

## CHECKLIST OF THE HERPETOFAUNA OF PULAU LANGKAWI, MALAYSIA, WITH COMMENTS ON TAXONOMY

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(with 19 text-figures)

**ABSTRACT.**– A checklist of amphibians and reptiles based on vouchered material (specimens and/or photographs) from Pulau Langkawi, located 38 km off the northwest coast of Kedah, peninsular Malaysia, is presented for the first time. Comments are provided to rectify errors in the literature concerning the composition and taxonomy of this island's herpetofauna. Although Pulau Langkawi is approximately three times larger than Pulau Tioman off the southeast coast of peninsular Malaysia, it currently has only 78% of the number of amphibian and reptile species. We interpret this as a strong indication that the species composition of Pulau Langkawi is not yet fully understood.

**KEY WORDS.**– Pulau Langkawi, Pulau Tioman, species checklist, Malaysia.

### INTRODUCTION

The Langkawi Archipelago is the largest group of islands along the west coast of peninsular Malaysia. It encompasses 104 islands located 35 km off the northwest coast of the state of Kedah in the eastern Indian Ocean, immediately adjacent to the southern border of Thailand. Its islands range in size from 0.01–328 km<sup>2</sup> and for the most part, are covered entirely by primary forest (Norhayati et al., 2004). By far the largest island of the archipelago, Pulau Langkawi (328 km<sup>2</sup>), is also the most environmentally diverse. Its interior is mountainous and covered with mixed dipterocarp forest and its highest peak, Gunung Raya, reaches 881 m above sea level. Its second highest peak, Gunung Machinchang,

reaches 701 m and is one of the oldest geological formations in south-east Asia (Jones, 1981; Stauffer and Mantajit, 1981). Broad, flat, low-lying expanses fringe the interior mountains, providing suitable relief for agriculture as well as lowland dipterocarp forest, coastal vegetation, and mangrove communities.

The latest herpetological inventories of Pulau Langkawi (Ibrahim et al., 2005; Zimmerer 2000, 2004) collectively report a total of 17 species of frogs, five non-marine turtles, 16 lizards, and 28 snakes. None of these surveys, however, listed voucher specimens for any of the reptiles although the amphibian records of Ibrahim et al. (2005) were specimen based and Zimmerer (2000, 2004) presented some photo-

graphs. Additional records by Boulenger (1912) and Manthey and Grossmann (1997) also lacked vouchered material (specimens or photographs). Thus, owing to recent taxonomic revisions of some groups and the confusion caused by many, similarly-appearing species, some of the previously cited records are erroneous and others remain unverifiable. The intent of this report is to provide a consolidated, up-to-date, working checklist of the herpetofauna of Pulau Langkawi based on vouchered material which will serve as the foundation for future studies of the entire Langkawi Archipelago.

#### MATERIALS AND METHODS

During four trips to Pulau Langkawi on 1–3 September 2004, 16–21 March 2005, 2–6 May 2005 and 18–23 August 2005, we carried out surveys concentrated in a significant portion of the western half of the island, working in mangrove and coastal vegetation communities, lowland rice padi fields, and hill dipterocarp forests up to 881 m. Collecting was done on foot along forest trails and streams both during the day and night in beach habitats, padi fields, and by driving roads at night. Specimens were captured by hand or with the aid of blowpipes. Daytime digging of soil and humus to a depth of c. 30 cm was carried out in padi fields and forests. During these surveys, we discovered six species of frogs, four species of lizards (including one new to science), and eight species of snakes previously unknown from Pulau Langkawi and confirmed the presence of three other species reported by other authors. All specimens have been deposited at the Forest Research Institute Malaysia (FRIM), Kuala Lumpur; the La Sierra University Herpetological Collection (LSUHC) at La Sierra University, Riverside, California; or the Natural History Museum, London (BMNH, field tags MW). Additional specimens were examined from the Raffles Museum of Biodiversity Research (ZRC), National University of Singapore, and BMNH. Voucher photographs are deposited in the La Sierra University Digital Photographic Collection (LSUDPC).

#### RESULTS

A checklist of both confirmed and unconfirmed species from Pulau Langkawi is presented in

Table 1. Below is a discussion of new species records and reassessments of the identifications of some of the photographs presented by Zimmerman (2000, 2004).

#### GYMNOPHIONA

##### **Ichthyophiidae**

*Ichthyophis* Fitzinger, 1826. A larval specimen of *Ichthyophis* sp. collected from Telaga Tuju was first reported and figured by Ng and Ng (1989:82). An adult *Ichthyophis kohtaoensis* Taylor 1960 was reported from Pulau Langkawi by Manthey and Grossmann (1997:Fig. 93) however, the specimen they photographed was lost before it could be examined in detail (Grossmann and Tillack 2000). The taxonomy of ichthyophiids is confused and unstable (Gower et al., 2002), and several striped taxa are known to occur in peninsular Thailand and Malaysia (Taylor 1968, Kupfer & Müller 2004), making identification from photographs extremely difficult.

During the evening of 20 March 2005, we collected five ichthyophiid larvae (LSUHC 7192–96) from a small, rocky stream draining one of the large pools at the Durian Perangan Waterfall. On the night of 3 May 2005 we collected another larva (BMNH field tag MW 4346) from a shallow forest stream at an altitude of c. 250 m on Gunung Raya. One adult ichthyophiid (BMNH field tag MW 4379) was dug out from loose soil beneath a rotting log at the same Gunung Raya locality, during the day of 18 August 2005. This specimen resembles, in colour, the specimen figured by Manthey and Grossmann (1997), and it has splenial teeth and can therefore be referred to the genus *Ichthyophis* rather than *Caudacaecilia* (Taylor, 1968). There is currently no larval taxonomy for caecilians, and the number and identity of species on Pulau Langkawi requires further study.

#### ANURA

##### **Megophryidae**

*Leptobrachium* Tschudi, 1838. Ibrahim et al. (2005) reported three larvae (Gosner stage 25) collected in rocky puddles from Sungai Perangan at the base of the Tuju Telaga waterfalls as

**Table 1.** Checklist of the confirmed (based on specimens or photographs) and unconfirmed species of amphibians and reptiles from Pulau Langkawi, Kedah, West Malaysia.

Taxon	Reporting author(s)	Status
<b>GYMNOPHIONA</b>		
<b>Ichthyophiidae</b>		
<i>Ichthyophis</i> sp.	Ng and Ng (1989)	Confirmed here as <i>Ichthyophis</i> sp.
<b>ANURA</b>		
<b>Megophryidae</b>		
<i>Leptobrachium smithi</i>	Reported as <i>L. hendricksoni</i> by Zimmerer (2004)	Confirmed here as <i>L. smithi</i>
<i>Megophrys aceras</i>	Zimmerer (2004)	Confirmed
<b>Bufonidae</b>		
<i>Bufo asper</i>	Zimmerer (2004)	Confirmed
<i>Bufo melanostictus</i>	Zimmerer (2004)	Confirmed
<b>Microhylidae</b>		
<i>Kaloula pulchra</i>	Zimmerer (2004)	Confirmed
<i>Microhyla berdmorei</i>	New record	Confirmed
<i>Microhyla butleri</i>	Ibrahim et al. (2005)	Confirmed
<i>Microhyla fissipes</i>	Reported as <i>Microhyla ornata</i> by Berry (1975)	Confirmed
<i>Microhyla heymonsi</i>	Ibrahim et al. (2005)	Confirmed
<b>Rhacophoridae</b>		
<i>Philautus parvulus</i>	New record	Confirmed
<i>Polypedates leucomystax</i>	Ibrahim et al. (2005)	Confirmed
<i>Rhacophorus bipunctatus</i>	New record	Confirmed
<b>Ranidae</b>		
<i>Fejervarya cancrivora</i>	Ibrahim et al. (2005)	Confirmed
<i>Fejervarya limnocharis</i>	Ng and Ng (1989)	Confirmed by Ibrahim et al. (2005)
<i>Limnonectes blythii</i>	Ibrahim et al. (2005)	Confirmed
<i>Limnonectes macroglyphus</i>	New record	Confirmed
<i>Occidozyga lima</i>	Ibrahim et al. (2005)	Confirmed
<i>Phrynoglossus laevis</i>	Ibrahim et al. (2005)	Confirmed
<i>Phrynoglossus martensii</i>	New record	Confirmed
<i>Rana erythraea</i>	Ng and Ng (1989)	Confirmed
<i>Rana glandulosa</i>	Ibrahim et al. (2005)	Confirmed
<i>Rana raniceps</i>	Ibrahim et al. (2005)	Confirmed
<i>Taylorana hascheana</i>	New record	Confirmed
<b>CHELONIA</b>		
<b>Trionychidae</b>		
<i>Amyda cartilaginea</i>	Zimmerer 2000	Confirmed
<i>Dogania subplana</i>	Confirmed by Zimmerer (2004)	Confirmed by Zimmerer (2004)
<b>Testudinidae</b>		
<i>Indotestudo elongata</i>	Zimmerer (2000)	Confirmed
<b>Bataguridae</b>		
<i>Cuora amboinensis</i>	Zimmerer (2004)	Confirmed
<i>Hieremys annandalei</i>	Zimmerer (2004)	Confirmed
<i>Siebenrockiella crassicollis</i>	Ibrahim et al. (2005); no voucher	Confirmed here
<b>SQUAMATA (LIZARDS)</b>		
<b>Agamidae</b>		
<i>Acanthosaura crucigera</i>	Reported as <i>A. armata</i> by Zimmerer (2004)	Confirmed here as <i>A. crucigera</i>
<i>Bronchocela cristatella</i>	Zimmerer (2004)	Confirmed

<i>Draco blanfordii</i>	Zimmerer (2004)	Confirmed
<i>Draco maculatus</i>	Reported as <i>D. volans</i> by Zimmerer (2000)	Confirmed here as <i>D. maculatus</i>
<b>Leiolepididae</b>		
<i>Leiolepis belliana</i>	Boulenger (1912); no voucher	Confirmed by Chan-ard et al. (1999:133)
<b>Gekkonidae</b>		
<i>Cosymbotus platyurus</i>	New record	Confirmed
<i>Cyrtodactylus pulchellus</i>	Manthey and Grossmann (1997); no voucher	Confirmed by Chan-ard et al. (1999:113)
<i>Cyrtodactylus quadrivirgatus</i>	Manthey and Grossmann (1997)	Confirmed
<i>Gehyra mutilata</i>	New record	Confirmed
<i>Gekko gecko</i>	Zimmerer (2000)	Confirmed
<i>Gekko monarchus</i>	Zimmerer (2004)	Unconfirmed
<i>Gekko smithii</i>	Ibrahim et al. (2005)	Unconfirmed
<i>Hemidactylus frenatus</i>	Zimmerer (2000)	Confirmed
<i>Ptychozoon kuhli</i>	New record	Confirmed
<b>Scincidae</b>		
<i>Dasia olivacea</i>	Zimmerer (2004)	Confirmed
<i>Eutropis macularia</i>	Ibrahim et al. (2005)	Unconfirmed
<i>Eutropis multifasciata</i>	Zimmerer (2000)	Confirmed
<i>Sphenomorphus</i> sp.	New record	Confirmed
<i>Lygosoma bowringii</i>	New record	Confirmed
<b>Varanidae</b>		
<i>Varanus nebulosus</i>	Zimmerer (2000)	Confirmed
<i>Varanus salvator</i>	Zimmerer (2000)	Confirmed
<b>SQUAMATA (SNAKES)</b>		
<b>Typhlopidae</b>		
<i>Ramphotyphlops braminus</i>	New record	Confirmed
<b>Cylidrophiiidae</b>		
<i>Cylindrophis ruffus</i>	New record	Confirmed
<b>Pythonidae</b>		
<i>Python reticulatus</i>	Zimmerer (2000)	Confirmed
<b>Colubridae</b>		
<i>Ahaetulla fasciolata</i>	Zimmerer (2000, 2004)	Unconfirmed
<i>Ahaetulla nasuta</i>	Zimmerer (2000, 2004)	Unconfirmed
<i>Ahaetulla prasina</i>	Chan-ard et al. (1999)	Confirmed
<i>Boiga cyanea</i>	Lim and Ratnam (1996)	Confirmed
<i>Boiga cynodon</i>	Ibrahim et al. (2005); no voucher	Confirmed by Zimmerer (2004)
<i>Boiga dendrophila</i>	Zimmerer (2000)	Confirmed
<i>Calamaria pavimentata</i>	New record	Confirmed
<i>Chrysopelea ornata</i>	New record	Confirmed
<i>Chrysopelea paradisi</i>	Zimmerer (2000)	Confirmed
<i>Dendrelaphis caudolineatus</i>	Zimmerer (2004)	Confirmed
<i>Dendrelaphis cyanochloris</i>	Zimmerer (2004)	Confirmed
<i>Dendrelaphis formosus</i>	Zimmerer (2004)	Unconfirmed
<i>Dendrelaphis pictus</i>	Zimmerer (2004)	Confirmed
<i>Dryocalamus subannulatus</i>	Reported as <i>D. davisonii</i> by Zimmerer (2004)	Confirmed here as <i>D. subannulatus</i>
<i>Dryophiops rubescens</i>	Chan-ard et al. 1999	Confirmed
<i>Enhydris enhydris</i>	Zimmerer (2004)	Confirmed
<i>Elaphe flavolineata</i>	Schulz 1996	Confirmed

<i>Gonyosoma oxycephalum</i>	Zimmerer (2004)	Confirmed
<i>Homalopsis buccata</i>	Ng and Ng (1989)	Confirmed
<i>Oligodon cyclurus</i>	Zimmerer (2004)	Confirmed
<i>Pareas margaritophorus</i>	New record	Confirmed
<i>Rhabdophis chrysargos</i>	Zimmerer (2000)	Confirmed
<i>Xenochrophis trianguligerus</i>	New record	Confirmed
<i>Zaocys carinatus</i>	New record	Confirmed
<b>Xenopeltidae</b>		
<i>Xenopeltis unicolor</i>	Zimmerer (2000)	Confirmed
<b>Elapidae</b>		
<i>Bungarus candidus</i>	Zimmerer (2000)	Confirmed
<i>Calliophis maculiceps</i>	Lim and Mohd. Sharef (1975)	Confirmed
<i>Naja kaouthia</i>	Zimmerer (2000)	Confirmed
<i>Ophiophagus hannah</i>	Zimmerer (2004)	Confirmed
<b>Viperidae</b>		
<i>Calloselasma rhodostoma</i>	Ibrahim et al. (2005); no voucher	Confirmed here
<i>Cryptelytrops purpureomaculatus</i>	Zimmerer (2000)	Confirmed
<i>Cryptelytrops venustus</i>	Zimmerer (2000)	Confirmed here
<i>Popeia fucata</i>	Reported as <i>Trimeresurus popeiorum</i> and <i>C. kanburiensis</i> by Zimmerer (2004)	Confirmed here as <i>P. fucata</i>
<i>Tropidolaemus wagleri</i>	Zimmerer (2000)	Unconfirmed

belonging to *L. nigrops* Berry and Hendrickson 1963. Given that the larvae of *L. nigrops* and *L. smithi* Matsui, Nabhitabhata, and Panha, 1999 are very similar in morphology and *L. nigrops* is not known any further north in peninsular Malaysia than Tasek Bera, Pahang (Berry, 1975), nor have any other *L. nigrops* (larvae or adults) been found on Pulau Langkawi, it is likely that these larvae were misidentified and belong to *L. smithi*. In a revision of *Leptobrachium* from Thailand, Matsui et al. (1999) indicated that populations from southernmost Thailand and northern Malaysia are referable to *L. smithi*. Zimmerer (2004) reports *L. hendricksoni* as occurring in the lowland rainforest of Pulau Langkawi but figures *L. smithi* (Plate 72; Fig. 251). During the evening of 1 September 2004 seven adult *L. smithi* (LSUHC 6847–53) were collected along a small stream at Lubuk Semilang and two more (LSUHC 6885–86) along the road to Gunung Raya. We currently consider all *Leptobrachium* from Pulau Langkawi to be *L. smithi*.

**Microhylidae**

*Microhyla berdmorei* (Blyth, 1856) (Fig. 2). On 1 September 2004, one specimen (LSUHC 6857) was found along the edge of a grassy pond at night at Lubuk Semilang. This is a new record for Pulau Langkawi.

### Rhacophoridae

*Philautus parvulus* (Boulenger, 1892) (Fig. 3). Several specimens were heard calling from within dense vegetation along the road near the top of Gunung Raya on 2 and 3 September 2004 and one neonate (LSUHC 6821) was collected sitting on a leaf 8 cm above the ground. This is a new record for Pulau Langkawi.

*Rhacophorus bipunctatus* Ahl, 1927 (Fig. 4). During the evening of 19 August 2005 13 specimens (LSUHC 7540–52) of *R. bipunctatus* were collected from a deep, forested ravine at the top of Gunung Machinchang at approximately 600 m in elevation. All were calling males sitting 1–4 m above the ground in the branches of bushes and trees. All differ in coloration from peninsular *R. bipunctatus* in lacking dark markings on the flanks, although some individuals from Indochina also lack such markings (pers. obs. of LLG 2005).

### Ranidae

*Limnonectes macrognathus* (Boulenger, 1917) (Fig. 5). Two specimens (LSUHC 6840–41) were collected at Lubuk Semilang from along the edge of a stream during the evening of 1 September 2004. On 2 September, three additional specimens (LSUHC 6854–56) were collected from within a drainage ditch along the road leading to Gunung

Raya approximately 300 m below the summit. Several others were heard calling from the edge of thick vegetation along this same road. This represents a new record for Pulau Langkawi.

*Phrynoglossus martensii* Peters, 1867 (Fig. 6). Three specimens (LSUHC 6881–82, 6884) were found on the evening of 3 September 2004 along side the road to Gunung Raya calling from the edge of tall grass during a rain shower. On 1 September 2004, a specimen (LSUHC 6883) was found at Lubuk Semilang in short grass at the edge of a small pond. This represents a new record for Pulau Langkawi.

*Taylorana hascheana* (Stolickza, 1870) (Fig. 7). Two juveniles (LSUHC 6858–59) were collected on the forest floor along the cable car trail at the base of Gunung Machinchang during the afternoon on 1 September 2004. Four others (LSUHC 7178–81) were found on the evening of 19 March 2005 at Tuju Telaga. This is a new record for Pulau Langkawi.

## CHELONIA

### Bataguridae

*Siebenrockiella crassicollis* Lindholm, 1929 (Fig. 8). Ibrahim et al. (2005) reported finding an individual from Sugai Lubok Semilang but listed no voucher specimen or photograph. On 15 August 2005 we found one individual (LSUDPC 1040–43) in a flooded padi field near Kadawang. Others were seen on 20 August 2005 and in padi fields at Jalan Bukit Belah on 16 and 17 August 2005.

## SQUAMATA (LIZARDS)

### Agamidae

*Acanthosaura crucigera* Boulenger, 1885. Zimmerman (2004) lists *A. armata* (Hardwicke and Gray, 1827) as being present on Pulau Langkawi although *A. crucigera* is the species figured (Plate 68; figs. 233–34). We collected an additional specimen of *A. crucigera* (LSUHC 6831) during the evening of 1 September 2004 at Lubuk Semilang while it was sleeping on a small branch approximately 1.5 m above the ground.

*Draco maculatus* (Gray, 1845). Zimmerman (2000) lists *D. volans* Linnaeus, 1758 as being

present on Pulau Langkawi but figures *D. maculatus* (Plate 67; figs. 227–230). On 1 September 2004 we collected a specimen of *D. maculatus* (LSUHC 6791) in coastal vegetation near the mangroves at Telok Burau and on 3 September 2004, six additional specimens (LSUHC 6823–28) were collected from coconut palms along the beach at Telok Burau.

### Gekkonidae

*Gehyra mutilata* (Wiegmann, 1834) (Fig. 9). One specimen (LSUHC 6871) was collected from a concrete drain along side the road to Gunung Raya on 3 September 2004. It represents a new record for the island.

### Scincidae

*Lygosoma bowringii* (Günther, 1864). Two individuals of *L. bowringii* (LSUHC 6837–38) were found beneath a log on the beach at Telok Burau on 3 September 2004 and another (LSUHC 7590) beneath a rock at Lubuk Semilang on 21 August 2005. These constitute a new record for Pulau Langkawi.

*Sphenomorphus* sp. On 1 September 2004 a skink (LSUHC 6709) referable to the genus *Sphenomorphus* Fitzinger, 1843 (Lim, 1998) was collected from beneath a rock near the top of Gunung Machinchang along the cable car trail. Although the specimen was damaged during collection, it is still possible to confirm that it is not referable to any known species from the Sunda Shelf (see Grismer, 2005a: Table 2) and is probably a new taxon. This constitutes a new record for Pulau Langkawi.

## SQUAMATA (SNAKES)

### Typhlopidae

*Ramphotyphlops braminus* (Daudin, 1803). On 1 September 2004, one specimen was found beneath a rock at the summit of Gunung Raya but escaped collection. On 3 September 2004 another specimen (LSUHC 6839) was collected beneath a log on the beach at Telok Burau. This represents a new record for Pulau Langkawi.

### Cylindrophidae

*Cylindrophis ruffus* (Laurenti, 1768) (Fig. 10). This species was relatively common in wet (but not flooded) rice paddies as well as along the small canals associated with the rice



Figure 1. *Ichthyophis* sp. (BMNH field tag MW 4379) from the top of Gunung Raya. Photo by DJG.



Figure 2. *Microhyla berdmorei* (LSUHC 6857) from Lubuk Semilang. Photo by LLG.



Figure 3. *Philautus parvulus* (LSUHC 6821) from the summit of Gunung Raya. Photo by LLG.



Figure 4. *Rhacophorus bipunctatus* (LSUHC 7540) from just below the summit of Gunung Machinchang. Photo by LLG.

fields. Specimens were observed at night on the surface. Two specimens (LSUHC 7574–75) were collected in a padi field along the edge of a drainage canal in Kampung Kadawang on 20 August 2005. These specimens constitute a new record for Pulau Langkawi.

#### Colubridae

*Ahaetulla* Link, 1807. Zimmerman (2000) indicates that *A. prasina*, *A. mycterizans*, the “Long Nosed Whip Snake” (*A. nasuta*), and the “Spotted Whip Snake” (*A. fasciolata*) all occur on Pulau Langkawi. Only the former can be confirmed based on photographs in Chanard et al. (1999:152) and Zimmerman (2004: Plate 61; Figs. 200–202). Zimmerman’s (2004) figures 200 and 202 are not of *A. mycterizans* but *A. prasina*, as is his figure 201. Zimmerman (2004) mentions that *A. fasciolata* is rare on Pulau Langkawi but does not figure it or *A.*

*nasuta*. Therefore, we consider their presence unconfirmed.

*Calamaria pavementata* Duméril, Bibron and Duméril, 1854. On 3 May 2005 a single specimen (BMNH field tag MW 4352) was dug out from soft soil under rotting wood close to the top of Gunung Raya. This constitutes a new record for Pulau Langkawi.

*Chrysopelea ornata* (Merrem, 1820) (Fig. 11). Zimmerman (2000, 2004) lists *C. ornata* (“Golden Paradise Tree Snake”) as occurring on Pulau Langkawi but provides no voucher. On 19 March 2005 an individual (LSUHC 7158) was found crawling through low shrubs in a garden area at the Langkawi Snake Sanctuary. It is unlikely that this specimen was a Sanctuary escapee, and an expert resident on Langkawi recognized it as a native species (O. Ayeb pers. comm., 2005). This constitutes a new record for Pulau Langkawi.



Figure 5. *Limnonectes macrognathus* (LSUHC 6854) from approximately 300 m below the summit of Gunung Raya. Photo by LLG.



Figure 6. *Phrynoglossus martensii* (LSUHC 6883) from Lubuk Semilang. Photo by LLG.



Figure 7. *Taylorana hascheana* (LSUHC 7178) from Tuju Telaga. Photograph by LLG.



Figure 8. *Siebenrockiella crassicollis* (LSUDP 783) from Jalan Bukit Belah. Photograph by DJG.

*Dryocalamus subannulatus* (Duméril, Bibron, and Duméril, 1854). Zimmerer (2004) reports the presence of *D. davisonii* (Blanford, 1878) but figures *D. subannulatus* (Plate 61; fig. 204). He also reports the possible presence of *Lycodon effraenis* Cantor, 1847 but figures another individual of *D. subannulatus* (Plate 61; fig. 203). During the evening of 1 September 2004 we collected a single specimen (LSUHC 6877) of the latter species while it was crawling down the trunk of a large tree approximately 4 m above the ground.

*Dryophiops rubescens* (Gray, 1835). Zimmerer (2004) reports the presence of *Dendrelaphis striatus* (Cohn 1906) but figures *Dryophiops rubescens* (Plate 62; fig. 208), a species previously reported from Pulau Langkawi by Chanard et al. (1999:163).

*Homalopsis buccata* (Linnaeus, 1758) (Fig. 12). Ng and Ng (1989) were the first to report

and figure *H. buccata* from Pulau Langkawi. During the evenings of 15–20 August 2005, several individuals of *H. buccata* (LSUHC 7568–73) were observed in the narrow canals bordering padi fields at Jalan Bukit Belah. Most were juveniles that had anchored themselves in the water-flow by wrapping their tails around vegetation, presumably to aid in ambushing passing prey.

*Oligodon* Boie 1827. Zimmerer (2004) figures an unidentified species of *Oligodon* (Plate 65: fig. 221) from the interior of a cave on the eastern side of Pulau Langkawi. The specimen is dark brown and appears to have a faint, vertebral stripe on the anterior portion of the body. The photograph is not clear enough for a positive species identification. On the night of 18 August 2005 we found an *O. cyclurus* (Cantor, 1839) on the road at the base of Gunung Raya (LSUHC 7561; Fig. 13). We have observed a tendency





Figure 9. *Gehyra mutilata* (LSUHC 6871) from approximately 300 m below the summit of Gunung Raya. Photograph by LLG.



Figure 10. *Cylindrophis ruffus* (LSUHC 7574) from Kadawang. Photograph by LLG.



Figure 11. *Chrysopelea ornata* (LSUHC 7158) from Langkawi Snake Sanctuary. Photograph by LLG.

for vertebral striping in other specimens of *O. cyclurus* from northern Malaysia and southern Thailand (also see Chanard et al., 1999:174) and believe that the specimen illustrated in Zimmerer (2004) is *O. cyclurus*. This constitutes a new record for Pulau Langkawi.

*Pareas margaritophorus* (Jan, 1866) (Fig. 14). On 3 September 2004 one specimen (LSUHC 6876) of this species was collected at night at the bottom of the road leading to the top of Gunung Raya. It represents a new



Figure 12. Upper; adult *Homalopsis buccata* (LSUDPC 1064). Lower; juvenile *H. buccata* (LSUDPC 1181). Specimens from Jalan Bukit Belah. Photographs by DJG.



Figure 13. *Oligodon cyclurus* (LSUHC 7561) from the base of Gunung Raya. Photograph by LLG.

species record for the island. Manthey and Grossmann (1997) report this species attaining a total length of 470 mm. LSUHC 6876 was a gravid female carrying three eggs and had a body and tail length of only 295 mm. This suggests that females from Pulau Langkawi might reach reproductive maturity at a smaller size.



Figure 14. *Pareas margaritophorus* (LSUHC 6876) from the base of Gunung Raya. Photograph by LLG.



Figure 15. *Xenochrophis trianguligerus* (LSUHC 6830) from Lubuk Semilang. Photograph by LLG.



Figure 16. *Zaocys carinatus* (LSUHC 7600) from Tuju Telaga. Photograph by LLG.

*Xenochrophis trianguligerus* (Boie, 1827) (Fig. 15). On 1 September 2004, a single specimen (LSUHC 6830) was collected at night from



Figure 17. *Calloselasma rhodostoma* (LSUDPC 785) from near Langkawi Snake Sanctuary. Photograph by LLG.



Figure 18. *Cryptelytrops venustus* (LSUDPC 975) from summit of Machincang. Photograph by PLW.

a small stream at Lubuk Semilang. It represents a new record for the island.

*Zaocys carinatus* (Günther, 1858) (Fig. 16). During the day on 19 August 2005 an adult *Z. carinatus* (LSUHC 7600) was found crossing the foot path at Telaga Tuju. This constitutes a new record for Pulau Langkawi.

#### Viperidae

*Calloselasma rhodostoma* (Boie, 1827) (Fig. 17). Ibrahim et al. (2005) reported finding a single specimen in an open field at Telok Datai but provided no voucher material. On 20 March 2005 we photographed a captive specimen (LSUDPC 783–87) at the Langkawi Snake Sanctuary that was collected by one of the curators, Ms. Noraini Ismail, near the Sanctuary during February 2005.

*Trimeresurus* Lacépède, 1804. Asian pitvipers of the genus *Trimeresurus* (*sensu stricto*)



**Figure 19.** Variation observed in *Popeia fucata* taken from the road to Gunung Raya. Upper left (LSUHC 6874; female, SVL 533 mm): iris red, postorbital stripe absent, body bands absent, white ventrolateral stripe, tail with red bands. Upper right (LSUHC 7564; female, SVL 472 mm): iris red, postorbital stripe absent, body bands absent, ventrolateral stripes absent, tail unicolor red. Middle left (LSUHC 7566; female, SVL 546 mm): iris red, postorbital stripe present, body banded, red and white ventrolateral stripes, tail with red bands. Lower right (LSUHC 7067; female, SVL 353 mm): iris yellow, postorbital stripe absent, body banded, red and white ventrolateral stripes, tail unicolor red. Lower left (LSUHC 6832; female, SVL 585 mm): iris green, postorbital stripe present, body banded, red and white ventrolateral stripes, anterior one-half of tail with red bands and posterior one-half unicolor red. Photographs by LLG.

have a long and confusing taxonomic history. The latest revision (Malhotra and Thorpe, 2004) provides solid molecular and morphological evidence for partitioning *Trimeresurus* into a number of monophyletic genera. Of significance to this survey are the genera *Cryptelytrops* (formerly referred to as the *T. albolabris* group) and *Popeia* (formerly the *T. popeiorum* group) because *P. popeiorum* Smith, 1937, *C. venustus* Vogel, 1991, and *C. kanburiensis* Smith, 1943 have been reported from Pulau Langkawi (Zimmerer, 2000, 2004: Figs. 215 and 216 for *P. po-*

*peiorum* and *C. kanburiensis*). Gumprecht et al. (2004) also report *C. venustus* from Pulau Langkawi, though apparently based on correspondence with J. Zimmerer.

David et al. (2004) confirmed the specific validity of *Cryptelytrops kanburiensis* and its distinction from *C. venustus* and noted that the former only occurs in the southern Thai provinces of Krabi, Nakhon Si Thammarat, and Surat Thani. Zimmerer (2000: Fig. 130) reported *C. venustus* as occurring on Pulau Langkawi. On 18 August 2005 we photographed a specimen of

*C. venustus* at the Langkawi Snake Sanctuary that was captured by Ms. Noraini Ismail during February 2005 (LSUDP 974–75; Fig. 18) from the upper elevations of Gunung Machinchang.

During our September 2004 and August 2005 surveys, we collected nine specimens of *Popeia* on the road to the top of Gunung Raya (LSUHC 6793, 6832–34, 6872, 6874, 7564–66; Fig. 19) which showed considerable colour pattern variation within the range of that reported for *P. fucata* (fide Vogel et al., 2004). They also matched *P. fucata* in squamation (Vogel et al., 2004). Therefore, we confirm the presence of *Popeia fucata* and *Cryptelytrops venustus* on Pulau Langkawi and consider the presence of *C. kanburiensis* unproven.

#### **Unconfirmed species.**

Zimmerer (2004) reports that *Dendrelaphis formosus* (Boie 1827), *Naja naja* (Linnaeus, 1758), and *Tropidolaemus wagleri* Wagler, 1830 occur on Pulau Langkawi but provided no voucher material. Although the presence of *D. formosus* and *T. wagleri* is possible, their occurrence is unconfirmed. *Naja naja* is not known from southern Thailand and northern Malaysia (Wüster and Thorpe, 1989). Further field-work is planned to ascertain the status of these species.

### **DISCUSSIONS**

This report brings the total number of confirmed species of amphibians and reptiles on Pulau Langkawi to 80; one caecilian, 23 frogs, six non-marine turtles, 17 lizards, and 33 snakes (Table 1). Certainly the herpetofauna of Pulau Langkawi is not completely known and a logical comparison with that from Pulau Tioman of the Seribu Archipelago off the southeast coast of Pahang is useful in bearing this out. Both islands are landbridge islands of similar age yet Pulau Langkawi (328 km<sup>2</sup>) is approximately three times the size of Pulau Tioman (110 km<sup>2</sup>) but has only 92% of the number of amphibians, 53% of the lizards, and 84% of the snakes (Grismer et al., 2006). Furthermore, these percentages may be over estimations because they assume all the unconfirmed species for Pulau Langkawi are present. Pulau Langkawi does however have five species of non-marine turtles versus one on Pulau Tioman. Additionally, there are at least 12

endemic species of amphibians and reptiles on Pulau Tioman (Grismer, 2006; Grismer et al., 2006) and only one on Pulau Langkawi (reported here for the first time). Thus, overall, Pulau Langkawi has only 78% of the herpetofauna of the much smaller Pulau Tioman. We believe this to be the result of a lack of field work. Pulau Tioman has been intensively investigated since 1999 (see Grismer, 2006; Grismer et al., 2006 and references therein) whereas Pulau Langkawi has received comparatively little attention (Ibrahim et al., 2005) even when compared to Pulau Pinang just 100 km to the south whose herpetofauna was reasonably well surveyed by the turn of the century (see Boulenger, 1912). Furthermore, the work that has been done on Pulau Langkawi has been restricted to only a few areas and very little of the island's pristine interior has been thoroughly investigated.

The remaining 103 islands that compose the Langkawi Archipelago range in size from 0.01–102 km<sup>2</sup>. With the exception of Pulau Singa Besar (Norsham Y., unpubl.), the vast majority of these remain virtually unexplored herpetologically. We expect the satellite islands surrounding Pulau Langkawi to have additional species not found on Pulau Langkawi, as well as their own endemics. A similar situation is found in the satellite islands surrounding the major islands of the Seribu Archipelago (Grismer et al., 2006). Field-work is currently being planned to survey all these islands.

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