Megophrys nasuta - Malayan Horned Frog

MALAYAN HORNED FROG
Megophrys nasuta (Schlegel, 1858)
THE MALAYAN HORNED FROG.

The Malayan Horned frog was first described by the German ornithologist and herpetologist Hermann Schlegel in 1858. It is often touted as a charismatic species due to its unusual appearance—a pair of horn-like skin projections on its head, and an extended, pointed snout. Betrayed by its loud metallic 'honk' for a call (sounding somewhat like a duck with a sore throat), this species also camouflages remarkably among the leaf litter of the forest floor and in streams.

Do you see what I see? SPOT THE FROG!
Megophrys nasuta is a sizeably large frog with adult males reaching 100-120 mm in snout-vent length (SVL: the length from snout to vent) and females capable of reaching a SVL of up to 160 mm (Malkmus et al., 2002). The species is characterized by the existence of prominent triangular projections on its upper eyelids and snout: these appendages create what looks like "horns" from which its common name, the 'horned' frog, is derived. The head of the frog is relatively large and broad as compared to its body size with a hidden tympanum. The tympanum can be described as "...diagonally placed, rounded below, somewhat angular on upper edge, [and] separated from eye by a distance greater than greatest diameter of tympanum" (Taylor, 1962).
Two pairs of dorsolateral folds run parallel and longitudinally between its head and groin – the folds begin at the occiput (Inger, 1966). The dorsal (or back) surface of *M. nasuta* individuals range in colour from a light to dark brown and is marked by the presence of several raised tubercles. These tubercles serve to identify individual frogs as tubercle presence, shape, number and location on body surface vary from individual to individual. The colour of the frog allows it to blend in with the colour of leaf litter of the forest floor.

Dorsal view of *M. nasuta* adult. The frog’s excellent camouflage is largely due to both body shape and colour patterns that closely mimic that of dried leaves.

The ventral (or abdominal) surface is a mottled brown colour that may become a cream-yellowish brown colour midway in some individuals.

The arms and legs are also marked by the mottled appearance – arms are moderate in size, and fingers are widened at the tips, and lack webbing between. Toes, however, show signs of webbing, while displaying similar widening at the tips as fingers (Inger, 1966).

All these morphological characteristics, especially that of head projections and its cryptic coloration, act as phytomimesis (which means the mimicry of plant structures or plants by animals) in the litterfall of the forest grounds (Inger, 1966; Wildenhues, 2012).

Despite its grumpy and disapproving demeanour, this species is actually shy in nature and will crouch down, motionless, when startled or disturbed. This is part of the frog’s strategy to avoid detection and for greater camouflage among the leaf litter.

Megophrys nasuta adopting a crouched position, enabling it to blend into the leaf litter (...perhaps a crouching frog thinks it is a hidden frog...)
Megophrys nasuta tadpoles are brown, their body shape distinctively elongate, and are capable of growing up to 42 mm during Gosner Stage 42 (Gosner, 1960; Inger, 1984). Tadpoles possess a distinctly shaped oral groove formed from the horizontal expansion of the lips, which results in a dorsally oriented funnel-mouth – this structure is unique to Megophryid species (Inger, 1984). Juvenile frogs are similar in colour to adults with noticeable protrusions at the eyelids and snout, although these are not fully formed.

For more details and pictures, please refer to the ‘Biology’ section below.

**BIOLOGY**

**I. CALL**

https://archive.org/details/20130930184854312

*Megophrys nasuta* individuals calling in Bukit Timah Nature Reserve.

*Megophrys nasuta* is known to inhabit mature rainforest or swamp forest, where its characteristic loud “honk” call can be heard especially during the early hours of dusk and just before rain: it is then that calling frequency increases, as opposed to almost solitary calls during the later hours of the night. This may be due to those periods being suitable breeding periods for the frog - it is perhaps useful to note here that most frogs usually call (period of greatest vocalization) in the later hours of dusk (Bickford et al., 2010).

**II. LIFE CYCLE & REPRODUCTION**

*Megophrys nasuta* exhibits inguinal *amplexus*: a type of amplexing position where the male clasps the female around her pelvic region. Males typically rest their feet on the female’s thighs (see picture). This posture is typically maintained for hours, (sometimes even for weeks), and pairs will usually not break away from the stance even when disturbed (Burger, 2000; Wildenhues et al., 2012).

*Megophrys nasuta* eggs are laid either adhered to surfaces in water or partially submerged in streams. Oviposition (that is, egg laying) is usually conducted beneath structures such as submerged logs or rocks. The large white eggs (of about 2 cm in diameter, including glutinous layer) are glutinous and laid attached to each other (Wildenhues, 2012). The larvae take approximately one week to hatch following egg deposition. The larvae are white and heavily dependent upon the yolk for sustenance and as a energy reservoir: following the early days of hatching, they remain motionless on the stream’s bottom.

*Megophrys nasuta* pair in amplexus. Note the obvious size difference between the male (smaller individual) and female: a clear example of sexual dimorphism. (Click picture to find out more about sexual dimorphism)
The larvae, when hatched, are a pale white in colour, and are attached to their yolk reservoir: a week later, they develop brownish pigment. Larvae begin to metamorphose in about two and a half months, although this may be delayed to up to seven months, depending upon development temperature. Captive breeding of *Megophrys nasuta* has shown that lower temperature of development (ranging from about 19°C to 22°C) would result in a longer and slower development rate, while higher temperatures led to quicker development rates. However, larvae that developed quicker resulted in smaller metamorphs and juveniles as compared to that raised in lower temperatures (Wildenhues et al., 2012).

Larvae commence development from metamorphs (Gosner Stage* 45) into juvenile frogs (Gosner Stage 46) where their tail is completely resorbed from about three to seven months following egg deposition.

*Gosner Stages define different stages of the developing anuran young: from its two cell stage (Gosner Stage 1) to when it has completely resorbed its tail (Gosner Stage 47).
III. DIET & FEEDING

*Megophrys nasuta* is known to be a voracious opportunistic predator. Adults are observed to feed on crickets, cockroaches, locusts, worms, slugs, and even snails, although this list is likely more diverse (Obst et al., 1984; Burger, 2000; Wildenhues et al., 2012). Its cryptic coloration and camouflage aid in its feeding strategy, allowing it to prey on smaller unsuspecting animals on the forest ground.

*Megophrys nasuta* tadpoles are surface feeders.

IV. HABITAT & ECOLOGY

*Megophrys nasuta* is known to primarily occur in mature rainforest - it is a forest specialist. The species inhabits lowland and submontane forests, and is usually found in the vicinity of clear forests stream: which serves as a necessary habitat for its tadpole and breeding grounds (Inger, 1954; Berry, 1975; Dring, 1979). In Singapore, it is found in the more pristine forested areas of Bukit Timah Nature Reserve, in addition to more mature swamp-forest in Central Catchment Nature Reserve (Teo & Rajathurai, 1997).

Adult frogs are completely terrestrial in nature, although usually always found near streams. Tadpoles, however, spend their entire larval period in streams, and are often observed congregated on the sides of streams: they are known to favour the root mats of streamside vegetation, and areas of dead leaves accumulation, possibly as these are areas of greater plankton abundance (Inger, 1954; Burger, 2000).

DISTRIBUTION

I. GLOBAL

Globally, the native range of *M. nasuta* stretches from Yala, southern Thailand, throughout the Malay Peninsula, Singapore, Sumatra, Borneo, till the Natuna Islands.
II. SINGAPORE
In Singapore, *M. nasuta* is confined within the Central Catchment Nature Reserves (CCNR) and Bukit Timah Nature Reserve (BTNR). Due to sensitivity of this species' location in Singapore, the exact sites within the reserves cannot be revealed.

![Map of Singapore](image1)

Map of Singapore. Locations of *Megophrys nasuta* are found within the shaded areas.

CONSERVATION STATUS

I. GLOBALLY
The International Union for Conservation of Nature (IUCN) lists *M. nasuta* as a taxon of ‘Least Concern’ due to its presumed wider distribution range, and population size (van Dijk et al., 2004). However, forest fragmentation coupled with habitat destruction and loss threatens population size—this is further compounded by harvesting for the pet trade (Wildenhues, 2012).

**WHY BOTHER ABOUT FROGS?**

Frogs often serve as indicators of ecosystem health. Some frogs—such as forest specialists like *Megophrys nasuta*, are particularly sensitive (and susceptible!) to changes in the environment: such as rising temperature, a drop in precipitation, and even the presence of pollutants in the stream. In fact, because frogs (like many amphibians) are partly aquatic and partly terrestrial, this makes them even more vulnerable to environmental changes and decline.

**II. SINGAPORE**

A comprehensive survey of the amphibians in Singapore was carried out from 1993 to 1997 by Teo and Rajathurai of the Vertebrate Study Group of Singapore’s Nature Society. The survey, carried out over four years with a six year pre-survey period (1987 to 1993), listed 36 records of *M. nasuta* in Singapore, confined to Bukit Timah Nature Reserve and Catchment Nature Reserve. This was corroborated in part by *M. nasuta* records from ‘The Pangolin’, a quarterly bulletin of Singapore’s vertebrates published by the Malayan Nature Society Singapore (Lim, 1998c, 1989c, 1989d, 1990c, 1995). However, current knowledge regarding this species’ current status in Singapore is lacking or unpublished.

The Singapore Red Data book currently records *M. nasuta* as *Endangered [EN]* (Davison et al., 2008). This category criterion is that “[T]here are fewer than 250 individuals and no evidence of decline or fragmentation” (Davison et al., 2008). However, a recent unpublished study on the conservation status of *Megophrys nasuta* in Singapore suggests that there was need to review this and possibly update the species’ local status to *Critically Endangered [CR]*. This category describes the possible current status of *M. nasuta*, considering that “[T]here are fewer than 50 mature individuals, OR if there are more than 50 mature individuals but less than 250, with some evidence of decline or fragmentation” (Davison et al., 2008).

Although the number of mature individuals was not determined, the study recorded evidence of decline and absences from surveyed historical sites suggesting that the overall population size in Singapore is fewer than 250 individuals. However, these are but preliminary surveys, and more robust surveys must be conducted before revisions to status can occur. Regardless, management programmes tailored to address the various potential causes of decline should be developed and effectively monitored to prevent greater extirpation (localized extinctions) of *M. nasuta* in Singapore.

**PAGE NAVIGATION:**

| MORPHOLOGY | BIOLOGY | DISTRIBUTION | CONSERVATION STATUS | DIAGNOSIS | TAXONOMY | USEFUL LINKS | REFERENCES |

**DIAGNOSIS**

“Zij hebben in het algemeen de kenmerken der Kikvorschen; maar hun kop is veel groter en plat; hun muil is bootsegewoon wijd, en hunne bovenste oogleden zijn meer of min puntig verlengd. Men vindt hen in Zuid-Amerika en Achter-Indie.”

- Hermann Schlegel, 1858

In Singapore, this species is easily distinguished from other frog species due to the prominence of its triangular projections of “horns” and snout. However, *M. nasuta* does look similar to other *Megophrys* species (all of which are not found in Singapore). There are currently five recognized species under the *Megophrys* (Frost, 2011).

<table>
<thead>
<tr>
<th>Species</th>
<th>Picture</th>
<th>Location</th>
<th>Brief Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Megophrys nasuta</em> (Malayan Horned Frog)</td>
<td><img src="image.png" alt="Picture" /></td>
<td>Endemic to Southeast Asia Region</td>
<td>Description: Extended palpebral (eyelid) and snout projection with presence of tubercles on body and wide large head. Colour of dorsal surface ranges from light brown to dark brown. Colour of ventral surface is botted brown to creamish brown in colour. <strong>Global Species Status</strong>: Least Concern</td>
</tr>
<tr>
<td>Species</td>
<td>Scientific Name</td>
<td>Description</td>
<td>Global Species Status</td>
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<tr>
<td>Megophrys kobayashii (Kobayashi’s Horned Frog)</td>
<td>Megophrys kobayashii</td>
<td>Endemic to Sabah, including Mount Kinabalu</td>
<td>Near Threatened</td>
</tr>
<tr>
<td></td>
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<td>Description: Palpebral slightly extended, with numerous warts on body surface. Lacks snout projection. Colour of dorsal surface is dark brown.</td>
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<tr>
<td></td>
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<td><strong>Global Species Status</strong>: Near Threatened</td>
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<tr>
<td>Megophrys montana (Javan Horned Frog)</td>
<td>Megophrys montana</td>
<td>Endemic to Java, Indonesia</td>
<td>Least concern</td>
</tr>
<tr>
<td></td>
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<td>Description: Elongated skin protrusion above each eyelid: extended palpebral projections with wide large head. Ventral surface is mottled light-dark brown in colour.</td>
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<tr>
<td></td>
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<td><strong>Global Species Status</strong>: Least concern</td>
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<tr>
<td>Megophrys ligayae (Palawan Horned Frog)</td>
<td>Megophrys ligayae</td>
<td>Patchy distribution: known to occur in western Philippines</td>
<td>Endangered</td>
</tr>
<tr>
<td></td>
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<td>Description: Extended palpebral. Has two pairs of dorsolateral ridges with a wide large head. Similar in morphology to M. nasuta, but is lacking the elongated pointed snout.</td>
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<tr>
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<td><strong>Global Species Status</strong>: Endangered</td>
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<tr>
<td>Megophrys stejnegeri (Mindanao Horned Frog)</td>
<td>Megophrys stejnegeri</td>
<td>Endemic to Mindanao</td>
<td>Vulnerable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Description: Brownish/greyish patterned bodies with scattered tubercles on skin surface. Tubercles greater in number as compared to that in M. nasuta. Body colour ranges from dark brown to greyish brown in colour. Has small skin protrusions above eyelid.</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td><strong>Global Species Status</strong>: Vulnerable</td>
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</tbody>
</table>
TAXONOMY

I. TAXONAVIGATION

- Amphibia
- Anura
- Megophryidae
- Megophrys
- Megophrys nasuta (Schlegel, 1858)
- Megophrys nasuta — Gee and Boring, 1929

II. ORIGINAL DESCRIPTION
Schlegel originally placed *M. nasuta* within the *Ceratophryne* genus - this was later revised several times and finally placed under *Megophrys* in 1929 by Gee and Boring (Gee & Boring, 1929).

The original description reads:


which translated: reads

They generally have the characteristics of the frogs, but their head is much larger and flat; their mouth is extremely wide, and their upper eyelids are more or less pointed extended. One can find them in South America and Back Indies.

The normal species, *Ceratophryne dorsata*, [can be found] from Guyana and Brazil, will become just as big as a normal frog (sometime in the future but not now). She has, because of her big head, an ugly [appearance], however [it] is decorated with beautiful green and red colours.

On Java you find a brown species, *Cer. montana* which is of the same size of the other Amphibians, which is replaced on Sumatra by a related specie, *Cer. nasuta*, which has one pointed skin flap to the muzzle.”

DID YOU KNOW?

How Amphib-uos!

Dr. Albert Gunther was a German zoologist and herpetologist who described more than 340 species. However, he mistakenly identified adult Megophrys montana males as Megophrys nasuta females (then referred to as Megalophrys montana and Megalophrys nasuta) - and only discovered his error when he was presented with specimens of larger size that were females, as compared to the smaller sized males that he dealt with (Gunther, 1873). Dr Gunther also mistakenly brought this information to Charles Darwin – who in his book 'The Descent of Man, and Selection in Relation to Sex', incorrectly wrote about the 'differences' between the “males” and "females" of Megalophrys montana, although these were in fact two different species.

III. TYPE SPECIMEN AND LOCALITY

Type Specimen: Two syntypes, RMNH 2143, deposited in the National Museum of Natural History, Leiden, The Netherlands (Miracle et al., 2007)

Type Locality: Batang Singalang, Sumatra, Indonesia

IV. PHYLOGENETICS

Maximum likelihood of amphibian phylogeny: *Megophrys nasuta* (boxed in red) is seen to be in the same clade with Brachytarsophrys and Xenophrys. Numbers at node are maximum likelihood boot-strap values. (Source: Adapted from Science Direct; Direct permission not obtained, but within the limits of Fair Use)
A recent study conducted by Pyron and Wiens in 2011 based on analysis of sequence data from 12 genes: three mitochondrial and nine nuclear reflects the position as Megophryidae as the sister taxon to Pelobatidae. Megophryidae is accepted as monophyletic – this is based on analyses carried by Frost et al., using comparative anatomical character evidence of Haas (2003), with DNA sequences from mitochondrial transcription unit H1 and several nuclear genes: H3, rhodopsin, tyrosinase and the large ribosomal subunit 28S (Frost et al., 2006).

V. GENE SEQUENCES

Barcode obtained from BOLD Systems from data deposited in GenBank, NCBI. (Clicking on the image will take you to the BOLD Systems Database. The above shows the illustrative barcode sequence for *M. nasuta*. The cytochrome c oxidase subunit 1 (COX I) gene sequence is available on GenBank.

COULD YOU FIND ME?

*All pictures and other media are property of author unless otherwise stated.*
USEFUL LINKS

For more information on Amphibians in Singapore:
1. Nick Baker's page on Amphibians of South-east Asia

REFERENCES


Lim, K. K. P., (1990c). Recent reports: amphibians. The Pangolin, Malayan Nature Society Singapore Branch 1(3)


Anything to say about the Horned Frog?

Thank you for reading this web-page! Should you have any queries or comments, spot an error in the information above or perhaps have more local (Singapore) information about this species, please feel free to drop me an email at prar.selv@gmail.com. :) Your comments are very much appreciated, and will help in adding to our knowledge of this species in Singapore.

This page was authored by Prarthini M. Selveindran

Last curated in 2013