Oliva ispidula var. samarensis Johnson, 1915 [Oliva oliva “complex”]
raised to specific level, with remarks on its feeding behavior.
Infraspecific variability and Iconography.

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Key words
Mollusca, Gastropoda, Olividae, Oliva samarensis, Palawan, Philippines.

Abstract
In 1915, JOHNSON recognized some Oliva specimens from Samar Is. (Philippines) as a variety of
Oliva ispidula (auct.) and named them Oliva ispidula var. samarensis. After the examination by
ÖLSSON & DANCE (1966) of the Oliva types in Linné’s collection, this taxon was assigned to the
Oliva oliva “complex.” Subsequently, this species was clearly separated from based on the
evident biological differences between the two taxa and on their sympatric occurrence in the
Palawan Is. (Philippines) (PERINI, 2000a). After evaluation of the morphological differences
separating it from Oliva tigridella Duclos, 1835, the specific status of Oliva samarensis Johnson,
1915, is validated herein.

Type Material
On May 1st 1915, JOHNSON deposited six syntypes in the Academy of Natural Sciences of
Philadelphia, where they are labeled N. 14984.

Additional Material
- Oliva oliva (Linné, 1758): 287 specimens from India, Sri Lanka, Indonesia, Philippines
- Oliva samarensis Johnson, 1915 : 475 specimens from Indonesia and Philippines.
- Oliva tigridella Duclos, 1835: 339 specimens from Indonesia, Philippines, Taiwan,
  Japan, Australia, New Caledonia.
All the above material is in the Author collection.

Introduction
In addition to the intraspecific variability of taxa included in the Oliva oliva “complex,”
the confusion characterizing this group stems from the erroneous identification of the
Oliva types in Linné’s collection, now located at the Linnean Society of London. With
regard to this complex, Linné named two taxa: Voluta oliva Linné, 1758, and Voluta
ispidula Linné, 1758. In 1789, Bruguière established that Linné’s two taxa did not belong
to the genus Voluta, but should be placed in a new genus. Applying the principles of
tautonomy and monotypy, he established the genus Oliva, with Oliva oliva (Linné, 1758)
as the type species.
In 1966, ÖLSSON & DANCE (Table 1), examined the Oliva types in the Linné collection
and ascertained the following:
- The Oliva ispidula (Linné, 1758) types do not belong to the genus Oliva, but to the
genus Agaronia; therefore, the name “ispidula Linné, 1758” is not available for the
genus Oliva.
- Among the five shells representing the Oliva oliva (Linné, 1758) types, only the
  one labeled N. 350, was considered original and, for that reason designated as lec
totype of Oliva oliva (Linné, 1758). The other four are homogeneous among
  themselves and have been considered as not belonging to Linné’s collection, but
  added after Linné’s death. These specimens were recognized as conspecific with
  those named by Röding in 1798 as Porphyria vidua (taxon subsequently placed in
  the genus Oliva) during the classification of the Bolten collection.
For this reason all authors dealing with the systematics of these gastropods prior to
1966 identified as Oliva oliva (Linné, 1758) the species now known unequivocally as
Oliva vidua (Röding, 1798) and Oliva ispidula (Linné, 1758), the taxa composing the
recent Oliva oliva “complex.”
JOHNSON in 1915 also followed this erroneous classification (Table 2) when he named a variety of *ispidula* (auct.) as *samarensis*. He wrote: “Specimens from Samar, Philippines, collected by Mr. E.L. Moseley, are all uniform in color, representing the dark reticulated form (*Thes. Conch.*, fig 248). This might bear the varietal name of *samarensis*.”

After 1966, considering *ispidula* (auct.) a synonym of *oliva* (auct.) and being characterized by a great variability, ZEIGLER & PORRECA (1969) located the var. *samarensis* in the *Oliva oliva* “complex” (Table 3).

**Description**
The shell of *Oliva samarensis* has a fusiform appearance, is slender and never biconical, it has the shoulder very weakly developed; the last whorl occupies more than 5/6 of the entire shell. After the protoconch, the spire bears an average of 4.5 whorls and is distinctly raised, commonly with a concave outline; moreover, it is often characterized by a rather wide subsutural channel. The protoconch is small, flat, and always clear, even in melanistic specimens. The suprasutural callosity is rather small even in full-grown specimens, smooth and slightly concave. The aperture is always dark inside; its external lip is gently arched, never straight, while the columellar folds are always well evident with no callosity even in old specimens. The fasciole area is smooth and never wrinkled. The appearance and proportions of the adult shell are maintained throughout development. The size, average to small for the genus, reaches an average of 40 mm.

**Discussion**
The differences between *Oliva oliva* and *Oliva samarensis* have already been widely examined in a previous work (PERINI, 2000). It is perhaps interesting to point out some differences between the latter taxon and *Oliva tigridella*. That species was recently raised to the specific level (TURSCH & GREIFENEDER, 2001) after having been considered a form of *Oliva oliva* for a long time.

The infraspecific variability of *Oliva samarensis* is very limited, primarily in color, rather than shape (Fig. 1). This homogeneity of shape is maintained even during growth (not always the case in *Oliva oliva*), as evident in the specimen of Fig. 2a. The geographical range seems limited to the Indonesian and Philippine Archipelagos.
The shell of *Oliva samarensis* is fusiform, slender with a rather tall spire; its outline is often concave. In very rare specimens (usually subadults) the spire is much taller because of the angle of growth of the shell to its own axis.

The appearance of these specimens (Fig. 3) is very similar to *Oliva oliva* var. *longispira* Bridgman, 1906. It is noteworthy that ZEIGLER & PORRECA (1969) synonymized *Oliva samarensis* with this very species (Table 3). The protoconch is much extended because of the strongly developed last whorl, the one just before the transition. Beyond the protoconch, the spire of *Oliva samarensis* consists on average of 4.5 whorls. The entire shell can be more than 45 mm in length.

A small percentage of *Oliva samarensis* specimens with a completely black shell (Fig. 2a) are often present in colonies of normally colored specimens. Some of these colonies have been observed at several sites in Palawan Is. (Philippines) where the substrate consists of beige sand. This form, named *gratiosa* by Vanatta in 1915, permits the assumption of a genetic melanism, which is not cryptic, with the black coloration already present in the juvenile stage.
Oliva tigridella shows high infraspecific variability, both morphologic or chromatic. This variability is surely a consequence of genetic drift arising from infraspecific diversity in geographically isolated colonies. This phenomenon was also reported in Oliva fulgurator (Röding, 1798) and Oliva spicata (Röding, 1798) by TURSCH et al. (1998); however, it does not depend upon a wide geographical range for the species. Nevertheless Oliva tigridella is present across a rather wide geographical area including Indonesia, Northern Australia, and other Pacific islands in addition to Philippines. Its infraspecific variability is clearly evident also in the Philippines colonies (Fig. 4).

The shell of O. tigridella, rarely more than 30 mm in length, is rather small, and rather broad at the shoulder, often giving a biconical appearance. The protoconch is flat and rounded, while the spire, always clearly extended, consist on average of 3.5 whorls. When Oliva tigridella colonies occur on clear substrates, the individual specimens have a uniformly grey-beige, yellow-orange or orange-pink shell. Longitudinal black bands are rarely present, while slight brown dots are observed more frequently. Only when the substrate is very dark are O. tigridella colonies constituted of uniformly dark specimens (Fig. 2b). Some of these colonies have been observed in Probolinggo (Java Is., Indonesia) where the substrate is composed of volcanic sand (Ongko, pers. com.). Therefore, in O. tigridella the dark coloration is cryptic and seems induced by their habitat.

When O. samarensis and O. tigridella occur together, the coloration is often similar (Fig. 5). Very rarely, both species show a dark band at the shoulder (frequently observed in O. oliva) and, when present, it is not continuous, but segmented.
Conclusions

Oliva samarensis Johnson, 1915, is considered valid at the species level based upon the following:

In the recent work by Tursch & Greifeneder (2001) on the genus Oliva, after a careful morphological study, the two authors raise *O. tigridella* Duclos, 1835, to the species level, thus recognizing it as a second species within the *Oliva oliva* “complex.” The var. *samarensis* Johnson, 1915, was synonymized with *O. oliva* (Linné, 1758), not with *O. tigridella* Duclos, 1835, recognizing it as substantially different from the latter (Table 5). This morphological difference is herein confirmed by a comparative examination of more than 1000 specimens from the typical localities of each species.

In a previous work (Perini, 2000a) the biological differences between *O. oliva* (Linné, 1758) and a sympatric *Oliva* species in the Palawan Is. (Philippines) were pointed out. That *Oliva* species, belonging also to the *Oliva oliva* “complex,” was named *Oliva* “G”. This temporary name, introduced by Tursch et al. (1992), was utilized because, considering the complexity of the present nomenclature referable to the possible taxa included within the *Oliva oliva* “complex,” a careful examination was required before restoring a previously synonymized name. Considering the criterion of priority, it was necessary that the name refer unequivocally to the species considered and preferable that the relative types be in existence and informative.

The study has pointed out the var. *samarensis*, named by Johnson (1915), corresponds perfectly both in morphology and in provenance (Philippines) to the previously mentioned *Oliva* “G”. Therefore, considering the morphological and biological differences mentioned above and summarized in Table 6, the validity of *Oliva samarensis* Johnson, 1915, at the species level is confirmed.
Tab. 6  
(All the illustrated specimens are from Philippines Is.)

<table>
<thead>
<tr>
<th></th>
<th>Oliva samarensis</th>
<th>Oliva oliva</th>
<th>Oliva tigridella</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Johnson, 1915</td>
<td>(Linnaeus, 1758)</td>
<td>Duclos, 1835</td>
</tr>
<tr>
<td>Suprasutural callosity</td>
<td>smooth, slightly concave</td>
<td>convex, often corrugated</td>
<td>no swollen</td>
</tr>
<tr>
<td>Subsutural channel's width</td>
<td>fairly wide</td>
<td>apparently very narrow</td>
<td>moderately narrow</td>
</tr>
<tr>
<td>Columellar plications</td>
<td>well evident</td>
<td>replaced by a callus</td>
<td>two ridges well evident</td>
</tr>
<tr>
<td>Shape</td>
<td>fusiform</td>
<td>cylindrical</td>
<td>broad fusiform to biconical</td>
</tr>
<tr>
<td>Fasciole's area</td>
<td>smooth</td>
<td>clearly wavy</td>
<td>smooth</td>
</tr>
<tr>
<td>Medium adult size (mm)</td>
<td>40</td>
<td>42</td>
<td>28</td>
</tr>
</tbody>
</table>

Remarks on the feeding behavior

Considering how observations relative to *O. samarensis* are probably common to the behavior of many other *Oliva* species, it is interesting to comment on the photo sequence of Fig. 6 A-F.

The observation took place on the southern coast of the Palawan Is. (Philippines), about 3 km south of Aborlan village (9°23’0”N, 118°32’5”E). The purpose was to measure the reaction speed of *O. samarensis* to appropriate food and to observe the behavior in the successive stages.

During low tide, chicken or fish pieces were put on small tidal areas where there were no clues of olivids. Within 35-40 seconds, the first *O. samarensis* appeared, emerging from the sand at a distance of 60 and 100 cm. After a few centimeters, it turned strongly in the direction of the bait; in Fig. 6A the change in direction is indicated by the track. During the approach, the propodium was kept in the sand while the siphonal canal was continuously swung from side to side. At 2-3 cm from the bait, the propodium emerged from the sand (Fig. 6B) and, upon reaching the food, the mollusk touched it once or twice with excited movements (its reaction seemed to indicate that it was able to “taste” the bait). Immediately afterwards and with surprising speed, the two free sides of the propodium seized the prey (Fig. 6C). The animal then rotated onto its left side and the foot contracted, allowing the propodium to put the beef piece into a foot pouch in the lower extremity of the metapodium (Fig. 6D). After carrying out this operation, the olivid disappeared quickly into the sand (Fig. 6E-F). From the first touch between propodium and bait to the complete disappearance of the animal under the sand required an average 7-10 seconds.

This exact behavior was observed several times. The unique observation was that the animal sometimes did not turn over on its side to place the food into the foot pouch. When the bait was rather small, the animal would complete its capture without rotation, disappearing into the sand even more quickly. In such a way, the risk of predation (because of exposure to predators) was very reduced. It has been ascertained that the food preserved in the foot pouch was consumed at irregular time intervals, for up to several days after the capture of the food.
Fig. 6, A-F. *Oliva samarensis*. Feeding behaviour.
(ba = bait, mt = metapodium, pf = pouch-foot, pp = parapodium, pr = propodium, tr = track, sf = siphon)
Acknowledgements
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References

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Tab. 1: Olsson & Dance (1966).

<table>
<thead>
<tr>
<th>Species</th>
<th>Synonyms</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Oliva oliva</em> (Linné, 1758) (type n. 350)</td>
<td><em>Voluta oliva</em> Linné, 1758</td>
</tr>
<tr>
<td><em>Agaronia hispidula</em> (Linné, 1758) (type n. 351)</td>
<td><em>Voluta ispídula</em> Linné, 1758, <em>Oliva plicaria</em> Lamarck, 1811</td>
</tr>
</tbody>
</table>

Tab. 2: Johnson (1915).

<table>
<thead>
<tr>
<th>Species</th>
<th>Synonyms</th>
<th>Variety</th>
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<tbody>
<tr>
<td><em>Oliva oliva</em> (Linné, 1758)</td>
<td><em>Voluta oliva</em> Linné, 1758 <em>Porphyria vidua</em> Bolten (Röding), 1798 <em>Cylindrus nigellus</em> Meuschen <em>Oliva maura</em> Lamarck, 1811 <em>Oliva mauritiana</em> (Martini) Marrat, 1870</td>
<td><em>fenestrata</em> Bolten (Röding), 1798 (= <em>fusca</em> Link, 1807) <em>fulminans</em> Lamarck, 1810 <em>septuralis</em> Lamarck, 1810 <em>macleaya</em> Duclos, 1835 (= <em>fabreii</em> Ducros de St. Germain, 1857)</td>
</tr>
<tr>
<td><em>Oliva ispídula</em> (Linné, 1758)</td>
<td><em>Voluta ispídula</em> Linné, 1758 <em>Oliva ispídula</em> Duclos in Chenu <em>Oliva tigridella</em> Duclos in Chenu</td>
<td><em>stellata</em> Duclos in Chenu <em>taeniata</em> Link, 1807 <em>flaveola</em> Duclos in Chenu <em>candida</em> Lamarck <em>n. var.: samarensis</em> Johnson, 1915</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Species</th>
<th>Synonyms</th>
<th>Color form</th>
</tr>
</thead>
</table>
**Tab. 4:** Petuch & Sargent (1986).

<table>
<thead>
<tr>
<th>Taxon</th>
<th>Synonyms</th>
<th>Color forms</th>
</tr>
</thead>
</table>
| *Oliva oliva* (Linné, 1758) | *ispida* Röding, 1798  
                          | *fenestrata* Johnson, 1915  
                          | *ispidula* Fischer von Waldheim, 1807  
                          | *oliva* Dillwyn, 1817  
                          | *variabilis* Gray, 1858  
                          | *aurea* Martini, 1773  
                          | *mica* Röding, 1798  
                          | *ornata* Röding, 1798  
                          | *punctata* Röding, 1798  
                          | *umbrosa* Röding, 1798  
                          | *ispidula* Marrat, 1871  
                          | *samarensis* Johnson, 1915  
                          | *flaveola* Duclos, 1835  
                          | *jayana* Ducros de St.Germain, 1857  
                          | *dealbata* Röding, 1798 (= *lacteana* Dautzenberg, 1927)  
                          | *oriola* Lamarck, 1811  
                          | *tigridella* Duclos, 1835  |
| *Oliva oliva taeniata* Link, 1807 |                                                   | *algida* Vanatta, 1915  
                          |                                                   | *broderipi* Ducros de St.Germain, 1857  
                          |                                                   | *candida* Lamarck, 1811  
                          |                                                   | *martini* Dautzenberg, 1927  
                          |                                                   | *stellata* Duclos, 1835  |

**Tab. 5:** Tursch & Greifeneder (2001).

<table>
<thead>
<tr>
<th>Species</th>
<th>Synonyms</th>
</tr>
</thead>
</table>
| *Oliva oliva* (Linné, 1758) | *Voluta oliva* Linné, 1758  
                          | *Oliva oriola* Lamarck, 1811  
                          | *Oliva flaveola* Duclos, 1835  
                          | *Oliva olorinella* Duclos, 1835  
                          | *Oliva pygmaea* Reeve, 1850  
                          | *Oliva ispidula* (auct.) not Linné, 1758 var.  
                          | *longispira* Bridgman, 1901  
                          | *Oliva ispidula* (auct.) not Linné, 1758 var. *algida*  
                          | *Vanatta, 1915*  
                          | *Oliva ispidula* (auct.) not Linné, 1758 var. *gratiosa*  
                          | *Vanatta, 1915*  
                          | *Oliva ispidula* (auct.) not Linné, 1758 var. *samarensis*  
                          | *Johnson, 1915*  |
| *Oliva tigridella* Duclos, 1835 | *Oliva stelleta* Duclos, 1835  
                          | *Oliva rufopicta* Weinkauff, 1878  
                          | *Oliva blanda* Marrat, 1867  
                          | *lacteana* Dautzenberg, 1927  
                          | *Oliva ispidula* (auct.) not Linné, 1758 var. *martini*  
                          | *Dautzenberg, 1927* |