Scatophagus argus - Spotted Scat

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Figure 1. Spotted scat, Scatophagus argus (Linnaeus, 1766).
Photo of Spotted scat by Chinese Academy of Fishery Sciences, Information Center.
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Overview

The spotted scat (*Scatophagus argus*) is a native fish of Singapore that could be found in both brackish and freshwater environments, including monsoon drains. It has an average total length of 200 mm. It is an important food fish, and brackish water aquarium fish in many countries, including Singapore. It is also known by the name “*kim kor*” in Cantonese, and “*Ikan Ketang*” in Malay. *Scatophagus argus* is also known to have been caught by anglers in the coastal waters of Singapore.

As this fish has venomous spines, it should be noted of and avoided when one enters its habitats especially the mangroves, or attempts to handle similar-looking fishes. This species page thus seeks to provide a comprehensive identification guide (see description and diagnosis) of the spotted scat, and information on the venomous spines possessed by the fish.

*Spotted scats are reported to have been caught by anglers at the Woodland Jetty. See [http://woodland-jetty.blogspot.sg/2012/09/spotted-scat-caught-at-woodland-jetty.html](http://woodland-jetty.blogspot.sg/2012/09/spotted-scat-caught-at-woodland-jetty.html) for an example.*

Name

**Scientific name:** *Scatophagus argus* (Linnaeus, 1766)

**Common names:** Spotted scat, Butterfish, *Ikan kitang* (Malay), *Kim kor* (Cantonese)

Etymology

*Scatophagus*: means feeding upon dung:
- Scat= ‘dung’, from Greek stem *skat*
- -phagus= ‘eating, feeding on’, from Latin -phagus, from Greek –phagos

*argus*: The hundred-eyed giant of Greek mythology. It's probably so named due to the many spots on its body, resembling many eyes.

Synonyms

(Referenced from IUCN)

- *Chaetodon argus* Linnaeus, 1766
- *Scatophagus argus* argus (Linnaeus, 1766)
- *Ephippus argus* (Linnaeus, 1766)
- *Chaetodon pairatalis* Hamilton, 1822
- *Chaetodon atromaculatus* Bennett, 1830
- *Scatophagus purpurascens* Cuvier, 1831
- *Scatophagus ornatus* Cuvier, 1831
- *Scatophagus bougainvillii* Cuvier, 1831
- *Sargus maculatus* Gronow, 1854
- *Scatophagus argus ocellata* Klunzinger, 1880
- *Scatophagus quadratus* De Vis, 1882
- *Scatophagus aetatevarians* De Vis, 1884

Description

**Body:** greenish colouration; quadrangular body shape; many dark spots on body

**Size:** up to 350 mm total length

**Sexual dimorphism:** slight; differ in head profile and body colouration

Generally, scats have a distinctly quadrangular and highly laterally compressed body which is usually greenish or silvery with dark spots or bars. The figure below shows other descriptive characters of *S. argus.*
Figure 2. Diagnostic characteristics of the family Scatophagidae (adapted from Kottelat, 2001 [6] with additional labels added).

Size

The average total length of *S. argus* is about 200 mm, and they can grow up to a total length of 350 mm.

Adults and Juveniles

In particular, adults *S. argus* have dark spots that could be faded, and more concentrated at the dorsal side of the body (figure 3). Juveniles resemble the adults but have dark spots about the same diameter as the eyes (figure 4, right) or have 5 – 6 dark and broad vertical bars along their body (figure 4, center).
Scatophagus argus go through a tholichthys postlarval stage. The tholichthys larval stage is unique to fishes in the family Chaetodontidae (butterflyfishes) and Scatophagidae, and is characterized by having large body plates that enclose the body, particularly the head, forming a hard protective covering. These larvae are small, ranging between a total length of 6mm to 12mm. These protective plates disappear as the larva develops into a juvenile.
Sex determination

*Scatophagus argus* exhibit slight sexual dimorphism. Males and females can be distinguished by their head profile. In females, the head profile ascends in a gentler slope, whereas males have an abrupt steep sloping of the head above the eyes. In addition, females are of a lighter colour than males.

Diagnosis

The family Scatophagidae consists of two genera, *Scatophagus* and *Selenotoca*.

**Genus *Scatophagus***

Unlike *Selenotoca*, the gill membrane of *Scatophagus* forms a free fold that covers the isthmus (or throat area of fish) as depicted in figure 6a below.
Figure 6. Ventral view of a) Scatophagus argus and b) and a Selenotoca species, Selenotoca multifasciata. In Scatophagus, the gill membrane forms a fold that covers the isthmus but not in Selenotoca (Image from FAO in Kottelat, 2001). 

**Species Scatophagus argus**

The genus Scatophagus consists of only two species, the other being *S. tetracanthus* (Lacepède, 1802).

*Scatophagus argus* can mainly be distinguished from *S. tetracanthus* by having a greenish silver coloured body with dark round spots on its upper part of its body, while *S. tetracanthus* has a yellow body with seven vertical dark bars across its body.
Similar-looking coastal fishes
Figure 8. Both of these fishes can be found in the coastal areas of Singapore. On first look, both S. argus (left) and the spotted green pufferfish (right) may look alike (photos by and used with permission from Ria Tan).
Other native fishes, the spotted green pufferfish (*Tetraodon nigroviridis*) and Orange-spotted rabbitfish (*Siganus putativus*) resemble *S. argus* superficially, and co-occur with *S. argus* in coastal waters of Singapore. Thus, these three fishes could be easily misidentified.

Nevertheless, it is important that handling of all three fishes with hands are avoided as they are all venomous-rabbitfishes and *S. argus* have venomous spines while the pufferfish may excrete tetrodoxins through their skin which could be readily absorbed through our skin.

The spotted green pufferfish co-occurs with *S. argus* in the mangrove areas of Singapore while the orange-spotted rabbitfish are more commonly found in the coastal areas further from the shore, where seagrass and corals are.

It seems that both the orange-spotted rabbitfish and *S. argus* could be fished from the same coastal area as accounted by an angler in a blog. Along with other species of rabbitfishes, the orange-spotted rabbitfish, like *S. argus*, are also sold in markets whole and eaten during the Chinese Lunar New Year period in Singapore (Kwik, 2014, pers comms).

The table below shows how the spotted green pufferfish and rabbitfish can be distinguished from *S. argus* by comparing their body shape, body colour, features of jaws, and dorsal fin.

Table 1. Table of comparison of features between *S. argus*, spotted green pufferfish and rabbitfish.

<table>
<thead>
<tr>
<th>Features</th>
<th><em>S. argus</em></th>
<th>Spotted green pufferfish</th>
<th>Orange-spotted rabbitfish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body shape</td>
<td>Laterally flattened and quadrangular</td>
<td>Blunt and round</td>
<td>Laterally flattened, oval-shaped, deep-bodied</td>
</tr>
<tr>
<td>Body colour</td>
<td>Greenish silver body with dark spots</td>
<td>Bright green body and white belly; with dark spots</td>
<td>Bluish colour at upper body, silvery below. Orange spots on body, large golden spot below the end of dorsal fin</td>
</tr>
<tr>
<td>Jaws (see figures below)</td>
<td>Jaws bear narrow finger-shaped teeth and hidden in mouth</td>
<td>Jaws modified to form beaks</td>
<td>Jaws bear slender, close-set teeth</td>
</tr>
<tr>
<td>Dorsal fin (see figures below)</td>
<td>Long and bears spines</td>
<td>Short, bears no spine and located posteriorly on body</td>
<td>14 dorsal fin spine, first dorsal fin spine pointed forward</td>
</tr>
</tbody>
</table>
Native distribution and habitat

**Distribution:** From Indian ocean to Indo-West Pacific

**Habitat:** Freshwater, brackish
Scatophagus argus has a wide native range which spans across the whole coastal area of the Indian Ocean, and the tropical to warm temperate regions of Indo-West Pacific region, including Australia, Tahiti, and the Southern areas of China, and Taiwan. Scatophagus argus is the only Scatophagus species that occurs in the Southeast Asian region.

Scatophagus argus thrive in both freshwater and brackish waters, and are usually found between surface to a depth of 5m. In Singapore, S. argus has been spotted along coastal areas, where mangroves and seagrass occur, as well as under jetties and near monsoon drains. It has been caught or sighted along the northern (Johor Straits) and southern coast of Singapore.

Video 1. Scatophagus argus can be caught at the Woodlands Waterfront Jetty.

Listed below are examples of places in Singapore where S. argus was recorded.

**At northern coast:** Woodland Waterfront fishing jetty, Chek Jawa, Lim Chu Kang, Sungei Buloh Wetland Reserve, Pasir Ris, Pulau Seduku or Frog Island

**At southern coast:** Waters of Kallang, Changi, Tanah Merah

**Inland:** Lower Seletar Reservoir Yishun Dam fishing spots, Below Seletar North Link Bridge

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**Biology**

**Diet and feeding habits**

**Primary Diet:** Omnivorous (mainly detritus and algae)
Scatophagus argus is usually gregarious, with adults forming smaller groups than juveniles (Kwik, 2014, pers. comms.). It is also known to feed actively during the day. As mentioned in etymology, “Scatophagus argus” means dung-eater. It was so named as many were observed to feed on unwanted waste and offal discarded from ships at harbor. However, its preference for dung matter remains unconfirmed. Instead, its main diet appears to consist of detritus and algae. Juvenile S. argus consumed a greater proportion of unicellular algae while adults consumed more multicellular algae, and a greater diversity of food items such as rotifers and sea anemones.

Scatophagus argus appear to be non-choosy feeders and would consume any food available though there might be a preference for filamentous algae in larger fishes. Other animal matter such as copepods, fish scales and fish eggs have also been found in the guts of S. argus.

Barry & Fast suggest that S. argus is primarily herbivorous and adapted to feed on plant material given its long gut length relative to body length and the presence of “small, sharp teeth used for scraping and shredding plant material”.

Reproduction

Reproduction: Dioecious (having distinct male and female individuals); Oviparous; mature at one year of age; eggs can hatch within a day under certain conditions

Scatophagus argus is dioecious (having distinct male and female individuals) and is able to reproduce at 1 year of age. It is estimated that males reach the age of sexual maturity at 115 mm standard length, weighing about 83.5g, while females, at 140 mm standard length and 150g.

The reproductive behavior of S. argus in the wild does not seem to have been documented thus far. Barry & Fast, however, observed the mating behavior of S. argus in captivity: Males, when placed in a tank with a female, appear to be aggressive towards each other and attempt to guard the female. The more aggressive male was observed to chase and attack the submissive male which held its dorsal fin erect most of the time. Nudging of the female’s abdomen by the domineering male was seen as well. Both male and female were observed to undulate their bodies in rhythm while holding each other by the lip. This behavior led to wounded upper lips in both partners. Unfortunately, the spawning behavior was not observed during the study.

In the life cycle of S. argus, it appears that both adults and their offspring have different salinity requirements - the offspring live in brackish water while adults have to spawn in waters of higher salinity.

The spawning season of S. argus likely correspond to that of the rainy season. A female has an average absolute fecundity (number of eggs laid in a spawning season) of 456,320 eggs. It is vital that spawning occurs in high salinity, such as 25‰, with fertilised eggs that stay afloat in seawater. The eggs have an average diameter of 0.75mm and are round and transparent. In fertilised eggs, oil droplets merge together, conferring buoyancy to the eggs while this does not occur in unfertilised eggs which turn opaque and sink.

With a temperature of 27—29 and salinity 25‰, fertilized eggs require about 20 to 24 hours to hatch and larvae measures between 1.75 to 1.88 mm in length. First feeding begins after 3 to 4 days when the larvae’s yolk sac disappears. The larvae then undergo a tholichthys larval stage (see figure 4).

Tolerance to salinity changes

Scatophagus argus being euryhaline (able to thrive in both salt and freshwater) has been documented to be able to withstand sudden salinity changes between 0% to 30%.

Venomous fin spine

Symptoms: pain, redness, swelling, throbbing sensation, dizziness

Treatment: treat wound with hot water, medical treatment is recommended

Nature of fin spine

Like all other Scatophagids, S. argus possess venomous fin spines for defence purposes, but the pain caused by S. argus is alleged to be more painful. These spines are not used as offense but inflict painful wounds when the fish is handled carelessly. Some fishermen who are oblivious of the venomous spines have been wounded by them. Fortunately, the protein-based venom present in the spines is seldom life-threatening.

The venomous spines of S. argus is well-described by Cameron & Endean. All fin spines of S. argus contain venom glands - the 11 dorsal fin spines, 2 pelvic fin spines, and 4 anal fin spines. Each spine is sharp and pointed, and consists of two lateral grooves that contain venom gland cells. Smaller fishes were found to have relatively longer glands compared to larger fishes. However, the longest gland found in any of the specimens studied did not correspond to a particular fin spine, that is, the longest venom gland can occur in any of the fin spines in S. argus.

In the event that the spine punctures the skin, it erects and pressure exerted on the spine causes the venom to be released into the wound.
Venom’s biochemical nature

In a study done by Sivanet al. on the biochemical nature of the venom of S. argus, it was found that the venom causes haemolysis (lysis of red blood cells) in humans. In addition, when tested on mice, the venom appears to be “cytolytic, oedematous, nociceptive, proteolytic and myotoxic”, leading to tissue damage and pain.

Symptoms

The effects of the venom could be felt within 5 to 10 minutes. In addition to unbearable localized pain at the wound that can last for an hour (Ibister, 2004), other symptoms include redness, swelling and a throbbing sensation that extends to the limbs, followed by dizziness. The severity of the venom varies depending on the amount of venom injected, and the size of the fish.

Treatment

The wound should be cleaned, and is typically treated by submerging it into hot water. This suggests that wounds inflicted by S. argus are treated similarly as like any other venomous fish stings. It is important to sought medical treatment in case there is any likely infection of the wound and if the pain does not subside.

Uses

Aquarium fish
Scatophagus argus is a popular aquarium fish sold in many countries including Singapore. Juveniles are usually caught from the wild for aquariums fish trade.

Video 2. Scatophagus argus in (left) freshwater aquarium and (right) brackish aquarium with the spotted green pufferfish and archer fish as tankmates (Video obtained from Youtube under fair use).

Food fish

Scatophagus argus is also sold fresh or salted in markets as food in the Indo-Pacific islands and Southeast Asian region in countries such as Cambodia. In certain countries, S. argus is of minor commercial importance and is not frequently sold in markets, while in countries, such as the Philippines, it is highly priced and considered a delicacy.

In Singapore, S. argus is sold in markets, such as those in Chinatown, particularly during the Chinese Lunar New Year. This is because the spawning period of S. argus happens to fall in the early months of the year, and when these fishes aggregate to spawn and females carry riped eggs, they are highly sought-after as food fish (Kwik, 2014, pers comms).

Figure 12. Grilled Scatophagus argus prepared as a dish (Image by Hernee Samshudin, obtained from herneenazir.com, Creative Commons Attribution-NonCommercial 3.0 Unported License).

Taxonavigation
Note: Each subsequent taxon is a subset of the one before it.

Animalia
Bilateria
Deuterostomia
Chordata
Vertebrata
Gnathostoma
Osteichthyes
Actinopterygii
Neopterygii
Teleostei
Acanthopterygii
Perciformes
Acanthuroidei
Scatophagidae*

Scatophagus Cuvier in Cuvier and Valenciennes, 1831
Scatophagus argus (Linnaeus, 1766)

* It must be noted that Scatophagidae in Pisces is not a junior homonym of Scatophagidae in Diptera. The spelling of “Scatophagidae” in Diptera is a misspelling of the correct term, “Scathophagidae”, which is based on the genus Scathophaga Meigen, 1803: 277.

Phylogeny

Currently, it seems that the phylogenetic relationships within the suborder Acanthuroidei have yet to be resolved, with different families proposed to be the sister family of Scatophagidae.

Thus far, however, it seems that the Chaetodontidae (butterflyfishes) is closely related to Scatophagidae. According to the study done by Fessler & Westneat, Scatophagidae appears to be the sister group to Pomacanthidae (marine angelfish), and that this sister-family pair (Scatophagidae and Pomacanthidae) is the clade most closely related to Chaetodontidae (butterflyfishes) (see figure 9 below).

Within Scatophagidae, however, the phylogenetics has yet to be studied.
PISCES. THORACICI. Chætodon.


Art. spec. 94. Chætodon li- neis utrinque 2 nigris, ra- dio quarto dorsiali longissi- mo fetiformi.

Gros. musf. 2. n. 194. Chæ- todon officulus dorsiibus 3 aculeatis, quarto fetiformi, 7 subsequentibus iterum aculeatis.

Seb. musf. 3. t. 25. f. 8.

Habitat in Indiis.


Habitat in India; et Mus. Schloæeri.

16. C. cauda integræ, spinis pin- ne dorsiibus 12, corpore lirí- ato, rostro prominenti.


f. 7. Chætodon flavecens, fasciis 5 fuscis.

Art. spec. 95. Chætodon ma- crolepidotus, lineis utrinque tribus nigris latissimis, linea quartâ in cauda.

Amm. acad. 1. p. 313. La- brus rostro refleixo, fasciis lateralisbus 3 fuscis.

Gros. musf. 1. n. 110. Chæ- todon rostro longo offeo, mac- rolepidotus albo flavescens lineis transversalisibus 4 bruneo-

Seb. musf. 3. t. 25. f. 9.

Habitat in Indiis.

17. C. cauda bifida, spinis pinne dorsiibus 12, corpore fasciis fuscis.

Musf.
Conservation status and threats

*Scatophagus argus* does not seem to face any risk of extinction. It is not threatened nor endangered in Singapore and is also listed as “Least Concern” on IUCN Red List of Threatened Species. However, potential localized threats might exist given that *S. argus* occur in coastal areas, and is thus subjected to threats such as pollution in estuarine areas, and coastal habitat loss through development activities such as land reclamation. In Singapore, coastal developments and over-fishing may affect local populations.

Acknowledgement

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Personal Communications

Kwik, Jeffrey Teik Being, Post-doctoral Research Fellow, Freshwater and Invasion Biology Lab, Department of Biological Sciences, National University of Singapore.

References
