While its name suggests its dietary preference, in fact, it could eat anything it can fit into its mouth.

With a loud rattling call that sounds like a machine gun, *F. cancrivora* is more often heard than seen. They are commonly found in the back mangroves, disturbed forests and parks. There is a higher chance to encounter these nocturnal frogs after a rain.

### 1. Identification

The easiest way to identify the Crab-eating frog is not by sight, but by hearing its "machine gun" calls.

#### 1.1 Diagnosis
F. cancrivora can be distinguished from F. limnocharis by having a deeper head and a more pointed beak-like snout. But can you really tell the difference?

1.2 Comparison with other species in same habitat
F. cancrivora

Kaloula pulchra
To identify a frog at night (they are nocturnal) can be tricky. However, it is possible to narrow down the candidates of the unknown species to a few, and all it is left to do is to hear its mating call.
For mating call comparison, refer to section 2.1 Calls.

1.3 Coloration
Color varies from brown, or greenish-brown, to gray, with irregular darker bars scattered on the lips and hindlimbs. The venter is whitish, sometimes with scattered darker markings.


1.4 Variation

Males have vocal sacs. Mature males may or may not have dark throats and thumbs, and sometimes lack slits opening to the vocal sac.
1.5 Tadpole Morphology

Tadpoles have a maximum total length of 40 mm. The body is oval-shaped and dark-colored with dark spots. The tail is less than twice the body length. The spiracle is centered on one side of the body. The mouth is situated under the snout. The upper lip has a single row of papillae and the lower lip has two rows. (Unfortunately, an image of its tadpoles are not available. Do feel free to contribute one! Email to a0125203@u.nus.edu)

2. Biology

Frogs and toads of different species call at different frequencies and rhythms, filling up the soundscape while preventing overlapping of sound waves.

2.1 Calls - Machine Gun

The mating calls of F. cancrivora sound like fast throat gargles, and can be easily distinguishable from other anurans living in the same habitat.

In Singapore, you would be expected to find 4 to 5 other Anurans in places that you would find the crab-eating frog. Below are the sounds of some of these anurans. The first sound you hear is the crab-eating frog, but do play all the sound files at the same time to test yourself if you can still identify the calls of the crab-eating frog amongst all the others.

Comparison of common anuran calls

Crab-eating frog

[Image of crab-eating frog]

F. cancrivora

Asian common toad

2.2 Breeding Habits - All year long

*F. cancrivora* breeds all year-round, but most active at the beginning of the wet season.

2.3 Feeding Habits - They eat anything they can find and fit into their mouth!
Fejervarya cancrivora is a very opportunistic species that will feed on Crustaceae when insects are scarce. The diet of *F. cancrivora* inhabiting brackish water is predominantly crustacean, while the diet of those in freshwater is mainly insects and some small vertebrates such as frogs. It is also suggested that the only choice-limiting factor is prey size.

### 2.4 Salt Tolerance - Best of the Frogs

While there are other species (*Xenopus laevis* and *Bufo viridis*) that can withstand salinity (20 and 26 ppt of salinity respectively), only *F. cancrivora* can tolerate saline waters constantly. The average salinity of seawater is 35 ppt. It is able to adapt from freshwater to seawater within a few hours. Adults and tadpoles can live in saltwater with salinity up to 2.8% and 3.9% respectively. It can regulate water gain/loss through its skin such that the rate is maintained constant at any osmolarity. This is credited to its ability to raise the osmolar concentration of its plasma greater than that of the external environment.

In other words, you can't find a better frog at tolerating salt waters.

### 2.5 Reduced Cutaneous Water Loss - Lowest of them all

The area-specific evaporative water loss rate from cutaneous skin in *F. cancrivora* is the lowest known for frogs. It is suggested that cutaneous resistance has evolved as a way for it to reduce water loss while on land, in order to offset high osmotic losses to seawater before frogs fully acclimate to the high salinity of seawater.

### 3. Habitat & Distribution

#### 3.1 Habitat

*F. cancrivora* are found in both fresh water and brackish water. For brackish water habitats, they can usually be found on the banks of meanders and edges of tidal prawn ponds. Fresh water habitats, on the other hand, includes flooded rice fields, ponds, swamps and ditches. In Singapore, *F. cancrivora* can be commonly found in mangroves, forests, and even parks. In other words, they can be found anywhere.

#### 3.2 Native Distribution

In Singapore, *F. cancrivora* can be found in both fresh and brackish water swamps and ditches, though it is usually collected near slow-moving or stagnant fresh water. It is also usually found in mangrove swamps.
3.3 Global Distribution


F. cancrivora was first reported from Java, and other reports have come from India, Sri Lanka, Indonesia, the Gulf of Thailand and land areas bordering the South China Sea. It is widely distributed in Southeast Asia, including Brunei, India, Indochina (Cambodia, Laos, Malaysia, Thailand, Vietnam), coastal southern China (Hainan and Guangxi), Philippines, Sulawesi, Nusa Tenggara, and Irian Jaya.

4. Habitat Loss

4.1 Environmental degradation

Fejervarya cancrivora
5. Conservation Status

Although *F. cancrivora* is listed as Least Concern, over-harvesting and habitat loss due to deforestation still threaten its local populations. According to The IUCN Red List of Threatened Species, *F. cancrivora* is listed as Least Concern due to its wide distribution, tolerance of a broad range of habitats, presumed large population, and it is unlikely to decline to qualify for listing in a more threatened category. Nevertheless, over-harvesting, habitat loss, wood harvesting from mangroves, urbanisation processes may still threaten *F. cancrivora* populations. Up to 75% of Indonesia’s export of frog legs for food consumption are from *F. cancrivora*. Although *F. cancrivora* is not a particular species of concern, it is good to note that amphibians are a vulnerable group, where about 1 out of 3 species are endangered on the Red List.

6. Taxonomy

6.1 Description

The original description by Gravenhorst (1829) based on lost samples could not be traced back. A neotype from Java, Indonesia is used as a replacement. The species is described from a neotype by Dubois and Ohler (2000). *Fejervarya cancrivora* has a SVL (snout to vent length) of 68.2 mm. The sides of the head have small glandular warts. Parts of the flanks have glandular folds and the lower part has glandular warts. The back has interrupted dorsolateral folds. The dorsal sides of the limbs have warts and folds, while the ventral surfaces are smooth. It has a medium sized, narrow head. The snout is oval. *Fejervarya cancrivora* has a rounded canthus rostralis, a concave loreal region, and a flat interorbital space. The nostrils, which are closer to the tip of the snout than the eye, are oval and have a small flap. The tympanum is distinct. The pupil is rounded. It has a few teeth between the choanae on the vomerine ridge. The tongue is large. It has a supratympanic fold. No parotoid glands are present. The fingers are long and the finger tips are pointed. Some of the fingers have dermal fringes, but have no webbing. Subarticular tubercles are present and are rounded. Toes are long and have webbing and dermal fringes.* (Dubois & Ohler, 2000).

External features of frog

Figure available from [http://www.kshitij-pmt.com/Biology/Structural-organisation-in-animals/frogs.aspx](http://www.kshitij-pmt.com/Biology/Structural-organisation-in-animals/frogs.aspx)

6.2 History of *Fejervarya*

*Fejervarya* is one of the Asian genera of frogs in the Dicroglossidae family. First proposed in 1915, the genus did not see widespread adoption at first. In the 1990s, it was generally included as the subgenus of *Rana* and later placed as subgenus as *Limnonectes*. It was first treated as an independent genus in 1998.

6.3 English Common Names

*Fejervarya cancrivora* goes by many common names, but in Singapore, it is commonly known as the crab-eating frog.

List of english common names:
- Crab-eating Frog
- Asian Brackish Frog
- Rice Field Frog
- Mangrove Frog
- Javan Wart Frog
- Java Wart Frog
- Marsh Frog
- Brackish Water Frog
- Pattani Wart Frog
- Gulf Coast Frog

6.4 Classification
Synonyms:
Rana cancrivora: Gravenhorst, 1829
Rana tigrina var. angustopalmata: Van Kampen, 1907
Rana tigerina angustopalmata:Barbour, 1912
Rana tigerina var. cancivora: Boulenger, 1918
Rana cancivora: Annandale, 1918
Rana (Rana) cancivora: Boulenger, 1920
Rana cancivora cancrivora: Dunn, 1928
Rana cancivora raja: Smith, 1930
Dicroglossus cancivorus: Deckert, 1938
Rana raja: Taylor, 1962
Rana (Euphylctis) cancivora: Dubois, 1981
Euphylctis cancivora: Poynton and Broadley, 1985
Limnonectes (Hoplobatrachus) cancivorus: Dubois, 1987
Limnonectes (Hoplobatrachus) raja: Dubois, 1987
Limnonectes (Fejervarya) raja: Dubois, 1992
Limnonectes (Fejervarya) cancivorus: Dubois, 1992
Fejervarya raja: Iskandar, 1998; Dubois and Ohler, 2000; Fei, Ye, Jiang, and Xie, 2002
Fejervarya cancivora: Iskandar, 1998; Fei, 1999; Dubois and Ohler, 2000; Fei, Ye, Jiang, and Xie, 2002

### 6.5 Taxonavigation

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From: Integrated Taxonomic Information System (ITIS)

### 7. Phylogeny

The genera Fejervarya consists of 16 described species, and some putative but undescribed ones. In a paper by Pyron and Wiens, large-scale maximum likelihood estimate of amphibian phylogeny, containing 2871 species represented by up to 12,871 bp of sequence data from 12 genes (3 mitochondrial, 9 nuclear genes) is conducted. The maximum likelihood tree is based on rapid-bootstrapping analysis. Numbers at nodes at based on bootstrap value over 50%.

There are 4 species with unknown and/or missing holotypes, and are placed incertae sedis in Fejervarya. They are namely: F. altilabris, F. brama, F. assimilis, and F. thitii.

Fejervarya cancrivora is located at the top right of the figure. There are strong support for the branching of F. cancrivora and its sister taxon F. vittigera at 100% bootstrap value. In the genus alone, F. cancrivora and its sister taxon F. vittigera has one of the highest node stability, and thus can be said with more certainty that they are indeed 2 different species.

8. References