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Checklist and Simple Identification Key for Frogs and Toads from District IV of The MADA Scheme, Kedah, Malaysia

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Abstrak: Satu kajian telah dilakukan untuk mendapatkan senarai spesies katak dan kodok daripada Kawasan IV Projek Lembaga Kemajuan Pertanian Muda (MADA), Kedah Darul Aman, Malaysia bermula dari Julai 1996 hingga Januari 1997. Hasil menunjukkan bahawa terdapat lapan spesies anura daripada tiga famili berada di kawasan kajian tersebut. Katak Rumput *(Fejevarya limnocharis),* adalah spesies dengan kelimpahan tertinggi diikuti oleh Katak Bakau *(Fejevarya cancrivora)*, Katak Kaki Panjang *(Hylarana macrodactyla)* dan Katak Puru *(Duttaphrynus melanostictus)*. Tiga spesies lain iaitu Katak Limbah *(Occidozyga lima)*, Katak Taiwan *(Hoplobatrachus rugulosus)* dan Katak Betong *(Kaloula pulcra),* jarang ditemui sementara hanya seekor Katak Padi (*Hylarana erythraea)* yang ditangkap. Pemeriksaan ke atas spesimen-spesimen ini telah menghasilkan satu kekunci pengenalan untuk katak-katak di sini yang boleh digunakan oleh para saintis dan juga orang biasa.

Kata kunci: Katak, Kodok, MADA

Abstract: A survey was conducted to catalogue the diversity of anurans in District IV of the Muda Agriculture Development Authority Scheme (MADA) in Kedah Darul Aman, Malaysia, from July 1996 to January 1997. Eight species of anurans from three families were present in the study area. Of these, the Common Grass Frog *(Fejevarya limnocharis)* was the most abundant, followed by Mangrove Frog *(Fejevarya cancrivora),* Long-legged Frog *(Hylarana macrodactyla),* and Common Toad *(Duttaphrynus melanostictus)*. Puddle Frog *(Occidozyga lima)*, Taiwanese Giant Frog *(Hoplobatrachus rugulosus),* and Banded Bullfrog *(Kaluola pulchra)* were rare during the sampling period, and only one Paddy Frog *(Hylarana erythraea)* was captured. A simple identification key for the anurans of this area is included for use by scientists and laymen alike.

Keywords: Frogs, Toads and MADA

INTRODUCTION

Malaysia is home to more than 150 species of amphibians (Inger 2005), while Peninsula Malaysia harbours just over 100 species (Inger 2005). Although the number of amphibian species in Malaysia is considerable, little data on our local frogs and toads has been published to date (Berry 1975; Ibrahim 1994). Dole and Durant (1974) noted this regrettable state of affairs when they reported that

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numerous studies contained information on temperate anurans, but very few have described tropical species.

The objectives of this study were to survey the amphibian fauna of the MADA Scheme and create a simple field identification key for these species, so as to better describe the diversity of amphibians in the area.

MATERIALS AND METHODS

The Study Site

The site for this study was District IV of the MADA Scheme (5° 59' N, 100° 22' E), which lies 13 kilometres southwest of Alor Star, the capital of Kedah Darul Aman, and has an area of approximately 61,000 acres. This area consists predominantly of rice (*Oryza sativa*) monoculture; paddy fields are interspersed with rural villages, small roads, canals, and bunds. A few small towns, such as Kuala Kedah, Simpang Empat, Kota Sarang Semut, and Yan Kecil, are located in this area.

Weeds such as sambau (*Echinochloa colona, Echinochloa crus-galli* and *Leptochloa chinensis*), lallang (*Imperata cylindrica*), and water hyacinth (*Eichorrnia crassipes*) are abound in the MADA Scheme. Herbs like lemon grass (*Cymbopogon citratus*), ginger (*Zingiber officinale*), betel leaf (*Piper betle*), and others are found here, as are fruit trees such as coconut (*Cocos nucifera*), banana (*Musa paradisiaca*), mango (*Mangifera indica*), guava (*Psidium guajava*), jack fruit and breadfruit (both *Artocarpus*), papaya (*Carica papaya*), tamarind (*Tamarindus indica*), ciku (*Manilkara zapota*), rambutan (*Nephalium lappaceum*), and carambole (*Averrhoa carambola*). Bamboo clumps (*Bambusa* sp.) are ubiquitous in this area. Flowering garden plants, such as *Bougainvilla spectabilis, Ixora* sp. *Hibiscus* sp.*,* and *Rosa* sp., are also found in the MADA Scheme.

Sampling

Amphibians were captured from rice paddies and surrounding villages by hand or fishnets. Field parties consisting of 2–3 people would scour the area from 20:00 hrs to 22:00 hrs, twice monthly, from July 1996 to January 1997. Captured specimens were identified by referring to Berry (1975), Inger (1966), Inger and Stuebing (2005), and Frost *et al*. (2006). Specimens were then weighed using a triple beam balance (Series 700); body length and head width were measured with a pair of Vernier callipers. Specimens were then anesthetised and sacrificed with chloroform, fixed in 4% formaldehyde, and stored in the Herpetological Collections in the School of Distance Education, University of Science Malaysia, for future reference.

RESULTS AND DISCUSSION

Sampling of anurans over this time period found eight species of amphibians from three families in the study area. Six species were from the family Ranidae, while

one species each represented the Bufonidae and Microhylidae families. Table 1 lists the species of frogs and toads present in District IV of the MADA Scheme.

Table 1: List of anurans from District IV of the MADA Scheme, Kedah Darul Aman.

Family	Species	Common name
Bufonidae	*D. melanostictus*	(Schneider) Common toad
Ranidae	*F. limnocharis* Boie	Common grass frog
	F. cancrivora Gravenhorst	Mangrove frog
Microhylidae	*H. macrodactyla* (Günther)	Long-legged frog
	H. erythraea (Schlegel)	Paddy frog
	H. rugulosus Wiegmann	Taiwanese giant frog
	O. lima Kuhl and van Hasselt	Puddle frog
	K. pulchra Gray	Banded bullfrog

Of the eight species identified through sampling in our study, *F. limnocharis* was the most abundant (269 specimens), followed by *F. cancrivora* (107 specimens*), H. macrodactyla* (8 specimens) and *D. melanostictus* (7 specimens). Three species, namely *O. lima, H. rugulosuss,* and *K. pulchra*, were rarely seen or captured; no more than five specimens of each of these species were collected. Only one example of *H. erythraea* was captured during the study. *F. limnocharis* and *F. cancrivora* were observed to be breeding during the months of July and August 1996, which corresponds to the inundation phase of rice-growing. All of the anurans we studied were active at night, but concealed themselves in hiding places such as vegetation mats, bottom mud, cracks and crevices in bunds, and in weed banks.

A simple identification key for the anuran species in this area is attached.

Identification Key for Anuran Species from District IV of The MADA Scheme, Kedah

1. Eardrum hidden; legs short, feet not webbed……*K. pulchra* (Fig. 7)
   Eardrum exposed, distinct……... 2

2. Tip of toes pointed …… 3
   Tip of toes expanded or partially expanded into discs…… 6

3. Hind feet fully webbed; skin rough with granules on dorsal and ventral surfaces of body ……*O. lima* (Fig. 5)
   Hind feet partially webbed ……... 4

4. Skin warty, especially on dorsum; parotoid gland and bony supraorbital ridges present ……..*D. melanostictus* (Fig. 4)
   Parotoid glands absent …… 5

5. Loose fold of skin on outside of fifth hind toes present; usually with 'W' mark between shoulder ……*F. cancrivora* (Fig. 2)
   No loose skin fold on outside of fifth hind toes; presence of small metatarsal tubercle, sometimes with white vertebral line. *F. limnocharis* (Fig. 1)…….....

6. Presence of dorsolateral skin fold …… 7
   Absence of dorsolateral skin fold; long and short dermal ridges on dorsum; black blotches on back ……..……..*H. rugulosus* (Fig. 6)

7. At least three pale white stripes along back (two on dorsolateral folds and one central stripe); dark longitudinal stripes on femur *H. macrodactyla* (Fig. 3)…….....
   Two pale white stripes at sides of back; no dark longitudinal stripe on femur; web membrane connects all toes……..*H. erythraea* (Fig. 8)

Figure 1: *F. limnocharis* (Boie).

Descriptions: Grey or brownish above with irregular, longitudinal folds. Sometimes with grey, greenish stripes and cross-bar. The side of the throat is black in males. Some individuals may have a creamy yellow line extending from the middle of the snout towards the anus. Vomerine teeth present. Fingers without fringes of skin. Webbing on the toes extends less than half way up. Supratympanic fold present and dorsolateral fold absent. Commonly found in disturbed areas, agricultural areas, etc.
Adult size: Females 48–60 mm, males 32–50 mm.
Diet: Insects, millipedes and occasionally snails.

Figure 2: *F. cancrivora* (Gravenhorst).

Descriptions: Vomerine teeth present. Brown or grey above with grey or black markings. Dark grey cross-bars on hands and limbs. Longitudinal skin folds present on the back. An inverted V shape marking is usually present on the mid-dorsal area. Supratympanic fold present and dorsolateral fold absent. This frog is usually found in disturbed areas close to a coast or mangroves, especially paddy fields. It is known to be the only saline-tolerant frog in Malaysia.
Adult size: Females 53–82 mm, males 51–70 mm.
Diet: Small invertebrates including crabs.

Figure 3: *H. macrodactyla* (Gunther).

Note: Bar equals 20 mm

Descriptions: Vomerine teeth present. Skin smooth. Dorsal colour is dark brown to vivid green with dull yellow. Four or five distinct whitish longitudinal lines present along the dorsum. Limbs and hands are yellowish. Narrow dorsolateral fold. Supratympanic fold absent. This frog can be found in paddy field areas of the northern states of Peninsular Malaysia.
Adult size: 42 mm.
Diet: Insects, arthropods and other invertebrates.

Figure 4: *D. melanostictus* (Schneider).

Descriptions:	Skin has large round warts. Parotoid glands present. Pale yellow to brownish in colour. Dorsolateral and supratympanic folds absent. Commonly found in disturbed areas.
Adult size:	Females 65–85 mm, males 57–83 mm.
Diet:	Insects such as ants and termites.

Figure 5: *O. lima* Kuhl and van Hasselt.

Note: Bar equals 10 mm

Descriptions:	An aquatic frog. Vomerine teeth absent. Skin warty above. Dorsal colour is greenish brown with small darker markings. Sometimes has light yellow or green vertebral stripe. Supratympanic and dorsolateral folds absent. Can be found in swamps and pools, including paddy fields.
Adult size:	33–39 mm.
Diet:	Small insects.

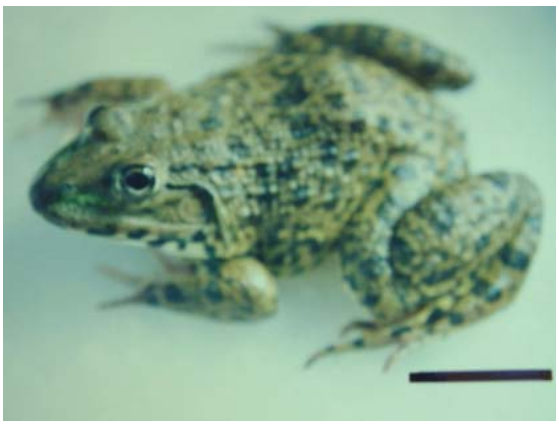

Figure 6: *H. rugulosus* (Wiegmann).

Note: Bar equals 30 mm

Descriptions: Skin is extremely granular with many horny ridges along the dorsum and sides of the body. The colour on the dorsum is yellow with irregular black markings. A strong supratympanic fold. Dorsolateral fold absent. This invasive frog was imported to Malaysia as a source of meat. It can be found in disturbed areas.
Adult size: Females 85–125 mm, males 70–100 mm.
Diet: Invertebrates and smaller frogs.

Figure 7: *K. pulchra* Gray.

Note: Bar equals 20 mm

Descriptions: Dark brown to chocolate in colour with lighter broad lateral stripe present. Throats of males are black. Dorsolateral and supratympanic folds absent. Belly with mottled dirty yellowish brown colour. May be found in disturbed areas, often close to human settlements. The call is a loud honking sound.
Adult size: Females 55–75 mm, males 54–67 mm.
Diet: Ants and beetles.

Figure 8: *H. erythraea* (Schlegel).

Note: Bar equals 20 mm

Descriptions:	Vomerine teeth present. Skin smooth with broad dorsolateral fold and a weak supratympanic fold. Dorsum usually green to yellowish brown. Commonly found in ponds, swamps, and paddy fields.
Adult size:	Females 48–75 mm, males 31–45 mm.
Diet:	Insects, arthropods and other invertebrates.

According to Berry (1975), 22 species of anurans have been recorded in the Malaysian state of Kedah. Our survey yielded only eight species. This discrepancy can be attributed to the fact that Berry's work covered numerous habitats and surveyed a much larger area, with data collected and collated over a much longer time frame. Our study focused exclusively on the rice field ecosystem of District IV of the MADA Scheme. Monoculture systems are inherently less complex than, for example, a forested area or a riverine watershed, and McArthur and McArthur (1961) reported that a more diverse or complex habitat would support a more diverse animal community. This could explain why the number of species found here is much lower than the 22 reported by Berry (1975) for the entire state.

The number of species present here is, however, comparable to the number recorded by Kiew (1972), in Tasik Bera, and Ibrahim *et al*. (2002), in three different sites in Penang, Malaysia. Again this supports McArthur and McArthur's (1961) prediction that a more complex habitat supports greater animal diversity. The area that Kiew (1972) studied did not differ significantly from our sampling area in the complexity of its ecosystem, and was confined to the shores of a fresh water lake in the state of Pahang.

As we stated previously, the most prevalent species in our study were *F. limnocharis* and *F. cancrivora*. The reason for this observation could be that these two species have adapted very successfully to the ever-changing regime of rice-growing in the area. Ibrahim (1994) showed that these two species have adapted their breeding and growth cycles to the dynamic rice-growing seasons in Tanjung Karang, Selangor, which include tilling, ploughing, irrigation, broadcasting, draining, and harvesting in four-month cycles. Hence, these species breed, feed, and grow in a cycle of about four to five months, which is presumably the rice-growing timeline in this study area as well.

Another interesting phenomenon was the scarcity of *H. erythraea* in our study area. Not long ago, this species was one of the most abundant species in rice field ecosystem (pers. observation). Now, however, it is being replaced by *F. limnocharis* and *F. cancrivora*; *H. erythraea* is now found primarily in sump ponds and roadside ditches and canals. The reason for the decline of this species in the rice field ecosystem is not presently apparent, and further studies are merited to understand why this shift has occurred.

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