Notes about colour displays observed in female specimens of *Tremoctopus* (Cephalopoda: Octopoda) and their taxonomic value

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Abstract

The dorsal arms of egg carrying females of *Tremoctopus* spp. are characterized by autotomic properties finalized to the protection of the mass of embryos. In case of danger, distal segments of the arms with their large lateral web are detached; mimicking the presence of eggs, the web exhibits different patterns in *Tremoctopus violaceus* and in *Tremoctopus gracilis*. Such patterns may be used to distinguish the two species, in the same way as morphological characteristics of the hectocotylized arm of male are used for taxonomical purposes.

Results and discussion

During August 2002 a large egg-carrying female of *Tremoctopus* sp. was observed and photographed in the coastal waters of Ponza island, in the Tyrrenhenian Sea (Belluscio et al., 2003).

The specimen exhibited a remarkable series of vivid colours such as blue, red, violet, orange, etc., and the observers – researchers engaged in biological sampling – did not attempt to capture it, probably because they were satisfied with the wonderful sight they were documenting with their camera (Fig. 1).

Subsequently, on the basis of the available literature about similar observations on living specimens (Müller, 1852; Kramer, 1937; Voss & Williamson, 1972), the Ponza specimen was assigned to the species *Tremoctopus gracilis* (Orsi Relini et al., 2004). In fact the comparison of colour patterns and distinctive spots exhibited on the dorsal arms by egg-carrying females allowed me to recognize two types of display: one, figured by Delle Chiaie (1830) and described in detail by Müller (1852), on specimens caught in the harbour of Messina (Sicily) (here shown by the figure from Portmann (1952) on the basis of a Ligurian specimen, Fig. 2), consisting in a large round spot, encircled by minor figures, was considered typical of *Tremoctopus violaceus*; another one, in form of transversal bunches of spots figured in a colour table by Voss & Williamson (1972) was considered typical of *T. gracilis* (Fig. 3).

The pattern observed by Kramer (1937) in some Adriatic specimens (Fig. 4) appeared similar to the latter type. So, in the same time, a new exotic species of Indopafic origin was listed among the cephalopods recently immigrated from the Red Sea (Salman et al., 1999; Salman & Katalan, 2002) and the arrival of this immigrant was traced back to 67 years earlier (Orsi Relini et al., 2004).

The aim of these brief notes is to show the pictures of the females colour patterns which, for editorial reasons, could not be documented in the previous paper (Orsi Relini et al., 2004); some comments on their possible taxonomic use are added.

In a recent taxonomic survey of the genus *Tremoctopus* Delle Chiaie, 1830 four species are listed (Mangold et al., 1996): *Tremoctopus violaceus* Delle Chiaie, 1830, type locality: Mediterranean Sea; *Tremoctopus gracilis* (Eydoux & Souleyet, 1852), type locality: 8°N 106°W (Pacific Ocean);
Fig. 1. The female Tremoctopus of Ponza in the photographic sequence by Conticelli and Pelliciari. Both colour changes and different extensions of the web can be appreciated; in the lower right corner the egg mass is visible.

Fig. 1. La femmina di Tremoctopus di Ponza nella sequenza fotografica di Conticelli e Pelliciari. Si possono apprezzare sia i cambi di colore sia l’estensione variabile della membrana interbrachiale; nell’angolo in basso a destra si vede la massa delle uova.
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Tremoctopus gelatus Thomas, 1977, type locality: East Florida (Atlantic Ocean);
Tremoctopus robsoni Kirk, 1884 (or T. robsonianus as indicated by O’Shea, 1999, who resurrected the name by Kirk), type locality: New Zealand.
Tremoctopus gracilis, in the revision of the genus by Thomas (1977), was considered a subspecies of T. violaceus. Later on the separation of the two taxa in terms of species was possible on the basis of the structure of their hectocotylus (Mangold et al., 1996). The use of morphological patterns of the sexual apparatus for taxonomical purposes is of widespread use in several animal groups. In particular, in this genus of cephalopods, the counts of proximal and distal suckers of the hectocotylus are easily transformed into a key for species or subspecies identification (Thomas, 1977; Mangold et al., 1996).

On the contrary, females have been recognized by less precise criteria: those of T. gelatus are characterized, as well as in males, by gelatinous tissues (Thomas, 1977); those of T. robsoni have exceedingly long and convoluted distal oviducts (O’Shea, 1999); those of T. violaceus and T. gracilis are almost indistinguishable in their juvenile phase (Thomas, 1977). Nesis (1987) suggested that the chromatic pattern of the web surrounding the dorsal arms could be used to distinguish the two so similar forms (in his opinion, subspecies). The same author gave also evidence to the role of this web as a defensive tool, by means of the detachment of segments in the process of autotomy, which Kramer (1937) had previously described.

Nesis wrote (1987: p. 84): “Autotomy occurs along a predetermined line perpendicular to the axis of the arm.”
The broken off portion has one sucker and one to three colored spots. Being deprived of nervous control, it instantly widens up to the size of an handkerchief, and the bright spots suddenly blazing before predator’s eyes on the transparent membrane distract and probably frighten the enemy, thus allowing the female to flee”.

It may be added that the spots or bunch of spots mimic the presence of eggs or groups of eggs. As a consequence, the coloration of the female dorsal arms are not an adaption for the defence of the individual, as generally occurs in octopuses, but for the defence of the egg mass that the female is brooding at the base of the dorsal arms. The detached arm segment and its colour display can therefore be considered as the terminal expression of the female sexuality as, the hectocotylus, with its own autotomic capabilities, is the final expression of the male sexuality. On such a basis, the use of egg-carrying female colour pattern as a taxonomic tool, albeit till now scarcely used in octopuses, but for the defence of the egg mass that the female is brooding at the base of the dorsal arms. The detached arm segment and its colour display can therefore be considered as the terminal expression of the female sexuality as, the hectocotylus, with its own autotomic capabilities, is the final expression of the male sexuality.

In occasion of new records of adult females, in my opinion it is important to pay particular attention to their colour pattern. It is not excluded that the description of colour can be completed with notes on the distribution of bioluminescent tissues. In fact, an occasional nocturnal underwater record of *Tremoctopus “violaceus”* occurred in the Red Sea near Hurghada (Goud, 1989). The animal could be photographed thanks to its light display. The species concerned was probably *T. gracilis* (Fig. 5); however, as more and more pictures of *Tremoctopus* are stored in the internet, the complexity of morphological and chromatic patterns of this genus gains evidence as well as the paucity of the present taxonomical categories. New species seem to be waiting to be recognized.

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**References**


