, body size (Snoutvent length, SVL) is always a listed trait and always for adults, where possible also separate size ranges for females and males. Those descriptions based solely on data from Tanintharyi specimens are identified by a dot [•] in front of the specific name. In a few instances, these strictly Tanintharyi accounts are based on small samples (n = 2–5); however, data from the literature, presumably of the same species, have differences hence our preference for small samples rather than adding features that may not occur in the populations of South Tanintharyi. Readers will find question marks in some descriptions because we were unable to confirm meristic or mensural values for an account item owing to our sample lacking one member of a sex and/or the data were not available in the herpetological literature.
Some "species" were identified based on comparison of published

sequences from other sources. Because of the close genetic similarities, we infer these to be the same, undescribed species revealed by other scientists (e.g. ***Fejervarya*** sp1). Because the "species" also occur in other regions, we wait for taxonomic experts on these groups to conduct comprehensive studies and properly describe them. We look forward to updating these sections in later versions of the guide.

We would be remiss if we did not inform the user that accurate identification of some Tanintharyi species is not always possible. Juveniles, especially among frogs, are difficult to segregate by species owing to absence of adult characteristic. Another aspect, again mainly among frogs, is the presence of cryptic species pairs or triplets occurring in the same location. We discovered this phenomen first among the ***Polypedates*** treefrogs. We would not have recognized it as quickly as we did if we had not been preparing molecular genetics for each specimen. Those data are being published elsewhere in the primary literature with reservations because they are based on a limited amount of data and sampling. This situation has been repeated in subsequent surveys and is one of the reasons for asking users of the guide to use descriptions for the identification of species rather than a single key couplet. We anticipate future work will improve our understanding of the species in this region as we become more familiar with them, which will allow for complete identification keys and ask user for patience and participation by providing feedback to this initial guide.

Common Descriptive Terminology

Position Terms:	
Anterior.	Front
Dorsal.	Top side, includes head, neck, back (=dorsum), sacrum (sacral).
Dorsolateral.	Outer upper edge of body and head where it curves ventrally.
Lateral.	Side, includes all surface from head onto tail.
Middorsal. **Sagittal.**	Midline of the body on top side; used in reference to this position whether on the head, trunk, and so forth. Sagittal typically used in a longitudinal sense.
Parasagittal.	Longitudinal and parallel to the sagittal plane.
Posterior.	Rear.
Venter.	Entire underside of an animal.
Ventral.	Underside, composed of chin (outside of mouth cavity to corners of lower jaw), throat (from chin to base of neck), chest (base of neck to rear of rib cage), belly (end of chest to pelvic area; also known as abdomen).
Ventrolateral	Outer lower edge of body and head where it curves beneath body.

Morphology:	
Abdomen, also belly.	From the end of the sternum to the pubis (muscle mass of hindlimbs).
Axillary.	Area or point where forelimbs attaches to the body, usually referenced to posterior edge of the juncture.
Chest, also throax.	From base of throat to the end of the sternum.
Chin.	Area from the tip of mandibles to end of mandibles; outer surface of head beneath buccal cavity.
Face.	Area between naris and orbit (eye); also referred to as loreal or preorbital area.
Inguinal.	Area or point where hindlimbs attaches to the body, usually referenced to anterior edge of the juncture.
Intercalary cartilage.	Block of cartilage between penulitimate and ultimate phalanges in the feet of treefrogs. It gives the toe tip a hinged appearance.
Metacarpal tubercles.	Tubercles of various sizes on inner and outer edge of the palm of the forefoot or hand.
Metatarsal tubercles.	Tubercles of various sizes on inner and outer edge of the sole of the hindfoot or foot.
Naris or nostril.	Opening of nasal passage to exterior; often called choana (plural, choanae).

Morphology:	
Nuchal.	Border area between and on back of head and neck; also Nape.
Parietal.	Top rear of the head; also large paired bone forming rear of braincase.
Postorbital or temporal.	Side of head between orbit and eardrum (tympanum).
Sacrum.	Area above the pelvic girdle.
Snout.	Dorsal tip of head, including nostrils.
Supraorbital, interorbital, and frontal.	Immediately above the orbit, between the orbits, and immediately behind orbits, respectively.
Throat.	Area from behind jaw articulation to immediately in front of chest; lower surface of neck from chin to chest.
Trunk.	Body from shoulders to hips (sacrum) and base of tail.
Tympanum.	Ear drum.
Vent.	Opening at base of tail or end of body in postmetamorphic frogs. Vent is the exit of the cloaca that collects the waste products of urinary and digestive systems, as well as sperm or eggs from the reproductive tract.

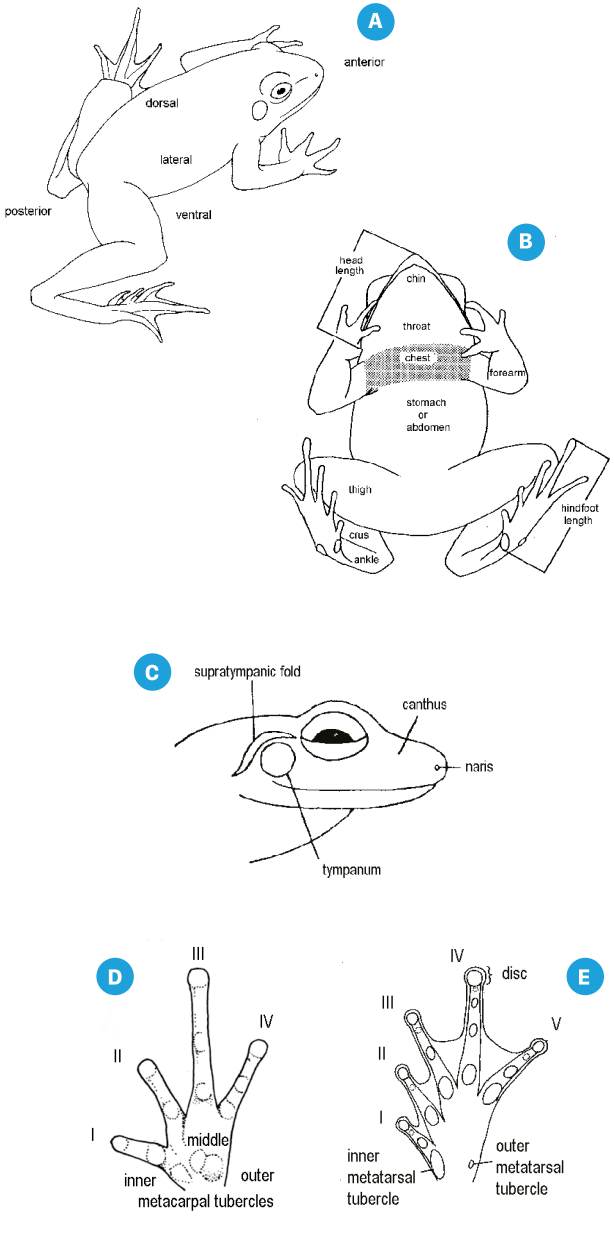


Fig.2 Anatomical features of anurans.

(A) Dorsolateral view of frog with anatomical position terms.

(B) Ventral view of frog with anatomical regional terms and two visual measurement examples.

(C) Lateral view of frog head with anatomical terms.

(D) Ventral view of forefoot (hand) and metacarpal terminology.

(E) Ventral view of hindfoot (foot) and metatarsal terminology.

Amphibia

Common Terms Used in Amphibian Descriptions

Measurements	
SVL.	Snout-vent length, straight-line distance from tip of snout to anteromedial edge of vent.
HeadL.	Head length, distance from tip of snout to posterior edge of the jaw articulation.
HeadW.	Head width, transverse distance from left to right outer edge of jaw articulation.
EyeD.	Eye diameter, horizontal diameter of eye.
TympD.	Tympanum diameter, measured horizontally from outside of tympanic annulus (raised edge around the ear drum).
TrunkL.	Trunk length, distance from posterior edge of forelimb at its juncture with the body to anterior edge of the hindlimb at its junction with the body.
HindlL.	Hindlimb length, with limb straightened from the vent to the tip of the longest toe, almost always the fourth toe.

Skin Surface Morphology	
Corrugated.	Numerous low glandular skin folds, closely packed and arranged longitudinally.
Dermal rings.	Transverse segmental folds (annuli; singular, annulus) in skin of caecilians; in some species, dermal scales are buried in the groove between the rings.
Glandular.	Low to mid height, small to medium-sized tubercles with flat tops.
Granular.	Low, small tubercles with rounded or blunt tops.
Pebbled.	Small to large flatten tubercles, usually in juxtaposition and often of mixed sizes.
Rictal gland.	Glandular enlargement at corner of mouth.
Rugose.	Mixture of various size tubercles closely packed.
Smooth.	No tubercles or folds.
Spinose [also spiny].	Bearing spines; often atop conical tubercles or sheet of small spines, each rising from a single cell.
Warty.	Numerous warts, multiple sizes, and usually separated by low rugose or granular skin.
Wrinkled [also folded].	Similar to corrugated with numerous skin folds

Morphology, general	
Circummarginal groove.	Expanded digital pads often possess a groove between the outer portion of the pad in contact with the substrate and inner part adjacent to the phalangeal tip.
Intercalary cartilage.	An extra cartilaginous rod that occurs between the terminal and penultimate bony phalanges in hylid and rhacophorid frogs, permitting the expanded digital pad to be placed fully parallel to the substrate to which the toe is adhering.
Metacarpal tubercles.	Enlarged friction pads (tubercles) on proximal surface of palm.
Metatarsal tubercles.	Enlarged friction pads (tubercles) on proximal surface of sole.

Coloration includes Color and Pattern	
Inguinal spot.	Single unicolor spot or bicolored ocellus on trunk near its juncture with the hindlimb.
Rump patch.	Area of contrasting color above or surrounding vent.

For other coloration terms, see snake section's common terms.

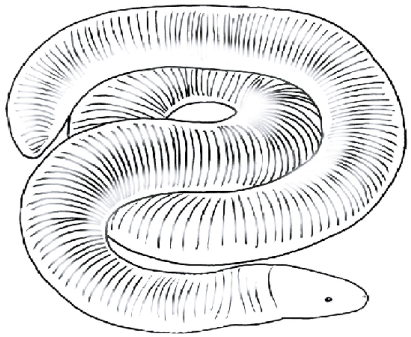


Fig.3 Schematic illustration of a caecilian.

Caecilians — Worm Amphibians

Caecilians (Gymnophiona) are a peculiar group of tetrapodous vertebrates. They have an ancient divergence from the other living amphibians, frogs (Anura) and salamanders (Caudata). They are totally limbless with no trace of fore- or hindlimb skeletal remnants, and the body is strongly annulated with dermal rings, head short with broad rounded snout and an extremely short tail. In general appearance, caecilians are easily mistaken for earthworms (or snakes), and like earthworms and some snakes, they are burrowers. They are readily distinguised from snakes by their dermal annuli. Although occasionally found on the surface, they are primarily subterranean, burrowing through soil and thick leaf litter. They burrow with forward head thrust pushing the soil aside. This digging behavior explains the many cranial adaptations of caecilians, such as a compact and tightly sutured skull, eyes beneath surface of skin, and an underslung jaw. In addition to a well-developed sense of smell, they a have a pair of retractable, chemosensory tentacles, one on each side behind the nostril.

Caecilians occur worldwide, except Australia, in the tropics. Most are burrowers, a few aquatic. They have internal fertilization; this enables some species to be live bearers, although all ichthyophid species lay eggs, and likely all may have a parent stay with the eggs until they hatch.

Asia has two families of caecilians, although only one (Ichthyophiidae) has representatives (genus Ichthyophis) in southern Tanintharyi and adjacent peninsular Thailand. Presently we have found only one species to occur in our area of study.

Ichthyophiidae Taylor, 1968

Ichthyophis kohtaoensis Taylor, 1960

Kohtao Striped Caecilian

Adults to 290 mm total length, not known to be sexually dimorphic in size; data on size is limited.

Overall purplish brown above and below; lateral cream stripe on lips to middle of eye continuing length of body to near vent; first cervical groove shallow dorsally and often absent middorsally; 358 to 366 annuli on body, 3 to 5 on tail; no middorsal light stripe on body

Comments.— Occurs in wet forest habitats, often adjacent to streams; forages on the surface of forest floor during wet weather; likely preys mainly on arthropods. Distribution is likely confined to the north-central part of the Malay Peninsula

Ichthyophis supachaii Taylor, 1960

Peninsular Striped Caecilian

Adults to 313 mm total length, not known to be sexually dimorphic in size; data on size is limited.

Overall lavender grey above and medium grey below, lateral cream spots on lips; lateral cream stripe on trunk from neck to near vent; first cervical groove shallow dorsally and often absent middorsally; 295 to 321 annuli on body, 3 to 5 on tail; no middorsal light stripe on body

Comments.— This species occurs south of Isthmus of Kra in Thailand. It is a possible, although unlikely, caecilian species in South Tanintharyi.

Anurans — Frogs & Toads

Anurans are unique among the coldblooded (ectothermic) vertebrates in having no tail and a reduced and constant number of trunk vertebrae in their post-embryonic larval (tadpole) stage. Their unique body form of a short body with head joined directly without neck and four sturdy limbs, hind pair almost always longer than forelimbs is an adaptation for jumping (saltatory locomotion).

This body form has proved incredibly adaptative and adaptable, and has permitted high diversification with nearly 7000 species worldwide. Frogs are absent only from Antarctica and oceanic islands, otherwise occurring everywhere from the driest habitats to the edge of snow lines on high mountains, and even edging into the Arctic in some areas. They are, however, most abundant and diverse in subtropical and tropical habitats. There are eight families in Myanmar. They occur in all habitats, including the Central Dry Zone with its five months without rain. SouthTanintharyi has seven families and nearly 50 species of frogs, although likely more. An exact number of species is not possible because our molecular studies are revealing that many species, assumed to be a single species, appear to be complexes of multiple species.

Frogs are characterized by a twophase life style: aquatic larvae (tadpoles) metamorphosing into a terrestrial four-limbed juvenile in a miniaturized adult body form. However, not all frog species have this indirect developmental mode; however, all but one Burmese species (Alcalus tasanae) do. Frogs with direct development deposit their eggs in a moist, terrestrial location (commonly guarded by one of the parents) and development occurs totally within the egg capsule. When the egg hatches, a miniature froglet emerges.

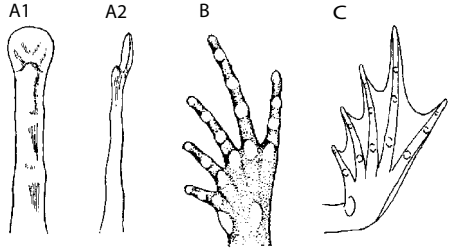


Fig.4 Some identification features of anuran feet. Dorsal (A1) and lateral (A2) views of a digit of ***Rhacophorus*** showing an expanded digit tip (pad) dorsally and laterally the offset pad owing to the presence of an intercalary cartilage between the penultimate and ultimate phalanges. (B) Ventral view of a hindfoot lacking webbing. (C) Ventral view of a hindfoot with full webbing.

Key to the Families of Tanintharyi Anurans

1. No teeth on the upper jaw (maxillae) 2

1′. Teeth present on the upper jaw 3

2. Dorsal surface of head, trunk, and limbs rough with numerous warts (small to large)..... *Bufonidae*

2′. Dorsal surface of head, trunk, and limbs smooth or superficially smooth but finely spinose..... *Microhylidae*

3. Hindfeet webbed and toes with expanded digit tips (pads); intercalary cartilage between penultimate and terminal (ultimate) phalanges, giving the toe tip a hinged appearance; all digits possess an intercalary cartilage ..... *Rhacophoridae*

3′. Hindfeet partially or fully webbed, or web free; with or without expanded digital pads; no intercalary cartilage in digits 4

4. Fore and hindfeet with medium to strongly expanded digital tips 5

4′. Digit tips of fore and hind feet variable, ranging from narrow but rounded digit tips to slightly expanded 6

5. Adults medium to large bodied, greater than 50 mm SVL; expanded digit tips of forefeet larger commonly larger than those of hindfeet; forefeet web free, usually extensive webbing on hindfeet ..... *Ranidae*

5′. Adults small, less than 50 mm SVL; fore and hindfeet digit tips modestly expanded, squarish and subequal; forefeet web free, hindfeet strongly webbed.Ceratobatrachidae

6. Terrestrial frogs with multicolored irises; fore and hindfoot digits not expanded.....[***Leptobrachium***] ..... *Megophryidae*

6′. Semiaquatic frogs with single colored irises, digit tips expanded or not-Dicroglossidae

Bufonidae

Bufonids are the true toads, and most species possess a warty skin. Each wart is a concentration of single-celled cutaneous poison glands. Most of the medium-sized and larger warts ooze (secrete) a thick, milky poison. Aside from the poison being distasteful and an irritant, it is also lethal in large doses to most vertebrates. Most toad species look like a toad and are easily identified as bufonids. The species do vary greatly in size from tiny species of 14 to 16 mm SVL to large species over 200 mm SVL. Among the 400+ species and 30+ genera, toads vary greatly in shape, although most are terrestrial and move by walking and hopping. Toads occur almost everywhere; only Australia lacks a native species of toad.

Key to genera and species of Bufonidae

1. Cranial ridges absent or indistinct 2

1′. One or more distinct cranial ridges present (Figure 3A) 3

2. Tympanum large, its diameter nearly equals diameter of eye; small, round parotoid glands; stout, small (SVL ≤ 50 mm) bodied..... *Ingerophrynus macrotis*

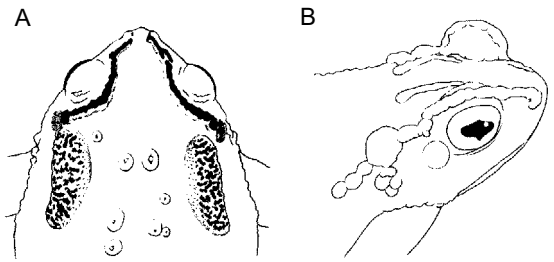
2′. Tympanum large, its diameter equals diameter of eye; no parotoid glands; slender, small (SVL ≤ 50 mm), and long limbed .... *Ansonia*

3. Weak canthal and no preorbital ridges, supraorbital and parietal ridges forming straight or slightly curved ridge on each side above eye, supratympanic ridge distinct; no dermal fold on inside of ankle ..... *Ingerophrynus parvus*

3′. Canthal and supratympanic ridges present; dermal fold present or absent on inside of ankle 4

4. Canthal and supraorbital present, latter commonly flattened; large dermal fold (tarsal fold) on sided of ankle; hindfeet with well-developed webbing ..... *Phrynoides asper*

4′. Canthal and supratympanic well developed and usually cornified on dorsal crests; large oblong parotoid gland on neck and shoulder of each side .....



Duttaphrynus melanostictus

Fig. 5 Morphological features of toads. (A) Dorsal view of head and shoulders of a ***Duttaphrynus melanostictus*** with well-developed cranial crests of canthal ridge continuous with supraorbital ridge joining postorbital ridge and a short supratympanic ridge touching the large parotoid gland. (B) Dorsolateral view of head and shoulder of an Ingerophrynus, glandular covered pre- and supraorbital ridges continuous with supratympanic ridge joining the small, round parotoid gland.

Ansonia kraensis Matsui, Khonsue & Nabhitabhata, 2005

Malayan Stream Toad

Adults, females 24–28 mm, males 20–22 mm SVL, sexually dimorphic; TrunkL/SVL not available, HindlL/SVL 148–156%, HeadL/SVL 29–34%, HeadW/SVL 28–32%, OrbD/SVL 8–11%, TympD/SVL 4–7%.

Skin, dorsally head and trunk with minute to small warts, underside coarsely granular on abdomen, finally granular on throat and chest. Digit tips, bluntly rounded on fingers and toes; no webbing between fingers of forefoot, modest webbing between toes of hindfoot.

Dorsal ground color medium brown with irregular darker marks on head and on trunk; dorsal surface of thigh brown banded with wide indistinct orangish yellow bands; underside shiny white background strongly mottled with dark brown.

Comments.— This species occurs in montane forest streams and seepage areas on the Thai side of the Tenasserim mountain range south of the southern tip of Tanintharyi. We have not found it on the Burmese side where it is apparently replaced by Ansonia thinthinae.

• ***Ansonia thinthinae*** **Wilkinson, Sellas, & Vindum, 2012**

Thin Thin's Stream Toad

Adults, females 22–27 mm, males 19–24 mm SVL, sexually dimorphic; TrunkL/SVL 36–48%, HindlL/SVL 156–180%, HeadL/SVL 30–34%, HeadW/HeadL 81–94%, OrbD/HeadL 32–40%, TympD/OrbD 54–71%.

Skin, dorsally from tip of head to sacrum tuberculate, variable small tubercles closely packed; upper surface of limbs with equal-sized small tubercles; underside, chin and throat smooth, chest and stomach granular with pavement of flattened tubercles. Digit tips, bluntly rounded on fingers and toes; no webbing between fingers of forefoot, near full webbing of hindfoot.

Overall dorsal ground color black from head to sacrum and dorsally on limbs, occasional splashes of yellow, especially on limbs; eyelids, lips, and entire underside mottled bright yellow on black.

Comments.— Presently known from only Tanintharyi; occurs in forested streams, usually streamside and mostly nocturnal.

• ***Duttaphrynus melanostictus*** **(Schneider, 1799)**

Asian Black-spined Toad

Adults, females 79–104 mm, males 67–86 mm SVL, sexually dimorphic; TrunkL/SVL 31–44%, HindlL/SVL 121–147%, HeadL/SVL 33–40%, HeadW/HeadL 102–120%, OrbD/HeadL 25–37%, TympD/OrbD 53–77%.

Skin, dorsally head and nape smooth except for supraorbital crests, remainder of dorsal surface with various size warts, two longitudinal series of widely spaced warts parasagitally on back and another series mid-laterally on each side of trunk, latter often cream colored; underside granular with closely packed flatten tubercles. Digit tips, bluntly rounded on fingers and toes; no webbing between fingers of forefoot, moderate webbing (two-thirds) between toes of hindfoot. Large round outer metacarpal tubercle and small inner one; modest inner and outer metatarsal tubercles.

Dorsal ground color mid olive-brown, darker or lighter on tops of some warts; no thigh pattern dorsally, occasional white irregular shaped spots on dark background on rear of thigh. Underside olive-tan with diffuse brown spotting.

Comments.— Secondary forests to villages, this terrestrial and nocturnal anuran is widespread and well known to most inhabitants of Southeast Asia.

• ***Ingerophrynus parvus*** **(Boulenger, 1887)**

Malayan Dwarf Toad

Adults, females 40–46 mm, males 31–40 mm SVL, sexually dimorphic; TrunkL/SVL 35–42%, HindlL/SVL 145–156%, HeadL/SVL 30–34%, HeadW/HeadL 108–114%, OrbD/HeadL 36–41%, TympD/OrbD 65–73%.

Skin, dorsally coarse granular owing to dense covering of small warts; only interorbital area smooth and lacking warts; moderate round to shorten oblong parotoid gland on each side of neck; venter also granular with closely packed small flatten tubercles. Digit tips, bluntly rounded on fingers and toes; no webbing between fingers of forefoot, only fourth toe of hindfoot extends beyond tightly bound foot; palmar surface of forefoot with large external metacarpal tubercle, internal tubercle smaller but conspicuous.

Dorsal ground color variable, usually medium brown on head, face, lips and trunk with ill-defined dark marks on dorsum, esp., posterior two-thirds of trunk; dorsal surface of thigh and crus with broad dark bars. Underside dusky tan background mottled with dark brown, chin and throat of males uniformly dark.

Comments.— Streamside in forest, terrestrial and nocturnal. Occurs broadly in southern Indochina to Sumatra and Java.

• ***Phrynoidis asper*** **(Gravenhorst, 1829)**

Asian Giant Toad

Adults, females 123–128 mm, males 96–108 mm SV, sexually dimorphic; TrunkL/SVL 32–40%, HindlL/SVL 145–158%, HeadL/SVL 33–35%, HeadW/HeadL 101–116%, OrbD/HeadL 28–39%, TympD/OrbD 32–44%.

Skin warty everywhere, dorsally on head scattered small warts, parotoid moderatesized elliptical and connected to orbit with thick glandular cranial ridge; underside pebbly, with edge of lower jaw and chest rugose with small warts/tubercles. Digit tips, bluntly rounded on fingers and toes, underside of tips of all digits with round, moderate size articular pads, large round outer metacarpal tubercle, moderate, round inner metacarpal tubercle, small elliptical metatarsal tubercles; no webbing between fingers of forefoot, moderately complete webbing between toes of hindfoot. Distinct tarsal fold in juveniles and adults.

Dorsal ground color mid to dark brown, unicolor on head to sacrum, mottled with cream on side of head and ventrolaterally on neck and trunk; dorsal surface of hindlimbs medium brown banded with dark brown; underside tannish white speckled with dark brown.

Comments.— Streamside in forest, terrestrial and nocturnal. Occurs in peninsular Thailand southward to Sumatra, Java and northern Borneo.

Ceratobatrachidae

A diverse group of mostly small to medium-sized frogs that occur from southern China to the Philippines and New Guinea. All appear to have direct development, i.e., eggs laid in moist microhabitats and development proceeds entirely within the egg-capsule, upon hatching a miniature froglet appears.

Alcalus tasanae (Smith, 1921)

Tha San Dwarf Cascadefrog

Adults, females ~26–43 mm, males ~20–37 mm SVL, sexually dimorphic; TrunkL/SVL ~30%, HindlL/SVL 152%, HeadL/SVL 45%, HeadW/HeadL 108%, OrbD/HeadL 34%.

Skin, dorsally from head to sacrum with numerous small, smooth tubercles, underside smooth without raised tubercles; tympanum exposed. Fore- and hindfeet digits broadly expanded with squarish tips bearing circummarginal grooves; no webbing of forefeet, hindfeet strongly webbed.

Dorsal ground color medium brown to orangish brown on head, trunk, and limbs, usually unicolor, occasionally ill-defined brown blotch from between eyes, expanded on trunk, to near sacrum; upper lip tan with two to three dark brown bars, dorsal surface of thigh with widely spaced dark brown bars; undersided creamy to grayish white.

Comments.— Lives adjacent to streams in heavily forested areas. Presently known in Myanmar only from the Kawthaung area of southern-most Tanintharyi and the Tanintharyi Nature Reserve.

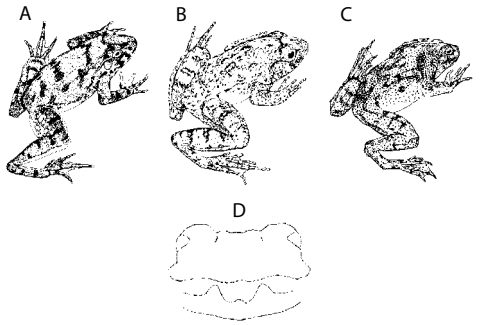


Fig.6 Morphological features of dicroglossids. Body shapes of *Fejervarya* (A), *Limnonectes* (B), and *Occidozyga* (C). (D) Front of mouth/jaws of *Limnonectes* showing the enlarged odontoid processes (“fangs”) on the lower jaw.

Dicroglossidae

Dicroglossid frogs with a single exception are Asian frogs. Their center of diversity is tropical Asia from India to the Philippines and southward into the Lesser Sunda Islands. Dicroglossids consist of two morphotype groups. The dicroglossinae possess the more typical ranoid (“true frog”) shape; whereas the occidozygine display two distinct shapes, a wartless toad shape and a teardrop shape with large, horizontal positioned hindlimbs with very large webbed feet. The latter subfamily contains only two genera (Ingerana [4 species], Occidozyga [12+ sp.]); all species are small to moderate-sized. The dicroglossines are more diverse in size, shape, and habits although most terrestrial or semiaquatic.

Key to genera of Dicroglossidae — Dicroglossinae & Occidozyginae

1. Fore- and hindfeet digit tips blunt to modestly expanded; no webbing on forefeet, hindfeet strongly webbed 3

1′. Forefeet with narrow round tips, hindfeet digit tips not or slightly expanded; no webbing on forefeet, hindfeet modestly or strongly webbed 2

2. Short, robust body; finger and toe tips expanded, hindfeet basally webbed ... *Ingerana*

2′. Body broad tear-shaped; fingers and toes pointed, hindfeet strongly webbed nearly to tips ..... *Occidozyga*

3. Head usually broad, as wide or nearly as wide as length; lower jaw with "fangs," center odontoid process lower than process on each side; prominent rictal gland at posterior corner of jaw ..... *Limnonectes*

3′. Head pointed triangular, width of head less than its length; lower jaw lacks fangs, center odontoid process as high as side or lower than odontoid concavity..... 4

4. Adults large, SVL>70 mm SVL; two large metacarpal tubercles, no inner metatarsal tubercle; midventral black stripe from chin onto throat ..... *Hoplobatrachus*

4′. Adults moderate sized to large, SVL usually <70 mm SVL; three large metacarpal tubercles, tiny inner metatarsal tubercle; dark marking confined to margin of lips and dark lateral throat marks (vocal sacs) in adult males ..... *Fejervarya*

Dicroglossidae — Dicroglossinae

Fejervarya cancrivora (Gravenhorst, 1829)

Crab-eating Grassfrog

Adults, females 61–98 mm, males 59–71 mm SVL, sexually dimorphic; TrunkL/SVL ~ 42%, HindlL/SVL 143–154%, HeadL/SVL 30–35%, HeadW/HeadL 96–108%, OrbD/HeadL 33–34%, TympD/OrbD sexually dimorphic ♀ 52–58%, ♂ 63–65%.

Skin, dorsally head and trunk smooth to slightly rugose, underside smooth. Digit tips, bluntly rounded on fingers, narrowly rounded on toes; no webbing on forefoot, hindfoot fully webbed with webbing extending as flange to tip of 4th toe.

Dorsal ground color medium olive brown from head to sacrum, including limbs; scattered small blackish marks on trunk; dorsal surface of thigh with faded dark bars, posterior thigh dark brown with white mottling. Face brown, large dark brown spots on light upper lip; dark spots on lower lip highlighted on cream-colored background; venter cream with numerous faded small brown marks.

Comments.— Recently a molecular and morphological study revealed that the widespread Crab-eating Frog was really a species complex of three species. F. cancrivora is the species living along the coast of the Bay of Bengal and Andaman Sea. The preceding metrics derive from a sample from Selangor, Malaysia. This frog is a tidal flats, mangrove and tidal stream frog. Our surveys have not censused its preferred habitat, thus its presence in South Tanintharyi remains unverified, although it likely occurs here.

• *Fejervarya "limnocharis"*

Grassfrog complex

Comments.— *Fejervarya "limnocharis"* as indicate by quote marks is a complex of similar appearing widespread terrestrialsemiaquatic frogs, common throughout the lowlands of tropical Asia. They occur in a variety of open-sky habitats from rice paddies to grass and sedge borders of rivers and lakes. The following three Tanintharyi species (*F.* cf. *multistriata*, *F.* sp1, *F.* sp2) are members of this complex.

• *Fejervarya multistriata* (Hallowell, 1861)

Grassfrog

Adults, females 41–59 mm, males 41–42 mm SVL, sexually dimorphic; TrunkL/SVL 31–41%, HindlL/SVL 165–185%, HeadL/SVL 39–46%, HeadW/HeadL 77–86%, OrbD/HeadL 25–29%, TympD/OrbD 54–57%.

Skin, dorsally rugose and bearing numerous narrow longitudinal glandular fold, also on sides; venter smooth. Finger and toe tips not expanded, bluntly rounded; no webbing on forefoot, hindfoot half webbed with third toe elongate with half of its length beyond webbing; forefoot with three nearly equal-sized metacarpal tubercle at base of palm, hindfoot with large spade-shaped inner metatarsal tubercle, tiny outer tubercle.

Dorsal ground color medium brown to brown overlain by dark brown blotches (some transverse) on top, about half individuals with cream middorsal longitudinal stripe; laterally trunk light brown to gray background with dark brown spots; dorsally thigh with distinct dark brown bars, rear of thigh dark brown with small white reticulations. Lips barred in dark brown and broad cream diagonal postorbital stripe to corner of jaw. Underside shiny white, thighs tan.

Comments.— Semiaquatic and nocturnal, marsh and pond edges in forested areas. Overall distribution unknown.

• *Fejervarya* sp1 (Kotaki et al. 2010-hp2 Clade 21)

Grassfrog

Adults, females 46–55 mm, males 39–46 mm SVL, sexually dimorphic; TrunkL/SVL 34–47%, HindlL/SVL 141–168%, HeadL/SVL 34–45%, HeadW/HeadL 83–96%, OrbD/HeadL 28–33%, TympD/OrbD 58–72%.
Skin, dorsally head smooth to parietals, thereafter strongly rugose with combination of broken longitudinal glandular folds and small tubercles, tubercles especially concentrated on side of trunk and dorsally on hindlimbs. Digit tips, bluntly rounded on fingers, slightly expanded on toes; no webbing between fingers of forefoot, nearly full webbing between toes of hindfoot; three enlarged ellipitical metacarpal tubercle, inner largest, progressively smaller; tiny outer metatarsal tubercle, medium large ellipitical inner metatarsal tubercle.

Overall dorsal color brown to dark brown, usually numerous dark brown spots on top and sides of trunk; dorsal surface of thigh dark banded, posterior surface mix of dark spots above and light spots below; face dark, lower lip with dark bars extending onto chin; chin and throat patterned with midventral dark stripe, some spotting near lips and irregular spotting on lips, remainder of venter creamy white.

Comments.— Semiaquatic, nocturnal residents of banks of forest streams. Overall distribution unknown.

• *Fejervarya sp2* (Kotaki et al. 2010–hp3 Clade 11)

Grassfrog

Adults, females 38–43 mm, males 31–34 mm SVL, sexually dimorphic; TrunkL/SVL 43–48%, HindlL/SVL 166–177%, HeadL/SVL 37–39%, HeadW/HeadL 85–86%, OrbD/HeadL 30–37%, TympD/OrbD 60–71%.

Skin, dorsally head smooth to parietals, thereafter strongly rugose with combination of broken longitudinal glandular folds and small tubercles, tubercles especially concentrated on side of trunk and dorsally on hindlimbs. Digit tips, bluntly rounded on fingers, slightly expanded on toes; no webbing between fingers of forefoot, nearly full webbing between toes of hindfoot; three large metacarpal tubercle, inner largest with progressive decrease in size to outer; modest ellipitical inner metarsal tubercle, outer small but distinct.

Overall dorsal color brown to dark brown, usually numerous dark brown spots on top and sides of trunk; some individuals with thin (occas. broad) middorsal light stripe from snout to sacrum; dorsal surface of thigh dark banded, posterior surface mix of dark spots above and light spots below; face dark, lower lip with dark bars extending onto chin; chin and throat patterned with midventral dark stripe, some spotting near lips and irregular spotting on lips, remainder of venter creamy white.
Comments.— Semiaquatic, nocturnal residents of banks of forest streams. Overall distribution unknown.

Hoplobatrachus rugulosus (Wiegmann, 1834)

Asian Rugose Bullfrog

Adults, females 77–103 mm, males 63–89 mm SVL, sexually dimorphic; TrunkL/SVL 34–43%, HindlL/SVL 137–143%, HeadL/SVL 18–23%, HeadW/HeadL 120–149%, OrbD/HeadL 46–69%, TympD/OrbD 61–83%.

Skin, dorsally head smooth to parietals, thereafter strongly rugose with combination of broken longitudinal glandular folds and small tubercles, tubercles especially concentrated on side of trunk and dorsally on hindlimbs. Digit tips, bluntly rounded on fingers, slightly expanded on toes; no webbing between fingers of forefoot, nearly

full webbing between toes of hindfoot; two enlarged metacarpal tubercle, inner ellipital, outer round; tiny outer metatarsal tubercle, medium large ellipitical tubercle on inner margin.

Overall dorsal color brown to dark brown, usually numerous dark brown spots on top and sides of trunk; dorsal surface of thigh dark banded, posterior surface mix of dark spots above and light spots below; face dark, lower lip with dark bars extending onto chin; chin and throat patterned with midventral dark stripe, some spotting near lips and irregular spotting on lips, remainder of venter creamy white.

Comments.— Likely resident of South Tanintharyi, although its presence has not been confirmed. Occurs broadly in tropical Asia from southern China and Myanmar southward into Peninsular Malaysia. Beginning of monsoon breeder in semi-permanent water, such as paddies, then frogs seemingly disappears.

Preceding meristic data from the Myanmar sample of Schmalz and Zug, 2002.

• *Limnonectes blythii* (Boulenger, 1920)

Blyth's Fanged Frog

Adults, females 83–105 mm, males 88–101 mm SVL, sexually dimorphic; TrunkL/SVL 28–35%, HindlL/SVL 165–185%, HeadL/SVL 39–46%, HeadW/HeadL 77–86%, OrbD/HeadL 25–29%, TympD/OrbD 54–87%.
Dorsally skin superficially smooth, but finely rugose to lightly rugose with few small tubercles on sided of trunk; underside shiny smooth. Digit tips on hands and feet slightly expanded and bluntly rounded; no webbing between fingers of forefoot, near full webbing between toes of hindfoot; forefoot with three metacarpal tubercle at base of palm, inner largest outer smallest, hindfoot with large spade-shaped inner metatarsal tubercle, tiny outer tubercle.

Dorsal color variable from medium tan, brownish olive to rufous brown; dorsum without pattern to scattered dark spots, few individuals with middorsal longitudinal cream stripe; dorsal surface of thigh dark banded or not, posterior thigh usually with finely reticulate pattern; soles of hindfeet dark brown to black; top of head and face uniform ground color, dark supratemporal border, lips dark and light banded (most evident ventrally); entire underside white.

Comments.— Nocturnal and semiaquatic, although adults often occurs in streams; a forest species of clear water streams. Occurs widely in Southeast Asia including Sumatra and Java.

• *Limnonectes doriae* (Boulenger, 1887)

Doria's Fanged Frog

Adults, females 38.1–49.6 mm, males 46.1–50.7 mm SVL, sexually dimorphic; TrunkL/SVL 31–41%, HindlL/SVL 161–201%, HeadL/SVL female 41–48% male 47–52%, HeadW/HeadL female 80–102% male 95–105%, OrbD/HeadL 22–33%, TympD/OrbD female 59–83% male 90–112%.

Skin, dorsally from middle of head to sacrum finely rugose becoming strongly rugose on sides and dorsal surface of limbs; underside, chin and throat smooth to lightly rugose, chest and abdomen lightly corrugated. Digit tips, slightly expanded on fingers and toes; no webbing on forefoot, modest (two-thirds) webbing on hindfoot; forefoot with three nearly equal-sized metacarpal tubercle at base of palm, hindfoot with large spadeshaped inner metatarsal tubercle, tiny outer tubercle.

Dorsal color variable from medium brown to dark olive brown; male unicolor to some diffuse dark markings dorsally, females typically lighter dorsally often with intraocular dark bar, scattered dark spots to streaks on trunk and regularly light middorsal stripe; no distinct thigh pattern; on face of both sexes bold, broad white and dark bars on lips, most evident on lower lips. Underside, dusky chin elsewhere white, hindlimbs in males often yellow to orange, especially on crus.
Comments.— Nocturnal in primary and secondary forest; stream-side resident of forest streams. Occurs throughout Malay Penisula.

• *Limnonectes limborgi* (Sclater, 1892)

Limborg's Fanged Frog

Adults, females 24.7–28.0 mm, males 20.8–27.9 mm SVL; TrunkL/SVL 36–45%, HindlL/SVL 160–184%, HeadL/SVL 39–49%, HeadW/HeadL 85–101%, OrbD/HeadL 24–37%, TympD/OrbD 43–68%.

Skin, dorsally head to sacrum smooth, smooth to finely rugose on dorsal surfaces limbs and on sides of trunk, underside from chin to pubis shiny smooth. Digit tips slightly expanded on fingers and toes, somewhat conical shaped; no webbing between fingers of forefoot,

toes half webbed; forefoot with three metacarpal tubercles at base of palm, inner largest decreasing in size to outermost; hindfoot with large spade-shaped inner metatarsal tubercle, tiny outer tubercle.

Overall dorsal color medium brown throughout, some darker spots on trunk, thighs banded diffuse to bold; few individuals with middorsal cream stripe for snout to vent; underside ivory to creamy white; lower lip white and dark barred.

Comments.— Nocturnal in primary and secondary forest; stream-side resident of forest streams Occurs in Malay Peninsula.

Dicroglossidae — Occidozyginae

• *Ingerana tenasserimensis* (Slater, 1892)

Tenasserim Tricklefrog

Adults, females 20–22 mm, males 14–20 mm SVL, sexually dimorphic; TrunkL/SVL 37–45%, HindlL/SVL 176–197 %, HeadL/SVL 39–46%, HeadW/HeadL 90–97%, OrbD/HeadL 30–39%, TympD/OrbD 55–79%.

Skin, dorsally head smooth, trunk smooth to lightly corrugated; venter smooth from chin to thighs. Digit tips lightly expanded equally on fingers and toes; hands web free, hindfoot about half webbed; two equal-sized metacarpals on base of palm, large elongate inner metatarsal tubercle, outer small or none, narrow flange on outside of sole and proximal phalanx of outer toe.

Overall dorsal color brown to medium brown; numerous dorsal dark brown marks, first is intraorbital and continues on trunk to sacrum, occasional indication of broad light brown dorsolateral stripes; upper lip light with pair of dark bars beneath corners of eye; thigh and crus dark banded dorsally; underside dusky brown (speckled) from chin through chest, abdomen light brown to tan.

Comments.— Nocturnal and terrestrial living along forest streams. Distribution appears to be Peninsular Myanmar and adjacent Thailand into northern Malaysia.

• *Puddlefrogs (Occidozyga)*

Small frogs (18–55 mm SVL) with pointy head and robust body; dorsal skin is finely spiculate; fore and hindlimbs project distinctly laterally from body, rather than downward; forefeet without webbing and all four fingers are long and pointed; hindlimbs stout and longer than body; large hindfeet fully webbed and toe tips similarly pointed.

Puddlefrogs are diurnal and nocturnal, terrestrial and semiaquatic often sitting adjacent to small bodies of water; secondary forest and open agricultural land, often in road-rut puddles to banks of small ponds and streamside.

• *Occidozyga lima* (Gravenhorst, 1829)

Gray-green Puddlefrog

Adults, females 27–32 mm, males 26–27 mm SVL, sexually dimorphic; TrunkL/SVL 29–38%, HindlL/SVL 153–178%, HeadL/SVL 30–38%, HeadW/HeadL 90–110%, OrbD/HeadL 28–33%, TympD/OrbD 79–94%.

Skin, dorsally head numerous small spiculate tubercles, trunk uniformly tuberculate with small tubercles, underside with large flatten tubercles on chest and stomach. Digit tips, tapering to narrow bluntly rounded tips on fingers, similarly on toes; no webbing between fingers of forefeet, fully webbed hindfeet.

Overall dorsal color light to dark greyish olive, scattered small dark marks on head, larger ones on trunk, face and temporal area lighter than top of head; dorsal surface of thigh with scattered black, posterior surface boldy patterned with broad horizontal white stripe highlighted ventrally with black stripe; underside from near white to dusky ground color with paired dark stripes on chin and neck, chest and belly usually darker than chin and irregularly marked with white spots, base of thigh with pair of dark bars edged medially with white spots.

Comments.— The preceding description of an Occidozyga is a general match for what has been considered the widespread Burmese O. lima. Over the past decade, we have discovered that there are likely multiple "O. lima" species in Myanmar. This observation has been recently confirmed by DNA analysis (Mulchay et al., 2018) and simultaneously morphological examination reveals external differences among the multiple populations. "O.lima" is widespread from eastern India through southern China and Southeast Asia to Java.

• ***Occidozyga martensii*** **(Peters, 1867)**

Malayan Puddlefrog 1–3

Adults, females 21–28 mm, males 19–24 mm SVL, sexually dimorphic; Females — TrunkL/SVL 30–41%, HindlL/SVL 142–177%, HeadL/SVL 30–37%, HeadW/HeadL 95–128%, OrbD/HeadL 26–34%, TympD/OrbD 57–95%; Males — TrunkL/SVL 25–37%, HindlL/SVL 159–190%, HeadL/SVL 31–39%, HeadW/HeadL 93–114%, OrbD/HeadL 32–38%, TympD/OrbD 48–80%.

Skin, dorsally head smooth, trunk lightly corrugated with scattered, smooth flat tubercles, chin and throat smooth, chest and stomach faintly corrugated. Digit tips, narrow and bluntly rounded on fingers and toes; no webbing between fingers of forefeet, fully webbed hindfeet.

Overall dorsal color medium brownish olive, with broad transverse tan band from behind eye to anterior edge of the trunk; some individuals lack this "parietal" band and may have broad tan parasagittal stripes; few individuals with narrow vertebral light stripe. Face with broad diagonal light stripes from eye to lip and to corner of jaw.

Comments.— Our recent molecular analyses reveal that this species complex represents three distinct clades and more work is needed to determine if this complex consists of multiple species. Occurs from southern China throughout Southeast Asia.

• ***Occidozyga*** **spD Malayan Puddlefrog**

Adults, females 25–29 mm, males 19–22 mm SVL, sexually dimorphic; Females — TrunkL/SVL 35–42%, HindlL/SVL 145–171%, HeadL/SVL 34–43%, HeadW/HeadL 81–103%, OrbD/HeadL 26–35%, TympD/OrbD 54–76%; Males — TrunkL/SVL 34–36%, HindlL/SVL 164–174%, HeadL/SVL 36–41%, HeadW/HeadL 87–106%, OrbD/HeadL 32–46%, TympD/OrbD 35–62%.
Skin, dorsally head smooth to lightly corrugated, trunk lightly corrugated with widespread, smooth flat tubercles, chin and throat smooth, chest and stomach with numerous small flat tubercles. Digit tips, bluntly rounded on fingers and toes; no webbing between fingers of forefoot, fully webbed hindfeet.

Overall dorsal color medium brownish olive with broad tan band from behind eyes to nape; some individuals lack this band, other with or without band possess broad parasagittal tannish stripes, few individuals with narrow light vertebral stripe from nape to sacrum; dorsal and posterior surfaces of thigh patternless; face with broad diagonal stripe from eye to anterior lip and to corner of jaw.

Comments.— Our recent molecular analyses reveal several unique lineages of *Occidozyga*, including this one from the proposed Tanintharyi National Park, close relationship was found with specimens from the National Nature Reserve northeast of Dawei (A. Bogisich pers. comm.). This lineage represents an undescribed species, which may be endemic to the Tanintharyi region.

Megophryidae

South Tanintharyi has a single representative genus of megophryid frogs, Leptobrachium. Thus far, a single species has been detected and appears widespread in forested habitats and in some instances disturbed one that retains some forest-like habitats. *Leptobrachium* is easily identified by bright bicolor or tricolor irises. The megophryid family or Toadfrogs is a small group of less than 100 species, and most are terrestrial anurans. Their distribution is centered on Southeast Asia and the Greater Sundas. Most species occur streamside in forested habitats. All have indirect development with eggs laid in water, hatching into free-swimming larvae (tadpoles) and metamorphosing into tiny froglets.

• ***Leptobrachium smithi*** **Matsui, Nabhkitabhata, and Panha, 1999**

Southern Bicolor-eyed Toadfrog

Adults, females 50–69 mm, males 46–58 mm SVL, sexually dimorphic; TrunkL/SVL 41–47%, HindlL/SVL 122–135%, HeadL/SVL 39–49%, HeadW/HeadL 91–105%, OrbD/HeadL 27–36%, TympD/OrbD 48–66%. Size range for Thai specimens is females 56–78 mm, males 36–68 mm SVL
Skin, dorsally head and trunk smooth and shiny, flat tubercles laterally onto underside. Digit tips, bluntly rounded on fingers and toes; no webbing between fingers of forefoot, modest webbing

(two-thirds) between toes of hindfoot. Pair of large round metacarpal tubercles on palm, small inner metatarsal tubercle on sole.

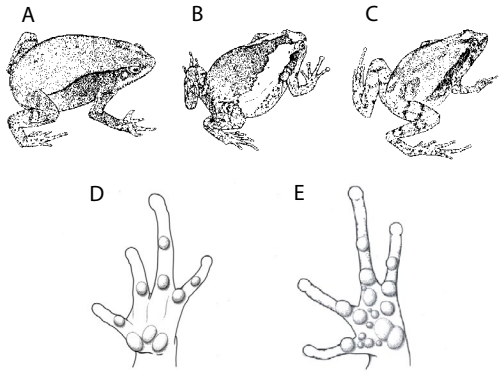


Fig.7 Some morphological features of microhylid frogs. Body shapes of (A) *Kalophrynus*, (B) *Kaloula*, (C) *Microhyla*. Ventral view of the hands of a (D) *Microhyla heymonsi* and (E) *Micryletta inornata*.

Overall dorsal color medium brown on head, trunk, and limbs; large dark brown irregular-shaped mark edged narrowly with black and white occurs on top of head with extensions forming supratympanic crescent on each side, forming smaller marks on dorsal trunk, and even smaller and rounded marks on lower side of body; dorsal surface of thigh distinctly banded with narrow, white-edged bands, posterior surface white-spotted to reticulate on dark brown. Underside, males with dark chins and throats, females dusky; chest white to beige, stomach heavily spotted in dark brown to black. Eyes with double colored irises, yellow, orange or red above and dark below

Comments.— Nocturnal forest floor denizen in both primary and secondary forest. Occurs broadly in Myanmar and Thailand.

Microhylidae

A diverse group of small to medium-sized frogs. They occur worldwide and have diversified broadly from fossorial to arboreal species, and on most continents, their diversification have lead to unique morphologies, which are recognized by 10 subfamilial designation based on morphotypes and molecular data (clades). Only two, Kalophryninae and Microhylinae, occur in Southeast Asia, and both are present in southern Tanintharyi.

Key to the genera of Microhylidae

1. Large, triangular digital pads on fore- and hindfeet ..... *Kaloula*

1′. Forefeet with small digital pads or rounded finger tips; hindfeet with none to modest digital pads 2

2. Dorsally with broad cloak of glandular skin with tiny spinules from rear of head to vent, giving frog triangular body outline .... *Kalophrynus*

2′. Dorsally skin lightly rugose to smooth, body outline tear-shaped with pointed snout or elongate with blunt snout 3

3. Hindfeet without webbing; toes lack disks, tips bluntly rounded ..... *Micryletta*

3′. Hindfeet moderately to strongly webbed, web extends third or more length of the fourth toe; toes with small discs, variable in size ..... *Microhyla*

Microhylidae — Kalophryninae

• ***Kalophrynus interlineatus*** **(Blyth, 1855)**

Striped Sticky Frog

Adults, females 35–46 mm, males 34–45 mm SVL; TrunkL/SVL 35–44%, HindlL/SVL 122–148%, HeadL/SVL 28–37%, HeadW/HeadL 95–115%, OrbD/HeadL 30–37%, TympD/OrbD 63–100%.

Skin, dorsally head smooth, trunk with glandular cloak from nape to vent, its surface covered with tiny spines; limbs similarly spiny above, underside lightly rugose. Digit tips, bluntly rounded on fingers and toes; no webbing between fingers of forefoot, modest webbing between toes of hindfoot.

Ground color variable (rufous, tan to dark brown), usually with dark reverse-V striping from nape through length of trunk; dark circular spot (ocellus) in inguinal area; top of thighs distintly banded; underside with dusky chin and anterior throat, lighter posteriorly.

Comments.— Forests, secondary and primary, although occurs adjacent to streams often found distant from stream bed; terrestrial and nocturnal. Occurs from central Myanmar through Indochina.

Microhylidae — Microhylinae

• *Kaloula latidisca* Chan, Grismer & Brown, 2014

Malayan Painted Bullfrog

Adults, females 43–52 mm, males 39–51 mm SVL; TrunkL/SVL 39–47%, HindlL/SVL 136–166%, HeadL/SVL 28–39%, HeadW/HeadL 81–136%, OrbD/HeadL 22–36%, Tympanum hidden by large glandular fold.

Short, blunt-snouted head indistinguishingly joining block-shaped body; limbs slender of modest length and short; hands appear large. Skin, dorsally head smooth to lightly corrugated, trunk lightly corrugated, underside smooth with flattened tubercles. Digit tips large and triangular on fingers, blunt, unexpanded square tips on toes; slight webbing at base of fingers, toes about third webbed with flattened flanges on free edge of toes.

Overall dorsal color medium brown with dark brown markings; head unicolor or lightly dark spotted dorsally, lighter brown without markings on face and cheeks; variably shaped dark brown marking on trunk from nape to pelvis, similarly on sides of trunk; commonly white patches on fore- and hindlimbs at insertion with body; rear of thigh dark and white mottled; underside medium dark brown with scattering of irregular-shaped mark of medium brown.

Comments.— Mainly a forest species, terrestrial, arboreal, and nocturnal. Our recent molecular analyses indicate that the Tanintharyi specimens are K. latidisca, a recently described species from West Malaysia and a member of the K. baleata complex.

Kaloula pulchra (Gray, 1831)

Painted Bullfrog

Adults, females 52–58 mm, males 53–70 mm SVL; TrunkL/SVL 40–52%, HindlL/SVL 127–154%, HeadL/SVL 26–29%, HeadW/HeadL 117–130%, OrbD/HeadL 24–40%, TympD/OrbD 70–90% (tympanum often covered by glandular fold in males).

Skin dorsally smooth, almost leatherly from to sacrum and on limbs; underside, chin and throat granular with tightly backed small tubercles, remainder of venter leathery and faintly rugose. Hands with long fingers, tips expanded as blunt rectangular pads without circum-marginal grooves; toe tips not expanded, bluntly rounded; no webbing between fingers, modest webbing between toes.
Three metacarpal tubercles (circular to elliptical), outer largest, inner medium-sized, and middle smallest. Two metatarsal tubercles, both spade–like, inner largest.

Overall dorsal color medium to dark brown, broad beige to tan dorsolateral stripes that are continuous with light colored snout; most individuals with light cream patch at each junction of leg with body, these patches continuous with dorsal thigh pattern, posterior surface of thigh dark with some dusky spots. Underside, chin dusky, throat to pubis dusky tan background with dense small reticulate of medium brown.

Comments.— Nocturnal, terrestrial to semiarboreal; ecologically tolerant from town to open forest habitats; widespread in Myanmar and Southeast Asia.We observed K. pulchra in the towns of Myeik and Bokpynin during our recent surveys, along streets and parking lot along the coastal ports; perhaps these populations represent an introduction.

• *Microhyla butleri* Boulenger, 1900

Butler's Narrow-mouth Frog

Adults, females 22–23 mm, males ?? mm SVL; TrunkL/SVL 42–43%, HindlL/SVL 180–194%, HeadL/SVL 32%, HeadW/HeadL 96–97%, OrbD/HeadL 30–32%, TympD/OrbD ??, tympanum covered by glandular fold.

Skin, dorsally smooth on head and limbs, lightly rugose on trunk from nape to sacrum, underside lightly rugose. Digit tips, bluntly rounded and slightly expanded without circummarginal grooves on fingers and toes; no webbing on forefoot, basally webbed on hindfeet; three metacarpal tubercles, oblong, near-equal sized; two metatarsal tubercles, moderate and subequal sized, inner elliptical, outer circular.

Dorsal ground color medium brown with large dark brown mark from supraorbital area posteriorly to sacrum, irregular-shaped dark brown stripe laterally on trunk; dorsal surface of thigh and crus with narrow dark brown bars, posteriorly thigh yellowish with brown speckling.

Comments.— Secondary forest and cultivated areas, terrestrial and nocturnal. Widespread in Southeast Asia from southern and southwestern China to Myanmar and southward to Singapore. Southern Vietnamese M. butleri female SVL to 26mm, male's to 23 mm.

• *Microhyla fissipes* Boulenger, 1884

Oriental Ornate Narrow-mouth Frog

Adults, females 24–28 mm, males 23–27 mm SVL, borderline sexually dimorphic; TrunkL/SVL 33–39%, HindlL/SVL 152–236%, HeadL/SVL 26–33%, HeadW/HeadL 94–116%, OrbD/HeadL 31–41%, TympD/OrbD ??, tympanum covered by glandular fold.

Skin, dorsally smooth to finely rugose, underside smooth. Digit tips, bluntly rounded on fingers and toes; no webbing of forefoot, slight webbing basally between toes of hindfoot; three large metcarpal tubercles, round to oblong, outer largest, middle and inner subequal, outer and inner usually touch proximally; two well-developed metatarsal tubercles, outer slightly larger than inner, both circular.

Dorsal ground color medium brown with large, dark brown arrow-like figure from between eyes to sacrum; face dark brown and dark brown laterally from behind eye to midtrunk; dorsal surface of thigh with one or two narrow dark bars, posterior surface with pericloacal dark mark and densely dark speckled laterally. Venter white to cream, dark speckling from chin to throat in females, densely speckled in males.

Comments.—Secondary forest and cultivated areas, terrestrial and nocturnal; widespread in Southeast Asia. Many Asian Microhyla species appear to be species complexes of multiple populations of individuals morphologically very similar, yet each population represents a genetically distinct, independent lineage. Microhyla fissipes is a name resurrected for the "Microhyla ornata" populations from Myanmar through Indochina and China. M. ornata is the populations in peninsular India and Sri Lanka. Our unpublished analyses demonstrate that M. fissipes is similarly a composite species and that the Tanintharyi and other Myanmar populations are presently unnamed, although for convenience, here we use M. fissipes. Recently, one research article used M. mukhlesuri for Thai and south Indochinese M. fissipes populations, previously a named used only for the Bangladesh population.

• *Microhyla heymonsi* Vogt, 1911

Black-sided Narrow-mouth Frog

Adults, females 22–25 mm, males 18–23 mm SVL, sexually dimorphic; TrunkL/SVL 32–43%, HindlL/SVL 172–209%, HeadL/SVL 28–33%, HeadW/HeadL 100–120%, OrbD/HeadL 28–39%, TympD/OrbD ??, tympanum covered by glandular fold.
Skin, dorsally head smooth, trunk, sides, and limbs finely rugose, underside smooth. Digit tips, bluntly rounded on fingers, barely expanded on toes; no webbing of forefeet, hindfeet about half webbed; three large metacarpal tubercles, inner and outer circular touching proximally, inner oblong and about half size of other two tubercles; two oblong metatarsal tubercles, moderate and subequal sized.

Dorsally superficially two-toned, light dorsum and dark laterally from snout to inguina; dorsum tan ground color with broad medial wash of grayish tan, regularly with thin tan medial stripe from snout to vent; dorsally limbs tan with vague grayish tan bars; posteriorly thigh with ventrolateral (bottom) dark brown stripe extending to ankle and bottom of feet; venter tan with dusky chin.

Comments.— Secondary forest and cultivated areas, terrestrial and nocturnal. Another widespread Asian Microhyla species that is a complex of multiple species from southwestern China to eastern Myanmar southward to Sumatra.

• *Microhyla mantheyi* Das, Yaakob, and Sukumaran, 2007

Manthey's Narrow-mouth Frog

Adults, females 25–26 mm, males 19–21 mm SVL, sexually dimorphic; TrunkL/SVL 39–45%, HindlL/SVL 173–185%, HeadL/SVL 28–32%, HeadW/HeadL 98–104%, OrbD/HeadL 28–33%, TympD/OrbD ??%, tympanum covered by glandular fold.

Skin, dorsally head to sacrum smooth, trunk and underside smooth to lightly rugose abdomen. Digit tips barely expanded, bluntly rounded on all digits, slightly larger on toes; no webbing between fingers of forefeet, about half webbed on hindfeet.

Dorsally ground color various shades of light brown from snout to sacrum and hindlimbs with darker brown paired chevrons marks on shoulder and mid trunk; sides with broad dark diagonal stripe from above forelimb to bottom of inguina; dorsally hindlimbs with narrow dark stripe in middle of thigh and crus, rear of thigh with dark cloacal spot otherwise faintly mottling; head with diagonal dark stripe from eye forward to upper lip, another diagonal dark edged white stripe from eye to behind jaw articulation. Venter tannish white with dusky chin and throat.

Comments.— Lowland forest floor species from primary forest into degraded forest. Present known distribution is South Tanintharyi and adjacent Thailand, and southern Penisular Malaysia to Singapore.

• *Microhyla* sp

Pygmy Tanintharyi Narrow-mouth Frog

Adults, female 15 mm, males 12–13 mm SVL, sexually dimorphic; TrunkL/SVL 33–43%, HindlL/SVL 208–236%, HeadL/SVL 30–33%, HeadW/HeadL 107–120%, OrbD/HeadL 37–41%, TympD/OrbD ??%, tympanum covered by glandular fold.

Skin, dorsally and ventrally smooth. Digit tips bluntly rounded on fingers, slightly expanded on toes, oblong shape; no forefoot webbing, full webbing on hindfeet. Three oblong metacarpal, outer and inner equal-sized, middle one slender; two metatarsal tubercles, outer small projecting cone, inner larger and oblong.

Dorsally pulchra-like pattern, brownish gray background, large dark brown guitar-shaped mark from between eyes to sacrum, dark brown dorsolateral stripe on each side from neck to inguina, diagonal broad white stripe from eye to forearm; hindlimbs distinctly barred; underside white with dark spotting on chin and throat.

Comments.— Secondary forest and cultivated areas, terrestrial and nocturnal. Our present sample for South Tanintharyi is three individuals.

• *Micryletta lineata* (Taylor, 1962)

Spotted Narrow-mouth Frog

Adults, females 22–26 mm, males 22–24 mm SVL; TrunkL/SVL 36–47%, HindlL/SVL 145–187%, HeadL/SVL 30–40% (blunt snout), HeadW/HeadL 91–105%, OrbD/HeadL 35–42%, TympD/OrbD 41–54%.
Skin, dorsally and ventrally smooth. Digit tips, bluntly rounded on fingers and toes; no webbing between fingers or toes. Typically six metacarpal tubercles on palm, three proximal one and three distal ones; all subequal in size, occasionally smaller tubercles between proximal and distal ones; single moderate–sized metatarsal tubercle

Dorsal color variable from light or medium brown to grayish brown with various dark brown marking from back of head to sacrum, ranging from broken stripes to longitudinal rows of spots or spots confined to sides of trunk; dark brown lateral stripe from snout to inguina bordered below on trunk by irregular dark spots on light background; venter creamy tan, chin and throat dusky in males; hindlimbs dark mottled dorsally on thigh, rear of thigh with light irregular-shaped spots on mid brown background

Comments.— Secondary forest and cultivated areas, terrestrial and nocturnal. We recommend the use of lineata as specific name because of the genetic similarity to adjacent Thai populations.

• *Micryletta* sp.

Tanintharyi Spotted Narrow-mouth Frog

Adults, females 20–22 mm, males ?? mm SVL; TrunkL/SVL 37–43%, HindlL/SVL 153–170%, HeadL/SVL 31–32% (blunt snout), HeadW/HeadL 94–103%, OrbD/HeadL 38–39%, TympD/OrbD ??, tympanum covered by glandular fold.

Skin, dorsally and ventrally smooth. Digit tips, bluntly rounded on fingers and toes; no webbing between fingers or toes. Seven or eight metacarpal tubercles, three basal or proximal one and four or five distal ones; latter ones of variable size, basal outer and inner tubercles largest and elliptical; inner metatarsal tubercle inconspicuous to tiny round, small ovoid outer metatarsal tubercle.

Dorsally grayish brown background with faded dark brown stripes, broad medial one from between eyes to sacrum and similarly colored dorsolateral ones from nuchal area to inguina; irregular-edged dark brown dorsolateral stripe from nuchal area to inguina breaking into mottled markings on posterior third of trunk; hindlimbs dark mottled dorsally on thigh, rear of thigh light irregular-shaped spots on mid brown background; face with dark brown stripe from snout through eye and continuous with dark lateral stripe of trunk; upper lip white to cream; underside white to cream, occasionally with some dark flecking on chin and anterior throat.

Comments.— Secondary forest and cultivated areas, terrestrial and nocturnal. Two individuals among the many M. lineata vouchered were genetically distinct. Examination of this limited material indicates that they are also morphologically distinct. Their description as a new species is in progress.

Ranidae

Ranids are often referred to as the true frogs owing to their widespread occurrence and visibility in the northern hemisphere. They were the first frogs to attract biological studies and entered the biological literature as the example of anurans. The "Rana" shape is widespread (~70 %) among the diverse genera (n = 23) of ranids; however, many of the South Asian genera have diverged from the classic external morphology as they adapted to diverse lifestyles and habitats. Ranids predominantly possess external development, although owing to the diverse selection of aquatic habitats for egg laying, Asian ranids display a high diversity in tadpole morphology.

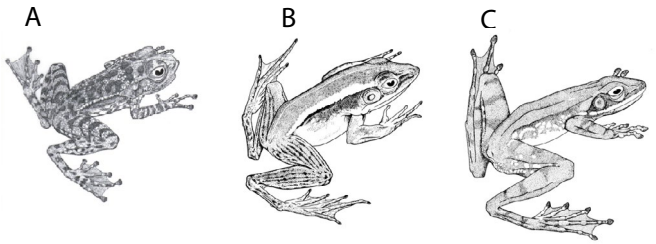


Fig. 8 Body shapes of some ranid frogs: (A) ***Amolops,*** (B) ***Hylarana,*** and (C) ***Odorrana***

Key to the genera and species of Ranidae

1. Dorsolateral glandular fold single and continuous on each side of trunk 2

1′. Dorsolateral folds composed of series of interrupted glandular folds; treefrog body shape; dorsal color dark olive to green with dense overlay of dark mottling ....*Amolops panhai*

2. Tympanum large, 70% to 100% of eye diameter 3

2′. Tympanum modest, 70% or less of eye diameter 6

3. Dorsolateral fold thin to moderate and same color as or slightly darker than dorsum; snout sharp pointed and scoop-like ..... *Clinotarsus penelope*

3′. Dorsolateral fold variable thin to moderately thick; snout variable but not sharp or scoop–like 4

4. Dorsolateral folds thin to moderately thick and same color or slightly lighter than dorsum; tympanum nearly as large as orbit 5
4′. Dorsolateral folds moderately thick and slightly darker than dorsum; tympanum about 75% diameter of orbit .... *Sylvirana nigrovittata*

5. Two metacarpal tubercles, both modest sized, inner largest; no yellow ventrolaterally on trunk ..... *Indosylvirana milleti*

5′. Two metatarsal tubercles, inner elliptical and largest, outer small and circular; with yellow tint ventrolaterally on the trunk ..... *Chalcorana eschatai*

6. Dorsolateral fold same color as or slightly darker than dorsum; digit tips strongly expanded especially on forefoot..... [Odorrana] 8

6′. Dorsolateral fold light colored, cream to white; digit tips expanded but not greatly so .....[Hylarana] 7

7. Three elliptical metacarpal tubercles, inner and outer subequal and largest, middle tubercle about two-thirds outer tubercle ..... *Hylarana erythraea*

7′. Three large metacarpal tubercles on each forefoot, inner largest, middle and outer about half size of elliptical inner, middle one round ..... *Hylarana tytleri*

8. One metatarsal tubercle, inner large and elliptical, no outer tubercle ..... *Odorrana hosii*

8′. Two metatarsal tubercles, inner elliptical and larger than circular outer tubercle ..... *Odorrana livida*

Amolops panhai Matsui & Nabhitabhata, 2006

Peninsular Torrentfrog

Adults, females 48–58 mm, males 31–34 mm SVL, sexually dimorphic; TrunkL/SVL 37–44%, HindlL/SVL 190–200%, HeadL/SVL 39–44%, HeadW/HeadL 84–93%, OrbD/HeadL 38–41%, TympD/OrbD 45–54%.

Skin, dorsally and ventrally smooth to finely rugose. Digit tips expanded on fore- and hindfeet, near circular, each with circummarginal groove; pads of forefeet nearly twice as large as those of hindfeet for corresponding digits; forefeet web free, hindfeet fully webbed with webbing to base of expanded pads. Three metacarpal tubercles, inner largest 3–4X larger than middle and outer tubercles; two metatarsal tubercles, inner elliptical and midsize about 2X larger than circular outer tubercle.
Dorsal ground color olive to dark green nearly obliterated by dark brown mottling on head and trunk, dorsal surface of limbs less heavily marked than trunk, on both fore- and hindlimbs dark markings arranged in bands, rear surface of thigh dark mottling. Ventrolaterally on trunk, lighter with yellowish wash in inguina and on ventral surface of hindlimbs, remainder of venter from chin through anterior abdomen glossy white.

Comments.— Saxicolous in and along rocky forest streams; confined to the Tenasserim Mountain Range in Thailand and Myanmar.USNM data supplement by data on adults from Matsui & Nabhitabhata, 2006.

• *Chalcorana eschatai* (Inger, Stuart, and Iskandar, 2009)

Peninsular Copper-cheeked Frog

Slender bodied and limbed frog.Adults, females 32–46 mm, males 27–48 mm SVL; TrunkL/SVL 40–47%, HindlL/SVL 169–187%, HeadL/SVL 38–44%, HeadW/HeadL 69–81%, OrbD/HeadL 27–34%, TympD/OrbD 76–109% (large tympanum, diameter subequal to eye diameter.

Skin, dorsally head to sacrum and limbs finely granular or tuberculate, underside smooth to lightly rugose. Digit tips expanded as ovate pads, each with circummarginal groove; no webbing on forefeet, nearly totally webbed hindfeet; three moderately large metacarpal tubercles, inner narrow elongate, middle oblong, outer round, declining slightly in size from inner to outer; two metatarsal tubercles, inner elliptical and largest, outer small and circular.

Dorsally snout to sacrum and hindlimbs medium brown or green; ventrolaterally dark brown from rear of ear to mid-trunk or to inguina, upper lip bright white highlighted below by dark lower lip, wash of pale yellow to orange ventrolaterally on trunk; venter immaculate creamy white. Dorsal surface of thighs uniform brown or green, posterior surface lighter than dorsal surface with no distinct pattern.

Comments.— Low arboreal species in forest and forest edge habitats. All previous records of this species' occurrence were below the Isthmus of Kra.Larger samples in the original description give larger maximum SVL, females to 57 mm, but males only to 40 mm.

Clinotarsus penelope Grosjean, Bordoloi, Chuaynkern, Chakravarty, and Ohler, 2015

Penelope's Tadpole Frog

Moderate bodied and limbed frog. Adults, females 45 mm, males 34–46 mm SVL; TrunkL/SVL ??–??%%, HindlL/SVL ??–??%%, HeadL/SVL 39–44%, HeadW/SVL 30–35%, OrbD/HeadL ??–??%, TympD/OrbD ??–??%. Data on adults largely nonexistent; see comments below.

Skin, dorsally from snout to sacrum finely rugose with closely packed small smooth–topped tubercles; distinct but narrow and flat dorsolateral fold from above eye to sacrum; slightly less rugose on dorsal surface of limbs; venter appears smooth to lightly rugose.

Digit tips modestly expanded on fingers and toes, pads with circumperipheral grooves; forefoot without webbing, hindfeet strongly webbed with 4th toe extending well beyond web. Three moderate large, oval metacarpal tubercles; single outer metatarsal tubercle.

Largely uniform beige dorsally; underside beige to light brown.

Comments.— Low arboreal species in forest and forest edge habitats. All previous records of this species' occurrence were below the Isthmus of Kra. Thus far, we found only in the Myeik Archipelago. This species is vouchered by several large tadpoles and a recent metamorph still with tail. Even the type description of this frog as a new species was based on tadpoles and the specific name was associated with adult frogs by supposition. Tadpoles are large (~70 mm total length) and rotund, dark brown to nearly black dorsally and ventrally; easily recognized by dark-centerd red ocellus at base of tail.

• *Hylarana erythraea* (Schlegel, 1837)

Green Paddyfrog

Adults, females 67–78 mm, males 38–47 mm SVL, sexually dimorphic; TrunkL/SVL 36–39%, HindlL/SVL 124–146%, HeadL/SVL 37–40%, HeadW/HeadL 78–86%, OrbD/HeadL 25–30%, TympD/OrbD 77–94%.

Skin, dorsally head smooth becoming increasingly finely rugose to sacrum, laterally flatten tuberculate, forelimbs smooth, hindlimbs finely rugose; underside including limbs smooth; broad, lightly colored dorsolateral glandular fold from above tympana to inguina. Digit tips modestly expanded on fingers and toes, obovate on both, toe pads slightly smaller than on fingers; no webbing between fingers, full webbing between toes; three metacarpal elliptical tubercles, inner and outer subequal and largest, middle tubercle about two-thirds outer tubercle; large elliptical inner metatarsal tubercle, inner small and circular.

Dorsally from snout to sacrum variably colored from light to dark green bordered by broad cream to white dorsolateral folds; side of head (face and temporal) and body to inguina dark brown bordered below by white stripe from lips to inguina; dorsal surface of hindlimbs tan to light green with light speckling of dark brown or narrow transverse dark bands, posteriorly thigh often with narrow, horizontal dark stripe; underside white to cream.

Comments.— Disturbed area from grassy borders of ponds and lakes to paddies, nocturnal and semiaquatic.

• *Indosylvirana milleti* (Smith, 1921)

Millet's Forestfrog

Adults, females 37–45 mm, males ?? mm SVL; TrunkL/SVL 34–35%, HindlL/SVL 146–196%, HeadL/SVL 41–43%, HeadW/HeadL 77–78%, OrbD/HeadL 30–34%, TympD/OrbD 72–77%.

Skin, dorsally from snout to sacrum finely rugose with closely packed small smooth-topped tubercles; distinct dorsolateral fold from above eye to sacrum; slightly less rugose on dorsal surface of limbs; venter appears smooth but finely spiculate with dense tiny tubercles.

Digit tips modestly expanded on fingers and toes, pads with circumperipheral grooves; forefoot barely webbed basally, hindfeet strongly webbed with 4th toe extending well beyond web. Three ellipitical metacarpal tubercles, inner largest; two metacarpal tubercles, modest sized, inner largest.

Distinctly two-toned dorsally, middorsally brown from snout to sacrum and between dorsolateral folds, laterally from tip of snout to inguina dark brown; broad white upper lip stripe from snout to shoulder; underside uniform creamy white.

Comments.— Nocturnal and terrestrial, predominantly forest species living streamside although found in disturbed forests; occurs spottedly throughout Southeast Asia and southern China. Tanintharyi Indosylvirana milleti are smaller than Vietnamese topotypic individuals (♀♀ 43–49 mm, ♂♂ 33–38 mm SVL) and Thai males are 38–42 mm SVL.

• *Odorrana hosii* (Boulenger, 1891)

Green Odorfrog

Adults, females 80–89 mm, males 54–58 mm SVL, sexually dimorphic; TrunkL/SVL 36–45%, HindlL/SVL 183–207%, HeadL/SVL 34–40%, HeadW/HeadL 78–95%, OrbD/HeadL 26–39%, TympD/OrbD 52–80%.

Skin, dorsally from head to sacrum finely rugose, more tuberculate on sides, especially ventrolaterally; underside smooth from chin to midbody, posteriorly lightly corrugate. Digit tips on fingers and toes enlarged as ovate pads with circumperipheral grooves, pads somewhat larger on fingers than toes; no webbing between fingers, fully webbed between toes of hindfoot; three large elliptical metacarpal tubercles, inner 2–3X middle and outer tubercles, inner extends distally along first phalanx; single inner, elliptical metatarsal tubercle, no outer tubercle.

Dorsally bright green from head to sacrum; face light green; dorsolaterally brown from eye to midtrunk; ventrolaterally light brown, slightly mottled; dorsally hindlimbs olive with narrow brown bars, posteriorly thigh finely mottled olive; underside dirty white with light dusky mottling on throat.

Comments.— Forest streams, primary to moderately disturbed montane forest. Nocturnal and semiaquatic in and among the rocks of cascading streams. Occurs throughout southern Thai-Malaysia Peninsula to Borneo.

• *Odorrana livida* (Blyth, 1856)

Tenasserim Odorfrog

Adults, females to 88 mm, males to 73 mm SVL, sexually dimorphic; TrunkL/SVL 32–33%, HindlL/SVL 192–198%, HeadL/SVL 39–40%, HeadW/HeadL 86–87%, OrbD/HeadL 31–33%, TympD/OrbD 56–58%. Skin, dorsally from head to sacrum finely rugose, more tuberculate on sides, especially ventrolaterally; underside smooth from chin to midbody, posteriorly lightly corrugate. Digit tips on fingers and toes enlarged as ovate pads with circumperipheral grooves, pads somewhat larger on fingers than toes; no webbing between fingers, fully webbed between toes of hindfoot; three large elliptical metacarpal tubercles, inner about 2X larger than middle and outer tubercles; two metatarsal tubercles, inner elliptical and 2X larger than circular outer tubercle.

Dorsally bright green from head to sacrum; face medium brown; dorsolaterally brown from eye to midtrunk; ventrolaterally light brown, slightly mottled; dorsally hindlimbs olive with broad brown bars, posteriorly thigh dark brown with scattered small white spots; underside tannish white, dark brown chin and throat with small patches of tannish white.

Comments.— Forest streams, primary to moderately disturbed montane forest. Nocturnal and semiaquatic in and among the rocks of cascading streams. Distribution appears limited to Dawei-Tenasserim mountain range in Tanintharyi.

• *Sylvirana nigrovittata* (Blyth, 1856)

Black-sided Woodfrog

Adults, females 49–50 mm, males 41–47 mm SVL, sexually dimorphic; TrunkL/SVL 34–40%, HindlL/SVL 172–185%, HeadL/SVL 38–44%, HeadW/HeadL 75–87%, OrbD/HeadL 30–36%, TympD/OrbD 66–82%.

Skin, dorsally from head to sacrum finely rugose, limbs (dorsally and ventrally) and venter smooth; suggestion of dorsolateral folds but very weakly developed; distinct humeral gland anterior at junction of forelimb and neck (present in both females and males). Forefeet web free, hindfeet strongly webbed; digital tips slightly expanded, deltoid shaped, equal-sized on fore- and hindfeet,

without circummarginal grooves; three metacarpal tubercles, all elliptical, inner 2–3X larger than moderate-sized middle and outer tubercles; two metatarsal tubercles inner elliptical and moderate-sized, outer circular and about 1/3 size of inner.

Dorsal ground color brown from snout to sacrum and on hindlimbs; face (lores) dark brown from tip of snout, continuous to inguina; white upper lip continuous to shoulder and usually to inguina; dorsal surface of thigh with dark brown bands, rear of thigh mottled usually with white horizontal stripe on lower margin. Venter variable from uniform creamy white to dusky brown.

Comments.— Lowlands to mid-montane forest (secondary or primary) usually stream side; nocturnal and terrestrial. Until recently widespread across Southeast Asia, now a more restricted range in southeastern Myanmar and adjacent Thailand. The type locality of Sylvirana nigrovittata is the valley of the Tenasserim River. Our surveys in southern Tanintharyi vouchered only one from immediately adjacent to that river, other vouchers derive from further south in the proposed Lenya National Park. Both samples are summarized in the preceding description.

Rhacophoridae

Rhacophorids are the Asian and African treefrogs, possessing slender bodies and long slender limbs ending in hands and feet with expanded digit tips. They comprise three subfamilies with the rhacophorines being the most diverse with several genera being widespread throughout tropical Asia and commonly encountered in forests or agricultural lands with scruby or wooded fence rows. Many of the common genera, e.g., Chiromantis, Polypedates, and Rhacophorus, create foam nest by stirring the eggs and their jelly coating with their hindlimbs as the egg mass is extruded by the female and fertilized by the male. These foam nests are usually suspended in vegetation above water; foam nest placement appears species specific. When the larvae hatch, they wiggle through the foam and drop into the water below, beginning the typical anuran tadpole lifestyle.

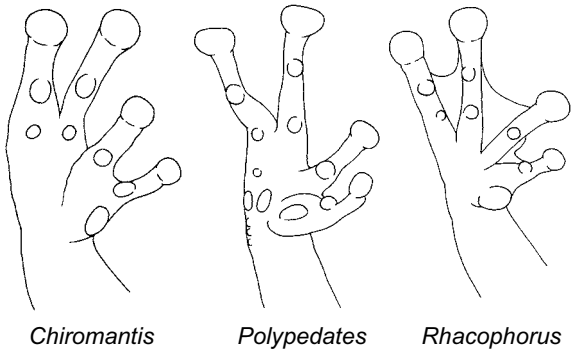


Fig. 9 Hand morphology of rhacophorid frog genera. ***Chiromantis*** with basal fusion of first and second fingers, no webbing; ***Polypedates*** with independent first and second fingers, no webbing; ***Rhacophorus*** with independent first and second fingers, well-developed webbing.

Rhacophoridae — Rhacophorinae

1. Forefoot with somewhat opposable digits, first and second digits fused at their base..... *Chiromantis*

1′. Forefoot not opposable and first and second digits not or slightly fused at their bas..... 2

2. Both fore- and hindfeet strongly webbed ..... *Rhacophorus*

2′. Only hindfeet modestly to strong webbed; if forefeet webbed, only at base of fingers 3

3. Dorsal skin on crus and ankle with scattered tubercles ..... *Kurixalus*

3′. Dorsal skin on crus and ankle smooth ..... *Polypedates*

• *Chiromantis doriae* (Boulenger, 1893)

Dorsal-striped Bushfrog

Adults, females 29–30 mm, males 27–31 mm SVL; TrunkL/SVL 43–51%, HindlL/SVL 161–180%, HeadL/SVL 34–40%, HeadW/HeadL 81–94%, OrbD/HeadL 35–41%, TympD/OrbD 43–54%.

Skin, dorsally head and trunk smooth granular to rugose; underside pebbled. Digit tips, expanded pads on fingers and toes; no basal webbing between fingers of forefoot, strong webbing between toes of hindfoot. Three metacarpal tubercles, inner largest and elliptical, middle and outer tubercles much smaller elliptical; inner metatarsal tubercle midsize elliptical, outer tiny or absent.

Overall dorsal color tan to cream, variously marked from totally speckled with tiny dark brown spots to larger, irregularly shaped marks from head onto back; dorsal surface of thigh with no or faded dark band, posterior surface unicolor light yellow; underside unicolor cream.

Comments.— Schrubby forest-edge species, arboreal in bushes, low trees, and grass; strictly nocturnal.

- ***Kurixalus bisacculus*** **(Taylor, 1962)**

Taylor's Rough-armed Treefrog

Adults, females 36–40 mm, males 32 mm SVL, sexually dimorphic; TrunkL/SVL 43–50%, HindlL/SVL 176–183%, HeadL/SVL 37–40%, HeadW/HeadL 81–94%, OrbD/HeadL 31–41%, TympD/OrbD 42–60%.

Skin, dorsally head and trunk finely granular, some moderate sized tubercles on back of head, upper eyelid and temporal area; outer edge of forearm, ankle with low scalloped fringe. Digit tips with large pads on fore- and hindfeet; slight webbing between third and fourth fingers of forefoot, three-quarters webbing between toes of hindfeet; three, well-developed elliptical metacarpal tubercles, all nearly equal sized; two inner metatarsal and no outer tubercles, distalmost inner small and circular.

Overall dorsal ground color dull green with light orangish brown markings often edged in black, large marking extends from between eyes to sacrum covering most of dorsal surface; narrow stripe on dorsal surface of thigh dark and light bands, bordered anteriorly and posteriorly by broad orange bands. Underside, throat to pubis white with numerous irregular dark gray spots and red on the lower abdomen and hindlimbs. A kaleidoscopic colored frog.

Comments.— Primary and secondary midmontane forest, usually in scrubby vegetation at edge of forest openings; arboreal and nocturnal. Occurs spottedly from Nagaland, India to Cardamon Mountains, Cambodia.

- ***Polypedates discantus*** **Rujirawan, Stuart, and Aowphol, 2013**

Malayan Slender Treefrog

Adults, females 64 mm, males 48–53 mm SVL, sexually dimorphic; TrunkL/SVL 41–50%, HindlL/SVL 164–195%, HeadL/SVL 33–38%, HeadW/HeadL 78–99%, OrbD/HeadL 32–39%, TympD/OrbD 53–70%.

Skin, dorsally head and trunk smooth granular, narrow glandular ridge from posterodorsal edge of eye above tympanum to shoulder, underside pebbled. Digit tips, bluntly rounded on fingers, disk large on fingers 2 to 4 about ¾ size of disk on finger 1; expanded pads on toes, smaller than on fingers; slight basal webbing between fingers of forefoot, modest webbing between toes of hindfoot; three well-developed metacarpal tubercles, inner narrow elliptical, middle largest broad oblong, outer broad oblong about half area of middle; one or two metatarsal tubercles, inner moderately large broad oblong, outer if present small round.

Overall dorsal color grey to light tan, near unicolor to indistinct pair of longitudinal medium brown stripes from snout to slightly beyond shoulders trunk; face medium brown dorsally fading to white upper lip, light temporal area below the dark brown edged dorsolateral fold; dorsal surface of thigh with three dark brown bands, posterior surface with reticulate pattern almost like series of nearly abutting small white spots on dark brown background ; dorsal surface of thigh indistinctly banded alternately in medium brown, posterior surface nearly unicolor.

Comments.— Various forests to scrubby fence rows in agricultural areas; arboreal and nocturnal. Our record represent the first occurrence outside of Thailand.

• ***Polypedates cf. leucomystax*** **(Gravenhorst, 1829)**

White-lipped Treefrog

Adults, females 68–69 mm, males 44–50 mm SVL, sexually dimorphic; TrunkL/SVL 36–52%, HindlL/SVL 161–176%, HeadL/SVL 36–40%, HeadW/HeadL 80–91%, OrbD/HeadL 27–32%, TympD/OrbD 62–100%.

Skin, dorsally head smooth to granular where co-ossified, trunk smooth, underside pebbled. Digit tips, bluntly rounded on fingers, disk large on fingers 2 to 4 about ¾ size on finger 1; expanded pads on toes, smaller than on fingers; slight basal webbing between fingers of forefoot, modest webbing between toes of hindfoot. Three metacarpal tubercles, inner largest and oblong, oblong middle and round outer tubercles progressively smaller; inner metatarsal tubercle midsize obovate, circular outer small.

Overall dorsal color greyish tan to medium brown, pattern very variable from near unicolor to bold longitudinal stripes (two to four) on head through trunk, stripes thin to broad; top of head unicolor to two broad stripes between eyes, face dark brown dorsally fading to bright white upper lip; dorsal surface of thigh with three dark brown bands, posterior surface with reticulate pattern almost like series of nearly abutting small white spots on dark brown background.

Comments.— Various forests to scrubby fence rows in agricultural areas; arboreal and nocturnal. The South Tanintharyi population of Polypedates leucomystax likely represents two undescribed species.

• ***Polypedates megacephalus*** **Hallowell,1861**

White-spotted Thigh Treefrog

Adults, females 64–68 mm, males 45–47 mm SVL, sexually dimorphic; TrunkL/SVL 43–52%, HindlL/SVL 164–176%, HeadL/SVL 33–38%, HeadW/HeadL 83–102%, OrbD/HeadL 27–40%, TympD/OrbD 66–100%.

Skin, dorsally head smooth to granular where co-ossified, trunk smooth, underside pebbled. Digit tips, bluntly rounded disks with circumperipheral grooves on fingers, disk large on fingers 2 to 4 about ¾ area on finger 1, toe pads also bluntly rounded, smaller, each less than double width of penultimate phalanx; on toes; slight basal web between fingers, modest to 2/3 webbing between toes of hindfoot; three well-developed metacarpal tubercles, inner largest obovate, middle large oblong to near round, outer oblong; two metatarsal tubercles, inner medium-sized round, outer moderately small round.

Overall dorsal color greyish tan to medium brown, dorsal pattern very variable from near unicolor (occasionally scatter small to medium-sized dark spots) to 2 to 4 dark brown, parasagittal longitudinal stripes; top of head unicolor to striped with face dark brown dorsally fading to white upper lip, narrow supraocular dark stripe above tympanum slanting downward to post axilla and sometime continuing horizontally to midtrunk; dorsal surface of thigh and crus vaguely to distinctly with brown bands (usually three), moderate distinct rump patch, posterior surface of thigh bold reticulate pattern (almost like abutting rows of small circular light spots on near black background); underside unicolor white, dusky chin and throat in some females.

Comments.— Various forests to scrubby fence rows in agricultural areas; arboreal and nocturnal. Widespread from Northeast India and southern China, and throughout Southeast Asia.

• ***Polypedates mutus*** **(Smith, 1940)**

Smith's Striped Treefrog

Adults, females ?–? mm, males 55–66 mm SVL, sexually dimorphic; TrunkL/SVL 40–57%, HindlL/SVL 152–177%, HeadL/SVL 33–40%, HeadW/HeadL 86–95%, OrbD/HeadL 30–36%, TympD/OrbD 64–84%. Skin, dorsally head tuberculate from snout to nape, trunk strongly tuberculate, underside pebbled. Digit tips, bluntly rounded disks with circumperipheral grooves on fingers, disk large on fingers 2 to 4 about 2–3 X width of penultimate phalanx, half that of finger 1, expanded pads on toes, each slightly less than double width of penultimate phalanx; no webbing between fingers of forefoot, modest webbing between toes of hindfoot; three well-developed metacarpal tubercles, inner obovate and largest, middle large oblong to near round, outer oblong; two metatarsal tubercles, inner medium size near round, outer moderately small round.

Overall dorsal color greyish tan to medium brown, usually four darker brown, parasagittal longitudinal stripes on dorsum of trunk, top of head with parasagittal stripes, face dark brown dorsally fading to white upper lip, postocular dark brown stripe on top half

of tympanum slanting downward to postaxillary and continuing horizontally to midtrunk or beyond; dorsal surface of thigh vaguely barred with brown bands, usually three dark brown rump patch with white border above, posterior surface with bold reticulate pattern; underside unicolor white from chin to pubis.

Comments.— Various forests to scrubby fence rows in agricultural areas; arboreal and nocturnal. Previously known from southern China and adjacent northern Myanmar and Indochina. Populations of "P. mutus" in Tanintharyi likely represent two species.

• *Rhacophorus bipunctatus* Ahl, 1927

Double-spotted Orange-webbed Treefrog

Adults, females 49–59 mm, males 37–46 mm SVL, sexually dimorphic; TrunkL/SVL 48–56%, HindlL/SVL 167–185%, HeadL/SVL 30–33%, HeadW/HeadL 90–97%, OrbD/HeadL 29–37%, TympD/OrbD 57–85%.

Skin, dorsally from head to sacrum and limbs finely rugose (small, smooth-topped tubercles), sides of trunk smooth, venter rugose less so than dorsum. Digit tips expanded, round-edged trapezoidal, all with circummarginal grooves; fore- and hindfeet fully webbed. Three metacarpal tubercles, inner large occupying base of first finger, middle and inner tubercles small and faint; small metatarsal tubercle, no outer.

In alcohol, entirely creamy white above and below with scattering of small brown spots on top of head to midtrunk; snout and canthus brown edged; axilla; webbing orangish with red spot on outer web of 4th and 5th toes.

Comments.— Nocturnal and arboreal in trees bordering streams and ponds in primary to secondary forest. Widespread from Northeast India and southern China into Myanmar, Thailand, and Vietnam. The female size data derive from Bordolio et al., 2007, as that was absent in our sample.

• *Rhacophorus kio* Ohler and Delorme, 2006

Asian Black-webbed Treefrog

Adults, females 88–90 mm, males 70–79 mm SVL, sexually dimorphic; TrunkL/SVL 45–55%, HindlL/SVL 160–176%, HeadL/SVL 32–36%, HeadW/HeadL 89–101%, OrbD/HeadL 27–36%, TympD/OrbD 45–54%.

Skin, dorsally superficially smooth (finely rugose, small smooth-topped tubercles) from head to sacrum, becoming tuberculate ventrolaterally and merging into pebbled venter of trunk and thighs; ventrally chin and throat nearly smooth. Digit tips strongly expanded on fingers and toes, pads ellipsoidal with circummarginal grooves, forefoot pads larger than hindfoot ones. Three metacarpal tubercles, inner large and oblong, middle and outer smaller, flattened, and nearly invisible; small, elliptical inner metatarsal tubercle, no outer metatarsal tubercle.

Dorsally uniform mid green on head, trunk and limbs, ventrolaterally light orange fading into uniform white venter; large black spot in axilla; webbing organish with black basally on outer two webs of fingers and outher three webs of toes.

Comments.— Nocturnal and arboreal on leafy branches overhanging forest streams. Occurs from southwestern China and northeastern Myanmar into northern Indochina.

• *Rhacophorus nigropalmatus* Boulenger, 1895

Wallace's Treefrog

Adults, females 85–98 mm, males 83–87 mm SVL, sexually dimorphic; TrunkL/SVL ~50%, HindlL/SVL ~185%, HeadL/SVL 29–35%, HeadW/HeadL ~96%, OrbD/HeadL ~30%, TympD/OrbD ~74%.
Skin, dorsally from head to sacrum smoothly rugose with densely packed small tubercles become larger laterally and ventrally, underside pebbled with medium-sized flat tubercles. Digit tips strongly expanded on fingers and toes, pads ellipsoidal with circummarginal grooves, forefoot pads larger than hindfoot ones; fingers three-quarters webbed, toes fully webbed; large inner metacarpal tubercles, two others faint; modest inner metatarsal tubercle, outer small.

Uniform dorsal color of medium to dark green; underside and dorsally on first and second fingers yellow; webbing above and below black.

Comments.— Nocturnal and arboreal in trees bordering streams and ponds in primary to secondary forest. Occurs in scattered localities from central Malay Peninsula into Sumatra and Borneo.

• *Rhacophorus norhayatii* Chan and Grismer, 2010

Wallace's Orange-sided Treefrog

Adults, females 76–83 mm, males 61–65 mm SVL, sexually dimorphic; TrunkL/SVL 51–52%, HindlL/SVL 164–168%, HeadL/SVL 34–35%, HeadW/HeadL 105–108%, OrbD/HeadL 27–32%, TympD/OrbD 72–88%.

Skin, dorsally smooth from head to sacrum and limbs, ventrolaterally becoming rugose and underside strongly pebbled from chin to pelvis and on hindlimbs. Digit tips enlarged on fingers (slightly larger) and toes, pads rounded trapezoidal with circummarginal grooves, hands and feet fully webbed; lateral skin fold on outer edge of forearm and hand, and ankle and foot; three ellipsoidal metacarpal tubercles, inner twice size of middle and outer, single elliptical inner metatarsal tubercle.

Dorsally dark green body and legs; ventrolaterally black with orange mottling on trunk, fore- and hindfoot webbing black with white mottling; underside ground color creamy white or orange speckled with black.

Comments.— Nocturnal and arboreal in trees bordering streams and ponds in primary to secondary forest.Distribution appears to be southern half of Malay Peninsula. Our small sample's characteristics supplemented by data from Chan and Grismer, 2010.

1. Toads

Ansonia thinthinae
[Thin Thin's Stream Toad]
adult SVL 19–27 mm;

Duttaphrynus melanostictus
[Asian Black-spined Toad]
SVL 67–104 mm;

Phrynoides asper
[Asian Giant Toad]
SVL 96–138 mm;

Ingerophrynus parvus
[Malayan Dwarf Toad]
SVL 31–46 mm.

From upper left and clockwise.

2. Fanged frogs and relatives

Fejervarya sp1.hp2 Kotaki
[unnamed Grassfrog]
adult SVL 29–59 mm;

Hoplobatrachus rugulosus
[Asian Rugose Bullfrog]
SVL 63–103 mm;

Limnonectes blythi
[Blyth's Fanged Frog]
SVL 83–105 mm;

L. doriae
[Doria's Fanged Frog]
SVL 38–51 mm.

From upper left and clockwise.

3. Puddlefrogs and relatives

Ingerana tenasserimensis
[Tenasserim Tricklefrog]
adult SVL 14–22 mm;

Occidozyga lima
[Gray-green Puddlefrog]
SVL 26–32 mm;

Occidozyga martensi
[Malayan Puddlefrog]
SVL 19–28 mm.

Megophryidae:
Leptobrachium smithi
[Southern Bicolored Toadfrog]
SVL 46–69 mm.

From upper left and clockwise.

4. Narrow-mouth frogs

Kalophrynus interlineatus
[Striped Sticky Frog]
adult SVL 35–46 mm;

Kaloula latisticta
[Malayan Painted Bullfrog]
SVL 39–52 mm;

Micryletta lineata
[Spotted Narrow-mouthed Frog]
SVL 22–26 mm;

Microhyla fissipes
[Oriental Ornate Narrow-mouthed Frog]
SVL 23–28 mm.

From upper left and clockwise.

5. True frogs

Amolops panhai
[Panha Torrentfrog]
adult SVL 31–58 mm;

Odorrana hosii
[Green Odorfrog]
SVL 54–89 mm;

Hylarana erythraea
[Green Paddyfrog]
SVL 38–78 mm;

Sylvirana nigrovittata
[Black-sided Woodfrog]
SVL 41–50 mm.

From upper left and clockwise.

6. Treefrogs

Chiromantis doriae
[Dorsal-striped Bushfrog]
adult SVL 27–31 mm;

Kurixalus bisacculus
[Taylor's Rough-armed Treefrog]
SVL 32–40 mm;

Polypedates cf. leucomystax
[White-lipped Treefrog]
SVL 41–50 mm;

Rhacophorus norhayatii
[Wallace's Orange-sided Treefrog]
SVL 61–83 mm.

From upper left and clockwise.

7. Flying lizards and relatives

Acanthosauria crucigera
[Masked Prickle-naped Lizard]
adult SVL 79–110 mm;

Bronchocela burmana
[Burmese Green Crested Lizard]
SVL 79–93 mm;

Calotes emma
[Barred Forest Lizard]
SVL 80–106 mm;

Draco taeniopterus
[Barred Flying Lizard]
SVL 59–76 mm.

From upper left and clockwise.

8. Geckos

Cyrtodacylus brevipalmatus
[Short-palmed Bent-toed Gecko]
adult SVL 68–74 mm

Cyrtodactylus lenya
[Lenya Banded Bent-toed Gecko]
SVL 73–74 mm;

Cyrtodactylus oldhami
[Oldham's Bent-toed Gecko]
SVL 55–84 mm;

Gekko gecko
[Tokay Gecko]
SVL 132–166 mm.

From upper left and clockwise.

9. More geckos

Gehyra mutilata
[Asian Stump-toed Gecko]
adult SVL 47–56 mm;

Hemidactylus frenatus
[Indo-Pacific House Gecko]
SVL 42–59 mm;

Hemidactylus tenkatei
[Southeast Asian Spiny Gecko]
SVL 45–65 mm;

Ptychozoon lionotum
[Smooth-backed Flying Gecko]
SVL 84–93 mm.

From upper left and clockwise.

10. Skinks

Dasia olivacea
[Olive Treeskink]
adult SVL 68–115 mm;

Eutropis macularia
[Side-spotted Sunskink]
SVL 47–62 mm;

Eutropis multifasciata
[Common Sunskink]
SVL 92–127 mm;

Lipinia vittigera
[Malayan Yellow-tailed Lipinia]
SVL 34–44 mm.

From upper left and clockwise.

11. More skinks

Lygosoma siamensis
[Siamese Suppleskink]
adult SVL 57–78 mm

Scincella reevesi
[Black-spotted Smoothskink]
SVL 41–55 mm;

Sphenomorphus maculatus
[Asian Spotted Forestskink]
SVL 55–65 mm;

Tropidophorus berdmorei
[Berdmore's Waterskink]
SVL 63–85 mm.

From upper left and clockwise.

12. Filesnake and treesnakes

Acrochordus granulatus
[Little Filesnake]
adult TotL ~700–1050 mm

Colubridae:
Ahaetulla mycterizans
[Malayan Vinesnake]
TotL ~700–1050 mm;

Boiga cyanea
[Green Catsnake]
TotL ~800–1860 mm;

Boiga drapiezii
[White-spotted Catsnake]
TotL ~1300–2100 mm.

From upper left and clockwise.

13. Mostly treesnakes

Chrysopelea ornata
[Ornate Flying Snake]
adult TotL ~400–1400 mm;

Elaphe taeniura
[Cave Racer]
TotL ~900 mm–3 m;

Dendrelaphis caudolineata
[Striped Bronzeback]
TotL to 1450 mm;

Dendrelaphis cyanochloris
[Blue Bronzeback]
TotL 425–1235 mm.

From upper left and clockwise.

14. Ratsnakes and Wolfsnake

Dryocalamus subannulatus
[Malayan Bridlesnake]
adult TotL ~360–600 mm;

Gonyosoma oxycephalum
[Red-tailed Green Ratsnake]
TotL to 2.1 m;

Lycodon effraensis
[Brown Wolfsnake]
TotL ~700–1050 mm;

Ptyas mucosus
[Oriental Ratsnake]
TotL ~1–2.5 m.

From upper left and clockwise.

15. Keelbacks or watersnakes

Xenochrophis trianguligerus
[Red-sided Keelback]
adult to 1350 mm;

Rhabdophis nigrocinctus
[Banded Green Keelback]
TotL ~635–880 mm;

Rhabdophis subminiatus
[Red-necked Keelback]
TotL ~580–1300 mm;

Xenochrophis. piscator
[Checkered Keelback]
TotL ~725–1050 mm.

From upper left and clockwise.

16. Kraits and cobras – dangerously venomous

Bungarus fasciatus
[Banded Krait]
adult TotL ~650 mm–2.1 m;

Naja kaouthia
[Monocled Cobra]
TotL ~950 mm–2.3 m;

Ophiophagus hannah
[King Cobra]
TotL ~1.0–4.0 m;

Calliophis bivirgatus
[Blue Malayan Coralsnake]
TotL ~950 –1.8 m;

From upper left and clockwise.

17. Mudsnakes and Mockviper

Cerberus rhynchops
[Bockham]
adult TotL 550–1.2 m;

Enhydris enhydris
[Rainbow Mudsnake]
TotL ~360–880 mm;

Homalopsis semizonata
[Burmese Masked Mudsnake]
TotL ~500–730 mm;

Lamprophiidae:
Psammodynastes pulverulentus
[Asian Common Mockviper]
TotL ~250–540 mm.

From upper left and clockwise.

18. Blindsnakes and other burrowers

Argyrotyphlops diardii
[Mueller's Blindsnake]
adult TotL to 420 mm;

Indotyphlops braminus
[Brahminy Blindsnake]
TotL ~100–180 mm;

Cylindrophidae:
Cylindrophis burmanus
[Burmese Pipesnake]
TotL ~220–300 mm;

Xenopeltidae:
Xenopeltis unicolor
[Sunbeam Snake]
TotL ~600–1.3 m;

From upper left and clockwise.

19. Vipers – dangerously venomous

Daboia siamensis
[Eastern Russel's Viper]
adult TotL to 1.6 m;

Trimeresurus albolabris
[White-Lipped Tree Pitviper]
TotL ~600–900 mm;

Trimeresurus cf popeiorum
[Southern Green Tree Pitviper]
TotL ~380–520 mm;

Trimeresurus purpureomaculatus
[Mangrove Pitviper]
TotL to 900 mm;

From upper left and clockwise.

Reptilia

Common Terms Used in Reptile Descriptions

Measurements	
SVL.	Snout-vent length, straight-line distance from tip of snout to anteromedial edge of vent.
HeadL.	Head length, distance from tip of snout to posterior edge of the jaw articulation.
HeadW.	Head width, transverse distance from left to right outer edge of jaw articulation.
TrunkL.	Trunk length, distance from posterior edge of forelimb at its juncture with the body to anterior edge of the hindlimb at its junction with the body.
HindlL.	Hindlimb length, with limb straightened from the vent to the tip of the longest toe, almost always the fourth toe.

Meristic, Counts

Different ones for lizards and snakes. See definitions at beginning of those sections.

Dorsals (Dorsal)	Number of middorsal/parasagittal body scales from parietals or nuchal scales to end of trunk at base of tail.
Labials	Number of scales bordering the mouth from rostral (supralabials, Suplab) or mental (infralabials, Inflab) to posterior corner of the mouth.
Midbodys (Midbody)	Number of trunk scales around body at midpo int between fore- and hindlimbs.

Nuchal Crest Spines (NucCrsS)	Number of middorsal spines with height greater than base length.
Subdigital lamellae	Number of enlarged scales from base of digit to claw; usually counted on the fourth digit of fore- (ForefLm) or hindfoot (HindfLm).

Morphology	
Keel	Longitudinal, raised ridge on scales of lizards and snakes. Contrasted with smooth scales lacking keel.
Plates	Alternate term for scutes of turtles; also used regularly for the enlarged head scales of lizards, snakes, and turtles.
Scales	Cornified (keratinized) epidermal covering of the bodies of reptiles.
Scutes	Used exclusively for the scales covering the carapaces and plastrons of turtles.

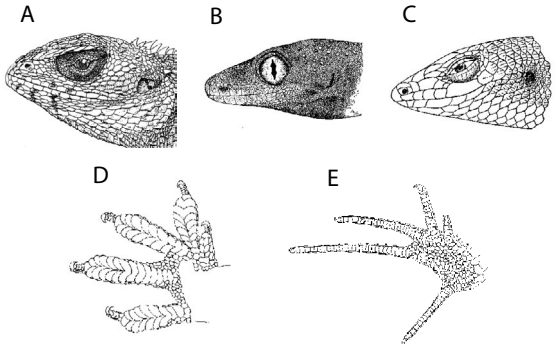


Fig. 10 Anatomical features of lizards. Lateral views of heads of: (A) an agamid ***Calotes,*** (B) gekkonid ***Phyllodactylus,*** and (C) scincid ***Eutropis***.The sequence illustrates large, over-lapping head scales often keeled, small granular juxtaposition scales, and large overlapping smooth scales, respectively. Ventral views of two hindfeet highlight: (D) expanded digital pads of many geckos with broaden scales (lamellae) on the underside of digits, and (E) the narrower digit morphology of a skink and most other lizards with narrow lamellae.

Lizards

Lizards and snakes are closely related but anciently so. Snakes had their origin from a group of lizards, likely in the Early Cretaceous, within the lineage that today includes among others the Agamidae, Varanidae, and Anguidae. Because snakes are within the lizard evolutionary group, current biologists use the name Squamata for this large group and Serpentes for the snake group, but we have no formal classificatory name for all lizards, excluding snakes.

Lizards are the most abundant living reptiles with over 6000 species. Lizards come in all shapes and sizes from those with long snake-like bodies, some with visible limbs and others without visible limbs, to those with short, stout bodies and thick, robust limbs, from species with total length less than 20 mm to nearly 4 m. This diversity in body form is matched by a diversity of life styles from nectar-licking, grazing and browsing, to obligate carnivores, and from living in cool, rocky arid landscapes to tropical rainforest, and from egg-laying to giving birth to miniature adult-like neonates. Much of this diversity is seen in the five lizard families occurring in Myanmar and Tanintharyi.

Common Terms Used in Lizard Descriptions

Measurements	
Head length (HeadL)	As in frogs, distance from tip of snout to posterior angle of jaw.
Hindlimb length (HindlL)	Distance from inguina (anterior juncture of limb with body) to tip of longest toe.
Tail length (TailL)	Distance from middle of vent to tip of tail.
Trunk length (TrunkL)	Distance from axilla to inguina

Scalation (scales)	
Acuminate	Ending in a slender, sharp point.
Digital lamellae	Enlarged scales beneath the digits, often transversely rectangular in shape. Usually counts are taken on the fourth digit, hence fourth finger lamellae (ForefLm = Fourth Forefoot Lamellae) and fourth toe lamellae (HindfLm).
Infralabials	Enlarged scales bordering the mouth ventrally, extend from the rostral scale to corner of the mouth.
Nasal	Scale pierced by the naris or pair of scales surrounding the naris.
Nuchal	Nape, dorsal area on neck immediately behind head.
Rostral	Anteriormost scale on top of head; snout scale.
Supralabials.	Enlarged scales bordering the mouth dorsally, extend from the rostral scale to corner of the mouth.
Supranasal.	Scale above and touching nasal scale, in contact with rostral anteriorly and nasal laterally. If large, left and right supranasals contact on midline, and if smaller, separated by an internasal or prefrontal scale.

Key to the Families of Tanintharyi Lizards

1. Belly scales, small to large, circular or leaf shaped, nonoverlapping (juxtaposed) or overlapping (imbricate) 3

1′ Belly scales small to large, rectangular shape and nonoverlapping 2

2. Head covered with small, tubercle-like scales; eyelids present ..... *Varanidae*

2′. Head covered with large, plate-like scales; eyelids present ..... *Lacertidae*

3. Head with soft, small, nonoverlapping, tubercle-like scales; no eyelids ... *Gekkonidae*

3′. Head with variable-sized, plate-like scales; eyelids present 4

4. Body scales keeled and acuminate, usually small and in 40 or more rows at midbody ..... *Agamidae*

4′. Body scales smooth (occasionally keeled) and cycloid; scales of back and venter near equal size and usually in 36 or fewer rows at midbody ..... *Scincidae*

Agamidae

Agamid lizards are largely diurnal and arboreal, hence one of the most visible Asian lizards as many sit head-down on tree trunks scanning the ground for prey. Agamids occur broadly in the Eastern Hemisphere with three separate centers of radiation: Africa; Asia, both temporate and tropical; and Australopapua. Most are moderate-sized (60–120 mm SVL) but a few are larger, reaching total length greater than 1 m. There are about 10 species in South Tanintharyi. All lay eggs.

Key to the genera of Agamidae

1. Five or six elongated ribs supporting wing-like skin surface ..... *Draco*

1′. Ribs not elongated into a wing-like surface 2

2. Tail very long and slender, length about three times body length; low nuchal crest; overall color green ..... *Bronchocela*

2′. Tail moderately long and robust, about two times body length or less; coloration variable, not entirely green 3

3. Trunk scales, dorsally and laterally, small, granular, and non overlapping; hindlimb and tail thick and moderately long; caudal scales small to moderate, keeled and nearly equal sized above and below ..... *Leiolepis*

3′. Trunk scales plate-like, usually overlapping and often keeled 4

4. Two large dorsal spines on side of head, postorbital and posttemporal; well developed middorsal crest, esp. nuchal area..... *Acanthosaura*

4′. Small spines above tympanum or not, spines equal or less than eye diameter; small to moderate middorsal crest 5

5. Scales on trunk moderate-sized keeled and diagonal rows;

nuchal crest scales moderately large, erect and continuous with dorsal crest spines; fourth toe of hindfoot distinctly longer than third toe ..... *Calotes*

5′. Scales on trunk, small keeled and diagonal rows; low or no dorsal crest spines, nuchal crest scales few and usually not erect; third and fourth toes nearly equal in length..... *Pseudocalotes*

• *Acanthosaura crucigera*(Boulenger, 1885)

Masked Prickle–naped Lizard

Adult SVL, females 108–110 mm, males 79–85 mm; TrunkL/SVL 44–52%, TailL/SVL 160–182%, HindlL/SVL 84–95%, HeadL/SVL 27–28%. Top of head with small scales, large supraorbital spine and moderate supratemporal spine; middorsal spine divided, 5–6 nuchal ones longer than and separated from 26–32 dorsal trunk spines gradually decreasing in height to sacrum; Suplab 11, Inflab 12, ForefLm 17–18, HindfLm 24.

Strikingly colored in shades of brown; top of head medium brown, face with wide stripe on lower loreal area and labials, large dark brown eye patch, temporal area and neck cream tan continuous with chin, throat, and chest; trunk raggedly striped with dark brown and white; tail banded in dark brown and white.

Comments.— Arboreal forest lizard, diurnal. Occurs in peninsular Myanmar and adjacent Thailand to central Peninsular Malayasia.

• *Bronchocela burmana* (Blanford, 1878)

Burmese Green Crested Lizard

Adult SVL, females 79–84 mm SVL, males 84–93 mm; TrunkL/SVL 47–56%, TailL/SVL 243–361%, HindlL/SVL 86–97%, HeadL/SVL 25–27%. Top of head with small scales, Suplab 9–11, Inflab 9–11, ForefLm 26–32, HindfLm 31–38, NucCrsS 6–9, no dorsal trunk spines, Midbody 55–67.

Overall green lizard that can lighten or darken; cheek patch of greenish white; trunk with transverse band of small greenish white spots; tail with closely spaced, greenish white transverse bands.

Comments.— Lowland forest, often stream side. Diurnal and arboreal, mainly on outer end of branches. Likely a central peninsular Malay species; there is no evidence of B. cristatella in Tanintharyi. It is likely that the Bronchocela in the adjacent Thai provinces are not B. cristatella. They were identified as B. cristatella prior to the description of B. rayensis and resurrection of B. burmana.

• *Calotes emma* Gray, 1845

Barred Forestlizard

Adult SVL, females 82–106 mm, males 80–102 mm; TrunkL/SVL 47–51 %, TailL/SVL 252–288%, HindlL/SVL 77–86%, HeadL/SVL 27–83%. Top of head with small keeled scales, large supraorbital spine, temporal cluster of spines and supratympanic cluster on each side; distinct spiny crest from nuchal area (12–17 spines with height > basal length), declining in height to midbody. Preaxial pocket of small black scales on neck in front of forelimb; all body scales keeled, trunk scales oriented diagonally upward and backward. Suplab 10–12, Inflab 9–11, NucCrsS 12–17, Dorsals (parasagittally) 41–45, Midbody 49–54. ForefLm 20–23, HindfLm 23–28.

Boldly patterned in shades of brown; head light brown with narrow dark brown pre- and postorbital stripes above dark temporal patch, broad light colored labial stripe from snout to below temporal patch. Trunk medium brown with white lateral stripe from neck to base of tail; series of five or six middorsal dark brown bars or spots that often continue below lateral white stripe as diffuse dark marks; limbs usually transversally banded in light and dark brown.

Underside dusky with scattered white spots; chin and throat often dark, nearly black, with median cream patch.

Comments.— Diurnal and arboreal, mainly woodland species, especially in open and edge areas;occurs in peninsular Myanmar and adjacent Thailand and southern Indochina.

Calotes mystaceus Duméril & Bibron, 1837

Moustached or Blue Forestlizard

Adult SVL, females to 68 mm, males to 77 mm; TrunkL/SVL 46–48%, TailL/SVL 196–215%, HindlL/SVL 196–215%, HeadL/SVL 30%. Top of head with small keeled scales, no supraorbital spine, temporal and supratympanic cluster of short spines on each side; distinct spiny crest (NucCrsS) from nuchal area (female 20–26, males 32–38 spines with height > basal length). Preaxial pocket of small black scales on neck in front of forelimb; all body scales keeled, trunk scales oriented diagonally upward and backward. Suplab 9–11, Inflab 10–11, Dorsals (parasagittally) 41–50, Midbody 47–54, ForefLm 20–23, HindfLm 23–28.

Unmistakable Forestlizard, entire head, neck and anterior trunk bright medium blue highlighted by broad white upper lip stripe from below naris onto neck or slightly beyond; medium brown from middle of trunk onto tail, with series of four large dark to rufous brown spots dorsolaterally on trunk. Females often with medium brown background dorsally on head and trunk; light lip stripe and dorsolateral spots persist.

Comments.— Commonly living in disturbed habitats with isolated trees on which it perches, often head down, watching for prey on the ground. Not presently reported from South Tanintharyi, common in mainland Myanmar through southern China, Thailand, and Indochina.

Calotes "versicolor" (Daudin, 1802)

Variable Forestlizard

Adult SVL, females 78–84 mm, males 83–98 mm; TrunkL/SVL 44–52%, TailL/SVL 260–295%, HindlL/SVL 326–395%, HeadL/SVL 22–24%. Top of head with small keeled scales, no supraoribital spine, temporal and supratympanic cluster of short spines on each side; distinct spiny crest (NucCrsS) from nuchal area (female 20–26, males 32–38 spines with height > basal length). No preaxial pocket of small black scales on neck in front of forelimb; all body scales keeled, trunk scales oriented diagonally upward and backward. Suplab 9–11, Inflab 10–11, Dorsals (parasagittally) 41–50, Midbody 47–54, ForefLm 20–23, HindfLm 23–28. [data from Bago lizards]
Boldly patterned in brown; head orangish brown with dark brown postorbital–temporal patch and below broad light colored labial stripe from snout to below temporal patch. Trunk medium brown with white lateral stripe from neck to base of tail; series of five or six middorsal dark brown bars or spots that often continue below lateral white stripe as diffuse dark marks; limbs usually transversally band in light and dark brown. Underside dusky with scattered white spots.

Comments.— Open canopied forest and disturbed habitats with isolated trees on which it perches, often head down, watching for prey on the ground; diurnal and semiarboreal. We have not seen this species in southern Tanintharyi. We suspect it is absent here, because it is common in disturbed and agricultural habitats in main Myanmar.

The scientific name is in quote marks because C. versicolor is a southern Indian species; however, before this limited distribution was recognized, versicolor was used for the multiple species of this complex from Pakistan into Southeast Asia, and in many instances, the name still occurs in scientific reports. Most species of this complex are undescribed.

• *Draco blanfordii* Boulenger, 1885

Blanford's Flying Lizard

Adult SVL, females 98–114 mm, males 101–118 mm; TrunkL/SVL 51–59%, TailL/SVL 174–191%, HindlL/SVL 42–56%, HeadL/SVL 17–20 %. Top of head with small keeled scales, flatter, tiny scales on neck and small keeled, slightly imbricate scales on trunk and patagium; underside chin to neck small scales, 65–109 moderate-sized keeled and imbricate scales on chest and abdomen; Suplab 8–11, Inflab 8–11; digits slender and elongate, third and fourth fused at base, ForefLm 27–31, HindfLm 27–35, no NucCrsS or dorsal trunk spines.

Slender lizard, dorsally ground color olive to dusky green with scattered small dark spots to dark grayish green irregular and interrupted crossbars, similar banding dorsally on fore- and hindlimbs; females lighter colored tannish green; male dewlap greenish white merging into dusky throat; dorsally patagium with alternating curved yellow and black bands, latter with yellow spots, outer edge often with broad reddish orange band. Underside of patagium faded dorsal pattern and color; body venter greenish white; tail uniform dusky to closely spaced, greenish–white transverse bands.

Comments.— Arboreal and diurnal in open forest habitats, commonly in forest edges and along streams. Occurs from Bangladash to southern China and southward through Southeast Asia to central Western Malaysia.

• *Draco maculatus* Gray, 1845

Spotted Flying Lizard

Adult SVL, females 69–77 mm, males 62–86 mm; TrunkL/SVL 54–56%, TailL/SVL 148–158%, HindlL/SVL 46–48%, HeadL/SVL 22 %. Top of head with small scales, Suplab 9, Inflab 7–8, ForefLm 22–26, HindfLm 24–28; no NucCrsS, no dorsal trunk spines, 66–68 keeled ventral scales between axilla and inguina.

Slender lizard, dorsally ground color light olive gray to medium brown with few irregular dark brown and cream marks, few dark narrow bands on hindlimbs; male dewlap yellow to orange with large light blue spot medially at its base; dorsally patagium with curved broken bands of dark brown and black bands on yellowish red background. Underside of patagium dusky yellow without pattern, body unicolor beige to grayish white.

Comments.— Arboreal and diurnal in open forests and forest edges, including plantations and coconut grooves. Found from southern China and eastern Myanmar through Thailand and Indochina to central Western Malaysia. Size data supplemented by data from Inger (1983).

• *Draco taeniopterus* Günther, 1861

Barred Flying Lizard

Adult SVL, females 62–76 mm, males 59–69 mm; TrunkL/SVL 46–57%, TailL/SVL 186–208%, HindlL/SVL 52–60%, HeadL/SVL 19–21 %. Top of head with small scales, Suplab 7–8, Inflab 7–10, ForefLm 20–23, HindfLm 23–26, no NucCrsS, no dorsal trunk spines, ventrals between axilla & inguina 59–73.

Slender lizard, dorsally ground color light brown with regular pattern of beige to light brown irregular crossbars, similar banding dorsally on fore- and hindlimbs; male dewlap green with large patch of rufous red at its base, female's dewlap largely rufous red; dorsally patagium with alternating curved green and black bands, outer edge with broad reddish orange band; ventrally patagium faded dorsal coloration with a pinkish tint; underside of body unicolor beige.

Comments.— Forest and forest edge; diurnal and arboreal. Occurs from southeastern Myanmar and southern Thailand to Vietnam and to central Western Malaysia.

Leiolepis belliana (Hardwicke & Gray, 1827)

Common Butterfly Lizard

Adult SVL, females 107–145 mm, males 103–156 mm; TrunkL/SVL ~55–60%, TailL/SVL ~170–190%, HindlL/SVL ~48–56%, HeadL/SVL 15–20%. Top of head with small granular scales, Suplab 8–11, Inflab 7–11, ForefLm 20–22, HindfLm 33–34, no dorsal trunk spines, dorsally and laterally body with small, abutting granular scales; 13–20 precloacal scales.

Dorsally background light brown to grayish brown from head onto tail, tail often with greenish tint; dorsum from mid neck to anterior sacrum densely marked with abutting dark-edged, brown-centered ocelli in transverse rows of 6–8 ocelli (ocelli abutting one another laterally, anteriorly, and posteriorly); side of trunk with vertical black bars from dorsolateral edge of ocelli rows to near ventrolateral

edge of body; in males, interspaces bright orangish red, lighter in females. Tail dorsally with faded ocelli, not in contact with one another; top of head and face uniform grayish brown; venter near uniform white.

Comments.— We have not examined specimens from South Tanintharyi, rather a color image of eight adult individuals collected by a hunter in the vicinity of Myeik. We are treating this Tanintharyi population as L. belliana. G. Peters (1971) examined specimens from three localities in South Tanintharyi and identified all of them as L. belliana. Diurnal, terrestrial species living in burrows in open-canopied forests in southern Thailand and eastern Cambodia into Malaysia.

Pseudocalotes microlepis (Boulenger, 1888)

Small-headed False Mountain Lizard

Adult SVL, females to 83 mm, males 52–67 mm; TrunkL/SVL ~46%, TailL/SVL 210–260%, HindlL/SVL 52–65%, HeadL/SVL 27–31%. Top of head with small scales, body also with small scales, 69–72 Midbody; Suplab 8–10, Inflab 8–10, ForefLm 20–21, HindfLm 23–26, NucCrsS 3–4 and small, no dorsal trunk spines.

Brown dorsally with dark spots anteriorly, grading to grayish brown dorsolaterally on trunk and becoming light gray ventrolaterally and grading into white of venter. Head dark brown above with bright white upper and lower lips.

Diurnal and arboreal forest resident of montane forest.

Comments.— This species is not confirmed for southern Tanintharyi although a likely inhabitant at high elevations. Its type locality is Pla-pu, west of Mt. Muleyit in northern Tenasserim (now Mon State). It occurs spottedly in southern China and adjacent Laos, then Myanmar-Thailand Peninsula and southern Vietnam.

Gekkonidae

Gekkonids with their nocturnal and human commensal habits are known to all inhabitants and visitors to the tropics. Only a few species, however, live with humans, and these commensal species are now widely distributed throughout the tropics. For some of these ubiquitous species such as the Common House Gecko, we do not know their original homes owing to their now widespread distributions. Geckos lack moveable eyelids; each eye is protected by a transparent scale, the spectacle. Most geckos have expanded digital pads with wide subdigital lamellae, whose surface is covered with thousands of fine, flexible spicules. These spicules provide the surface friction that allows the gecko to adhere to vertical walls and to walk upside down on ceilings. Not all geckos are members of the family Gekkonidae. While the latter family is the most speciose family with more than a thousand species, two of the six other gecko families have more than 100 species each.

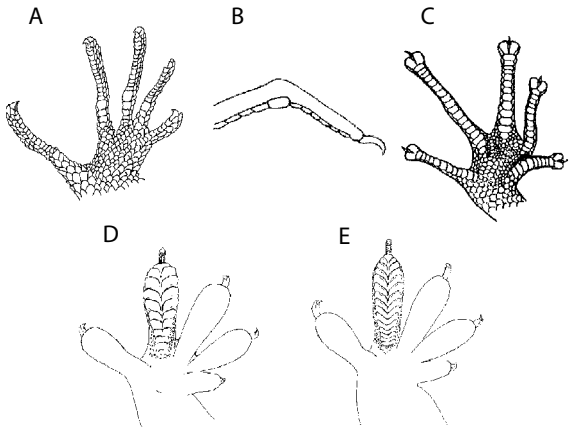


Fig. 11 Foot morphology (ventral views) in gekkonids is variable with some genera characterized by narrow digits and lamellae, for example: (A) *Cnemaspis,* (B) *Cyrtodactylus*, and (C) *Dixonius*. Others have broader digital lamellae such as: (D) *Hemidactylus frenatus* and (E) *Hemidactylus garnotii*.

Key to the genera of geckos (Gekkonidae)

1. Digits narrow throughout entire length, visibly clawed, and distinctly angled at mid-length 2

1′. Digits broadened, slightly or greatly, with some ventral scales forming distinct digital pads with transversally elongate lamellae....3

2. Pupil round; each claw surrounded by two large scales, upper and lower claw-scales nearly equal sized ..... Cnemaspis

2′. Pupil vertically elliptical; each claw surrounded by two large scales, upper claw-scale smaller (half or less) than lower claw-sca le..... *Cyrtodactylus*

3. Single, terminal pair of broad lamellae on each digit; claw retractile between lamellae .....Dixonius siamensis

3′. Digit pad not on end of digit; ultimate and penultimate phalanges narrow and at least partially free of digital pad of second to fifth digit 4

4. Side of body with well-developed, ventrolateral skin fold between fore- and hindlimbs.....5

4′. Side of body with small or no ventrolateral skin fold 6

5. Hands and feet moderately webbed; tail distinctly flattened with continuous edge..... *Hemidactylus platyurus*

5′. Webbing of hands and feet extending to near end of digital pads; tail moderately flattened and edged laterally with large, rounded scale lappets ..... *Ptychozoon lionotum*

6. Terminal portions of forefoot's second to fifth digits elevated above but fused with pads 7

6′. Terminal portions of forefoot's second to fifth digits elevated and free of pads 8

7. Dorsal and lateral surface of trunk with tiny granular scales .... Lepidodactylus lugubris

7′. Dorsal and lateral surface of trunk with moderate–sized granular scales with large tubercle scales interspersed ..... *Gekko gecko*

8. First digit of fore- and hindfoot rudimentary and lacking claw..... ..... *Hemiphyllodactylus typus*

8′. First digit of fore- and hindfoot well developed and clawed *9*

9. Terminal portion of first digit raised and free of pad ..... *Hemidactylus*

9′. Terminal portion of first digit fused to pad ..... *Gehyra*

Cnemaspis punctatonuchalis Grismer, Sumontha, Cota, Grismer, Wood, Pauwels and Kunya, 2010

Spotted-neck Rockgecko

Adult SVL, females to 44 mm, males to 50 mm; tail length to ~60 mm; TrunkL/SVL ~44%, TailL/SVL ~120%, HindlL/SVL ??%, HeadL/SVL ~26%. Top of head with small scales, Suplab 8, Inflab 7–8; dorsally trunk with 24–27 longitudinal rows of keeled tubercles and scattered patches of two to three elongate tubercles on side of trunk, smooth ventral scales; ForefLm ??, HindfLm 29–31; no precloacal pores.

Dorsally background grayish tan, regularly spotted from nape to sacrum with alternate large spots of white (paired posteriorly) and paired black circular spots, tail banded in white and black; limbs with narrow bands of black; underside beige with some dark stipling.

Comments.— Diurnal forest floor and rockwall resident. Possible resident of southern Tanintharyi, presently known from adjacent Prachuap Khiri Khan Province, Thailand.

• *Cnemaspis siamensis* (Smith, 1925)

Siamese Rockgecko

Adult SVL, females and males to 39 mm; TrunkL/SVL ~38%, TailL/SVL ~125%, HindlL/SVL 57–61%, HeadL/SVL ~30%. Top of head with small scales, Suplab 8–9, Inflab 6–8; dorsally trunk with 19–25 longitudinal rows of keeled tubercles and no scattered patches of tubercles on side of trunk, keeled ventral scales; ForefLm 23–25 , HindfLm 24–26; no precloacal pores.

Dorsally background grayish to pinkish tan, double row of white spots, edged anteriorly by smaller black marks, limbs similarly white

and black marked, tail banded in white and black; limbs with narrow bands of black; underside tannish white with yellow chin and throat with three rows of thin black stripes, midline one always present.

Comments.— Diurnal, lowland forest both in litter and beneath bark on trees and rocky outcrops. Now known from South Tanintharyi and adjacent peninsular Thailand.

• *Cnemaspis* sp

South Tanintharyi Rockgecko

Adult SVL, females and males to 39 mm; TrunkL/SVL ~38%, TailL/SVL 100–170%, HindlL/SVL 53–59%, HeadL/SVL ~30%. Top of head with small scales, Suplab 8–9, Inflab 6–8; dorsally trunk with 19–25 longitudinal rows of keeled tubercles and no scattered patches of tubercles on side of trunk, keeled ventral scales; ForefLm 13–16, Hind fLm 24 –26; few precloacal and femoral pores.

Dorsally background grayish olive overlain by small smudges of white and black (lichenous like pattern), limbs similarly white and black marked, tail banded in white and black; limbs with narrow bands of black; underside with white chin, dusky throat and white chest and abdomen.

Comments.— Diurnal, lowland forest both in litter and beneath bark on trees and rocky outcrops. This new speices is a kandiana group member.

• *Cyrtodactylus brevipalmatus* (Smith, 1923)

Short-palmed Bent-toed Gecko

Adult SVL, females 68–74 mm, males 70–71 mm, not sexually dimorphic; TrunkL/SVL 45–50%, TailL/SVL 100–125%, ForeaL/SVL 13%; CrusL/SVL 15–17%, HeadL/SVL 24–26%; HeadW/HeadL 62–68%. Top of head with small scales, Suplab 8–10, Inflab 9–10, one pair of enlarged postmentals; dorsally trunk with 15–19 longitudinal rows of tubercles, 37–42 tubercles in parasagittal row, indistinct ventrolateral fold, 33–34 smooth ventral scales at midbody; ForefLm 17–18, HindfLm 19 –20; distinctly enlarged row precloacal and femoral scales, some males with pores, maximum of 20.

Dorsally uniform medium brown or greyish brown, lighter below; adult typically patternless, juveniles may have darker markings on the lighter brown background.

Comments.—Nocturnal, semiarboreal gecko of forested area, often in the buttresses of large dipterocarp trees; occurs in Myanmar-Thai peninsula.

• *Cyrtodactylus lenya* Mulcahy, Myint Kyaw Thura & Zug, 2017

Lenya Banded Bent-toed Gecko

Adult SVL, 73–74 mm, not sexually dimorphic; TrunkL/SVL 47%, TailL/SVL 120–125%, ForeaL/SVL 16%; CrusL/SVL 16%, HeadL/SVL 27%; HeadW.HeadL 61–67%. Top of head with small scales, Suplab 9, Inflab 7–10, one pair of enlarged postmentals; dorsally trunk with 15–19 longitudinal tubercle rows, 39–41 tubercles in parasagittal row, indistinct ventrolateral fold, 29 smooth ventral scales at midbody; ForefLm 15–16, HindfLm 17–18; distinctly enlarged row precloacal and femoral scales, both without pores.

Distinctly banded with two-toned bands of medium brown centers with dark brown edges on trunk; similarly colored nuchal band; interspaces a lighter brown.

Comments.— Nocturnal and saxicolous in caves and crevices of karst outcrops; restricted to karst areas of Lenya National Park.

• *Cyrtodactylus oldhami* (Theobald,1866)

Oldham's Bent-toed Gecko

Adult SVL, females 67–84 mm, males 55–70 mm, sexually dimorphic; TrunkL/SVL 43–46%, TailL/SVL 100–115%, ForeaL/SVL 14–16%; CrusL/SVL 16–19%, HeadL/SVL 25–32%; HeadW.HeadL 53–65%. Top of head with small scales, Suplab 9, Inflab 8–10, one pair of enlarged postmentals; dorsally trunk with 17–23 longitudinal tubercle rows, 37–46 tubercles in parasagittal row, indistinct ventrolateral fold, 24–34 smooth ventral scales at midbody; ForefLm 13–17, HindfLm 16–20; distinctly enlarged row precloacal and femoral scales, some males with pores, maximum of 8.

Dorsally medium brown ground color from snout onto tail; dark brown white edged nuchal collar from behind eyes looping across anterior half of neck; followed by short dark-edged white longitudinal stripes (usually four) and in turn by white centered, dark brown edged rows of ocelli onto base of tail

Comments.— Nocturnal, found in a variety of habitats, forest floor and vegetation along streams and trails; occurs in Myanmar-Thai peninsula.

• *Cyrtodactylus payarhtanensis* Mulcahy, Myint Kyaw Thura & Zug, 2017

Tenasserim Mountain Bent-toed Gecko

Adult SVL, females 74–83 mm, adult males 61–80 mm SVL; TrunkL/SVL 44–49%, TailL/SVL 125–135%, ForeaL/SVL 14–16%; CrusL/SVL 17–21%, HeadL/SVL 27–30%; HeadW.HeadL 34–46%. Top of head with small scales, Suplab 9–10, Inflab 10–12, one pair of enlarged postmentals; dorsally trunk with 17–20 longitudinal tubercle rows, 40–45 tubercles in parasagittal row, distinct ventrolateral fold, 26–32 smooth ventral scales at midbody; ForefLm 16–20, HindfLm 12–13; distinctly enlarged row precloacal and femoral scales but without pores.

Distinctly banded with irregular, medium brown bands on trunk and neck.

Comments.— Nocturnal and saxicolous in caves and crevices of karst outcrops; restricted to karst areas of Lenya National Park.

Dixonius siamensis (Boulenger, 1899)

Siamese Leaf-toed Gecko

Adult SVL, 45–53 mm; tail length 47–53 mm; TrunkL/SVL 45–49%, TailL/SVL 91–100%, HindlL/SVL 40–43%, HeadL/SVL 30–34%. Top of head with small granular scales only; these form basic scale covering except for small, flat, imbricate scales of venter in 20–25 transverse rows; single keeled tubercles in 9–12 rows cover the dorsum from neck to base of tail; Suplab 7–8, Inflab 6–7, ForefLm 11, HindfLm 12–13. Males with 6–7 precloacal pores.

Dorsally and laterally ground color of pinkish gray from nape onto tail, sides of trunk and limbs, top of head grayish; dark brown irregular transverse bars on snout, behind eyes to nape, thereafter bars break into smaller marks scattered over trunk and dorsolaterally; face with dark preoculars stripe and broader postocular one to ear opening, underside immaculate and dusky white.

Principally rock-dwelling (saxicolous), nocturnal lizard occurring mainly in forest on isolated rocky outcrops to karst ridges and associated caves.

Comments.— D. siamensis appears to be the most ecological tolerant member of the genus Dixonius and is moderately widespread in Southeast Asia. Other Dixonius species are mostly confined to single karst ridges.

Gehyra lacerata (Taylor,1962)

Kanchanaburi Stump-toed Gecko

Adult SVL, females 40–55 mm, males 43–59 mm; tail length to 38 mm; TrunkL/SVL ~45%, TailL/SVL ~69%, HindlL/SVL ~38%, HeadL/SVL ~27%. Top of head with small scales, Suplab 12, 10th or 10th & 11th beneath eye, 10–11 Inflab; ForefLm 7, HindfLm ?; 48 overlapping scales across venter, 18–20 precloacal scales in males. Scalation of small granular scales dorsally and laterally on head, trunk and limbs, ventrally small flattened, imbricate scales, ~46–50 scales transversely between poorly developed ventrolateral folds; subcaudal scales not enlarged in 4–6 transverse series. Thick, somewhat flattened tail with inconspicuous segmentation.

Overall medium-dark brown or brownish gray, venter lighter cream to yellowish white; numerous small gray spots from head to base of tail, spotting mostly dorsal and dorsolaterally, and dorsally on limbs.

Comments.— Nocturnal, principally on forest floor or low on base of large trees. Occurrence of G. lacerata has not yet been confirmed for Tanintharyi; known only from a few localities in southern Thailand and Vietnam.

• *Gehyra mutilata* (Wiegmann, 1834)

Asian Stump-toed Gecko

Adult SVL, females to 54 mm, males 47–56 mm; TrunkL/SVL 39–48 %, TailL/SVL 95–108%, HindlL/SVL 39–48%, HeadL/SVL 25–29%. Top of head with small scales, Suplab 7–9, Inflab 7–9, ForefLm 6–7, HindfLm 7; enlarged ventral scales at midbody 26–34, continuous series of precloacal–femoral pores 24–40; tail commonly lanceolate with midventral row of enlarged scales.

Overall gray to tan lizard dorsally that can lighten or darken, unicolor or with white and dark marks; usually white preorbital and postorbital stripe, latter often dark-edged below. Underside uniform white to cream.

Comments.— Nocturnal and arboreal, principally resident of human habitation, occasionally found in vegetation beside and near human dwellings. Widespread through tropical Asia.

• *Gekko gecko* (Linnaeus, 1758)

Tokay Gecko

Adult SVL, females 132–154 mm, males 150–166 mm; tail length 145–180 mm; TrunkL/SVL 41–48%, TailL/SVL 95–100%, HindlL/SVL 41–48%, HeadL/SVL 27–30%. Top of head with small scales, Suplab11–14, Inflab 10–12, body similarly with small granular scales with 12–14 longitudinal rows of enlarged, keeled conical tubercles with 17–19 tubercles per row on trunk; ventral scales larger, smooth and overlapping in 25–34 transverse rows; all digits well-developed, each with obovate digital pad of narrow transverse lamellae, ForefLm 17–20, HindfLm 18–21 Dorsal ground color light blue to grayish blue with numerous orange markings, those on head slightly elongate, those on neck and trunk usually centered on tubercles; tail with closely spaced, greenish–white transverse bands.

Comments.— Nocturnal, arboreal; forest to town. Diet includes arthropods and small vertebrates. Widespread from Nepal through southern China and southward into central Western Malaysia.

Hemidactylus berdmorei (Blyth, 1853)

Adult ~56 mm SVL, apparently a Hemidactylus bowringi group member thus a gecko with uniform dorsal and lateral scalation of small equal-sized tubercles or granules; tail distinctly segmented with pair of small erect scales at posterolateral edge of each segment.

Comments.— Presently known from a single specimen collected in 1853 at "Mergui." The type specimen is partially rotted and in several piece, thus it cannot be fully characterized.

Hemidactylus frenatus (Duméril and Bibron, 1836)

Indo-Pacific House Gecko

Adult SVL, females 42–49 mm, males 48–59 mm; TrunkL/SVL 39–53%, TailL/SVL ~100%, HeadL/SVL 24–28 %, HeadW/HeadL 61–72%. Top of head with small granular scales and occasional small flat tubercles on parietal and temporal areas, Suplab 9–12, Inflab 7–10; body similarly with small granular scales and also widely scattered flat, rounded tubercles, ventrally larger, flat overlapping scales; all digit of fore- and hindfoot well-developed , each with oblong digital pad, lamellae of pads rectangular, medially divided except for terminal one, ForefLm 7–9, HindfLm 8–11.

An individual's overall body color can change from light grey to medium brown, usually with darker stripes on face from nostril through eye to ear, occasionally dark stripe from upper lip on to side of body for variable distances; underside light from whitish to beige.

Comments.— Strongly human commensal, uncommonly found on vegetation even that adjacent to human structures. This species' standard name reflects its wide distribution throughout the tropics.

Hemidactylus garnotii(Duméril and Bibron, 1835)

Fox Gecko

An all female species. Adult SVL, 49–66 mm; TrunkL/SVL 39–46%, TailL/SVL ~120%, HeadL/SVL 24–26 %, HeadW/HeadL 60–72%. Top of head with small granular scales and occasional small flat tubercles, Suplab 8–13, Inflab 7–10; body similarly with small granular scales, ventrally larger, flat overlapping scales; all digit of fore- and hindfoot well-developed, each with oblong digital pad, lamellae of pads rectangular, medially divided except for terminal one, ForefLm 8–13 , HindfLm 10–15.

An individual's overall body color can change from light grey to medium brown, usually with darker postorbital stripes on head; in dark phase, trunk with 5 longitudinal rows of light spots; underside light from whitish to beige.

Comments.— Strongly human commensal, uncommonly found on vegetation even that adjacent to human structures; occurs broadly in tropical Asia to Oceania Pacific.

Hemidactylus platyurus (Schneider, 1792)

Asian Flat-tailed Gecko

Adult SVL, 47–58 mm; TrunkL/SVL 40–51%, TailL/SVL 100–105%, HeadL/SVL 23–25 %, HeadW/HeadL 63–74%. Top of head with small, equal-sized granular scales, Suplab 8–13, Inflab 8–11; body also uniformly covered with small equal-sized granular scales, ventrally larger, flat overlapping scales; distinct ventrolateral fold on each side, fold with slightly enlarged scales; all digit of fore- and hindfoot well-developed, each with oblong digital pad, lamellae of pads rectangular, medially divided except for terminal one, ForefLm 7–9, HindfLm 6–9.

An individual's overall body color can change from light grey to medium brown, usually with beige stripe between darker stripes on face from nostril through eye to ear, occasionally dark stripe on to side of body from shoulder to hips; underside light from whitish to beige.

Comments.— Strongly human commensal, uncommonly found on vegetation even that adjacent to human structures. Widespread but of spottedly presence through out tropical Asia including the Greater and Lesser Sundas.

Hemidactylus tenkatei (Lidth de Jeude, 1895)

Southeast Asian Spiny Gecko

Adult SVL, females 45–62 mm, males 50–65 mm; TrunkL/SVL 35–48%, TailL/SVL ~102%, HeadL/SVL 22–24%, HeadW/HeadL 57–72%.. Top of head with small granular scales, Suplab 8–11, Inflab 8–10; body similarly with small granular scales and 14–16 longitudinal rows of enlarged, slightly keeled conical tubercles, ventrally larger, flat overlapping scales; all digit of fore- and hindfoot well-developed, each with oblong digital pad, lamellae of pads rectangular, medially divided except for terminal one, ForefLm 6–8, HindfLm 7–8.

An individual's overall body color can change from light grey to medium brown, usually with broad whitish stripe on face from nostril through eye to ear, occasionally dark stripe from upper lip on to side of body for variable distances; underside light from whitish to beige.

Comments.— Strongly human commensal, uncommonly found on vegetation even adjacent to human structures.

The specific name "tenkatei" was recently resurrected for Southeast Asian geckos formerly called Hemidactylus brookii. The latter name was incorrectly applied to the Spiny Geckos and represent a nomen dubium (uncertain name) because the origin of the type specimens is questionable. Because of the nomenclatural name change, this gecko likely has the wide tropical Asian distribution of the former H. brookii, but this assumption has not been confirmed.

Hemiphyllodactylus typus (Bleeker, 1860)

Indo-Pacific Slender Gecko

Adult SVL, females 29–46 mm, unisexual (all-female species); TrunkL/SVL 40–65%, TailL/SVL ~75%, HindlL/SVL 33–36%, HeadL/SVL 18–24 %.; HeadW/HeadL 51–77%; EyeD/HeadL 20–32%. Top of head with small granular scales, Suplab 9–14, Inflab 7–13; first digit of fore- and hindfoot rudimentary with or without tiny claw, digits 2 through 5 on fore- and hindfoot with expanded digital pads with U-shaped lamellae, typically 3–3–3–4 on forefoot and 3–4–4–4 on hindfoot.

Body color light to medium brown head onto tail, darker brown broken reticulation on neck to sacrum, usually with cream to orangish tan transverse band on base of tail.

Comments.— Arboreal and nocturnal, occasionally found on human building but predominantly a secretive dweller of human-disturbed habitats. Hemiphyllodactylus typus is a common alien species, although not yet reported from southern Tanintharyi. Other Hemiphyllodactylus species occur to the north and south of the isthmus area of the peninsula. Unlike H. typus, these native species are not human commensal and likely to be found in the forest.

• *Ptychozoon lionotum* Annandale, 1905

Smooth-backed Flying Gecko

Adult SVL, females ?? mm, males 84–93 mm; tail length 52–95 mm; TrunkL/SVL ~46–52%, TailL/SVL ~60–98%, HindlL/SVL 52%, HeadL/SVL 26%. Top of head with small scales, Suplab 13 with 9th & 10th beneath center of eye, Inflab 11, ForefLm 17, HindfLm 17, dorsally trunk with smooth, flat, abutting circular scales, ventrally 15 larger, slightly overlapping scales across midbody. 13 enlarged precloacal scales with non–secreting pores.
Skin flaps projecting from cheeks, edging anterior and posterior edges of forelimbs, posteriorly on thigh and anteriorly on knee,

broad skin flap from axilla to inguina; tail flattened and edged with scalloping from base to tip.

Dorsal ground color medium brown head to tail and limbs, dorsolaterally and patagium grayish brown; top of head immaculate, face uniform brown, white upper and lower lips, dark brown stripe from eye to ear opening; dorsally trunk and limbs with faint dark brown mottling; underside uniform creamy white.

Comments.— Nocturnal and arboreal forest gecko, preferentially selects large trees and usually rests several meters above the ground; occurs broadly for southern Myanmar through Southeast Asia.

Ptychozoon kaengkrachanense Sumontha, Pauwels, Kunya, Limkikhitaksorn, Ruksue, Taokratok, Ansermet & Chanhome 2012

Kaeng Krachan Flying Gecko

Adult SVL, females 78–80 mm, males 78–86 mm; tail length 66–80 mm; TrunkL/SVL ~42–44%, TailL/SVL ~100%, HindlL/SVL ??%, HeadL/SVL 25–26%. Top of head with small scales, Suplab 8–10, Inflab 8–9, ForefLm 18, HindfLm 15–17, dorsally trunk with smooth, flat, abutting circular scales, ventrally 24 large, slightly overlapping scales across midbody. 13–17 precloacal pores in males, none in females.

Skin flaps projecting from cheeks, edging anterior and posterior edges of forelimbs, posteriorly on thigh and anteriorly on knee, broad skin flap from axilla to inguina; tail flattened and edged with scalloping from base to tip.

Dorsal ground color light gray head to tail and limbs, dorsum with three irregular-shaped and bicolored (dark gray and black) chevrons, top of head with large irregular-shaped dark mark, usually preorbital dark transverse bar; face with dark preorbital and postorbital stripes latter extending rearward and joining first trunk chevron; underside creamy white with black speckling on chest and abdomen.

Comments.— Nocturnal and arboreal forest gecko. Recently described (known only from 4 individuals) from Kaeng Krachan National Park, Phetchaburi Province, Thailand and likely a resident of high montane forest of southern Tanintharyi.

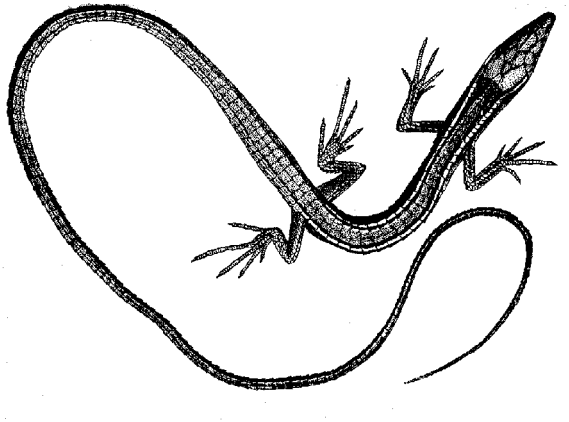


Fig.12 Schematic whole body of ***Tachydromis sexlineata***.

Lacertidae

Lacertids are a small family with about 240 species occurring from southernmost Africa and northernmost Europe throughout Euroasia to Japan and tropical Asia. Most are relatively slender lizards with long tails and body lengths ranging from ~50 mm to ~22 cm SVL. Their greatest diversity is in the western half of their European and African occurrences. For tropical Asia, there is a single genus, ***Takydromus***, with about twenty species and in most localities a single species. Most lacertids reproduce with eggs (oviparous) but a few species are live-bearers (viviparous).

• *Takydromus sexlineatus* (Daudin, 1802)

Six-lined Long-tailed Lizard

Slender, long-tailed lizards, adult SVL to ~45 mm; tail length to ~ 170mm; TrunkL/SVL 46–52 %, TailL/SVL ~370%, HindlL/SVL 46–52%, HeadL/SVL 22–26%. Scalation unlike any other Tanintharyi lizard species, top of head with plate-like scales, temporal scales strongly keeled, body scales in four longitudinal series of enlarged single keeled scales at midbody, dorsolaterally longitudinal strip of tiny, granular scales, lateral scales becoming larger, platelike and keeled ventrolaterally merging into moderate sized and strongly keeled ventral scales of 6–7 transverse rows. Suplab 6, 4th largest and beneath eye, Inflab 6, ForefLm 20–21, HindfLm 25–28. Only precloacal pores present, 3 on each side separated by two large keeled scales medially.

Top of head and center of back bronzy to olive brown, broad white supralabial stripe from temporal area onto base of tail, below preceding stripe broad dark brown lateral stripe from loreal region to anterior trunk, laterally trunk grades from brown to immaculate white venter.

Comments.— Lives in open areas, often seen atop high grass or weedy vegetation into which it dives to avoid capture. Our sample of southern Burmese T. sexlineatus is small but suggestive that those in eastern Indochina and southern China represent a different species. In Myanmar, T. sexlineatus is known from Kachin, Sagaing, Chin, Magway, Mandalay, Rakhine, and Tanintharyi.

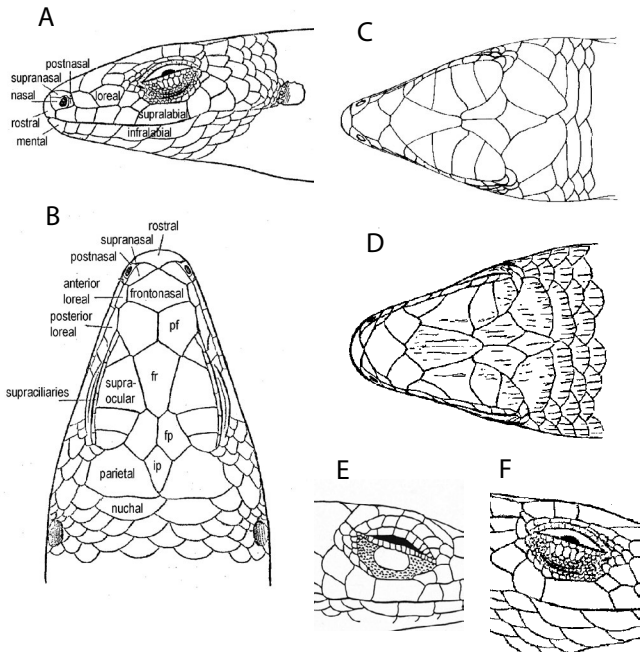


Fig.13 Head scales, dorsal and lateral views of scincid head scale morphology. Lateral view (A) and dorsal view (B) of the head of a ***Eutropis***; each with scales identified. Dorsal view of a ***Lipinia*** (C) lacking supranasal scales and a ***Eutropis*** (D) with supranasal scales. Lateral view of lower eyelid with single large transparent window (E) and with a transparent window of several medium-sized transparent scales.

Scincidae

Skinks (family Scincidae) are the most speciose group of lizards with more than 1600 species worldwide. Skinks occur on all continents except Antarctic. Africa, Australia, and tropical Asia each area is a center of diversification. Reproductively skinks lay eggs or are live-bearers. In size they range from species of ~30 mm SVL to 35 cm SVL; most, however, are in the range of 75–150 mm SVL. They vary widely in morphology from stout, heavy-bodied and strong limbed species to slender, elongate-bodied with small or no limbs.

Key to the genera of skinks

1. Body elongate cylindrical, diameter (thickness) equal from neck to base of tail; tail narrowing only at midlength.....2

1′. Body variable shape and thickness from head to base of tail; tail begins to taper immediately behind vent 3

2. Body strongly elongate; limbs absent; no supranasal scales ..... *Isopachys anguinoides*

2′. Body elongate; limbs exceptionally small and widely separated when adpressed to side of trunk; no supranasal scale above nasal scale and behind rostral scale ..... *Lygosoma siamensis*

3. Dorsally body with smooth scales on neck becoming progressively stronger and larger keeled posteriorly; typanum (ear-drum) on surface of head ..... Tropidophorus

3′. Dorsally body with smooth or keeled scales from neck to sacrum; tympanum in exposed pit or ear-opening covered with scales 4

4. Supranasals present, one medially to each nasal scale 5

4′. No supranasals present; frontonasal contacts posteromedial edge of rostral 7

5. Scales on dorsum and sides of trunk strongly to moderately keeled; limbs well developed 6

5′. Scales on trunk smooth, lacking keels throughout length of trunk or at least on neck; limbs well developed, although short ..... *Lygosoma bowringi*

6. Limbs well developed, when adpressed fore- and hindlimbs overlap; distinctly keeled from neck onto tail ..... *Eutropis*

6′. Limbs well developed but short, barely or do not overlap when adpressed to trunk; no keeled scales on neck, weak to moderately keeled scales from anterior trunk and posteriorly ..... *Dasia olivacea*

7. Moderately slender skink with long neck and sharply pointed snout; bright yellow stripe from tip of snout to tail tip ..... *Lipinia vittigera*

7′. Moderately slender to robust-bodied skink; head blunt conical, ear opening moderate to large and tympanum below surface of head; no bright stripe middorsally 8

8. Stout, moderate-length trunk; limbs well developed, when adpressed fore and hindlimbs touch or overlap..... *Sphenomorphus*

8′. Stout, elongate trunk; limbs well developed, when adpressed fore and hindlimbs do not overlap ..... *Scincella*

Dasia olivacea **(Gray, 1839)**

Olive Treeskink

Adult SVL, females to ~110 mm, males 68–115 mm; tail length ~110–180 mm; TrunkL/SVL ~46–48%, TailL/SVL ~160–180%, HindlL/SVL ~36–40%, HeadL/SVL ~20–24%. Snout with small supranasal scales not in contact medially, Suplab 7, 5th largest and beneath eye but separated by row of suboculars, Inflab 6; eyelid scaly with transparent window of 3–4 large rectangular scales; Dorsals 41–46, dorsal scales smooth on neck becoming tricarinate on trunk to base of tail; Midbody 26–30; ForefLm 14–16, HindfLm 17–21.

Dorsal ground color variable from shiny light bronzy tan to olive brown, head unicolor, from parietal onto neck black (dark brown) single-scaled black spots, neck to sacrum narrow transverse narrow bands of single-scaled white spots with occasional abutting black scales; face and temporal unicolor; venter uniform shiny bluish white.

Comments.— Diurnal and arboreal of lowland tropical forest; occurs broadly from southern Myanmar, Southeast Asia to Philippine Islands.

Eutropis macularia **(Blyth, 1853)**

Side-spotted Sunskink

Adult SVL, females 52–62 mm, males 47–58 mm; tail length 77–~110 mm; TrunkL/SVL 44–55%, TailL/SVL 130–180%, HindlL/SVL 38–43%, HeadL/SVL 20–22%. Snout with small supranasal scale above nasal, Suplab 7, 5th largest and beneath eye, Inflab 7–8; eyelid scaly with transparent disc of 4–5 rectangular scales; Dorsals 34–36, dorsal scales with 3 or 5 strong keels, mostly 5 keels; Midbody 28–34; ForefLm 10–12, HindfLm 14–16.

Dorsal ground color uniform shiny brown bordered on each side by white to cream dorsolateral stripe from upper lip to shoulder and faded thereafter, usually broad dark brown lateral stripe below; underside from chin to base of tail immaculate (unicolor) shiny white except for reddish orange infralabials, chin, and throat of reproductively active males.

Comments.— Diurnal and terrestrial to semiarboreal in lowland and midmontane forest, especially tolerant of disturbed forest.This skink occurs broadly although spottedly throughout tropical Asia and is likely multiple species under a single name.

• *Eutropis multifasciata* (Kuhl, 1820)

Common Sunskink

Adult SVL, females 93–120 mm, males 92–127 mm; tail length ~176–240 mm; TrunkL/SVL 46–52%, TailL/SVL ~190–210%, HindlL/SVL 39–47%, HeadL/SVL 18–22%. Snout with small supranasal scale above nasal, Suplab 7 rarely 8, 5th largest and beneath eye but separated by row of tiny suboculars, Inflab 6–8; eyelid scaly; Dorsals 44–48, dorsal scales with predominantly 3 keels; Midbody 29–32; ForefLm 12–17l, 16–18 on fourth toe.

Dorsal ground color variable from shiny light bronzy tan to brown, sometimes medium gray, dorsum unicolor or with scattered black marks; dorsolaterally diffusely marked coppery tan to orangish tan stripe; laterally trunk ranges from medium brown through orangish red to nearly black, often with white spots below; limbs usually match dorsum color; face with no special markings; underside color also variable, although uniform, commonly cream to grayish white.

Comments.— Diurnal and terrestrial to semiarboreal in lowland and midmontane forest, especially tolerant of disturbed habitats even agricultural and urban areas; occurs widely in tropical Asia. Preceding descriptive data from Tanintharyi specimens and a Myanmar sample (n = 20) of Zug, 2006, unpublished.

Isopachys anguinoides (Boulenger, 1914)

Thai Snakeskink

Adult SVL to 67 mm, total length to 122 mm, tail length approximately equal SVL; TailL/SVL ~100%, limbless skink; HeadL/SVL 9–10%, head elongated cone–shape with rounded snout. Snout without supranasal scale above nasal, Suplab 5–6, 1st largest and 3rd beneath eye, Inflab 4–6; single ocular scale covers eye; 95–118 smooth ventral scales from chin to vent; Midbody 22–26.

Dorsal ground color grayish brown from head to tip of tail; dorsolateral dark brown stripe on each side from neck to near tail tip, stipe usually broken into series of short long longitudinal bars or dashes; underside uniform grayish brown.

Comments.— Fossorial beneath debris of lowland forest and agriculturaly disturbed areas. This limbless skink of northern Penisular Thailand has not yet been vouchered from adjacent Tanintharyi.

Lipinia vittigera (Boulenger, 1894)

Malayan Yellow-tailed Lipinia

Adult SVL, females 35–44 mm, males 34–44 mm SVL; tail length to ~66 mm; TrunkL/SVL ~44–48%, TailL/SVL ~150%, HindlL/SVL ~38–40%, HeadL/SVL ~18–20%. Snout without supranasal scales, Suplab 7, 5th & 6th and beneath eye, Inflab 7; eyelid with large oblong window; Dorsals 48–50, dorsal scales smooth; Midbody 28; ForefLm 9–10, HindfLm 20–23.

Dorsal color dominated by broad middorsal yellow stripe from tip of snout to tip of tail, stripe gradually becomes orange from midbody onward, bordered laterally by black from snout to sacrum, laterally light brown to gray with midlateral black to dark brown stripe from eye to anterior trunk lower neck and entire underside from chin to base of tail immaculate white.

Comments.— Diurnal and semiarboreal in lowland to midmontane

forest of Southeast Asia to Sumatra and Borneo.

• *Lygosoma bowringii* (Günther, 1864)

Bowring's Suppleskink

Adult SVL ~50–57 mm; tail length 48–56 mm; TrunkL/SVL 53–57%, TailL/SVL ~90–120%, HindlL/SVL 25–32%, HeadL/SVL 16–18%. Snout with supranasal scales in contact medially, Suplab 7, 5th largest and beneath eye but separated by row of suboculars, Inflab 6–7; eyelid scaly with transparent disc of 3–4 large rectangular scale; Dorsals 52–58, dorsal scales smooth; Midbody 24–28; ForefLm 9–10, HindfLm 13–14.

Dorsal ground color shiny medium brown to brown, from head to tail; narrow dorsolateral stripe from behind eye to hindlimb, remainder of lateral surface light tan speckled with black; adult males with salmon to orange from inguina to entire lateral and ventral surface of tail; venter from chin onto tail beige to cream, usually immaculate.

Comments.— Diurnal and terrestrial in leaf litter of lowland forests and debris around gardens and villages. Preceding descriptive data exclusively from Tanintharyi specimens and very similar to a small sample (n = 7) of Vietnamese individual, suggesting morphological uniformity across 1000 km of varying habitat; however, other evidence suggest that L. bowringii is a species complex spread across tropical Asia.

Lygosoma quadrupes (Linnaeus, 1766)

Short-limbed Suppleskink

Adult SVL, females to 68 mm, males to 78 mm; tail length 55–82 mm; TrunkL/SVL ~78%, TailL/SVL ~100%, HindlL/SVL ~8–10%, HeadL/SVL ~11%. Long attenuated skink with small and widely separated limbs. Snout without supranasal scale above nasal, Suplab 6–7, 5th largest and beneath eye but separated by row of suboculars, Inflab 6–7; eyelid scaly; Dorsals 109–121, dorsal scales smooth; Midbody 24–28; ForefLm 4–6, HindfLm 4–7.

Dorsal ground color variable from shiny light bronzy tan to dark brown, head usually darker than trunk; lighter background dorsum with multiple narrow dark brown stripes from neck to sacrum, produced by dark margins of each dorsal scale; top of head and face dark brown, upper lip (commonly barred), lower neck and entire underside from chin to base of tail beige, uniform or thinly striped in brown.

Comments.— Presumably diurnal; lives under the surface debris of lowland forest. Widespread from southwestern China through Southeast Asia to Borneo and southwestern Philippines,

• *Scincella melanosticta* (Boulenger, 1887)

Black-spotted Smoothskink

Adult SVL, females 41–53 mm, males 43–55 mm; tail length to 92 mm; TrunkL/SVL 45–46%, TailL/SVL to 160%, HindlL/SVL 37–38%, HeadL/SVL ??%. Stout trunk with well-developed limbs that barely touch. Snout without supranasal scale above nasal, Suplab 7–8, 5th & 6th beneath eye but separated by row of suboculars, Inflab 6–7; eyelid with large transparent disc; Dorsals 63–64, dorsal scales smooth; Midbody 36–38; ForefLm 10–11, HindfLm 18–19.

Dorsal ground color variable from shiny light bronzy tan to dark brown, head usually unmarked; dorsum with multiple narrow dark brown smudges from neck to sacrum, produced by dark margins of each dorsal scale; face dark brown continuing on side of neck and usually as series of dark marks on trunk and, upper lip commonly barred; lower neck and entire underside from chin to base of tail beige, uniform or thinly striped in brown.

Comments.— Diurnal; lives under the surface debris of lowland forests from Myanmar to Vietnam.

• *Scincella reevesii* (Gray, 1838)

Short-limbed Smoothskink

Adult SVL, females 40–43 mm, males 37–41 mm; tail length to 56 mm; TrunkL/SVL 52–55%, TailL/SVL 110–150%, HindlL/SVL 28–35%, HeadL/SVL 18–23%. Long attenuated skink with small and widely separated limbs. Snout without supranasal scales, Suplab 8–9, 5th & 6th beneath eye but separated by row of suboculars, Inflab 6–8; eyelid with large transparent disc; Dorsals 63–72, dorsal scales smooth; Midbody 28–34; ForefLm 9–11, HindfLm 12–18.

Dorsal ground color shiny light bronzy tan, dorsally head spotted with irregular-shaped dark marks that continue on trunk and tail; face with dark brown preocular stripe and postocular stripe continuing laterally on trunk and tail, usually broken posteriorly; upper and lower lips brown and white barred; ventrolateral trunk

lightens with dark smudge marks and venter uniform shiny white from chin onto tail.

Comments.— Diurnal living and foraging under the surface debris of lowland forests from South China through Southeast Asia.

• *Sphenomorphus indicus* (Gray, 1853)

Indian Forestskink

Adult SVL, females 68–89 mm, males 72–83 mm; tail length 119–137 mm; TrunkL/SVL 50–53%, TailL/SVL 142–185%, HindlL/SVL 40–45%, HeadL/SVL 18–19%. Snout without supranasal scale above nasal, rear of rostral flat, Suplab 7–8, 5th & 6th largest and beneath eye, Inflab 7–8; eyelid scaly with transparent window of 4 rectangular scales; Dorsals 64–68, dorsal scales smooth; Midbody 34–36; ForefLm 11–13, HindfLm 17–18.

Dorsal ground color shiny bronzy brown on dorsum from head onto tail; broad dark brown lateral stripe from face (pre- and postocular stripes continuous with neck stripe) onto tail, lower edge of dark brown grades into lighter brown then tannish white; lateral trunk dark brown often with rufous tint; upper and lower lips light tan and continuous in color with ventrolateral surface of neck, trunk and tail; entire underside from chin to base of tail tannish white.

Comments.— Diurnal and terrestrial in primary and secondary forest, forages largely on surface debris and climbs atop logs and rocks. Sphenomorphus indicus appears to be much less common than S. maculatus, and many of its distributional records in Myanmar are actually mis-identified S. maculatus. Although a likely inhabitant of Tanintharyi forest, we have not confirmed its presence.

• *Sphenomorphus maculatus* (Blyth, 1853)

Asian Spotted Forestskink

Adult SVL, females 55–64 mm, males 61–65 mm; tail length 100–120 mm; TrunkL/SVL 45–50%, TailL/SVL 164–195%, HindlL/SVL 46–58%, HeadL/SVL 18–21%. Snout without supranasal scale above nasal, rear of rostral concave, Suplab 7–8, 5th largest and beneath eye, Inflab 7; eyelid scaly with transparent window of 5–7 rectangular scales; Dorsals 71–75, dorsal scales smooth; Midbody 38–44; ForefLm 11–12, HindfLm 16–22.

Dorsal ground color shiny bronzy brown on dorsum from head onto tail; broad dark brown lateral stripe from face (pre- and postocular stripes continuous with neck stripe) onto tail; upper and lower lips cream to yellowish tan, continuous with longitudinal stripe edging the dark lateral band of neck, trunk and tail; entire underside from chin to base of tail light beige and immaculate.

Comments.— Diurnal and terrestrial in primary and secondary forest, forages largely on surface debris and climbs atop logs and rocks. The population in the Myeik Archipelago averages larger than the mainland montane population, e.g., archipelago females 74–77 mm SVL. Sphenomorphus maculatus is widespread, occurring from western China to and through Southeast Asia.

Sphenomorphus tersus (Smith, 1916)

Peninsular Reddish Forestskink

Adult SVL to 96 mm; tail length to 170 mm, TailL/SVL ~170–190%,. Snout without supranasal scale above nasal, Suplab 6–7, 4th or 5th&6th beneath eye, Inflab 7–8; eyelid scaly; Dorsals 70–81, dorsal scales smooth; Midbody 34–40; ForefLm 11, HindfLm 18–21.

Dorsal ground color shiny reddish brown with numerous indistinct transverse brown marks on neck, trunk and tail. Entire underside from chin to base of tail light beige and immaculate.

Comments.— Diurnal and terrestrial in lowland forest of Peninsular Thailand, usually near streams. Suspected resident of southern Tanintharyi but not confirmed.

Tropidophorus berdmorei (Blyth, 1853)

Berdmore's Waterskink

Adult SVL 63–85 mm; tail length 92–104 mm; TrunkL/SVL 46–50%, TailL/SVL 110–146%, HindlL/SVL 34–37%, HeadL/SVL 34–36%. Snout without supranasal scale above nasal, Suplab 6, 4th largest and beneath eye, Inflab 4–5; eyelid with transparent window of 4 large scales; Dorsals 47–50, dorsal scales with single keels; Midbody 30–32; ForefLm 11–12, HindfLm 18–19.

Dorsal ground color medium brown with transverse cream bands edged anteriorly in black from neck unto tail; entire underside from chin to tail beige and immaculate.

Comments.— Diurnal, semiaquatic lizard of forest streams; occurs

broadly in southern China to Peninsular Malaysia.

Tropidophorus robinsoni Smith, 1919

Robinson's Waterskink

Adult SVL, 60–78 mm; tail length 80–95 mm; TailL/SVL 92–158%, HindlL/SVL 32–34%, HeadL/SVL 17–20%. Snout without supranasal scale above nasal, single frontonasal, Suplab 6, 4th largest beneath but separated from eye by large rectangular subocular scale, Inflab 5; eyelid scaly; head scales smooth, trunk scales variousl keeled, usually weakly to moderately tricarinate, Dorsals ~50, Midbody 32–34; ForefLm ??, HindfLm 17–18.

Dark background with light, dark-edged nape band, single preaxillary band and three trunk bands. Underside light, speckled with small black spots.

Comments.— Diurnal, semiaquatic lizard of forest streams. This species remains unvouchered for South Tanintharyi; it occurs in central Peninsular Thailand.

Varanidae

Varanids are the largest lizards with the Komodo Monitor (Dragon) reaching total lengths of more than 2 m and weights of 200 kg. Most species are considerably smaller with SVL less than 1 m; however, the Papuan Monitor also attains lengths greater than 2 m although more than half of its total length is tail, and it is a slender monitor. Monitors occur throughout Africa, Asia to and into Australia. With the exception of three fruit-eating Philippine species, all are carnivorous eating a variety of vertebrate and invertebrate prey. All reproduce by egg-laying.

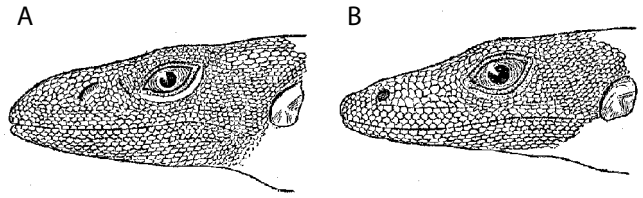


Fig. 14 Snouts of varanid lizards showing position of nares. (A) Naris closer to the eye than to tip of snout in ***V. nebulosi***. (B) Naris closer to tip of snout than to eye in ***V. salvator***.

Key to species of Varanidae

1. Dorsal neck scales enlarged, knoblike and several times larger than dorsal head scales ..... *Varanus rudicollis*

1′. Dorsal neck scales not enlarged, subequal to dorsal head scales and adjacent trunk scales 2

2. Nostril much closer to tip of snout than to eye ..... *Varanus salvator*

2′. Nostril much closer to eye than tip of snout .... *Varanus nebulosus*

Varanus nebulosus (Gray, 1831)

Clouded Monitor

Adult SVL to ~90 cm; tail length to 160 cm; TrunkL/SVL ~36–40%, TailL/SVL ~150%. Top of head and neck with small scales. Midbody scales 149–163, HindfLm 18–24; subcaudal scales dorsally double row keeled, lateral and caudal scales smooth.

Dorsally dusky olive with numerous yellow scales, head nearly uniform dusky olive.

Comments.— Forest species, although will forage in disturbed habitats. Diurnal and largely terrestrial, although climbs to escape; generalized diet including invertebrates and vertebrates. Mostly restricted to dense forest habitats of eastern Myanmar to Vietnam and southward into Western Malaysia.

Varanus rudicollis Gray, 1845

Roughneck Monitor

Adult SVL to 59 cm; tail length to 87 cm; TrunkL/SVL ~44–48%, TailL/SVL 130–160%. Top of head with small scales, neck scales enlarged in 10–12 longitudinal rows. Midbody scales 139–169, HindfLm 17–23; subcaudal scales keeled, dorsal and lateral caudal scales also keeled.

Dorsal ground color black to dark gray, anteriorly with yellowish wash, posterior trunk with transverse dark band and yellow spots.

Comments.— Forest species, primary and secondary, also mangrove swamps; occurring from peninsular Myanmar and Thailand to Sumatra and Borneo . Diurnal and largely terrestrial, although climbs to escape; generalized diet including ants and termites.

Varanus salvator (Laurenti, 1768)

Asian Water Monitor

Adult SVL females to 76 cm, males to 104 cm; tail length 88–120 mm; TrunkL/SVL ~44–48%, TailL/SVL 158. Top of head and neck with small scales. Midbody scales181–163, HindfLm 30–32; subcaudal scales keeled, dorsal and lateral caudal scales smooth.

Dorsally olive to olive brown with transverse bands with yellow black–centered ocelli from base of neck onto base of tail.

Comments.— Habitat generalist surviving in human habitats to forested areas. Semiaquatic, usually near water, streams to canals. Widespread and visible from eastern India to Indochina and southward into Greater and Lesser Sundas. This widespread "species" is actually a complex of multiple species with adult size and other biological aspects differing among populations.

Snakes

Everyone recognizes a snake, and most people immediately identify it as venomous. Yet for most countries, the snake fauna is largely composed of non-venomous species. This latter statement is true for Myanmar and Tanintharyi. Most snakes are totally limbless, and the few snakes with limb remnants (Pythonidae, Typhlopidae in Myanmar) have only scaly spurs or flaps on each side of the vent. Because snakes are limbless, prey capture and consumption require biting and swallowing the prey whole. To accommodate large prey, the skin and digestive tube is very elastic in order to stretch over the prey. The skull joints are also extremely flexible, except those components protecting the brain and sensory organs. To permit a wide gape, the front ends of the mandibles (lower jaw) are attach to one another by a stretchable ligament, allowing the left and right mandibles to separate.

Myanmar has a high diversity of snakes. In Tanintharyi, snakes are represented by 12 families and more than 40 species. Of these species, only 8 species are dangerously venomous.

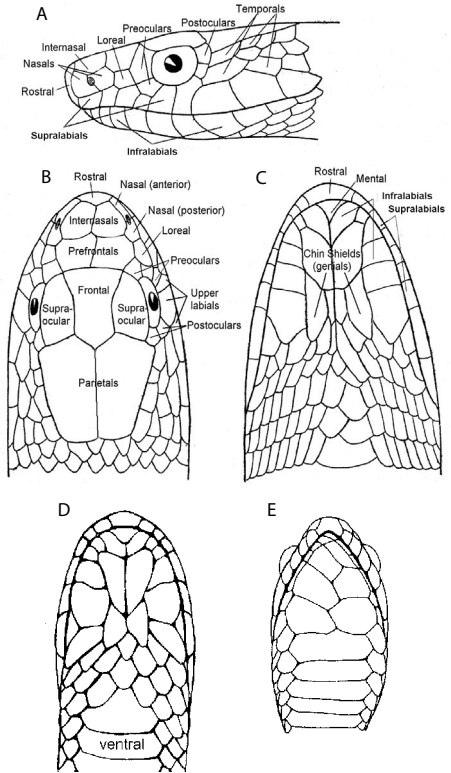


Fig.15 Head scalation of a colubrid snakes. (A) Dorsal view; (B) Ventral view; (C) Lateral view; each with scales identified. Chin and throat scales of a ***Calliophis*** (D) with a mental groove and a ***Pareas*** (E) lacking a mental groove.

Common Terms Used in Snake Descriptions

Measurements	
SVL.	Snout-vent length.
Tail length.	Distance from vent to tip of tail.
Total length	Head width, transverse distance from left to right Body length from the tip of snout to the tip of tail. outer edge of jaw articulation.

Morphology	
Dorsals.	An abbreviation for dorsal trunk scales.
Precloacal.	The single scale or pair of ventral scales immediate anterior to the vent (= cloacal opening).
Subcaudals.	Scales on underside of tail; can be single or paired.
Ventrals.	An abbreviation for ventral trunk scales.

Coloration	
Band.	Transverse stripe (narrow or broad) of contrasting color to background color; band may be partial, i.e., ending at the dorsal and ventral scale contact, or complete/entire, i.e., totally encircling the body, then usually labelled ring.
Bar.	Transverse stripe (narrow or broad) of contrasting color to background color; typically less than half body width.
Blotch.	Irregular patch of color; usually solid; edges usually smooth but can be irregular.
Mark.	Nearly equivalent to blotch, although typically refers to smaller patches of irregular shape of solid color.
Nuchal collar.	Band of contrasting color immediately behind head on anterior portion of neck, often descending to mid lateral area or curving anterior toward jaw articulation.
Ocellus.	Spot with contrasting colored center to thick band of color encircling center; center can be light or dark.
Reticulate.	Netlike pattern of contrasting color.
Speckled.	Tiny marks scattered across surface of contrasting color.
Spot.	More or less round mark of contrasting color to background; tiny to large.
Stripe.	Longitudinal line of contrasting color; can be narrow or broad, can occur dorsally or ventrally.

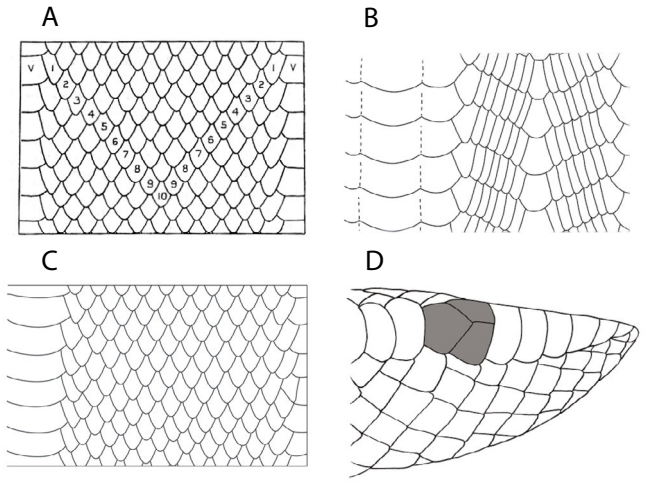


Fig.16 Body scalation of tropical Asian snakes. (A) Dorsal scales at midbody of a colubrid snake with numbers to show one method of counting dorsal scales. (B) Midbody scales of a **Dendrelaphis**, ventral scales on far left. (C) Midbody scales of a ***Cerberus***. (D) Ventrolateral view of the caudal end of ***Cylindrophis***, highlighting the short tail and subcaudal scales, and last ventral scale and paired precloacal scales shaded.

Key to the Families of South Tanintharyi Snakes

1. Body entirely encircled with smooth shiny scales, 28 or fewer scale rows; mid-ventral scale subequal to middorsal scales; head covered with large shiny scales; eye small, beneath scales as pigment spots; tail short, often ending with sharp pointed scales..... *Typhlopidae*

1′. Dorsal trunk scales usually smaller than ventral ones; ventral scales usually transversely rectangular; head scales variable, small to large plates; eyes prominent although small in some species..... 2

2. Tail compressed (laterally flatten) and fin-like, posterior of body also compressed; ventral scales narrow, occasionally little different in size from adjacent dorsal body scales..... *Hydrophiinae-Elapidae*

2′. Tail not laterally flatten; tapering cylindrical from short (= head length) to long (quarter to third of body length). 3

3. Dorsal, lateral and ventral scales on head and body granular and spiny ..... *[Acrochordus granulatus] Acrochordidae*
3′. Dorsal and lateral scales on head small to large but not granular; dorsal body scales smooth or keeled and arranged in diagonal rows on body..... 4

4. Tail short, equal to or less than head length; ventral scales only slightly larger than adjacent dorsal scales; vestige of hindlimb on each side of vent as a cloacal spurs ..... *[Cylindrophis burmanus] Cylindrophiidae*

4′. Tail medium to long, distinctly longer than head; ventral scale usually twice as large or larger than dorsal scales and transversely rectangular 5

5. Dorsal scales in more than 32 scales at midbody; vestige of hindlimb on each side of vent as a cloacal spur ..... *Pythonidae*

5′. Dorsal scales in less than 32 scales at midbody; no vestige of hindlimb on each side of vent 6

6. Enlarged tubular teeth (fangs) at the front of the upper jaw 7

6′. No enlarged tubular teeth at the front of upper jaw, although may have enlarged groove teeth at rear of upper jaw (maxilla) 8

7. Fangs immovably fixed (upright) in front of mouth, fangs short; head oblong to obovate, slightly larger than neck; head scales moderately large, no loreal scale between nostril (naris) and eye ..... *Elapidae*

7′. Fangs large and hinged; head large, triangular and sharply larger than neck; head scales variable, in some species top of head with plate-like scales and others subequal to dorsal scales; loreal area with heat-sensory pit or with several scales between nostril (naris) and eye ..... *Viperidae*

8. Ventrals modest sized, no more than 3X width of ventrolateral dorsal scales; pair of enlarged postparietal scales; parietal and postparietal scales paired and each separated on midline by large interparietal scale .....*[Xenopeltis unicolor] Xenopeltidae*

8′. Ventrals large, more than 4X width of ventrolateral dorsal scales; no postparietal scales; paired large parietal scales 9

9. Nostrils snorkel-like and opening on top of snout and opening upward ..... *Homalopsidae*

9′. Nostrils not snorkel-like, usually opening laterally 10

10. Chin-anterior throat lacks mental groove ..... *Pareatidae*

10′. Chin-anterior throat with mental groove ..... *Colubridae & Lamprophiidae*

Acrochordidae

The Wartsnakes are a small group of three uniquely scaled species. The entire body and head are encased in a skin of small denticulate scales, about 80–160 rows of scales at midbody and narrow midventral keel of spiny scales from throat onto tail. The skin is loose and somewhat baggy (flexible). This feature allows these fish-eating snakes to grab their prey and quickly ensare it. The loose skin and spiny scales ensure a non-slip grip allowing the snake to quickly position the fish for swallowing it. Wartsnakes are totally aquatic and reach body lengths of over two meters. They are largely coastal denizens living in brackish habitats from western India to Southeast Asia and southward through the Sunda Islands to New Guinea and northern Australia.

Acrochordus granulatus (Synder, 1799)

Little Filesnake or Wartsnake

Adult total lengths ~700–1050 mm, tail length ~230–345 mm; TailL/TotL 32–34%. Head blunt ovate in dorsal outline with closely spaced, valvular nostrils on end of snout pointed 45° upward, head barely distinct from neck-trunk, eyes medium-sized with round pupil, three rows of 12–13 supralabials well separated from eye by rows of granular scales. Dorsals small denticulate and in 78–110 rows at midbody; no enlarged ventrals or subcaudals.

Ground color dorsally and ventrally medium to dark brown banded with numerous moderately narrow bands of tan to white from neck onto tail; underside pattern continuous with dorsum.

Comments.— A coastal species not reported as yet from South Tanintharyi although a likely resident; occurs from Bangladesh to Hainan through Islands Asia to coast of Australia.

Colubridae & Lamprophiidae

These two look-alike families were only recently, about twenty years ago, recognized as distinct phylogentic lineages (clades) and the lamprophiids formally elevated to familial rank. The lamprophiids are mainly African snakes with only two genera (Psammophis, Psammodynastes) occurring in South Asia. There are no external traits to distinguish snakes from the two families. Colubrids are much more widespread occurring worldwide including Africa. They include a broad diversity of body forms and sizes, also non-fanged and rear-fanged genera. The toxins (venoms) of the rear-fanged species are usually not lethal to humans, although some humans may react to a rear-fanged snakes bite with an allergenic-like response. Venoms in snakes have been tailored by evolution to be lethal to their principal prey not as a defensive mechanism, although can also serve that purpose.

Key to genera of Colubridae & Lamprophiidae

1. Pupil horizontal and keyhole shaped; head long and narrow with sharp snout ..... *Ahaetulla*

1′. Pupil round to vertical elliptical; head elongate or short with blunt snout..... 2

2. Ventral and subcaudal scales each with strong lateral keels; middorsal scales of trunk enlarged, twice or more larger than adjacent dorsal 3

2′. Ventral and subcaudal scales not keeled laterally, usually smooth transition from dorsal to ventral scales 4

3. Dorsal scales in 17 rows at midbody..... *Chrysopelea ornata*

3′. Dorsal scales in 13 or 15 rows at midbody ..... *Dendrelaphis*

4. Rostral scale enlarged, extending upward and somewhat spade-shaped; rostral clearly visible from above ..... *Oligodon*

4′. Rostral normal sized, forming a smooth curved snout; not or barely visible from above 5

5. Pupil of eye vertically elongate 6

5′. Pupil of eye round..... 9

6. Pupil strongly elliptical; head large, triangular and sharply defined by narrow neck; vertebral row of dorsal scales enlarged ... . *Boiga*

6′. Pupil ovoid elliptical; head modest sized, if triangular shaped, ventrals 155 or more.....7

7. Head moderately triangular; ventrals less than 182; maximum adult total length to 60 cm..... *Psammodynastes pulverulentus*

7′. Head obovate to oblong, flattened, and slightly larger than neck; ventrals more than 150..... 8

8. Head flattened, snout not tilted downward; middorsal scales in 13 or 15 rows ..... *Dryocalamus*

8′. Head flattened, snout depressed, bent downward from eyes forward; middorsal scales in 15 to 17 rows ..... *Lycodon*

9. All dorsal scales smooth; large eyes .....

..... *Ptyas*

9′. All or some dorsal scales keeled, moderately to strongly 10

10. All dorsal scales moderately to strongly keeled, except in some instance ventral-most row smooth .....*[Natricinae] 14*

10′. Dorsal scales variable, some or all scale smooth, others with areas of weak keeling 11

11. Dorsal scales smooth except for lightly keeled on middorsal or vertebral row 13

11′. Dorsal scales variable, smooth anterior and weakly keeled posterior 12

12. Single loreal in front of eye; eyes moderate sized ..... *Coelognathus radiatus*

12′. Two to four loreals in front of eye; eyes large .....

..... *Ptyas*

13. Dorsal scales lightly keeled along the dorsal midline smooth elsewhere; middorsal scales in 25 rows; more than 260 ventrals ..... *Elaphe taeniura*

13′. Dorsal scales smooth or lightly keeled along the dorsal midline; middorsal scales in 23 to 25 rows; fewer than 260 ventrals ..... *Gonyosoma oxycephalum*

14. Internasals narrow anteriorly, nearly triangular in shape ..... *Xenochrophis*

14′. Internasals moderately broad anteriorly, more rectangular in shape..... 15

15. Single anterior temporal scale ..... *Amphiesma stolata*

15′. Pair of anterior temporal scales .... *Rhabdophis*

Colubridae — Colubrinae

Ahaetulla mycterizans (Linnaeus, 1758)

Malayan Vinesnake

Slender, attenuated body, adult total lengths ~700–1050 mm, tail length ~230–345 mm; TailL/TotL 32–34%. Head elongate ovate in dorsal outline with pointed snout, distinct from neck-trunk, eyes large with horizontal pupil, Suplab 9, 4th & 5th or 4th, 5th &6th touch eye, Inflab 8–9. Dorsals smooth, anterior 15, midbody 15, posterior 13, vertebral row enlarged; ventrals 186–207, paired subcaudals 115–156, precloacal single.

Dorsal ground color light to medium green, trunk banded with irregular dark green bars; narrow white stripe ventrolaterally from neck to base of tail; underside light green.

Comments.— Lowland to mid montane forests of peninsular Thailand south into Java and Sumatra. Diurnal, arboreal on outer edges of branches of shrubs and trees, from near ground level to near tree top.

Ahaetulla nasuta (Lacépède, 1789)

Long-nosed Vinesnake

Slender, attenuated body, adult total lengths ~700–1090 mm, tail length ~230–345 mm; TailL/TotL 29–37%. Head elongate ovate in dorsal outline with elongate snout appendage, distinct from neck-trunk, eyes large with horizontal pupil, Suplab 9, 4th, 5th & 6th touch eye, Inflab 8–9. Dorsals smooth, anterior 15, midbody 15, posterior 13, vertebral row enlarged; ventrals 135–207, paired subcaudals 129–180, precloacal paired.

Dorsal ground color bright green, occasionally olive brown, trunk with yellow ventrolateral stripe at intersection of dorsal and ventral scales; underside pale green.

Comments.— Widespread in thick bushy vegetation from urban landscapes, agricultural fields to edges of forest. Diurnal and arboreal, preying on variety of small vertebrates. Occurs broadly from western India into Indochina although not yet confirm for South Tanintharyi.

Ahaetulla prasina (Boie, 1827)

Asian Vinesnake

Slender, attenuated body, adult total lengths ~620–1200 mm, tail length to ~690 mm; TailL/TotL 56–58%. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes large with horizontal pupils, Suplab 9, 4th, 5th &6th touch eye, Inflab 9. Dorsals smooth, anterior 15, midbody 15, posterior 11; ventrals 194–235, paired subcaudals 151–187, precloacal paired.

Dorsal ground color variable, commonly shades of green, also brown to bright yellow; dark, near vertical slashes of dark brown or black on sides of trunk; underside lighter shade of same color as dorsally.

Comments.— Thick brushy vegetation, usually at edges of forest or in open-canopy forest. Diurnal and arboreal, preying mainly on birds and lizards. Occurs from India through southern China southward through Greater Sundas to Philippines.

Boiga cyanea (Duméril, Bibron & Duméril, 1854)

Green Catsnake

Slender-bodied, adult total lengths ~800–1860 mm, tail length ~190–440 mm; TailL/TotL ~23–25%. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes large with vertical elliptical pupils, Suplab 8–9, 3rd, 4th & 5th, 4th & 5th or 4th, 5th &6th touch eye, Inflab 10–12. Dorsals smooth, vertebral row enlarged, anterior 23, 21, midbody 21, posterior 17, 15; ventrals 231–258, paired subcaudals 118–158, precloacal single.

Dorsal ground color uniform green dorsally; chin bluish white; underside uniform greenish white; also with green head and light rufous trunk and tail.

Comments.— Lowland to mid montane forest species occurring broadly from northern India to China and Southeast Asia. Diurnal and arboreal species often near streams. Catholic diet of small vertebrates, mainly frogs and lizards.

Boiga cynodon (Boie, 1827)

Dog-toothed Catsnake

Slender and long-bodied, adult total lengths to ~2.8 m, tail length to ~61–100 mm; TailL/TotL 20–24% [especially long tail]. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes large with vertical elliptical pupils, Suplab 8–11, 4th & 5th or 4th, 5th &6th touch eye, Inflab 11–15. Dorsals smooth, anterior 19–25, midbody 19–25, posterior 13, 15; ventrals 254–289, paired subcaudals 125–165, precloacal single.

Variable coloration, dorsal ground color brownish olive, tan, reddish brown to grayish green, trunk alternately banded with narrow diffuse dark or distinct dark brown bars; head same color as trunk, usually light-colored postorbital stripe disappearing on neck; upper lip light colored to white, underside light colored and unicolor.

Comments.— Nocturnal and arboreal species, found broadly in forest and forest edge in Thailand, less well known in Myanmar although B. cynodon is reported from Bangladesh through Southeast Asia to Borneo and Philippines.

Boiga dendrophilia (Boie, 1827)

Mangrove Catsnake

Long, robust-bodied, adult total lengths ~1200–2500 mm, tail length ~300–625 mm; TailL/TotL 24–25%. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes large with vertical elliptical pupils, Suplab 8, 3rd, 4th & 5th touch eye, Inflab 10–12. Dorsals smooth, vertebral row enlarged, anterior 21, midbody 21, 23, posterior 13–17; ventrals 202–245, paired subcaudals 80–110, precloacal single.

Dorsal ground color black, trunk banded in subequal-sized yellow bars from neck onto tail; upper lip and throat yellow, underside grey to dusky white.

Comments.—Mainly lowland forest species often near streams. Nocturnal species, forages on ground and in trees; eats a variety of prey from fish to birds and mammals. Occurs broadly in Southeast Asia, Greater and Lesser Sundas, and Philippines.

Boiga drapiezii (Boie, 1827)

White-spotted Catsnake

Slender and long-bodied, adult total lengths ~1300–2100 mm, tail length 380–460 mm; TailL/TotL ~22%. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes large with vertical elliptical pupils, Suplab 8, 4th & 5th or 3rd, 4th & 5th touch eye, Inflab 10–11. Dorsals smooth, vertebral row enlarged, anterior 19, midbody 19, posterior 13, 15; ventrals 250–287, paired subcaudals 112–178, precloacal single.

Dorsal ground color variable from green through olive grey to tan, trunk alternately banded in subequal-sized light and dark bars; upper lip and throat yellow, underside whitish anterior becoming greenish posteriorly, black or pale ventrolateral stripe usually present.

Comments.— Lowland to mid montane forest species of southern Southeast Asia and Greater Sunda. Nocturnal and arboreal species preying on small vertebrates.

Boiga multomaculata (Boie, 1827)

Many-spotted Catsnake

Slender and long-bodied, adult total lengths to ~1870 mm, tail length to ~380 mm; TailL/TotL 19–22%. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes large with vertical elliptical pupils, Suplab 7–9, 3rd, 4th & 5th touch eye, Inflab 9–11. Dorsals smooth, vertebral row enlarged, anterior 17, 19, 21, midbody 17, 19, posterior 13, 15; ventrals 186–245, paired subcaudals 72–120, precloacal single.

Dorsal ground color light to medium brown, with series of paired white-edged reddish brown spots on head to tail, with smaller brown spots ventrolaterally alternating with larger dorsal spots; head with pair of dorsal narrow brown bars between eyes, broad brown postoribital stripe and white lips; underside greyish brown speckled with small dark brown spots.

Comments.— Lowland to mid montane forests, usually open canopy, to scruby forest and bamboo stands. Nocturnal and arboreal.

Chrysopelea ornata (Shaw, 1802)

Ornate Flying Snake

Slender-bodied, adult total lengths ~400–1400 mm, tail length ~220–390 mm; TailL/TotL 27–28%. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes large with round pupils, Suplab 8–9, 5th & 6th touch eye, Inflab 9–10. Dorsals smooth, anterior 17, midbody 17, posterior 13; ventrals 213–234 with lateral keel on each side, paired subcaudals 110–138, precloacal paired.

Dorsal ground color yellowish green to green, scale margins black creating boldly banded pattern; top of head black with three green to yellow transverse bars, black postorbital stripe ending on anterior neck; underside pale green with black spot laterally on each ventral scale.

Comments.— Lowland primary and secondary forest. Diurnal, principally arboreal although ascending to ground to search or follow prey, mainly lizards. Occurs broadly from India to southern China and Souteast Asia.

Coelognathus radiatus (Schlegel, 1837)

Copper-headed Trinket Snake

Long, moderately robust, adult total lengths ~800–2000 mm, tail length 150–380 mm; TailL/TotL 18–20%. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes large with round pupil, Suplab 9, 3rd, 4th & 5th or 4th, 5th & 6th touch eye, Inflab 10. Dorsals smooth except for five lightly keeled rows middorsally, anterior 19, midbody 19, posterior 17; ventrals 222–250, subcaudals 82–108, precloacal single.

Dorsal ground color beige through light brown to coppery brown, three sequential patterns: head uniform beige with two narrow postocular dark stripes and narrow dark nape stripe, anterior trunk uniform above with several broad brown blotches ventrolateral, middle half of trunk with four longitudinal black stripes dorsolateral broadest, ventrolateral narrower, at midbody or rearward trunk become largely unicolor light brown. Underside uniform yellowish gray to grayish white.

Comments.— Open habitat resident, grassland to open forest. Diurnal terrestrial; prey rodents, frogs and birds. Found from northern India and Nepal through to southern China and southward into Greater Sundas.

Dendrelaphis caudolineolatus (Gray in Gray & Hardwicke, 1834)

Striped Bronzeback

Slender-bodied, adult total lengths females to 1450 mm, tail length ~200–450 mm; TailL/TotL 30–33%. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes large with round pupil, Suplab 9, 5th & 6th touch eye, Inflab 9. Dorsals smooth, vertebral row enlarged, anterior 15, midbody 15, 13, posterior 13; ventrals 171–188, subcaudals 84–113, precloacal paired.

Dorsal ground color medium to dark brown, anteriorly head and neck copper becoming darker on trunk to about midbody, becoming lighter and distinctly coppery to near tip of tail, dorsal and dorsolateral scales dark edged; beginning laterally on neck white stripe edged in black above and below (bottom edge widest); underside greenish white to yellowish beige; tail with narrow, midventral black stripe from vent to tip.

Comments.— Lowland to mid montane forest; recently vouchered for South Tanintharyi; also from southern Peninsular Thailand to Sumatra and Borneo. Diurnal and arboreal.

Dendrelaphis cyanochloris (Wall, 1921)

Blue Bronzeback

Slender-bodied, adult total lengths ~426–1235 mm, tail length ~136–395; TailL/TotL 28–35%. Head elongate, ovate in dorsal outline, distinct from neck-trunk, eyes large with round pupil, Suplab 9, 5th & 6th touch eye, Inflab 10. Dorsals smooth, vertebral row enlarged, anterior 15 (16), midbody 15, posterior 11; ventrals 186–206, subcaudals 128–156, precloacal usually single.

Middorsal enlarged scales copper to bronze, lateral scales variously colored in blue, entirely blue or with blue centers; top of head uniform copper, horizontal dark pre- and postorbital stripe extends from naris onto anterior neck; upper and lower lips and chin yellow continous with yellow of entire underside.

Comments.— Lowland primary and secondary growth; also a fence–row species in cultivated landscapes; vouchered for South Tanintharyi. Diurnal and arboreal. Lives in eastern India through southern Myanmar and Thailand to West Malaysia.

Dendrelaphis haasi Van Rooijen and Vogel, 2008

Malay Long-tailed Bronzeback

Slender-bodied, adult total lengths females 785–945 mm, males 525–990 mm, tail length 190–355 mm; TailL/TotL 36–38%. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes large with round pupil, Suplab 8–10, 4th & 5th, 4th, 5th &6th, or 5th &6th touch eye, Inflab 9–10. Dorsals smooth, vertebral row enlarged, anterior 15, midbody 15, posterior 9, 11; ventrals 161–173, paired subcaudals 126–153, precloacal paired.

Dorsally ground color coppery on head becoming brownish; ventrolaterally bright white from upper and lower lips posteriorly, loreal area usually dark, narrow postorbital stripe to temporal area then broad black blotches laterally on anterior part of trunk, sometimes forming dark lateral stripe above ventrolateral white area on most of trunk; underside yellow on chin and throat thereafter yellowish white to pale green, largely immaculate.

Comments.— Mainly primary lowland to midmontane forest; recently vouchered for South Tanintharyi, mainly occurs south of Isthmus of Kra. Diurnal and arboreal.

Dendrelaphis nigroserratus Vogel, van Rooijen and Hauser, 2012

Sawtoothed-necked Bronzeback

Slender-bodied, adult total lengths 428–1210 mm, tail length ~150–350; TailL/TotL 30–31%. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes large with round pupil, Suplab 7–10, 4th, 5th & 6th touch eye, Inflab 9–10. Dorsals smooth, vertebral row enlarged, anterior 17, midbody 15, posterior 11; ventrals 197–204, paired subcaudals 148–152, precloacal paired.

Middorsal ground color coppery tan anteriorly becoming brownish and encompassing entire trunk posteriorly on final half or two-thirds of trunk; broad black postorbital stripe, sometimes serrated above and below, extending onto anterior trunk, then breaking into series of broad dark diagonal bars to mid-trunk, thereafter merging with brown ground color; underside yellow on chin and throat thereafter whitish to pale green, largely immaculate.

Comments.— Midmontane forest, generally requiring little disturbed woodlands; not yet vouchered for South Tanintharyi, recorded from Tak Province, Thailand. Diurnal and arboreal.

Dendrelaphis pictus (Gmelin in Linneaus, 1789)

Painted Bronzeback

Slender-bodied, adult total lengths ~600–1425 mm, tail length 135–425; TailL/TotL 30–38%. Head elongate, elongate ovate in dorsal outline, distinct from neck-trunk, eyes large with round pupil, Suplab 8–9, 5th & 6th touch eye, Inflab 9–15. Dorsals smooth, vertebral row enlarged, anterior 15 (13), midbody 15 (13), posterior 11 (rarely 9, 13); ventrals 160–176, paired subcaudals 125–144, precloacal paired.

Dorsal ground color bronzy brown to olive brown, trunk with yellow to cream ventrolateral stripe edged above and below in dark brown, dark preorbital and postorbital stripe continuous with dorsal dark border of lateral stripe; underside ivory to yellowish white.

Comments.— Occurs broadly in lowlands to mid-montane open-canopied forests to fence rows and gardens. Widespread through southern Asia, it is moderately abundant to the north in the Dawei area and photo voucher confirms its presence in South Tanintharyi. Diurnal and arboreal snake commonly found on outer portions of branches.

Dendrelaphis subocularis (Boulenger, 1888)

Mountain Bronzeback

Slender-bodied, adult total lengths 460–840 mm, tail length 120–235 mm; TailL/TotL 26–28%. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes large with round pupil, Suplab 8–9, enlarged 5th touches eye, Inflab 11. Dorsals smooth, vertebral row enlarged, anterior 15, midbody 15, posterior 11; ventrals ~150–175, paired subcaudals 74–105, precloacal paired.

Dorsal ground bronzy brown, top of head immaculate and bright bronze, trunk patterned with most dorsal scales narrowly edged in dark brown; dark brown postorbital stripe ending anteriorly on neck, ventrolateral (upper lip) cream stripe from tip of snout to tail, stripe on lips and chin often yellow becoming cream to white on neck or disappearing anteriorly on neck; venter cream to white anteriorly, grayish posteriorly and distinctly darker on tail.

Comments.— Arboreal and diurnal in forest, searches for prey on outer edges of leafy boughs; not confirmed for South Tanintharyi. Principally a montane species from upper Myanmar and adjacent China to Vietnam.

Dryocalamus davisonii (Blanford, 1878)

Blanford's Bridlesnake

Slender-bodied, adult total lengths ~360–920 mm, tail length ~88–212 mm; TailL/TotL 22–24%. Head ovate in dorsal outline, flattened, distinct from neck-trunk, eyes large with vertical elliptical pupils, Suplab 7, 3rd & 4th touch eye, Inflab 8. Dorsals smooth, anterior 17, midbody 13, posterior 13; ventrals 233–265, paired subcaudals 85–112, precloacal single.

Dorsal ground color white from head onto tail, snout to between eyes black; black oblong spots or bands from neck to middle of trunk, occasionally dividing middorsally into smaller paired spots onto tail; upper lips and throat yellow white, ventrolaterally and underside creamy white.

Comments.— Predominantly forest species from lowlands to mid-mountain of Thailand and Indochina; not yet confirmed for South Tanintharyi. Nocturnal and terrestrial, preys mainly on lizards.
The standard name is occasionally presented as "bridal," a misinterpretation of bridle that refers to the white head markings that mimic the narrow leather bands of a horse's bridle.

Dryocalamus subannulatus (Duméril, Bibron and Duméril, 1854)

Malayan Bridlesnake

Slender-bodied, adult total lengths ~360–600 mm, tail length ~90–150 mm; TailL/TotL 24–26%. Head ovate in dorsal outline, flattened, distinct from neck-trunk, eyes large with vertical elliptical pupils, Suplab 7, 3rd & 4th touch eye, Inflab 8. Dorsals smooth, anterior 15, midbody 15, posterior 15; ventrals 217–244, paired subcaudals 88–112, precloacal single.

Dorsal ground color pale gray to light brown from snout onto tail, black nearly square blotches from nape posteriorly; nape blotch with middorsal extension forward between eyes; by midbody dorsal blotches break middorsally into pairs of small blotches; underside unicolor white to pale yellow.

Comments.— Lowland forests and readily moves into disturbed habitats. Principally nocturnal and terrestrial; preys on small vertebrates. Occurs from Peninsular Thailand and Myanmar to Borneo and thus far vouchered only from the Myeik Archpelago.

Elaphe taeniura (Cope 1861)

Black-tailed or Cave Racer

Large, moderately slender, adult total lengths ~900 mm to 3 m, tail length 170–560 mm, TailL/TotL ~19–20%. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes large with round pupils, Suplab 8–10, 4th & 5th or 5th & 6th touch eye, Inflab 10–13. Dorsals smooth except for weakly keeled middorsal 5 rows, anterior 23, 25, midbody 23, 25, posterior 19, 17; ventrals 225–260, subcaudals 84–112, precloacal paired.

Dorsal ground color variable shades of brown, uniform anteriorly on neck, then broad dorsolateral stripe on trunk continuing to tail or disappearing by midbody and replaced by lateral–ventrolateral white black bordered spots; middorsally most of trunk retains neck and head color; head brown uniform above, usually white lip bordered by narrow or broad dark brown to black postorbital stripe, occasionally narrow transverse nuchal dark stripe; underside uniform yellowish tan to cream.

Comments.— Occurs broadly from lowland forest and disturbed habitats and throughout much of temperate and tropical eastern Asia. Diurnal-nocturnal species, often searching for prey on ground and in trees. Occurs broadly in temperate and tropical Asia. There are multiple color patterned forms of this species with distinct and restricted geographic distributions. Several subspecies are recognized and the form occurring in SouthTanintharyi is Elaphe taeniura rileyi. Additionally the generic status is unsettled with some authors using Orthriophis and other using Elaphe; herein we follow the Reptile Database.

Gonyosoma oxycephalum (Boie, 1827)

Red-tailed Green Ratsnake or Mangrove Ratsnake

Moderate-bodied, adult total lengths to 2.1 m, tail length to 500 mm; TailL/TotL 23–26%. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes large with round pupil, Suplab 9–11, 5th & 6th, 6th &7th, or 7th & 8th touch eye, Inflab 11–14. Dorsals smooth or lightly keeled, anterior 25 (23, 27), midbody mostly 25 (23, 27), posterior 17 (15); ventrals 230–263, paired subcaudals 120–157, precloacal paired.

Dorsal ground color green to yellowish brown with reddish orange tail; head green with black preorbital-postorbital stripe; underside greenish yellow.

Comments.— Variety of lowland to mid-montane treed habitats from forest to garden, occurring throughout Southeast Asia and Greater Sundas. Diurnal and arboreal, prey mainly birds and mammals.

• *Lycodon effraensis* Cantor, 1847

Brown Wolfsnake

Small, slender-bodied, adult total lengths ~700–800 mm, tail length 170–292 mm; TailL/TotL ~24%. Head elongate ovate in dorsal outline, flattened, distinct from neck-trunk, eyes small with vertical pupils, Suplab 9, 3rd, 4th & 5th touch eye, Inflab 10, preocular and loreal present. Dorsals smooth or weakly keeled, anterior 17, midbody 17, posterior 15; ventrals 215–233, subcaudals 72–100, precloacal single.

Dorsal ground color reddish to medium brown, trunk anteriorly with 8 large tan to cream bands widely spaced or unicolor; underside white to light brown, narrowed beneath each dark bands. Head brown, often with cream canthal stripe extending above eye and enlarging to temporal patch.

Comments.— Lowland forests and disturbed habitats of Thai-Malaysia Peninsula to Borneo. Diurnal and nocturnal, usually terrestrial.

• *Lycodon subcinctus* Boie, 1827

White-banded Wolfsnake

Medium slender-bodied, adult total lengths ~392–442 mm, tail length 89–109 mm; TailL/TotL 23–25%. Head elongate ovate in dorsal outline and moderately depressed, distinct from neck-trunk, eyes moderate with vertical elliptical pupils, only one loreal present, Suplab 9, 4th & 5th beneath eye, Inflab 9–10. Dorsals smooth, anterior 17, midbody 17, posterior 15; ventrals 184–199, paired subcaudals 68–72, precloacal usually paired.

Dorsal ground color medium to dark brown with widely spaced narrow, diffusely white bands (6–11) on anterior third of trunk, also

broader diffuse white nuchal band; head lighter brown than body, upper and lower lip light brownish white merging ventrally with same colored venter.

Comments.— Lowland to montane forests from southern China to Greater Sundas. Nocturnal and both terrestrial and arboreal in searching for small vertebrate prey.

Oreocryptophis porphyraceus(Cantor,1839)

Black-banded Trinket Snake

Moderate-bodied, adult total lengths ~560 mm–1200 mm, tail length ~110–216 mm; TailL/TotL 16–19%. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes large with round pupils, Suplab 7–8, 4th & 5th or 5th & 6th touch eye, Inflab 8–11. Dorsals smooth, weakly keeled middorsally, anterior 19, midbody 19, posterior 17; ventrals 179–217, paired subcaudals 52–80, precloacal paired.

Dorsal ground color bluish gray to dark grayish brown with middorsal tan stripe, stripe best developed on rear half of trunk; top of head same color as trunk, black postorbital stripe, upper lip white; underside white to cream.

Comments.— Occurs broadly in montane forest from northern India though southern China southward to Singapore. Diurnal and terrestrial species preying largely on rodents.

Ptyas fusca (Günther, 1858)

White-bellied Ratsnake

Moderately Slender-bodied, adult total lengths ~1.0–2.9 m, tail length ~170–1000 mm; TailL/TotL 33–34%. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes large with round pupils, Suplab 7–8, 5th & 6th touch eye, Inflab 10. Dorsals smooth, anterior 16, midbody 16, posterior 12; ventrals 189–198, paired subcaudals 158–165, precloacal paired.

Dorsal ground color shades of brown, occasionally narrow reddish brown middorsal stripe; head uniform brown above with white to cream upper lip; underside creamy white to light yellow.

Comments.— Inhabitant of lowland to mid-montane forests to agricultural areas with thick vegetation, typically near water; from Thai-Malaysia peninsula to Borneo. Diurnal and terrestrial-low arboreal, usually near water and excellent swimmer; diet predominantly anurans.

Ptyas korros (Schlegel, 1837)

Dark-eyed Ratsnake

Moderate-bodied, adult total lengths~1–2.2 m, tail length ~170–750 mm; TailL/TotL 32–39%. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes large with round pupils, Suplab 7–8, 3rd & 4th or 4th & 5th touch eye, Inflab 10. Dorsals smooth anteriorly, weakly keeled posteriorly, anterior 15, midbody 15, posterior 13; ventrals 160–187, subcaudals 122–147, precloacal paired.

Dorsal ground color shades of brown lighter anteriorly becoming darker to almost black posteriorly; head uniform brown; underside tan to ivory.

Comments.— Inhabits lowland and montane forests of Southeast Asia to Borneo. Diurnal and predominantly terrestrial.

Ptyas mucosa (Linnaeus, 1754)

Oriental Ratsnake

Moderate-bodied, adult total lengths ~1–2.5 m, tail length ~240–625 mm; TailL/TotL 24–26%. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes large with round pupils, Suplab 8, 4th & 5th touch eye, Inflab 9–10. Dorsals smooth, anterior 17, midbody 17, posterior 13 (14); ventrals 187–213, paired subcaudals 95–146, precloacal paired.

Dorsal ground color olive brown, head and trunk uniform, posteriorly trunk lightens and occasionally develops narrow dark bands; underside uniform cream, subcaudals with black spots.

Comments.— Preferentially a forest species but adapts to disturbed and agricultural landscapes with brushy habitats. Diurnal and largely terrestrial. Occurs broadly from Iran to southern China and Southeast Asia.

Colubridae — Natricinae

Rhabdophis chrysargos (Schlegel, 1837)

Speckled-bellied Keelback

Moderate-bodied, adult total lengths to 720 mm, tail length to 188 mm; TailL/TotL 25–28%. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes medium with round pupils, supralabial 9, 3rd, 4th & 5th touch eye, Inflab 11. Dorsals keeled (outermost scale row strongly keeled), anterior 19, midbody 19, posterior 17; ventrals 139–176, paired subcaudals 60–100, precloacal paired.

Dorsal ground color olive to grayish brown, trunk with numerous, widely spaced transverse dark bars, each tipped ventrally with orange; V-shaped, narrow cream nuchal collars in juveniles; upper lip and throat yellow, underside pale yellow with each ventral scale black edged.

Comments.— Occurs in lowland and mid-montane forests, usually adjacent to smaller streams; tolerates modest habitat alteration; southern Southeast Asia to Borneo. Mainly diurnal, subaquatic to terrestrial and preys on fish and frogs.

Rhabdophis nigrocinctus (Blyth, 1856)

Banded Green Keelback

Moderate-bodied, adult total lengths ~635–880 mm, tail length 165–255 mm; TailL/TotL 22–29%. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes medium with round pupils, Suplab 8–9, 3rd, 4th or 5th, 4th, 5th & 6th touch eye, Inflab 10–11. Dorsals keeled, anterior 19, midbody 19, 17, posterior 17; ventrals 150–168, paired subcaudals 72–96, precloacal paired.

Dorsal ground color medium to light green, trunk banded with widely spaced narrow, transverse black bars; head boldly marked, unicolor olive above, broad black postorbital blotch and black subocular bar separated by white area, also usually a black nuchal collar. Underside grayish anteriorly with faint dark-edged ventrals increasing darker from midbody onward, subcaudal darker than posterior ventrals.

Comments.— Midmontane forest streamside. Mainly diurnal, subaquatic to terrestrial and preys on fish and frogs. Occurring from Myanmar, adjacent China through Thailand and Indochina.

Rhabdophis subminiatus (Schlegel, 1837)

Red-necked Keelback

Moderate-bodied, adult total lengths ~580–1300 mm, tail length ~150–340 mm; TailL/TotL 24–31%. Head ovate in dorsal outline, distinct from neck-trunk, eyes large with round pupil, Suplab 8, 3rd, 4th & 5th touch eye, Inflab 9–10. Dorsals strongly keeled, anterior 19, midbody 19, posterior 17; ventrals 137–184, paired subcaudals 56–97, precloacal paired.

Dorsal ground color olive to brownish gray, trunk strongly marked with dark blotches, often with lighter centers, creating irregular checkerboard pattern at least anteriorly, no or indistinct nuchal collar, although rear of head and neck area often a rufous red; head with broad cream postorbital stripe; underside white to cream.

Comments.— Lowland to mid montane streams and bodies of water; occurs widely in disturbed habitats including paddies and urban slues and ponds. Diurnal and noctural, subaquatic, eating mostly frogs and fish. Broad Asian distribution from Nepal and northern India to southern China and southward to Greater Sundas.

Xenochrophis flavipunctatus (Hallowell, 1861)

Gold-spotted Keelback

Slender-bodied, adult total lengths ~600–940 mm, tail length 160–245; TailL/TotL 28–35%. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes moderate with round pupils, Suplab 9 (rarely 8 or 10) 4th or 4th & 5th touching eye, Inflab 9–11. Dorsals, anterior 19, midbody 19, posterior 17; ventrals 120–143, paired subcaudals 60–91, precloacal paired.

Dorsal ground color olive brown to medium brown with regular dark markings anteriorly disappearing on posterior third of trunk; distinct black-edged creamy yellow nuchal collar; underside white to cream with each ventral scale edged in black on anterior edge, hence venter barred;

Comments.— Occurs in a broad array of aquatic habitats, from roadside ditches and paddies to large rivers and lakes; predominantly nocturnal when searching for prey usually at water's edge. Presently know in Myanmar only from lower Sittaung River drainage; expected but not confirmed in South Tanintharyi.

Xenochrophis piscator (Schneider, 1799)

Checkered Keelback

Slender-bodied, adult females ~725–1050 mm, males ~460–800 mm total lengths, tail length 180–240 mm, 140–240 mm, respectively; TailL/TotL 25–30%, 28–33%, respectively. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes moderate with round pupils, Suplab 9 (rarely 8 or 10) 4th & 5th (rarely 4th or 5th) touching eye, Inflab, 10 (rarely 9 or 11). Dorsals, anterior 19, midbody 19, posterior 17; ventrals 128–154, paired subcaudals 68–96, precloacal paired.

Dorsal ground color olive brown, trunk alternately banded in subequal-sized light and dark bars; upper lip and throat yellow, underside white, nearly immaculate; broad black postorbital covering entire temporal area, becoming irregularly saw-toothed on neck.

Comments.— Lives in a broad array of aquatic habitats, from roadside ditches and paddies to large rivers and lakes; predominantly nocturnal when searching for prey usually at water's edge. Widespread in Myanmar and broadly in mainland South Asia from Pakistan to Taiwan.

Xenochrophis punctulatus (Günther, 1858)

Black and White Keelback

Slender-bodied, adult~400–630 mm total lengths, tail lengths 104–160; TailL/TotL 25–34%.

Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes large, Suplab 9, 4th & 5th touch eye, Inflab 9–10. Dorsals smoooth, anterior 17, midbody 17, posterior 17; ventrals 132–152, paired subcaudals 70–83, precloacal paired.

Dorsal ground color olive brown to medium brown with regular dark markings anteriorly disappearing on posterior third of trunk; distinct black-edged creamy yellow nuchal collar; underside white to cream with each ventral scale edged in black on anterior edge, hence venter barred;

Comments.— Found in marshy habitats, semiaquatic to terrestrial; seems to be diurnal and nocturnal. Known from Lower Burma, mainly Ayeryarwady Delta to lower Sittaung River drainage; occurrence confirmed for Upper Tenasserim (= Mon Region) and northern Tanintharyi.

Xenochrophis trianguligerus (Boie, 1827)

Red-sided Keelback

Slender-bodied, adult total lengths ~600–1350 mm, tail length ~150–340 mm; TailL/TotL 24–26%. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes medium with round pupil, Suplab 9, 4th, 5th & 6th touch eye, Inflab 10. Dorsals keeled, anterior 19, midbody 19 (17), posterior 15; ventrals 132–150, subcaudals 62–105, precloacal paired.

Dorsal ground color dark brown, largely overlain by lateral series of black inverted triangles bordered above with red, bright pattern fades with maturity becoming unicolor gray to grayish brown; head uniform ground color, upper lip whitish; underside cream.

Comments.— Largely lowland species in variety of aquatic habitats from paddies and ponds to forested streams from Southeast Asia to Greater Sunda Islands. Active both during day and night, semiaquatic.

Cylindrophiidae

Pipesnakes form a small family of two genera, the monotypic Anomochilus and Cylindrophis currently with 13 species. They are Asian snakes with species in Sri Lanka and Southeast Asia. All pipesnakes are thick-bodied, cylindrical snakes with smooth shiny scales, blunt heads, and moderately short tails. This body form is an adaptation to burying in friable, preferably moist soils. They eat a variety of invertebrate and vertebrate prey. All species are live-bearers with litters of two to twelve neonates.

Cylindrophis burmanus Smith, 1943

Burmese Pipesnake

Slender-bodied, adult total lengths ~218–330 mm, tail length 2–10 mm; TailL/TotL 2–3%. Head short, shortened ovate in dorsal outline, not distinct from neck-trunk, eye moderate with round pupil, 3rd supralabial touches eye. Dorsals, anterior 17 or 19, midbody 19, posterior 16 or 17; ventrals 201–225 same size as adjacent dorsal scales, subcaudals 5–7, precloacal paired.

Dorsal ground color dark purplish brown, trunk with widely spaced, narrow transverse bands of white; head uniformly dark as trunk, underside as trunk with narrow, light bands; tail with red to orange underneath.

Comments.— Various forest habitats with moist floor detritus of Myanmar. Subterranean (fossorial), likely active both during day and night.

Elapidae

The elapids are a diverse group of venomous species with a worldwide distribution: coralsnakes in the Americas, cobras throughout Africa and Asia, the diverse elapids of Australia, and the seasnakes and seakraits of the Indopacific. All are venomous with permanent erect maxillary fangs in the front of the mouth. The venom, as in viperids, is a complex mix of toxins and stablizers, adapted (evolved) for the species' main prey items. As a generality, venoms evolve for the rapid immobilization of prey, both to prevent the loss of the prey and also to prevent the struggling prey from injurying the snake. The elapids reproduce by ovi- and viviparity.

Key to genera of Elapidae

1. Body distinctly triangular in cross-section at midbody; middorsal (vertebral) row of scales enlarged, 1.5 to 2X width of adjacent parasagittal scales; subcaudal scales in single row .....*Bungarus*

1′. Body rounded in cross-section at midbody; middorsal row of scales equal-sized to adjacent parasagittal scales; subcaudal scales in double row or partially single 2

2. Internasal scale not touching nostril; neck not expansible .....*Calliophis*

2′. Internasal scale borders (touches) nostril; neck expansible (hood) 3

3. Single pair of enlarged postparietal(nuchal) scales ..... *Ophiophagus*

3′. No enlarged postparietal scales ..... *Naja*

Bungarus candidus (Linnaeus, 1758)

Malayan Krait

Moderate-bodied, adult total lengths to 1.4 m, tail short and conical length to ~190 mm; TailL/TotL 12–15%. Head elongate ovate in dorsal outline, distinct from neck-trunk, eyes moderate with round pupils, Suplab 7, 3rd & 4th touch eye, Inflab 6–7. Dorsals smooth, anterior 17, midbody 15, posterior 15; ventrals 195–235, single subcaudals 37–58, precloacal single.

Dorsal ground color black to blue-black, banded in subequal-sized white bands; upper lip and throat white to yellowish white; underside white.

Comments.— Lowland to mid montane forest and moderately disturbed forest. Terrestrial and nocturnal, preys on snakes and lizards. This krait has not been reported from Myanmar, including southern Tanintharyi, although it occurs widely in provinces of Thailand bordering Myanmar.

Bungarus fasciatus (Schneider, 1801)

Banded Krait

Moderate-bodied, adult total lengths ~650 mm–2.1 m, tail length ~64–190 mm; TailL/TotL 7–10%. Head broad ovate in dorsal outline, distinct from neck-trunk, eyes moderate with round pupils, Suplab 7, 3rd & 4th touch eye, Inflab 6–7. Dorsals smooth, anterior 17, midbody 15, posterior 15; ventrals 200–234, single subcaudals 23–40, precloacal single.

Dorsal ground color various shades of yellow with black transverse bars (~20–30) on trunk, not encroaching on white underside; head black with yellow lips.

Comments.— Diverse habitats from paddies to forest species. Terrestrial and nocturnal. This krait is widespread in main Myanmar, although not vouchered in Tanintharyi. It lives largely in disturbed areas from garden and rural agriculture areas into disturbed forest and tree plantations, feeding broadly on amphibians and reptiles to small mammals.

Calliophis bivirgatus (Boie, 1827)

Blue Malayan Coralsnake

Long and slender, adult total lengths ~950–1850 mm, tail length ~140–260 mm; TailL/TotL 12–14%. Head elongate ovate in dorsal outline, barely distinct from neck-trunk, eyes medium with round pupils, Suplab 6, 3rd & 4th touch eye, Inflab 5. Dorsals smooth, anterior 13, midbody 13, posterior 13; ventrals 242–304, paired subcaudals 34–53, precloacal single.

Dorsal ground color black from neck onto tail narrowing into stripe, ventrolateral mid blue stripe from behind neck to vent and bordered below by black stripe; underside and laterally and ventrally on tail red to bright salmon. Dorsally to ventrally the head and anterior neck red to bright salmon.

Comments.— Occurs in forest and forest edges from Thai-Malaysia peninsulat to Borneo. Terrestrial and nocturnal.

Calliophis maculiceps (Günther, 1858)

Small Spotted Coralsnake

Slender-bodied, adult total lengths ~450–1300 mm, tail length ~52–142 mm; TailL/TotL ~11–12%. Head short, blunt ovate in dorsal outline, barely distinct from neck-trunk, eyes small with round pupils, Suplab 7, 3rd & 4th touch eye, Inflab 6–7. Dorsals smooth, anterior 13, midbody 13, posterior 13; ventrals 174–203, paired subcaudals 21–31, precloacal paired

.

Dorsal ground color (trunk) medium brown though rufous brown to dusky red on trunk often with widely spaced narrow black transverse bar edged in white or no bars nearly uniform; Head and anteriormost neck black above and dorsolaterally, occasionally with broad white parietal blotch; underside pale blue to gray with some dark spots.

Comments.— Lowland to midmontane forests of Southeast Asia. Terrestrial, mainly nocturnal species; preys mainly on lizards and small snakes. Not vouchered as yet for Tanintharyi.

Naja kaouthia Lesson, 1831

Monocled Cobra

Moderate-bodied, adult total lengths ~950 mm–2.3 m, tail length ~140–400 mm; TailL/TotL 15–17%. Head broad ovate in dorsal outline, distinct from neck-trunk, eyes medium with round pupils, Suplab 7–8, 3rd, 4th & 5th or 4th & 5th touch eye, Inflab 8. Dorsals smooth, anterior 26–32, midbody 19–21, posterior 13–15; ventrals 161–182, paired subcaudals 49–58, precloacal single.

Dorsal ground color variable, from beige to dark gray, largely uniform dorsally, spread hood with dark-edged circle (sometimes U-shaped) often with dark circular spot in center; underside, chin and throat light, body usually darker matching color of back.

Comments.— Occurs broadly from open forest into agricultural areas, including paddies and often near human habitation. Terrestrial and crepuscular–nocturnal; prey diverse from fish and frogs to mammals.

Ophiophagus hannah (Cantor, 1836)

King Cobra

Robust-bodied, adult total lengths ~1–4 m, tail length ~170–680 mm; TailL/TotL 17–19%. Head broad ovate in dorsal outline, distinct from neck-trunk, eyes medium with round pupils, Suplab 7, 3rd & 4th touch eye, Inflab 7. Dorsals smooth, anterior 17–21, midbody 15, posterior 15; ventrals 241–266, subcaudals 74–106 single anteriorly and paired posteriorly, precloacal single.

Dorsal ground color variable from olive to brown or dark gray, typically alternating broad bands of dark and light color (especially in juveniles and young adults); underside creamy white to light gray anteriorly, darker posteriorly.

Comments.— Predominantly a forest species, tropical evergreen to open-canopied dry forest with heavy understory. Diurnal species, mostly terrestrial; prey snakes and monitor lizards.

Homalopsidae

The homalopsid snakes have a variety of common names, but owing to the habitats of many species occurring on soft, mud-bottom habitats, Mudsnakes has become a standard name for the family. They are totally aquatic snakes with a number of adaptations associated with this lifestyle, such as eyes shifted dorsally and valvular nostrils. They are also rear-fanged, and some species regularly attempt to bite when captured. No human deaths have been reported but they should be handled carefully.

Most genera and species are coastal inhabitants of tidal streams, mangrove forest, and esturaries. They feed on a variety of marine creatures. Fish and crustaceans being main prey and some species are specialists on particular group of prey, such as Fordonia leucobalia, the Crab-eating Mudsnake. The following key identifies all genera that we expect to encounter in South Tanintharyi, although only Homalopsis semizonata has been found by our surveys.

Key to genera of Homalopsidae

1. Nasal scales in contact on midline of snout 2

1′. Nasal scales not in contact on midline of snout, separated by one or two internasal scales 4

2. Dorsal trunk scales smooth and shiny .... *Enhydris*

2′. Dorsal scales keeled 3

3. Scales on posterior half of head small, not plate like ..... *Cerberus rhynchops*

3′. Scales on top of head plate-like; distinct pair of parietal plates (scales) on posterior surface of head..... *Homalopsis*

4. Loreal scale absent; midbody dorsal scale in rows of 23, 25, or 27

..... *Fordonia leucobalea*

4′. Loreal scale present; midbody dorsal scale in rows of 19 or 21..... *Cantoria violacea*

Enhydris enhydris (Schneider, 1799)

Rainbow Mudsnake

Moderate-bodied, adult total lengths ~360–882 mm, tail length ~60–148 mm; TailL/TotL 16–18%. Head elongate ovate in dorsal outline and slightly depressed, distinct from neck-trunk, eyes moderate with round pupils, Suplab 7–8, 4th touch eye, Inflab 9–10. Dorsals smooth, anterior 23, 25, 27, midbody 21. 23, posterior 17, 19, 21; ventrals >153–174, paired subcaudals 57–83, precloacal paired.

Dorsal ground color brownish gray to medium brown, trunk with longitudinal stripes of light and dark; upper lip and throat yellow, dark pre- and postorbital stripes from snout to end of head.

Comments.— Lowland marshes, sloughs, slues, heavy vegetated ponds and lakes, and paddies. Abundant in Lower Myanmar, but not yet reported for South Tanintharyi. E. plumbea may also occur. It has 19 midbody scale rows and light underside with row of black spots on midline.

• *Homalopsis semizonata* (Blyth, 1855)

Burmese Masked Mudsnake

Moderately robust body, adult total lengths ~500–728 mm, tail length ~115–166 mm; TailL/TotL 23%. Robust head, blunt ovate in dorsal outline, distinct from neck-trunk, eyes moderate with round pupil, Suplab 12–15, none touch eye separated by suboculars, Inflab 15–16. Dorsals lightly keeled, anterior 40–44, midbody 39–44, posterior 30–36; ventrals 153–165, paired subcaudals 69–90, precloacal paired.

Dorsal ground color tan with broad dark brown bands (~22–23) on trunk from nape to base of tail, bands continue to tip of tail; top of head tan, dusky anterior lighter posteriorly, rostral dark brown, dark brown postorbital stripe extending posteriorly into first dark band, labials tan to white, underside white with small dark brown marks laterally on ventrals.

Comments.— Freshwater streams of lowlands to mid montane forests to ponds and drainage ditches in disturbed habitats. Aquatic, nocturnal species preys mainly on fish.

Lamprophiidae — Pseudaspidinae

Psammodynastes pulverulentus (Boie, 1827)

Asian Common Mockviper

Slender-bodied, adult total lengths ~340–540 mm, female SVL 253–436 mm, males 222–471 mm,; TailL/TotL 13–22%. Head triangular in dorsal outline, narrow neck gradually thickening to moderate robust, although cylindrical trunk; eyes large, vertical elliptical pupil; Suplab 6–9, 3rd, 4th & 5th contact eye, Inflab 6–9. Dorsals smooth, anterior 17, midbody 17, posterior 15 or 17; ventrals 139–180, paired subcaudals 44–76, precloacal single.

Dorsal ground color variable ranging from light to dark brown, occasionally rufous brown, trunk usually with dark-edged light blotches dorsally on trunk; top of head with bicolor Y-mark continuous with dark nape stripe, upper lip usually dark and throat dusky, underside dusky anterior lightening posteriorly.

Comments.— Lowland to mid montane forest species, widespread throughout tropical Asia. Predominantly terrestrial, preys predominantly on frogs and lizards.

Pareidae

The pareids or Asian Slug-eating Snakes are tropical Asian snakes found from eastern India to southwestern China southward into the Greater Sundas. There are three genera but only Pareas occurs in Myanmar. All pareids have a long slender body capped by a large head. They feed on slugs and snails. They can extract a snail from its shell by shoving the lower jaw beneath the snail's body and shell, biting and holding the body of the snail, and then with a rachet-like movement pull the snail from the shell, when the snail's muscles tire and relax, the pulling movement tears the body from the shell. All pareids reproduce by oviparity.

Key to genera of Pareidae

1. Body scales smooth, in 13 rows at midbody ..... *Aplopeltura boa*

1'. Body scales smooth or keeled, in 15 rows at midbody ..... *Pareas*

Aplopeltura boa (Boie, 1828)

Blunt-headed Slug-eating Snake

Slender and very attentuate body, adult total lengths ~530–834 mm, tail length ~220–265 mm; TailL/TotL 32–36%. Head blunt triangular in dorsal outline and thick in lateral view, strikingly distinct from thin neck and body; eyes large with round pupils, occasionally vertically elliptical; Suplab 8–10, none touch eye separated by several rows of suboculars, Inflab 11. Dorsals smooth, middorsal row enlarged, anterior 13, midbody 13, posterior 13; ventrals 148–191, paired subcaudals 88–127, precloacal single.

Dorsal ground color variable, usually dark grey or brown with broad dark bands separated narrower interspaces; head distinctive with broad white upper and lower lips cleft below eye by large dark blotch, top of head usually unicolor and contrasting color to dorsal trunk color. Underside light, white to tan, regularly immaculate along center line with ventrolateral markings.

Forest inhabitant, usually low in the understory vegation. Arboreal and nocturnal.

Comments.— Literature reports an occurrence for Myanmar; we have been unable to confirm this record. Thai records are from the Isthmus of Kra and southward.

Pareas carinatus (Boie, 1828)

Keeled Slug-eating Snake

Slender and very attentuate body, adult total lengths ~430–522 mm, tail length ~90–108 mm; TailL/TotL 21–22%. Head blunt triangular in dorsal outline, strikingly distinct from thin neck and body; eyes large with vertically elliptical pupil, Suplab 7–8, none touch eye separated by several rows of suboculars, Inflab 8–9. Dorsals lightly keeled except for smooth ventrolateral rows, anterior 15, midbody 15, posterior 15; ventrals 158–206, paired subcaudals 53–99, precloacal single.

Dorsal ground color variable, shades of brown from grayish through yellowish to rufous, anteriorly trunk with narrow diffuse dark bars; head usually with narrow dark postorbital stripe onto neck, upper lip and throat usually lighter than remainder of head and unicolor, underside lighter than dorsum, often same shade of brown, immaculate or with lateral longitudinal row of dark spots.

Comments.— Lowland to mid montane evergreen forest; nocturnal and low arboreal; diet of slugs and snails.

Pareas macularis (Theobald, 1868)

White-spotted Keeled Slug-eating Snake

Slender and very attentuate body, adult total lengths ~300–550 mm, tail length ~70–125 mm; TailL/TotL ~23%. Head blunt triangular in dorsal outline, strikingly distinct from thin neck and body; eyes large with vertically elliptical pupil, Suplab 7, 4th or none touch eye separated by suboculars, Inflab 8. Middorsal rows (7–13) keeled and smooth scales below, anterior 15, midbody 15, posterior 15 (rarely 13); ventrals ~146–165, subcaudals ~32–56, precloacal single.

Dorsal ground color light to dark grey, trunk banded in irregular dark bars, occasionally anterior trunk with broad cream to yellow band; upper and lower lips white with black flecking, underside cream to white with black speckling.

Comments.— Mid montane evergreen forest; nocturnal and low arboreal; diet of slugs and snails. P. macularis and P. margaritophorus have overlapping ranges in the mountains of Southeast Asia but appear not to co-occur in the same locations. P. macularis has not been vouchered for South Tanintharyi.

Pareas margaritophorus (Jan, 1866)

White-spotted Smooth Slug-eating Snake

Slender and very attentuate body, adult total lengths ~270–500 mm, tail length ~50–95 mm; TailL/TotL ~19–20%. Head blunt triangular in dorsal outline, strikingly distinct from thin neck and body; eyes large with vertically elliptical pupil, Suplab 7, 4th or none touch eye separated by suboculars, Inflab 8. Dorsals smooth, anterior 15, midbody 15, posterior 15 (rarely 13); ventrals 136–159, subcaudals 32–56, precloacal single.

Dorsal ground color light to dark grey or brown, trunk banded in irregular dark bars formed by black white-tipped scales, nuchal and neck usually with dark band; upper and lower lips white with black flecking, underside cream to white with dense black speckling and blotches.

Comments.— Mid montane evergreen forest; nocturnal and low arboreal; diet of slugs and snails. Pareas macularis and P. margaritophorus were long recognized as separate species then recently considered briefly as a single species. They occur within the same mountain range and forest habitat, although apparently not at the same locations. P. margaritophorus has not been vouchered for Tanintharyi or anywhere else in Myanmar. P. macularis occurs both in Myanmar and Thailand.

Pythonidae

Pythons are mostly large (adults greater than 1 m total length), heavy bodied snakes of Africa, tropical Asia, and Australia. All are constrictors, grabbing their prey with a mouth lined with long, sharp recurved teeth, and immediately coiling around the prey. The constricted prey is not suffocated, rather the tightening of the snake' body coils restricts blood flow and compresses the heart thereby preventing blood flow; this action starves the prey's brain of oxygenated blood and results in a faster death than suffocation. Myanmar has potentially four species: two Short-tailed Pythons and two giants, Reticulated and Burmese Pythons. All pythons reproduce by laying eggs.

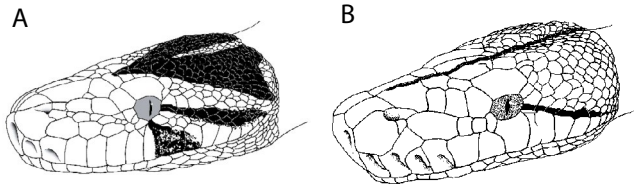


Fig. 17 Head color pattern in two Asian pythons. (A) Python bivittatus has large, bold head markings. (B) Malayopython reticulatus has slender stripes, middorsal and postorbital.

Key to genera of Pythonidae

1. Long, moderately slender body; tail usually greater than 12% of total length; 55–100 paired subcaudal scales 2

1'. Short, stout, body; tail usually less than 10% of total length; 24–36 paired subcaudal scales ..... *Python brongersmai*

2. Supralabial scales do not contact eye; five sensory pits, rostral and two supralabial ones on each side ..... *Python bivittatus*

2′. Seventh or eighth supralabial scale touches eye; four sensory pits, two supralabial ones on each side ..... *Malayopython reticulatus*

Malayopython reticulatus (Schneider, 1801)

Reticulated Python

Moderately heavy body, adult total lengths ~2–9 m, tail length 30–60 cm; TailL/TotL 13–16%. Head elongate triangular in dorsal outline, distinct from neck-trunk, eyes large with elliptical pupils, supralabial 12–14, 7th (occasionally 6th or 8th) touches eye, two supralabial pits on each side, Inflab 21–24. Dorsal scales smooth, anterior ~42–48, midbody 69–80, posterior ~34–40; ventrals 297–330, paired subcaudals 76–102, precloacal single.

Dorsal ground color beige to light brown with broad chain of beige-centered, black and orange edged blotches from neck onto tail; head with thin, middorsal stripe and narrow postorbital stripes; underside white.

Comments.— Lowland to mid montane evergreen forest of Southeast Asia through Sundas to Philippines; recorded in Myanmar only from Tanintharyi. Nocturnal, mainly arboreal as juveniles, terrestrial and semiaquatic as adults; preys mainly on birds and mammals.

Python bivittatus Kuhl, 1820

Burmese Python

Moderately heavy body, adult total lengths ~2–6.5 m, tail length 240–780 mm; TailL/TotL 11–13%. Head elongate triangular in dorsal outline, distinct from neck-trunk, eyes large with elliptical pupils; row of small suborbital scales separate supralabials from eye; rostral and two supralabial pits on each side. Dorsal scales smooth, anterior ~44–52, midbody 60–75, posterior ~38–48; ventrals 240–270, subcaudals 58–83 paired anteriorly, precloacal single.

Dorsal ground color variable from light to dark brown, series of middorsal irregular–sized blotches usually with mid–brown centers dark and then white edged, similar but smaller blotches laterally and ventrolaterally; top of head with broad dark mark joining first dorsal blotch; side of head with dark preorbital stripe, broader postorbital stripe and a short dark suborbital bar; underside white.

Comments.— An uncommon species in Myanmar, likely owing to its persecution by humans. Once a habitat generalists, but now relies on heavily vegetated habitats such as bamboo thickets or dense scruby regrowth forests. None vouchered for South Tanitharyi. Nocturnal and terrestrial; eats mainly warm-blooded prey. Presently the Indian Rock Python (P. molorus) and the Burmese Python (P. bivittatus) are recognized as separate species. The former, as the name implies, occurs mainly in India, the latter mainly in Myanmar and eastward.

Python brongersmai Stull, 1938

South Asian Short–tailed Python

Short and stout, adult total lengths ~80–200 cm, tail length ~72–180 mm; TailL/SVL 7–12%. Head elongate triangular in dorsal outline, distinct from neck-trunk, eyes large with elliptical pupils, 5th & 6th Suplab touch eye. Dorsal scales smooth, anterior 34–53, midbody 44–59, posterior 29–43; ventrals 160–178, paired subcaudals 22–34, precloacal single.

Dorsal ground color usually reddish to orangish brown, trunk with various-sized and -shaped darker blotches, adjacent ones often coalesce; top of head with narrow dark stripe broadening posteriorly and fusing with first dorsal blotch; side of head with broad dark postorbital stripe.

Comments.— Forests, palm-nut plantations and other agricultural area with ground cover. Noctural and terrestrial; preys mainly on warm-blooded prey, particularly rodents. This python is not presently confirmed for southern Tanintharyi, although a survey of palm-nut harvesters reported its presence here.

Typhlopidae

Presently only a single species, Brahminy Blindsnake, is confirmed for South Tanintharyi. Another species occurs nearby in Thailand. Over the past several decades, Burmese blindsnakes have passed through a variety of generic names, from Typhlop through *Ramphotyphlops* and now to *Argyrophis* and *Indotyphlops*. These name changes reflect our improving knowledge of blind snake phylogeny.

Argyrophis diardii (Schlegel, 1839)

Mueller's Blindsnake

Uniform cylindrical-bodied, adult total lengths to 420 mm, short tails, TailL/SVL 2–3%. Head, slightly flattened, blunt oblong in dorsal outline, continuous with trunk, eye visible beneath ocular scale. Dorsal and ventral scales subequal in size around body (~260–310 rows from snout to vent) and in 24 to 26, rarely 28 rows around body along entire length from head to tail.

Dorsal ground color from brown to blackish brown, underside creamy white sharply delineated from dark dorsum; head lighter than trunk dorsally.

Comments.— Found in forest to heavily vegetated habitats; subterrean (fossorial) in habits, feeding on soil arthropods.

Indotyphlops braminus (Daudin, 1803)

Brahminy Blindsnake

Very slender, uniform cylindrical-bodied, adult total lengths ~100–180 mm, short tails, TailL/SVL 2–3%. Head bluntly oblong in dorsal outline, continuous with trunk, eye visible beneath ocular scale. Dorsal and ventral scales subequal in size around body (~290–330 rows from snout to vent) and in 18 (rarely 15) rows around body along entire length from head to tail.

Dorsal ground color dark brown to black, somewhat lighter beneath although still dark; head also may be lighter.

Comments.— Occurs broadly from urban gardens into dry and wet forest, subterrean (fossorial) in habits. Indotyphlops braminus is an all-female species reproducing by parthenogenesis, laying 1–8 tiny eggs. It is an Asian, likely Indian, species that now has a worldwide tropical distribution, owing to its unintentional transport in the root masses of horticultural plants, hence its alternate name Flowerpot Snake.

Viperidae

It is a contentious issue whether vipers should be placed in three subfamilies or three families. We choose the former which recognizes the close relationship of the three viper lineages. All three lineages occur in Myanmar, but presently, we have confirmed only the presence of pitvipers in South Tanintharyi. The name pitviper refers to shared presence of paired infra-red sense organs in the snout of these snakes (Note that python and boas also have infra-red sense organs on their heads). Pitvipers occur in Southwest and South Asia, and the Americas. All reproduce by viviparity and all share uniquely hinged maxillary bones, each maxilla with a large fang (hollow tooth). The hinged adaptation allows long fangs that fold down when the mouth closes and quick erection and deep penetration of the fangs when the mouth opens and the prey is struck.

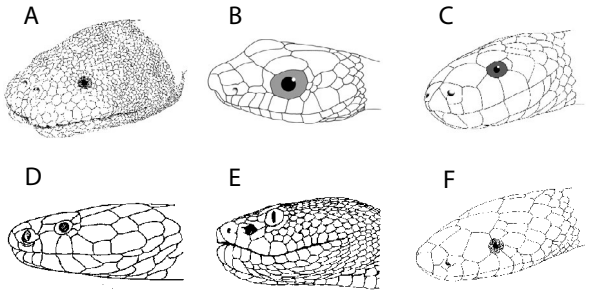


Fig.18 Diversity of scale patterns on heads of snakes. (A) *Acrochordidae, Acrochordus.* (B) Colubridae, *Dendrelaphis.* (C) Cylindrophiidae, *Cylindrophis.* (D) Elapidae, *Ophiophagus.* (E) Viperidae, *Trimeresurus.* (F) Xenopeltidae, *Xenopeltis.*

Key to genera of Viperidae

1. Loreal area with deep infrared sensory pit on each side..... 2

1'. Loreal area without pit, with sheath of scales ..... *Daboia siamensis*

2. Anterior top of head with large plates; sensory pit does not contact supralabials; snout upturned in lateral view; dorsal scales are smooth..... *Calloselasma rhodostoma*

2′. Top of head with small scales; sensory pit touches supralabials; snout not upturned; dorsal scales keeled ..... *Trimeresurus*

Viperidae – Crotalinae

Calloselasma rhodostoma (Kuhl, 1824)

Malayan Pitviper or Mocassin

Moderately heavy-bodied, adult total lengths ~480–880 mm, tail length ~50–125 mm; TailL/TotL females 11–12%, males 16–18%. Head triangular in dorsal outline with up-turned snout, distinct from neck-trunk, eyes large with vertical elliptical pupil, Suplab 7–8, subocular beneath eye, Inflab 11. Dorsals smooth, anterior 23, midbody 21, posterior 17; ventrals 148–167, paired subcaudals 38–55, precloacal paired.

Dorsal ground color variable, from light to dark brown to rufous, trunk with dorsal series of light edged dark brown blotches; upper and lower lips, chin, throat and entire underside white to cream, trunk often dark speckled; narrow dorsolateral stripe from in front of eye to end of head, broad dark rufous postorbital mark covering entire temporal area.

Nocturnal, terrestrial species of forested habitats, preying on both warm- and cold-blooded prey.

Comments.— This species is found broadly in Thailand, primarily in dry forest habitats. Not vouchered for Tanintharyi.

Trimeresurus albolabris Gray, 1842

White-lipped Tree Pitviper

Moderately slender-bodied, adult total lengths females ~600–900 mm, males~490–800 mm; tail length moderate, TailL/TotL females 16–17%, males 19–22%. Head elongate triangular in dorsal outline, distinct from neck-trunk, eyes large with vertical elliptical pupil, Suplab 10–11 none touch eye, Inflab 11–12. Dorsals keeled, anterior 21 (uncommonly 23), midbody 21, 19, posterior 15, 17; ventrals 155–176, paired subcaudals 48–72, precloacal single; tail prehensile.

Dorsal ground color uniform medium green from head to base of tail; tail reddish brown; side of head and labials light green to greenish white; underside greenish white with narrow ventrolateral white stripe from neck to vent

Comments.— Open to closed-canopy forest species; there are no recent Tanintharyi records of this species. Arboreal, nocturnal species, often on branches close to the ground awaiting terrestrial prey. Presently considered single widespread species from northern India to South China and Greater and Lesser Sunda Islands.

Trimeresurus cf. popeiorum

Southern Green Tree Pitviper

Moderately slender body, adult total lengths females ~300–520 mm, male 626 mm, tail lengths females 47–80 mm, male 131 mm; TailL/TotL female 15–17%, male 21%. Head triangular in dorsal outline, distinct from neck-trunk, eyes large with vertical elliptical pupil, Suplab 10–11 separated from eye by subocular, Inflab 12–13. Dorsals keeled, anterior 23, 21, midbody 21, posterior 15; ventrals 165–171, paired subcaudals 57–72, precloacal single.

Dorsal ground color uniform green from head to tail base with ventrolateral white stripe from labials to base of tail in females, bicolor red and white in males; underside greenish white; eye red.

Comment.— Nocturnal, often found on branch low to ground in ambush posture, waiting for terrestrial prey. Occurs in evergreen forest. Populations of this cryptic species occurs in southern Tanintharyi and adjacent Thailand. It has been listed previously as Trimeresurus fucatus, an extralimital species. Genetic data indicate that Tanintharyi specimens are more closely related to T. nebularis, Cameron Highlands species of Peninsular Malaysia as opposed to northern Myanmar T. popeiorum from northern Myanmar, suggesting the Tanintharyi population represents a new species.

Trimeresurus purpureomaculatus (Gray, Gray and Hardwicke, 1832)

Mangrove Pitviper

Moderately stout-bodied, adult total lengths female to 900 mm, males to 665 mm, TailL/TotL 14–20%. Head triangular in dorsal outline, distinct from neck-trunk, often appearing swollen dorsoventrally, eyes large with vertical elliptical pupils; Suplab 11–13 separated from eye by several rows of suboculars, Inflab 13–15. Dorsals strongly keeled, anterior 24–28, midbody 25–27, posterior 18–20; ventrals 160–183, paired subcaudals 56–76, precloacal single.

Dorsal ground color very variable from light olive to dark purplish brown, trunk may lack pattern or middorsally with tightly packed dark blotches, sometimes ocelli-like, and smaller solid blotches ventrolaterally; almost always a ventrolateral row of white scales subequal-sized light and dark bars; upper lip and throat yellow, underside light olive to yellowish green, unmarked or with diffuse, small black marks.

Comments.— Predominantly coastal species occurring in mangrove forest or gallery forest along tidal streams from Bangladesh to Singapore. Nocturnal and arboreal, preying on small vertebrates.

Viperidae — Viperinae

Daboia siamensis (Smith, 1917)

Eastern Russel's Viper

Heavy-bodied, adult total lengths to 1600 mm, although usually less than 900 mm; TailL/TotL 16–18%. Head broad triangle in dorsal outline, distinct from neck-trunk, eyes medium with elliptical pupils, Suplab 10–12, some touch eye. Dorsals strongly keeled except ventral most row, anterior 25–29, midbody 27–33, posterior 21–23; ventrals 153–180, paired subcaudals 41–64, precloacal paired.

Dorsal ground color tan to light brown, trunk with reddish brown blotches narrowly edged with dark brown and white, series of larger blotches in middle of back, similar but smaller spots on sides; top of head and temporal area with similar blotches, large diagonal postorbital stripe and smaller suborbital bar; underside yellowish-white with black spots.

Comments.— This species has a more northerly distribution in Myanmar and Thailand, and is most unlikely to occur in Tanintharyi.

It is a terrestrial species and common in drier habitats, often in agricultural ones. It would likely survive in palm-oil plantation if accidentally introduced.

Xenopeltidae

Sunbeam snakes (xenopeltids) consist of two species, one occurring in northern Vietnam and adjacent China and second widespread species occurring from Myanmar through Indochina and southward into the Sundas. These snakes are shallow-dwelling fossorial snakes that hunt their small vertebrate prey within the forest floor litter. Their name derives from the smooth, shiny iridescence of their scales.

Xenopeltis unicolor Reinwardt in Boie, 1827

Sunbeam Snake

Cylindrical-bodied, adult total lengths ~600–1300 mm, tail length 56–75 mm; TailL/TotL 9–10%. Head elongate ovate in dorsal outline, flattened, and barely distinct from neck-trunk, eye medium–small with round pupil, Suplab 8, 4th & 5th touch eye, Inflab 8. Smooth, shiny dorsals, anterior 15, midbody 15, posterior 15; ventrals 163–187, paired subcaudals 52–71, precloacal paired; ventral-most row of dorsal scales enlarged, about twice size of dorsal scales on the midline.

Dorsal ground color uniform dark olive brown to violet brown, yet iridescent, from snout to tail tip; upper and lower lip and underside chin to vent shiny cream to white, tail brown; enlarged ventral-most dorsal scales with diffuse black smudge on anterior margin of each one.

Comments.— Occurs broadly in Myanmar forests and other heavily vegetated habitats with heavy detritus cover in and under which X. unicolor lives and searches for prey, predominantly frogs and lizards although eats most small vertebrates encountered. South Asian species from Myanmar and Indochina into Greater Sunda Islands.

Testudines — Turtles

Everyone recognizes a turtle because of its shell. The turtle shell is unique among vertebrate animals because the top shell (carapace) is formed in part by the trunk ribs and vertebral column. The ribs extend laterally, rather than downward, from the vertebrae and encase both the pectoral and pelvic girdles, often even the upper ends of the fore- and hindlimbs within the shell. All turtles also have a bottom shell (plastron) that encases the limbs and viscera.

Even though the shell imposes limitations on mobility, locomotion is still quite efficient and especially so in the aquatic environment. The shell has also not been a hindrance to their evolutionary survival. Their shelled ancestors appeared in the late Triassic, about 120 million years ago. Now they are threatened with extinction owing to human predation and alteration and elimination of their habitats. Their slow maturity, many species taking a decade or longer to attain sexual maturity, results in high juvenile mortality. Few individuals reach maturity and begin to reproduce; thus the removal of adults quickly leads to the collapse of a population and local extinction.

Fourteen species of freshwater and terrestrial turtles have been reported for Tanintharyi. That number is certainly less today owing to local extinctions. Which species survive as small, isolated populations is unknown. Unfortunately, these isolates are likely doomed because when people discover a turtle in Asia, it is bound for the pot or the market.

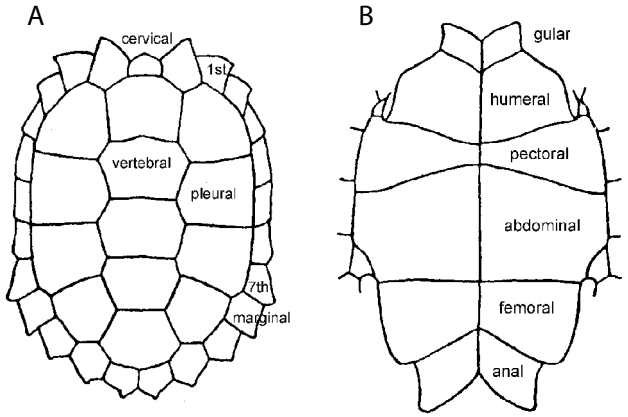


Fig.19 Anatomical features of turtles. (A) Dorsal view of the carapace of a geoemydid turtle. (B) Ventral view of the plastron of the same turtle species. Each with scutes identified.

Common Terms Used in Turtle Descriptions

Measurements	
CL.	Carapace length, straight-line distance from the anterior end of carapace to posterior end; measured along the midline, hence end often ends in posterior notch.
PL.	Plastron length, straight-line distance from the anterior end of plastron to posterior end; measured along the midline, hence end often ends in posterior notch.

Morphology	
Bridge.	Bony connection between carapace and plastron.
Carapace.	Top shell; the bony or skeletal portion consists of several units: medial series of eight neural plates, preceded by a nuchal bone and followed by a pygal bone, these latter two elements are not fused to vertebrae; on each side of the neural plates are costal plates, each fused to a rib. The neurals and costals are the major portion of shell and are bordered laterally by peripheral bones that encircle the shell linking left and right series of peripherals anteriorly by the nuchal and posteriorly by the pygal. Peripheral bones also join with the ends of the plastral bones (hyo- and hypoplastra) to form the bridge.
Plastron.	Bottom shell; it consists of nine elements, four paired and one single bone. From anterior to posterior the plastral bones are epiplastra (2, paired), entoplastron (1), hyoplastra (2), hypoplastra (2), and xiphiplastral (2).
Scutes.	The hard, horny epidermal covering of the carapace and plastron.

The carapace bears a similar set of epidermal units as the bony ones: cervical, single anteromedial scute, followed by a series of vertebrals running posterior over the neural bones to the pygal scute; pleural scutes cover the costal plates; and marginal scutes from the external margin of the carapace over the peripheral bones. The plastron scutes are all paired and from anterior to posterion gular, humeral, pectoral, abdominal, femoral and anal scutes. The bridge is usually covered by edges of the pectoral and abdominal scutes; often with a small scute in the anterior notch (axillary scute) and a posterior one (inguinal).

Key to the Families and Species of Tanintharyi Turtles

1. Forelimbs modified as flippers; all digits fused and indistinct, only 1–2 claws visible on forefoot ..... *seaturtles [Cheloniidae, Dermochelyidae]*

1′. Forelimbs not modified as flippers; all digits distinct, even if joined by web, 3 or more claws visible on forefoot 2

2. Surface of carapace and plastron lacking epidermal scutes; snout protruding and snorkel-like ..... [Trionychidae]..... 3

2′. Surface of shell with hard, epidermal scutes; snout usually not elongate and snorkel-like 7

3. Plastron with femoral flaps on posterior edge; carapace with peripheral bones, at least in posterior margin, usually not visible in living individuals ..... *Lissemys scutata*

3′. Plastron without femoral flaps on posterior edge; carapace without peripheral bone..... 4

4. Carapace pattern with four dark-centered ocelli or parts of ocelli, faded or absent in adults; large blunt tubercles on top of neck, especially on posterior half..... *Nilssonia formosa*

4′. Carapace pattern, uniform to variously mottled but without ocelli: no enlarged tubercles on neck 5

5. Snout short, shorter than diameter of orbit; head seemingly foreshortened by thick fleshy gular collar ..... *Pelochelys cantorii*

5′. Snout long, equal or greater than orbital diameter; head without thick fleshy gular collar 6

6. Five well developed callosities on plastron, medial one on entoplastron; large tubercles on front edge of carapace .... *Amyda ornata*

6′. Four weakly developed callosities, none on entoplastron; small or no tubercles on front edge of carapace ..... *Dogania subplana*

7. Hindlimb columnar and elephant-like; four claws but no digits visible on hindfoot..... [Testudinidae] 16

7′. Hindlimb not columnar, dorsoventrally compressed and similar in shape to forelimb; usually five claws and digits visible on hindfoot ..... [Geoemydidae] 8

8. No bony bridge in adults, carapace and plastron joined by ligamentous joint, hence no axillary or inguinal scutes between carapace and plastron 9

8′. Bony bridge in juveniles and adults, at least on anterior half of plastron-carapace junction; usually anterior axillary and posterior inguinal scutes in bridge area 10

9. Freely moveable transverse hinge between pectoral-abdominal scutes; plastron can close shell completely; carapace typically domed; head black with bright yellow stripes on side of head ..... *Cuora amboinensis*

9′. Weakly flexible plastral hinge; plastron entirely dark or with many dark brown markings; carapace moderate height but not domed; crown of head speckled with light to mid brown on dark brown to grey background ..... *Cyclemys oldhamii*

10. Entire triturating (crushing) surface of upper jaw (maxilla) narrow and without median, longitudinal ridge 11

10′. Triturating surface of upper jaw broad, at least posteriorly and usually with one or two medial longitudinal ridges; ridges typically denticulate 14

11. Carapace smooth or slightly serrate posteriorly; anterior margin of carapace mostly smooth, variously curved 12

11′. Carapace strongly serrate posteriorly; anterior margin of carapace spiny or jagged in juveniles, smoothing in adults .... *Heosemys spinosa*

12. Carapace domed, smoothly convex dorsally; side of head finely

mottled in green, yellow and red in juveniles and young adults, becoming uniform grey in older adults; bridge uniformly yellow ..... *Heosemys grandis*

12′. Carapace lightly to moderately domed, with weak to strong middorsal keel and lateral keels present or absent; side of head weakly to strongly striped or boldly patterned..... 13

13. Side of head with large red spot behind ear and numerous black and yellow stripes on neck; carapace lightly domed, middorsal ridge faint to absent; plastral scutes with large dark blotches .... [Emydidae] .....*Trachemys scripta*

13′. Side of head with no large red-spot; other stripes few and often fragmented; carapace typically with distinct middorsal keel and lateral ones variously developed 14

14. Triturating surface of upper jaw very broad throughout its length, with strong medial ridge; carapace distinctly domed and each pleural scute typically with light centered ocellus; plastron yellow and without marks ..... *Morenia ocellata*

14′. Triturating surface of upper jaw moderate to very broad, at least posteriorly; posterior edge of carapace smooth or lightly notched 15

15. Triturating surface of upper jaw narrower anteriorly and broader posteriorly, no medial ridge; small black turtle with broad head; light to white area or spot on side of head above tympanum; each plastral scute with broad dark marks on a yellowish background ..... *Siebenrockiella crassicollis*

15′. Triturating surface of maxilla (upper jaw) usually with one medial ridge, occasionally two ridges; five claws on forefoot; carapace dorsally flattened with middorsal keel and often with spines projecting from posterior edge of first three vertebral scutes ..... *Batagur affinis*

16. Fifth, sixth and seventh marginal scutes touch second pleural scute ..... *Indotestudo elongata*

16′. Only fifth and sixth marginal scutes touch second pleural scute ..... *Manouria emys*

Geoemydidae

The Asian pond turtles, geoemydids, occur through eastern Asia from Pakistan to Japan and southward from the Himalaysas to and through the Greater and Lesser Sunda Islands. A single terrestrial and semiaquatic genus, Rhinoclemmys, occurs in the forest of Central and northern South America. Southeast Asia is the center of geoemydid diversity with 18 genera and more than 50 species. This diversity includes fully terrestrial to fully aquatic (except for egg-laying) species. Geoemydids range in size from small species of 15 cm carapace length to a giant species of 80 cm carapace length. Most species are omnivores, a few with a preference for plant matter.

Cuora amboinensis **(Daudin, 1802)**

Asian Boxturtle

Adults, females 100–208 mm, males 100–206 mm CL, not sexually dimorphic; carapace shorten oblong in dorsal outline, strongly dome, rear margin smooth or lightly irregular; carapacial scutes smooth; plastron large covering most of underside, oblong in outline, transverse functional hinge in middle, rear margin smooth and rounded. Head small, approximately length of first vertebral scute; broadly ovate to blunt conical in dorsal outline, dorsal surface without enlarged plates, snout slightly protruding. Forefoot with five claws, fingers not joined by web; fore- and hindfeet near equal sized.

Carapace dark brown to olive, uniformly colored or with narrow light middorsal stripe in 50% of individuals; plastron unicolor cream to light yellow; head dorsally uniform brown edged with yellow canthal stripe, face with yellow preorbital and postorbital stripe, upper lip yellow continuing to below tympanum; forelimbs and hindlimbs without pattern.

Comments.— Semiaquatic turtle of wetlands from rice paddies to forest streams and ponds. Occurring broadly from eastern India through tropical Asia to Philippine Islands.

Cyclemys oldhamii **(Gray, 1863)**

Oldham's Leafturtle

Adults, to 22—25 cm CL, sexually dimorphism uncertain; carapace oblong in dorsal outline, moderately dome, rear margin slightly serrate; carapacial scutes smooth; plastron large covering most

of underside, oblong in outline, slight anal notch. Head small, approximately length of first vertebral scute; broadly ovate to blunt conical in dorsal outline, dorsal surface without enlarged plates anteriorly, small irregular ones posteriorly, snout not distinct from head. Forefoot with five claws, forefeet and hindfeet near equal-sized.

Carapace light to medium brown with indistinct radiating dark lines on each costal scute; plastron cream to light brown with thin brown stripes radiating from corner of each scute; head dorsally reddish brown without distinct markings; forelimbs and hindlimbs dark without pattern.

Comments.— Semiaquatic turtle, in and adjacent to forest streams of Myanmar. C. dentata is stilled occasionally listed as a Burmese species and reflects an older concept of Cyclemys diversity. Current taxonomy recognizes C. dentata as a species of southern Thailand (below Isthmus of Kra), Peninsular Malaysia, and the Greater Sundas.

Heosemys grandis (Gray, 1860)

Giant Asian Pondturtle

Adults, to 48 cm CL, sexually dimorphism uncertain; carapace broad oblong in dorsal outline, moderately dome although flattened dorsally with middorsal keel, rear margin smooth or lightly irregular; carapacial scutes smooth; plastron large covering most of underside, oblong in outline, rear margin smooth and rounded. Head small, approximately length of first vertebral scute; broadly ovate to blunt conical in dorsal outline, dorsal surface without enlarged plates, snout not distinct from head. Forefoot with 5 claws, fingers not joined by web; hindfoot large and strongly webbed.

Carapace color, no pattern; plastron unicolor cream; head grayish green to brown, uniform or mottled with yellow to orange; forelimbs and hindlimbs without pattern.

Comments.— Largely aquatic turtle living in variety of habitats from marshes and swamps to small streams and shallow lakes. Occurring from southeastern Myanmar to southern Cambodia and Vietnam.

Heosemys spinosa (Gray, 1830)

Spiny Turtle

Adults, to 22 cm CL, sexually dimorphic in carapace shape elongate oblong, moderately domed and dorsally flattened in males outline, broad oblong and moderately dome in females, both with prominent middorsal keel; margin of carapace increasingly serrate from above forelimb to posterior end of carapace; serration often blunted with age; plastron large covering most of underside, broad oblong in outline, deep anal notch on rear margin with. Head small, approximately length of first vertebral scute; broadly ovate to blunt conical in dorsal outline, dorsal surface without enlarged plates, snout not distinct from head. Forefoot with five claws, fore- and hindfeet near equal sized.

Carapace reddish to medium brown, each costal scute with radiating narrow line pattern; plastron yellow to cream with radiating line pattern on each scute; head uniform brown with yellow to orange area behind tympanum; fore- and hindlimbs dark brown with orangish scales.

Comments.— Semiaquatic turtle of streams in tropical evergreen forest. Reported only for Tanintharyi and southward through Malay Peninsula, Sumatra, and northern Borneo.

Malayemys macrocephala (Gray, 1859)

Malayan Snail-eating Turtle

Adults, to 21 cm CL, sexually dimorphism uncertain; carapace broad oblong in dorsal outline, domed with three longitudinal keels, margin of shell smooth and lightly upturned on posterior third; carapacial scutes smooth; plastron large covering most of underside, oblong in outline, rear margin smooth and rounded. Head modest, slightly longer than first vertebral scute; broadly ovate in dorsal outline, dorsal surface smooth with small plates posteriorly, snout not distinct from head. Forefoot with five claws; forefeet half webbed and hindfeet large and fully webbed.

Carapace medium brown with yellow margins; plastron cream to yellow with dark smudge-like marks on each scute; head brown with numerous yellow stripe, canthal yellow stripe from snout onto neck, broken postorbital stripe above upper lip onto neck; fore- and hindlimbs dark brown with narrow yellow stripe on outer margin of each.

Comments.— Aquatic turtle of slow-moving water, streams to paddies with soft bottoms; preferred prey are snails. Reported from Kayah southward, also occupies Chao Phraya River Basin to southern Thailand.

Morenia ocellata (Duméril & Bibron, 1835)

Burmese Eyed Turtle

Adults, to 20 cm CL, sexually dimorphic, males smaller; carapace broad oblong in dorsal outline, moderately dome, entire margin smooth; carapacial scutes smooth except for each vertebral with small median keel on posterior third of scute; plastron large covering most of underside, oblong in outline, rear margin with broad shallow anal notch. Head small, approximately length of first vertebral scute; broadly ovate in dorsal outline, dorsal surface smooth with small plates posteriorly, snout not distinct from head. Forefoot with five claws; forefeet half webbed and hindfeet large and fully webbed.

Carapace medium to dark brown, each costal scute with yellow-edged dark centered ocellus; plastron unicolor cream; head brown with yellow canthal stripe from snout onto neck, yellow postorbital stripe onto neck; fore- and hindlimbs brown without pattern.

Comments.— Predominantly aquatic in diverse habitats from paddies into forest streams and lakes of lowlands of main and peninsular Myanmar.

Siebenrockiella crassicollis (Gray, 1830)

Black Marshturtle

Adults, to 20 cm CL, sexually dimorphism uncertain; carapace broad oblong in dorsal outline, moderately dome with three longitudinal keels that disappear with age, rear margin lightly serrate; carapacial scutes smooth; plastron large covering most of underside, oblong in outline, rear margin with broad, shallow anal notch. Head small, approximately length of first vertebral scute; broadly ovate in dorsal outline, dorsal surface smooth with small plates posteriorly, snout not distinct from head. Forefoot with five claws, fore- and hindfeet equal sized.

Carapace black, no pattern; plastron black to cream with large dark smudge-marks on each scute; head brown to black with irregular-shaped white spots above eye and on neck; fore- and hindlimbs dark without pattern.

Comments.— Semiaquatic of slow moving water of paddies and marshes. Occurring from Tanintharyi and southern mainland Thailand to Sumatra and western Borneo.

Emydidae

Tropical Asia has no native emydids. The only emydid in the Eastern Hemisphere is Emys, the European Pond Turtle, occurring from the Caspian Sea westward through Europe and also in North Africa. All others occur in the Americas with the greatest diversity in southeastern North America. Most emydids are semiaquatic to aquatic species, although a few are totally terrestrial, such as the American boxturtles, Terrapene. Emydids range in size from about 8 cm to ~45 cm carapace length. Externally they cannot be differeniated from Asian geoemydids.

Trachemys scripta elegans (Weid, 1839)

Red-eared Slider

Adults, females 15–25 cm, males 10–20 cm CL, sexually dimorphic; carapace oblong in dorsal outline, moderately dome, rear margin smooth or lightly irregular; carapacial scutes smooth to lightly ridged; plastron large covering most of underside, oblong in outline, rear margin rounded with shallow notch. Head modest, larger than length of first vertebral scute; broadly ovate in dorsal outline, dorsal surface smooth, snout not distinct from head. Forefoot with five claws, fingers webbed; hindfoot large and strongly webbed.

Carapace background olive brown to black with yellowing streak markings, no pattern; plastron cream to yellow with black smudge marks on each scute; head black with broad red postorbital stripe onto neck, smaller yellow lower postorbital strip; forelimbs and hindlimbs black with yellow stripes.

Comments.— This aquatic turtle is an alien or exotic species, and potentially one that will become an invasive species in Myanmar as it has done widely throughout the world, e.g., Japan, Europe. Sliders have been reported from a few of Tanintharyi's Buddhist pools.

Testudinidae

Tortoises or testudinids occur worldwide, except for Australia; this distribution even includes Madagascar and a few oceanic islands. All tortoises share a unique hindfoot morphology that matches the hindfoot appearance of elephants. The hindfoot and crus are columnar and lack free or protruding toes. Forefeet are more diverse among tortoise genera, although many species have broad forearms and forefeet with large sturdy toe nails for digging. Also all tortoises are terrestrial, although a few such as Manouria emys will forage in the shallow water of forest streams. All tortoises are herbivores, eating a variety of plant matter; however, they do not ignore a meat treat, such as carrion, which is easy for them to "catch." They are slow methodical eaters.

Indotestudo elongata (Blyth, 1863)

Elongate Tortoise

Adults, to 35 cm CL, sexually dimorphism uncertain; carapace elongate oblong in dorsal outline, strongly dome, rear margin smooth; carapacial scutes regularly showing growth lamellae; plastron large covering most of underside, oblong in outline, rear margin with broad anal notch. Head modest, approximately length of first vertebral scute; blunt conical in dorsal outline, dorsal surface with two large prefrontal scales surrounded by smaller plates, snout not distinct from head. Forefoot with five claws; elephantine hindfoot with stout claws but no visible toes.

Carapace ground color tan, often with large dark marks on scutes; plastron cream with dark marks; head dorsally uniformly light brown; forelimbs and hindlimbs dark with yellowish scales.

Comments.—Living in a variety of forest from dry monsoonal to wet evergreen ones throughout tropical Asia.

Manouria emys (Schlegel and Müller, 1840)

Asian Giant Tortoise

Adults, to 60 mm CL, sexually dimorphism uncertain; carapace oblong in dorsal outline, moderately dome, rear margin smooth or lightly irregular; carapacial scutes smooth; plastron large covering most of underside, oblong in outline, rear margin smooth and rounded. Head small, approximately length of first vertebral scute; broadly ovate to blunt conical in dorsal outline, dorsal surface without enlarged plates, snout not distinct from head. Forefoot with 4 claws, fingers not joined by web; elephantine hindfoot with stout claws but no visible toes.

Carapace brown, no pattern; plastron unicolor cream; head dorsally uniform brown, face without preorbital stripe or postorbital stripe; forelimbs and hindlimbs without pattern.

Comments.— Terrestrial turtle of evergreen to bamboo forests. It is Asia's largest tortoise and occurs sporadically from western Myanmar to Malay Peninsula, western Sumatra, and northern Borneo.

Trionychidae

Softshells are another turtle groups with high diversity in South Asia with ~15 species in nine genera. This diversity is of turtle morphology not species numbers, because most genera are monotypic, i.e., have a single species. Asia has two giant softshells, Chitra and Pelochelys with shell lengths of over 1 m; most Asian softshells have shell lengths between 25 and 50 cm. All trionychids are aquatic turtles with flatten shells with a thick leathery covering and well-developed fore- and hindlimbs. Keeping with their aquatic lifestyles, they possess large hindlimbs with fully webbed hindfeet. They use all four limbs in swimming and the large, webbed hindfeet provide the main propulsion.

Amyda cartilaginea (Boddaert, 1770)

Asian Softshell Turtle

Adults, to 80 cm CL, likely sexually dimorphic; carapace near round in dorsal outline, flattened, anterior margin with series of smooth warts, rear margin smooth; both carapacial and plastral surface smooth and leathery; plastron large anteriorly, reduce posteriorly, rear margin smooth with rounded anal notch. Head moderate sized, broad blunt conical in dorsal outline with protuberant snorkel-like snout, dorsal surface without enlarged plates. Fore- and hindfeet with three claws, fingers fully webbed; hindfoot large and strongly webbed.

Carapace greenish brown to olive, variably covered with small yellowish spots; plastron unicolor whitish; head olive with numerous small yellow marks; forelimbs and hindlimbs dark, often with small light spots.

Comments.— Fully aquatic, uncommonly bask and comes ashore only to nest and lay eggs; occurs in larger streams and lakes. Resident of Ayeyarwady drainage, north peninsular Myanmar and Thailand to Vietnam.

Dogania subplana (Geoffroy Saint-Hilaire, 1809)

Malayan Softshell Turtle

Adults, to 35 cm CL, sexually dimorphism uncertain; carapace near round in dorsal outline, flattened, anterior margin large smooth to lightly corrugated, rear margin smooth; both carapacial and plastral surface smooth and leathery; plastron large anteriorly, reduce posteriorly, rear margin smooth with no anal notch. Head moderate sized, broad blunt conical in dorsal outline with protuberant snorkel-like snout, dorsal surface without enlarged plates. Fore- and hindfeet with three claws, fingers fully webbed; hindfoot large and strongly webbed.

Carapace brown to dark olive, without pattern in adult; plastron white to pale grey; head grey with narrow dark preorbital stripe onto base of snout; fore- and hindlimbs uniformly dark grey to brown above, lighter below.

Comments.— Fully aquatic resident of clear, fast-flowing mountain streams with gravel and rocky bottoms in forests. Occurring throughout Malay Peninsula to Sumatra, Java, and Borneo.

Lissemys scutata (Peters, 1868)

Burmese Flapshell Turtle

Adults, to 23 cm CL, sexually dimorphism uncertain; carapace near round in dorsal outline, flattened, anterior margin largely smooth, rear margin also smooth; both carapacial and plastral surface smooth and leathery; plastron large anteriorly, posteriorly covers abdomen and hindlimbs with large semicircular flap on each side of "regular" plastron, posterior margin smooth and rounded. Head moderate sized, broad blunt conical in dorsal outline with short protuberant snorkel-like snout, dorsal surface without enlarged plates. Fore- and hindfeet with three claws, fingers fully webbed; hindfoot large and strongly webbed.

Carapace olive brown with narrow yellow border; plastron white; head olive with with dark, irregular edged dark olive postorbital stripe onto neck; fore- and hindlimbs light olive.

Comments.— This aquatic species is of possible but unlikely occurrence in southern Tanintharyi. It occurs further north in peninsular Myanmar but as yet, no confirming records for Tanintharyi. It has a widespread presence in ponds, paddies, and slow streams of main Myanmar.

Crocodilia

Crocodilians are air-breathing, aquatic stealth predators catching their prey in the water or at water's edge. They are heavily armored above with bony plates (osteoderms) embedded in the dermal layer of the skin. Osteoderms are fused to the skull and in two groups, one on on the top of the neck (nuchal plate) and another extensive dorsal series over most of the trunk from the shoulders onto the tail. As each plate consists of abutting osteoderms, they form a nearly impenetrable shield from above yet permitting a high degree of flexibility. The head is equally robust with an elongated snout with numerous large conical teeth. Eyes, nostrils, and ears are positioned dorsally; a crocodilian can be largely submerged yet has its sense functionally airborn.

For Tanintharyi, we have included three species, although we expect only a single species to occur in larger streams and coastal waters. We have found no records of the False Gharial (Tomistoma) for Tanintharyi, and the Siamese Crocodile as a freshwater denizen is unlikely to persist in the short coastal streams in this area of high and long human presence. The Saltwater Crocodile often survives in the mangrove swamps and forests near humans. It is non-discriminating carnivore, hence a possible predator of unwary humans.

Common Terms Used in Crocodilian Descriptions

Crocodilians.	English word for all species of living and extinct species of the Crocodilia.
Crocodile.	Any or all species of the family Crocodylidae. All southern Tanintharyi and Malayan crocodilians are crocodiles, because all are members of the Crocodylidae, even Tomistoma as it is in a subfamilial group of the Crocodylidae.
Total length.	Midline distance from tip of snout to tip of tail.
Snout-vent length.	Midline distance from snout to anterior end of its longitudinal vent.
Head or skull length.	Midline distance from tip of snout to posterior edge of parietal plate.

Key to the Genera and Species of Tanintharyi Crocodilians

1. Dorsal trunk osteoderms in 20 to 21 transverse rows; lower jaw symphysis extends to level of 14th or 15th mandibular tooth; cervical shield (osteoderm shield) continuous with dorsal one .....*Tomistoma schlegelii*

1′. Dorsal trunk osteoderms in 19 or fewer transverse rows; lower jaw symphysis extends no further than 8th mandibular tooth; nuchal and cervical shields (osteoderms) separate from dorsal one ..... [Crocodylinae] 2

2. Snout with well-developed longitudinal ridge in front of each eye; no cervical shield between cervical shield and back of sku ll..... *Crocodylus porosus*

2′. Snout without longitudinal ridge in front of each eye; single row of nuchal osteoderms between cervical shield and back of skull ..... *Crocodylus siamensis*

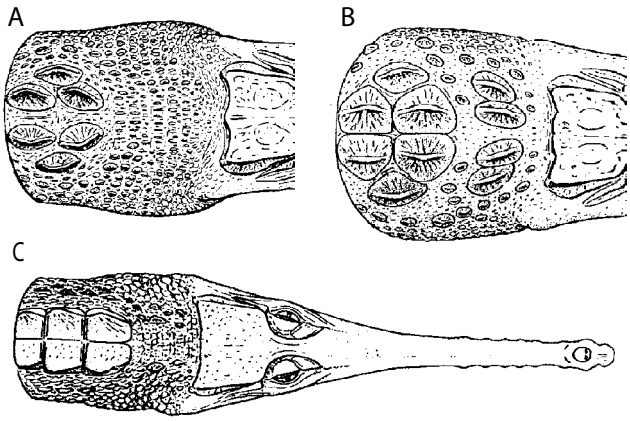


Fig.20 Osteoderms on neck of crocodiles. (A) ***Crocodylus porosus***. (B) ***Crocodylus siamensis***. (C) ***Tomistoma schlegelii***.

Crocodylidae

Crocodylus porosus Schneider, 1801

Saltwater Crocodile

Adult total length to > 6 m, most individual 2–3 m; commonly heavy bodied, head relatively large with thick snout, pair of low bony canthal ridges from eye to midway on snout, large, elevated parietal ridge on each side of head behind eye. Single set of armor plates (cervical plates) between back of head and trunk armor.

Juveniles brightly patterned, light olive to greenish gray with 4–5 black bands on body and black blotches on tail; adults light gray to tan, becoming uniformly dark gray with increasing size.

Comments.— Primarily a resident of brackish habitats, especially tidal streams in mangrove forest; also lives in freshwater rivers and impoundments with heavy shore vegetation.

C. porosus was a common resident of the lower reaches of the Tanintharyi and Lenya Rivers into the 1950s. Illegible harvesting then to the present have largely eliminated them and residents now enter the waters with little regard for their safety. Smaller resident populations may still exist in the Myeik Archipelago, but confirmation is not presently available.

Saltwater crocodiles are predators of vertebrates of all sizes, including humans, stealth predator approaching prey at water edge underwater with a final revealing lunge with mouth wide open to catch the prey and drag it back into the water to drown.

Crocodylus siamensis Schneider, 1801

Siamese Crocodile

Adults total length 1.5 to 3 m; commonly heavy bodied, head relativelty large with thick, smooth edged snout, large, elevated parietal ridge on each side of head behind eye. Two patches of armor plates between back of head and trunk armor, first set (nuchal plates) immediately behind the skull.

Juveniles brightly marked, olive green to dusky green with distinct bands on blotches on tail; young adults retain the olive color and become uniformly dark gray with increasing size.

Siamese crocodiles are freshwater inhabitants, preferring rainforest streams and adjacent swamps.

Comments.— Although they formerly occurred widely in adjacent peninsular Thailand, we have found no records of their occurrence in the rivers of South Tanintharyi. They are also predators of vertebrates but not reported to be man-eaters.

Tomistoma schlegelii (Müller, 1838)

False Gharial

Adult total length 2 to 5 m; slender as young adults becoming heavy bodied, head with long and slender snout, snout is 2/3 to ¾ the length of entire head. Except for short patch of unarmored neck immediately behind the head, the cervical armor is continuous with the dorsal or trunk armor.

Juveniles dark reddish brown with dark brown spots and bars on trunk, tail light and dark banded; underside greyish white.

Comments.— False Gharials are also fresh-water inhabitants of rainforest streams. Presently they have been exterminated from most of their former range with a few scattered populations in Peninsular Malaysia and Borneo. Although long narrow snouts with abundant long, sharp teeth are adaptations for catching fish, these crocodilians eat more broadly.

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Sources of illustrations

Figure / source text

Our guide has used illustrations from a wide variety of sources. We thank all individuals and publication outlets for permission to use their illustrations.

Plates-colored images. Plate 1: A. *thinthinae*, Daniel G. Mulcahy (DGM), photographer; D. *melanostictus*, Myanmar Herpetological Survey (MHS), photographers; P. *asper*, Mark Grindley, photographer; *Ingerophrynus parvus*, MHS. Plate 2: *Fejervarya* sp., Myint Kyaw Thura (MKT), photographer; *Hoplobatrachus rugulosus*, George R. Zug (GRZ), photographer; *Limnonectes blythi*, MHS; *L.doriae*, MKT. Plate 3: *Ingerana tenasserimensis*, MHS; *Occidozyga lima*, MHS; *Occidozyga martensi*, MHS; *Leptobrachium smithi*, GRZ. Plate 4: *Kalophrynus interlineatus*, DGM; *Kaloula latisticta*, DGM; *Micryletta lineata*, DGM; *Microhyla fissipes*, MHS. Plate 5: *Amolops panhai*, MHS; *Odorrana hosii*, MKT; *Hylarana erythraea*, DGM; *Sylvirana nigrovittata*, MHS. Plate 6: *Chiromantis doriae* MHS; *Kurixalus bisacculus*, MHS; *Polypedates* cf. *leucomystax*, MHS; *Rhacophorus norhayatii*, DGM. Plate 7: *Acanthosaura crucigera*, DGM; *Bronchocela burmana*, DGM; *Calotes emma*, DGM; *Draco taeniopterus*, MHS. Plate 8: *Cyrtodactylus brevipalmatus*, DGM; *Cyrtodactylus lenya*, DGM; *Cyrtodactylus oldhami*, DGM; *Gekko gecko*, DGM. Plate 9: *Gehyra mutilata*, GRZ; *Hemidactylus frenatus*, GRZ; *Hemidactylus tenkatei*, GRZ; *Ptychozoon lionotum*, MHS. Plate 10: *Dasia olivacea*, DGM; *Eutropis macularia*, MHS; *Eutropis multifasciata*, MHS; *Lipinia vittigera*, DGM. Plate 11: *Lygosoma quadrupes*, MHS; *Scincella reevesi*, GRZ; *Sphenomorphus maculatus*, GRZ; *Tropidophorus berdmorei*, MHS. Plate 12: *Acrochordus granulatus*, MHS; *Ahaetulla mycterizans*, DGM; *Boiga cyanea*, DGM; *Boiga drapiezii*, DGM. Plate 13: *Chrysopelea ornata*, DGM; *Elaphe taeniura*, DGM; *Dendrelaphis caudolineata*, DGM; *Dendrelaphis cyanochloris*, MHS. Plate 14: *Dryocalamus subannulatus*, DGM; *Gonyosoma oxycephalum*, DGM; *Lycodon effraensis*, DGM; *Ptyas mucosus*, GRZ. Plate 15: *Xenochrophis trianguligerus*, DGM; *Rhabdophis nigrocinctus*, GRZ; *Rhabdophis subminiatus*, GRZ; *Xenochrophis piscator*, GRZ. Plate 16: *Bungarus fasciatus*, GRZ; *Naja kaouthi*, GRZ; *Ophiophagus hannah*, MHS; *Calliophis bivirgatus*, DGM. Plate 17: *Cerberus rhynchops*, MHS; *Enhydris enhydris*, GRZ; *Homalopsis semizonata*, MHS; *Psammodynastes pulverulentus*, GRZ. Plate 18: *Argyrotyphlops diardii*, MHS; *Indotyphlops braminus*, GRZ; *Cylindrophis burmanus*, MHS; *Xenopeltis unicolor*, MHS. Plate 19: *Daboia siamensis*, MHS; *Trimeresurus albolabris*, MHS; *Trimeresurus cf. popeiorum*, DGM; *Trimeresurus purpeomaculatus*, MHS.

Tanintharyi Guide: Sources Figures

Figures.

Black & white line drawings derive from two sources:
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Fig. 1. Map of South Tanintharyi. Outline from SimpleMappr.net, modified by GRZ. Previously published illustrations.

Fig. 2. B. D. E., Heyer et al., 1990, Arquivos de Zoologia 31: 231-410; C., Atoda, 1950, Pacific Science 4: 202-207.

Fig. 4. A1–2., Boulenger, 1890. The Fauna of British India, . . . Reptilia and Batrachia. London, Taylor and Francis; B. Boring, 1934, Hong Kong Naturalist 5: 8-22, 95-107.

Fig. 10. A., Auffenberg & Rehman, 1993, Asian Herpetological Society 5: 14–30; B. C., Taylor, 1942, University of Kansas Science Bulletin 28: 91-112; D., Ota & Hikada, 1989. Journal of Herpetology 13: 35-39. Fig. 11. A., Das & Bauer, 2000. Russian Journal of Herpetology 7: 17-28; C., Mocquard, 1909, Synopsis des familles, genres . . . de Madagascar. Paris, Masson.

Fig. 12. de Rooij, 1915. The Reptiles of the Indo-Australian Archipelago. I. Lacertilia, Chelonia, Emydosauria. Leiden, E. J. Brill.

Fig. 13. A. B. D. F., Boulenger, 1890. The Fauna of British India, . . . Reptilia and Batrachia. London, Taylor and Francis.

Fig. 14. A. B., Boulenger, 1890. The Fauna of British India, . . . Reptilia and Batrachia. London, Taylor and Francis.

Fig. 15. A. B. C., Boulenger, 1912 A Vertebrate Fauna of the Malay Peninsula . . Taylor and Francis; D. E., Saint Girons, 1972. Mémoires du Muséum National d'Histoire Naturelle, Série A, Zoologíe 74: 1-170.

Fig. 16. A., Boulenger, 1890. The Fauna of British India, . . . Reptilia and Batrachia. London, Taylor and Francis.

Fig. 18. D. E., Saint Girons, 1972. Mémoires du Muséum National d'Histoire Naturelle, Série A, Zoologíe 74: 1-170. 20. A. B. Wermuth & Mertens, 1961, Schildkröten, Krokodile Brückenechsen. Jena: Gustav Fischer Verlag.
GRZ research illustration.

Fig. 1. A. TRK.
Fig. 3. TRK.
Fig. 4. C. TRK.
Fig. 5. A. B. TRK.
Fig. 6. A. B. C. MDG; D. G.Zug.
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Index Standard Names

SOUTH TANINTHARYI AMPHIBIANS AND REPTILES

Species arranged alphabetically by standard group name of each species.

Index Scientific Names

SOUTH TANINTHARYI AMPHIBIANS AND REPTILES