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## THE GENUS *NEREIS* L., 1758 (POLYCHAETA, NEREIDIDAE): STATE OF THE ART FOR IDENTIFICATION OF MEDITERRANEAN SPECIES

**Abstract** - *The Genus Nereis L., 1758 (Polychaeta, Nereididae): State of the Art for Identification of Mediterranean Species.* The existence of critical problems in the identification of species within the genus *Nereis* L., 1758 (Annelida Polychaeta: Nereididae) has led to several misidentifications within Mediterranean taxa. In the present paper we report a discussion on the Mediterranean species, with a re-examination of specimens collected along the Italian coasts. A redescription of each species is provided, pinpointing the diagnostic characters with detailed figures for easy identification. Old and recent synonymies are also discussed and a key for identification is provided.

**Keywords** - Nereididae, *Nereis*, Italian coasts, Mediterranean Sea.

**Riassunto** - *Il genere Nereis L., 1758 (Polychaeta, Nereididae): Stato dell'arte per l'identificazione delle specie mediterranee.* L'esistenza di alcune difficoltà per l'identificazione a livello di specie all'interno del genere *Nereis* L., 1758 (Annelida Polychaeta: Nereididae) ha generato varie identificazioni dubbie o sbagliate. Su queste premesse, nel presente lavoro affrontiamo una discussione sulle specie mediterranee del suddetto genere di policheti, basandoci sul riesame degli individui raccolti nel corso dei nostri studi lungo le coste italiane. Forniamo una ridescrizione di ciascuna specie, corredata di illustrazioni dettagliate dei caratteri diagnostici, per facilitare il processo di identificazione, e delle relative sinonimie e, infine, presentiamo la chiave dicotomica del genere per le specie mediterranee.

**Parole Chiave** - Nereididae, *Nereis*, Coste italiane, Mar Mediterraneo.

### INTRODUCTION

Nereididae Savigny, 1822 is one of the most diverse families of Polychaetes, including 43 genera with currently about 535 species described worldwide (Hutchings *et al.* 2000). They are elongate worms easily recognizable by the presence of two antennae, two biarticulated palps on the prostomium, and an eversible pharynx formed by two rings and bearing a pair of jaws. They are common in the sea on hard and soft bottoms at all depths. Nereidids can also penetrate freshwater and, to a limited extent, even terrestrial environments (Pflugfelder, 1933); they are also commonly found dwelling in brackish environments. Some species have a commercial value as bait for recreational fishery (Gambi *et al.*,

1994) and as food for aquaculture (Olive, 1994). The phylogeny of the family has been analyzed by Fitzhugh (1987) and Glasby (1991; 1993; 1999), and more recently by Bakken and Wilson (2005).

The genus *Nereis* L., 1758 comprises of about 150 species. The main diagnostic characters for the distinction of *Nereis* spp. consist in the armature of the pharynx, the shape of the parapodia and the nature and distribution of chaetae. The pharynx is divided into two rings (the basal or oral ring and the maxillary or distal ring); each ring is subdivided into areas bearing chitinous paragnaths, the arrangement of which is characteristic for each species. The fully developed parapodium consists of a dorsal notopodium, with two or three lobes, namely the superior, the chaetigerous and the inferior, and of a ventral neuropodium, with two lobes, the chaetigerous one with a pre- and a post-chaetal lobes and the inferior one. The number of the notopodial lobes in anterior parapodia and the modifications of the superior lobe of the notopodium in posterior parapodia are important characters for identification. The chaetae are typically compound: according to their shape they may be either homogomph, with the symmetrical shaft-head, and heterogomph, with the distal part of the shaft pronounced on one side. The blade of the compound chaetae may be falcigerous, short and stout with a hooked, or spinigerous, tapered with a thin tip. The morphology of the homogomph falcigerous chaetae in the posterior notopodia is an important diagnostic feature (Bakken *et al.*, 2009).

According to Çınar (2010) and Coll *et al.* (2010), the species of the genus *Nereis* hitherto recorded for the Mediterranean are: *N. funchalensis* (Langerhans, 1880), *N. lamellosa* Ehlers, 1864, *N. pelagica* Linnaeus, 1758, *N. perivisceralis* Claparède, 1868, *N. persica* Fauvel, 1911, *N. pulsatoria* (Savigny, 1822), *N. rava* Ehlers, 1868, *N. splendida* Grube, 1840 and *N. usticensis* Cantone *et al.*, 2003. Five of them (*Nereis funchalensis*, *Nereis perivisceralis*, *Nereis persica*, *Nereis pulsatoria*, *Nereis splendida*) are not reported in the check list of Italian fauna (Castelli *et al.*, 2008), where four addi-

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tional species are listed: *Nereis falsa* Quatrefages, 1865, *Nereis flavipes* Ehlers, 1868, *Nereis jacksoni* Kinberg, 1866, and *Nereis zonata* Malmgren, 1867. However, at present the status of *N. flavipes* is unaccepted, its being considered as a synonym for *N. zonata*.

Varios critical problems exist in the identification of species within the genus, reflecting the variability of the distribution of the teeth on the pharynx and the shape of some composite chaetae. To settle the confusion about the correct identification of species within the genus *Nereis*, we examined and re-described the morphological characteristics of all the species collected along the Italian coast, in order to provide features useful for easy discrimination between species. The synonymies are also reviewed and an annotated list of the species currently part of Italian fauna is provided.

## MATERIALS AND METHODS

The examined species of the genus *Nereis* L., 1758 preserved in the collections of the Department of Zoology of the University of Salento (Lecce) and of the Department of Biology of the University of Rome "Tor Vergata", come from various sites along Italian coast. External body structures, as well as jaw apparatus and other diagnostic characters of the specimens, have been examined under stereomicroscope and optical microscope. Drawings were obtained after dissection by using the camera lucida. Photos of the main diagnostic characters, chetae and pharynx were taken by means of a digital camera.

## RESULTS

### Genus *Nereis* Linnaeus, 1758

The specimens of the genus are characterized by a prostomium with two antennae and two biarticulated palps, and an eversible pharynx with conical chitinous paragnaths on both rings. The diagram of the pharyngeal areas is shown in ventral and dorsal view in Fig. 1a and the shape of the midbody parapodium in Fig. 1b. The different areas are conventionally marked with Roman numbers, areas I-IV are placed in the maxillary ring and areas V-VIII in the oral ring. The parapodia are biramous. The dorsal ramus (notopodium) bears a dorsal cylindrical cirrus and two or three lobes (prechaetal notopodial lobe present or absent), plus the acicular process. The ventral ramus (neuropodium) bears two lobes plus the acicular process, and a ventral cirrus. Notochaetae include homogomph spinigerous and falcigerous chaetae, with the latter present only in median and posterior chaetigers in low number; neurochaetae include homo- and heterogomph spinigers and heterogomph falcigers.

Type species *Nereis pelagica* Linnaeus, 1758

*Nereis pelagica* Linnaeus, 1758. Augener, 1933: 245. Hartmann-Schröder, 1962: 406-407. Imajima, 1972: 142-146, figs. 48-49. Wu *et al.* 1985: 120-123, figs. 67-68. Chambers & Garwood 1992: 38-39, fig. 45. de León-González *et al.*, 1999: 676. Hartmann-Schröder, 1996: 197-199, fig. 86a-f.

A redescription on the species is available in several papers (Hilbig, 1994; Imajima, 2003; Jirkov, 2001; Viéitez *et al.*, 2004). In Fig 1c the paragnath arrangement is shown according to Bakken (2004) and Viéitez *et al.* (2004). Oral ring of pharynx with area V = 0 paragnaths; area VI = 4-5 large conical paragnaths in a circle; areas VII - VIII = irregular rows of conical paragnaths arranged in a mixture of large and small paragnaths (Fig. 1c). Parapodia with two subequal notopodial lobes and a long dorsal cirrus, two neuropodial lobes, one of which as long as the acicular process, long ventral cirrus mostly in the posterior parapodia (Fig. 1d). Notochaetae of posterior parapodia include homogomph spinigers and a single falciger with a short, smooth blade (Fig 1e, f). Size up to 100 mm.

*Nereis pelagica* has been reported living among macroalgae from mesolittoral to circalittoral bottoms. It is considered cosmopolitan and a number of sub-species have been described (Hartman, 1959). In the Mediterranean the species is reported from the French (Bellan, 1964) and Iberian coasts (Campoy, 1982; Viéitez *et al.*, 2004), as well as from the Italian coast (Castelli *et al.*, 2008).

*Nereis zonata* Malmgren, 1867

*Nereis zonata* Malmgren, 1867; Fauvel, 1923; Augener, 1933; Chambers & Garwood, 1992.

*Nereis pulsatoria* Savigny, 1822; Viéitez *et al.*, (2004), here referred to synonym.

Material examined: Adriatic Sea Costa Merlata 1 m 5 spec.; Otranto 1 m 4 spec.; Torre Mileto 1m 4 spec.; Tyrrhenian Sea Isola di Pianosa, 3 m 12 spec.; Ischia Porto 1 m 44 spec.; Civitavecchia 1m 163 spec.; Pontine Islands 10-20m 28 spec.; Fregene artificial reef 14m 15 spec., Isola del Giglio 5-53m 25 spec.

A redescription of this species has been presented in several papers (Imajima, 2003; Jirkov, 2001; Bakken *et al.*, 2009). In our specimens paragnaths are arranged in the oral ring in the following way: area VI = 9-11 small conical paragnaths, area V = 0, areas VII-VIII = a single anterior row of large paragnaths plus two-three rows of small paragnaths (Fig. 2a, b, c). Anterior parapodia with two equal notopodial lobes and a long dorsal cirrus, two neuropodial lobes, one of which as long as the acicular process, posterior parapodia similar to the anterior ones (Fig. 2d). At the midbody and posterior parapodia one or few notochaetae homogomph falcigers with smooth or slightly serrated

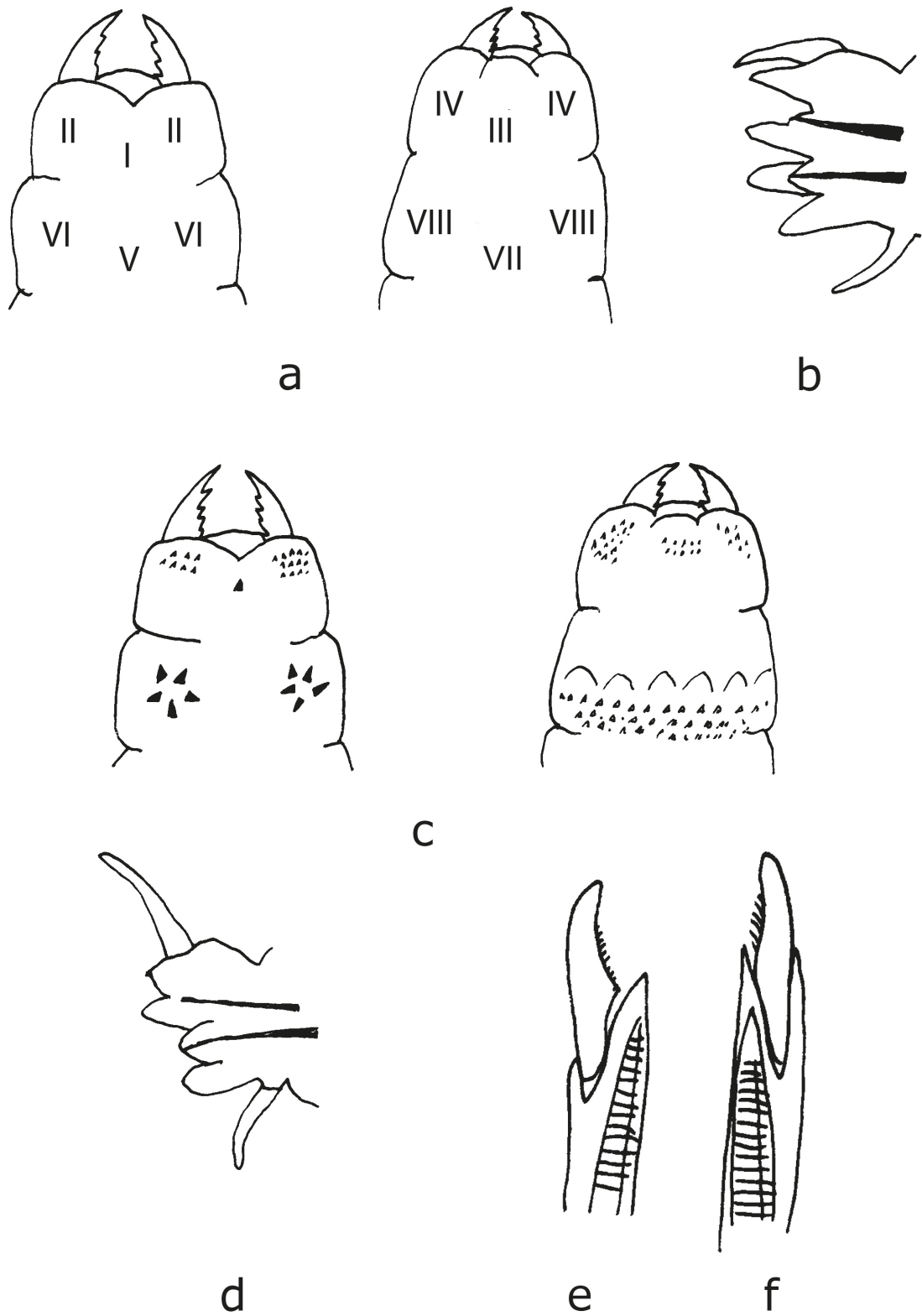


Fig. 1 - a) areas of the pharynx dorsal and ventral views; b) scheme of a parapodium; *Nereis pelagica* c) dorsal and ventral views of the pharynx; d) parapodium; e) heterogomph falciger; f) homogomph falciger.



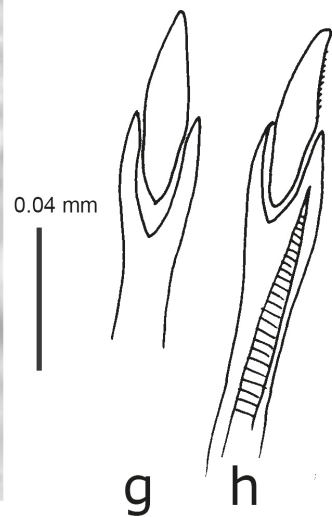
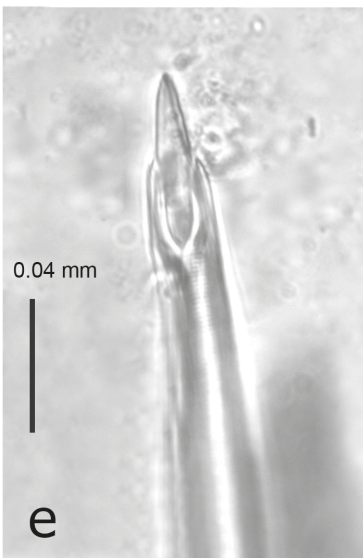
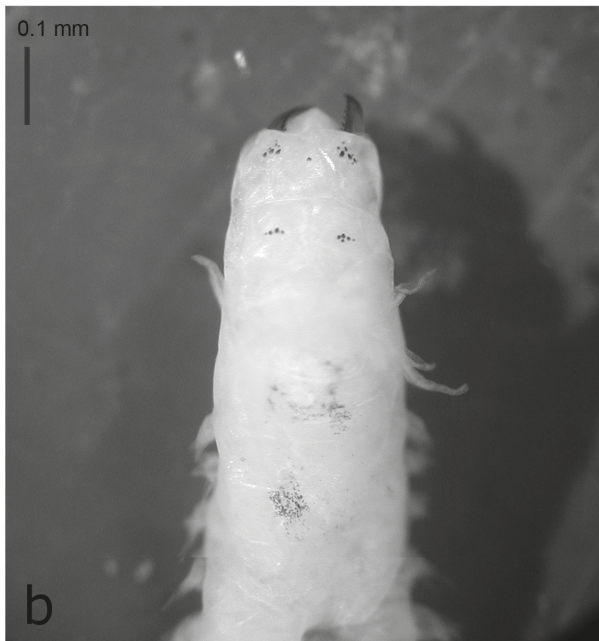
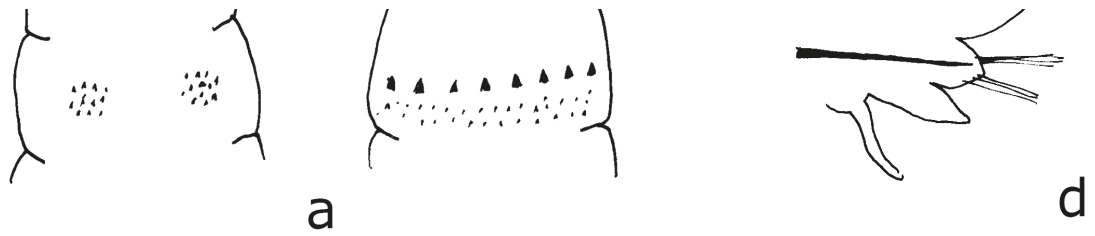


Fig. 2 - *Nereis zonata* a) dorsal and ventral views of the pharynx b) photo showing the anterior end dorsal view; c) photo showing the anterior end ventral view; d) parapodium from last segments; e-f) photos of homomorph falcigers; g) drawing of homomorph falciger in frontal view; h) homomorph falciger in lateral view.



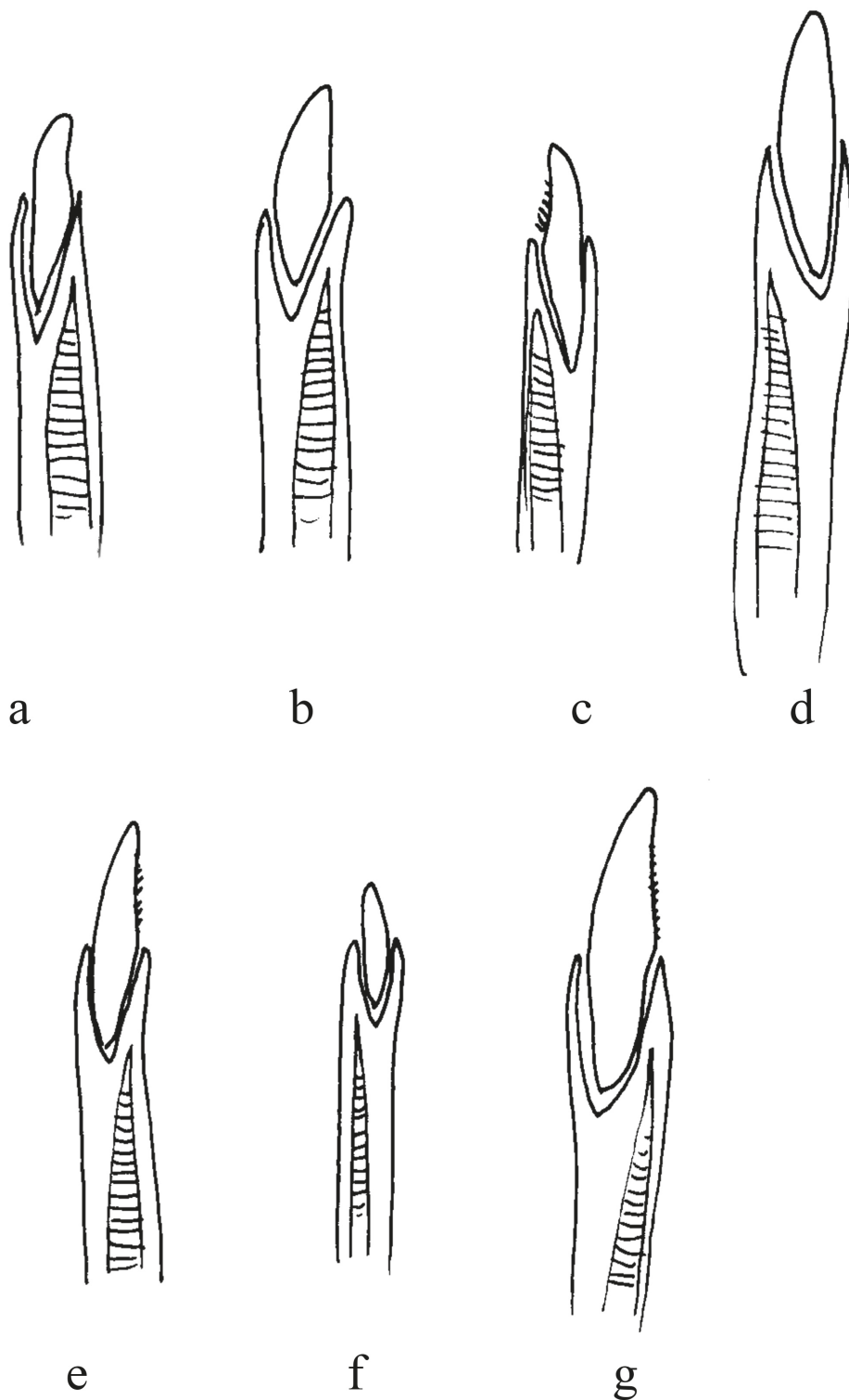


Fig. 3 - Different shape of chaetal blade from different authors: *Nereis pelagica* a) from Fauvel (1923); b) Vieitez *et al.* (2004); d) Bakken (2004); Jirkov (2001). *Nereis zonata* e) Fauvel (1923); f) Jirkov (2001); g) material from the present paper.

blades (Fig 2e, f, g, h) are present. The size is up to 100 mm for 80-90 chaetigers.

*Nereis zonata* was found living on detritic bottoms, among algae and in *Posidonia* beds. This species has a wide distribution (type locality: Spitsbergen, Greenland) and commonly occurred along the Mediterranean and Italian coasts (Fauvel, 1923; Bellan, 1964; Campoy, 1982; Castelli *et al.*, 2008).

*Nereis zonata* is morphologically very similar to *N. pelagica*. In fact they were grouped together in the parsimony analysis by Bakken (2004). However, some differences between the two species are noticeable in the shape of the blade of the notopodial homogomph falcigerous chaetae and in the disposition of paragnaths in the oral ring areas. The variability of chaetal shape of both species is reported in Fig 3 (*N. pelagica* Fig 3 a,b,c,d; *N. zonata* Fig. 3 e,f,g) following descriptions by different authors. In the specimens examined in this work, the homogomph falciger chaetae correspond to those reported by Fauvel (1923).

Viéitez *et al.* (2004) considered *N. pulsatoria* Savigny, 1822 as synonym of *N. zonata*, but chaetal shape reported by these authors is very different from that of *N. zonata*. Moreover, no type material was examined by the authors. Nor is any figure of paragnath arrangement available in the original description of *N. pulsatoria*.

*Nereis perivisceralis* Claparède, 1868

*Nereis zonata* x *rava* Amoureux, 1976; *N. splendida* Fauvel, 1923.

Material examined: Tyrrhenian Sea Isola dell'Asinara Sardinia 3m 15 spec.; Isola del Giglio 35m 3 spec. Adriatic Sea, Torre Mileto 20m 26 spec.

A re-description of the species has been presented in Viéitez *et al.* (2004). Our material agrees with this description, having a prostomium with very short antennae (Fig. 4b), paragnath arrangement in the oral ring as follows: area V = 0, area VI = patch of 8-10 small conical paragnaths, areas VII-VIII = a single row of paragnaths (Fig. 4a, b, c). Anterior and posterior parapodia with dorsal sharpened lobes and a reduced neuropodial lobe (Fig 4c). Notopodial superior lobes progressively reduced from anterior to posterior parapodia. Homogomph falcigerous notochaetae at median and posterior parapodia have few serrated teeth at the base (Fig 4 e, f, g). The size is about 20 mm for 70 chaetigers.

This species inhabits photophilous as well as sciaphilous environments from meso- to circalittoral, with various hydrodynamic degrees on hard bottom with algae and bryozoans and soft bottoms with coarse sediments. We found *N. perivisceralis* also on *Sabellaria spinulosa* bioconstruction at shallow depths. The species is distributed in the North Atlantic and the Mediterranean sea with the Gulf of Naples as type locality.

*Nereis persica* Fauvel, 1911

*Nereis zonata persica*; Fauvel, 1923

*Nereis persica*; Day, 1967; Ben-Eliahu, 1972

This species was described as a variety of *N. zonata* by Fauvel (1911). Figures of this species were rearranged from Cantone *et al.* (2003) and Day (1967). Oral ring of pharynx with area V = 0, area VI = a cluster of 6-11 paragnaths, areas VII and VIII = one anterior row of large paragnaths and two-three rows of small paragnaths (Fig. 5a). Anterior parapodia with notopodial sharpened lobes which became smaller and slender in the posterior parapodia. From midbody to posterior segments homogomph falcigerous notochaetae have blades with two-three blunt teeth (Fig. 5b).

This species was previously reported from the Indian Ocean, Pacific Ocean, Red Sea, Suez Canal and Mediterranean, with Persian Gulf as the type locality (Day 1967). In the Mediterranean, it was reported from the Israeli and Turkey coasts (Ben-Eliahu, 1972; Çınar, 2010) and it is considered an introduced species.

*Nereis funchalensis* (Langerhans, 1880)

*Nereis maroccensis* Amoureux, 1976

*Nereis persica* Fresi *et al.*, 1984

*Nereis jacksoni* Kinberg, 1865; San Martin *et al.*, 1982

More than two hundred specimens of this species were collected together with *N. zonata*, on the hard bottom of the harbour of Ischia Island in the Tyrrhenian Sea at 1 m depth (Fresi *et al.*, 1984), their being dubiously ascribed to the species *N. persica*. The careful re-examination of original figures of chaetae and paragnath arrangement of pharynx (here showed in Fig. 5 c, e,f), which correspond well to the description of this taxon available in Viéitez *et al.* (2004) and Bakken and Wilson (2005), made it possible to attribute such specimens to the species *N. funchalensis*. This species has paragnath arrangement of the oral ring with areas V and VI and VII-VIII placed in a almost continuous band of small teeth (Fig. 5c), and parapodia with rounded notopodial and neuropodial lobes (Fig. 5d). Homogomph falcigers notochaetae with two-three blunt teeth, (Fig. 5e) present from midbody to posterior segments. Posterior heterogomph notochaetae with very short blade (Fig. 5f).

The species is distributed in Eastern tropical and subtropical Atlantic ocean and Mediterranean sea, with type locality Madeira. It is frequently found on mid-littoral and sublittoral hard bottom with photophilous algae as well as sciaphilous habitat among sponges, corals and calcareous algae.

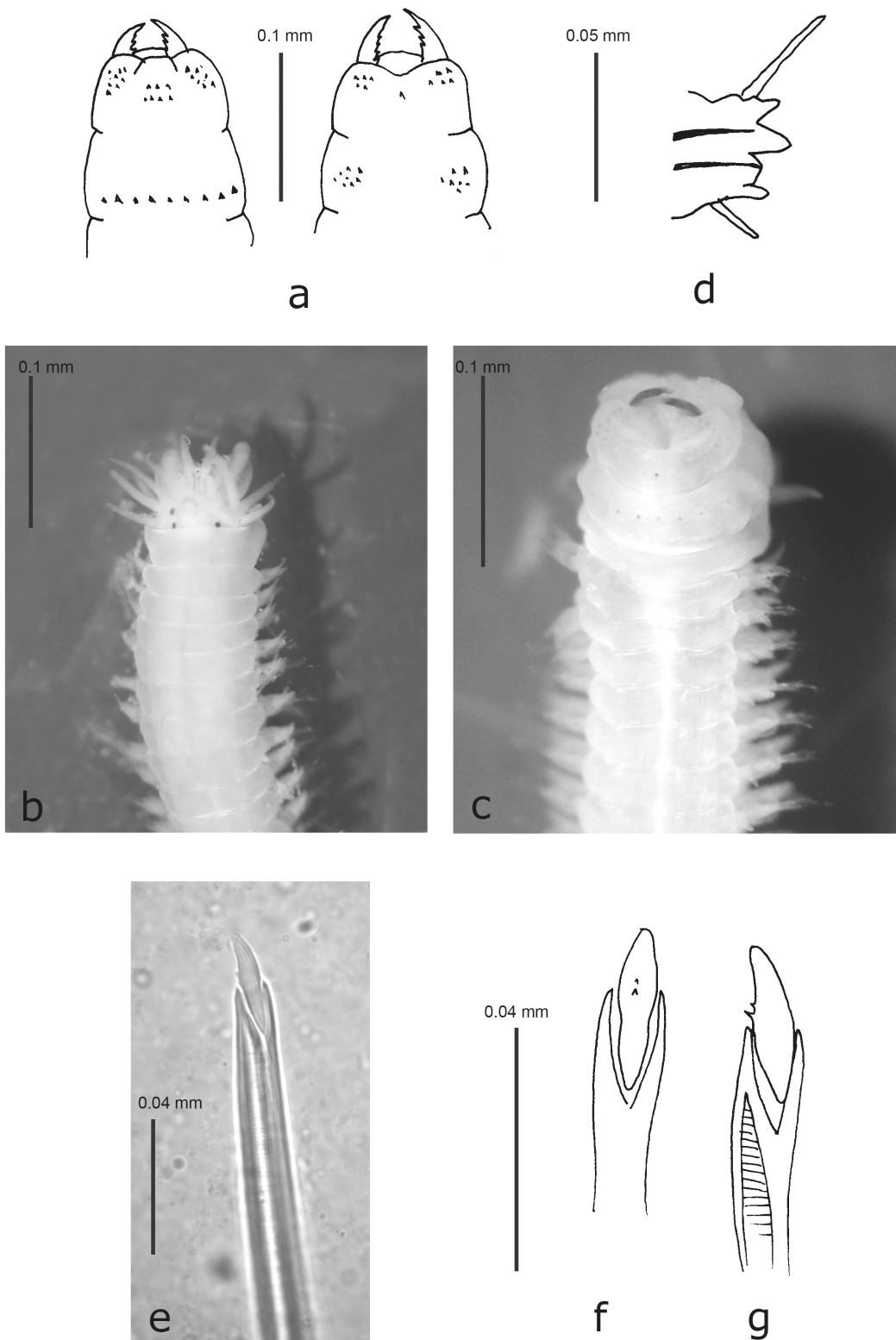


Fig. 4 - *Nereis perivisceralis* a) dorsal and ventral views of the pharynx b) photo showing the anterior end dorsal view; c) photo showing the anterior end ventral view; d) parapodium from last segments; e) photo of homogomph falciger; f) drawing of homogomph falciger in frontal view; g) homogomph falcigers in lateral view.

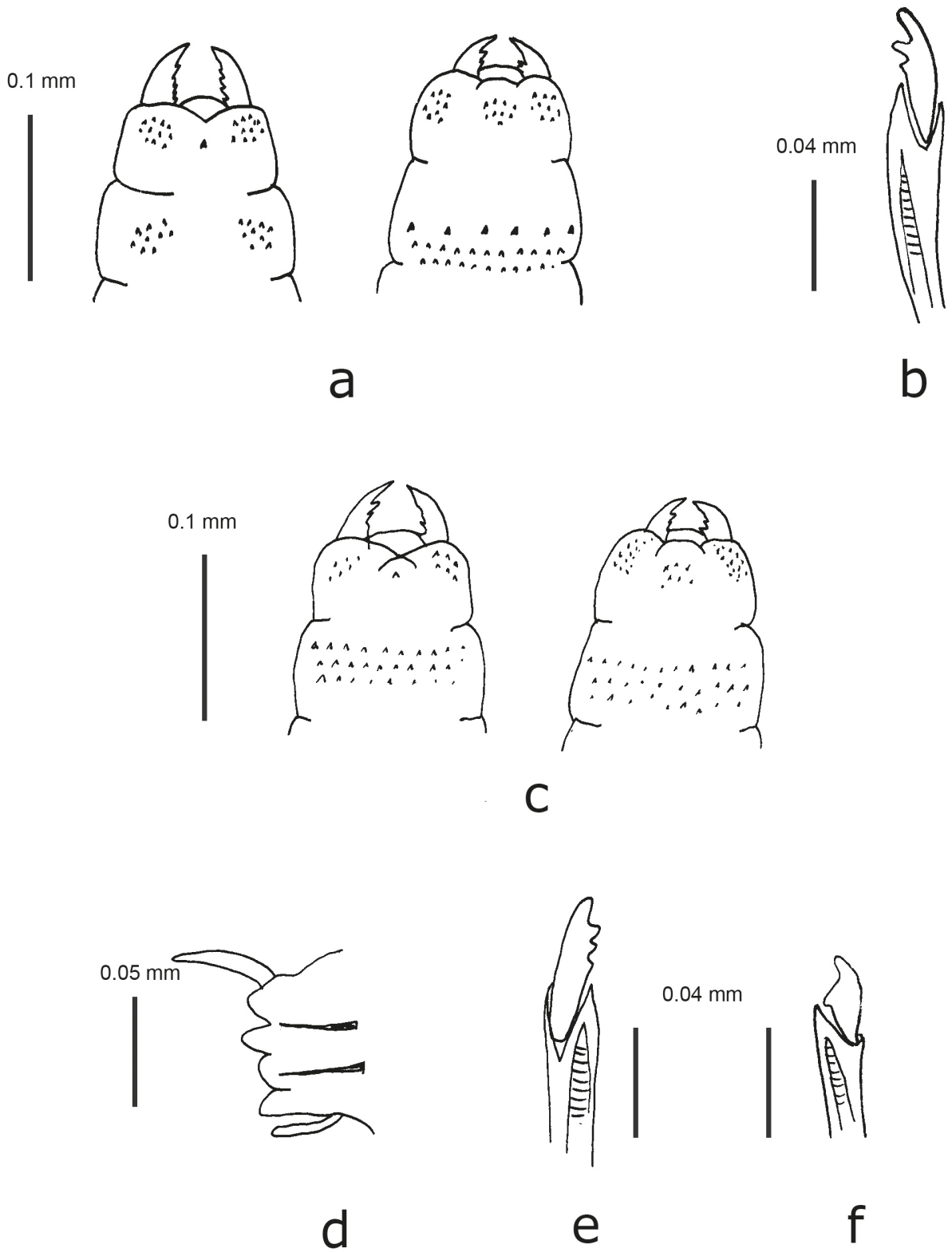


Fig. 5 - *Nereis persica* a) pharynx dorsal and ventral views; b) homogomph falciger in lateral view; *Nereis funchalensis* c) pharynx dorsal and ventral views; d) parapodium from last segments; e) homogomph falciger in lateral view; f) heterogomph falcigers from last segments.

*Nereis jacksoni* Kingberg, 1865

Material examined: Adriatic Sea Otranto 15m 20 spec.; Tyrrhenian Sea Civitavecchia 1m 10 spec.

Small species measuring 30 mm for 70 chaetigers (Fig. 6a). Paragnath arrangement of oral ring; area V = 0, area VI = a cluster of three small paragnaths, areas VII-VIII = a single row of small paragnaths (Fig. 6b). Anterior parapodia with two lobes, the superior of which is smaller and even smaller in posterior parapodia. One-two stout falcigers with two-three large teeth on the blade in median and posterior notopodia (Fig. 6c, d). Posterior heterogomph falcigers with slightly curved blades (Fig. 6c).

The species is circumtropically distributed in the Indo-West-Pacific ocean, with type locality New South Wales (Australia). It was reported several times from the Mediterranean Sea (Harmelin, 1964; Amoureux *et al.*, 1980; Sardà, 1984; Somaschini, 1988; Giangrande, 1988), it is considered an introduced species and Amoureux *et al.* (1980) hypothesized its migration through the Suez Canal.

*Nereis usticensis* Cantone *et al.*, 2003

Material examined: Isole Egadi 15 m 3 spec.; Adriatic Sea Torre Guaceto 5m, 2 spec.

This species was recently described from the Italian coast (Island of Ustica, Sicily) on the basis of distinctive characters in the pharynx and chaetae. Our specimens have a prostomium with very short antennae (Fig. 7 b,d). The pharynx has maxillary ring characterized by the absence of dorsal paragnaths; oral ring with area V = 0, area VI = an oblique row of 5 large conical paragnaths, areas VII-VIII = a single row of large paragnaths (Fig. 7a, b). Homogomph falcigerous notochoetae with blade present from midbody to the posterior parapodia, characterized by three-four blunt teeth and a stout shaft-head (Fig. 7 e, g). The heterogomph falcigers of the neuropodium of the posterior parapodia have a very short blade (Fig. 7 f) Size 20 mm for about 35-40 chaetigers.

The species is endemic to the Mediterranean.

*Nereis rava* Ehlers, 1864

Material examined: Tyrrhenian Sea, Isola dell'Asinara Sardinia 15m 12 spec., Isola di Pianosa 3m 7 spec. Isola del Giglio 5-35m 22 spec.; Pontine Islands 10-30 m 42 spec., Isole Egadi 15 m 15 spec.; Adriatic Sea Apulian coasts (Brindisi) 44 spec. Croazia 31-37m 4 spec. Pharynx oral ring with area V = 0, area VI = 3-5 small conical paragnaths, areas VII-VIII = a single row of large paragnaths (Fig. 8a). Parapodia biramous with two sharpened conical notopodial lobes; neuropodial chetigerous lobes shorter than

neuropodial lobes and inferior narrow lobe not exceeding the chetigerous lobes (Fig. 8b). Homogomph falcigerous notochoetae (Fig. 8 c, d) from median to posterior parapodia, bearing a finely serrate blade with a blunt, slightly hooked end. *N. rava* is also easily distinguished by its characteristic coloration with dorsal brown bands (Fig. 8e). Its size is up to 30 mm for 80 chaetigers.

The species is distributed in the north-tropical West Atlantic and in the Mediterranean Sea (Bellan, 1964; Fresi *et al.*, 1984; Abbiati *et al.*, 1987). It is an eurybathic species, widely distributed in hard sciaphilous habitats from meso- to circalittoral, in *Posidonia* beds, coralligenous bottoms and in vegetated sheltered biotopes such as harbours as a fouling assemblages component.

*Nereis falsa* Quatrefages, 1866*Nereis splendida* Grube, 1840; Viéitez *et al.*, 2004

Material examined from the Adriatic Sea Torre Mileto 1m; Tyrrhenian Sea Civitavecchia 0.5 m, 138 specimens, Fregene 12-14 m 20 spec., Pontine Islands 20-30 m 10 spec.

The paragnaths are arranged in the oral ring as follows: area V = 0, area VI = 3 in a wedge or 4 in a square, areas VII-VIII = 2-3 irregular rows of large subequal paragnaths; in the maxillary ring area I = 1-3 in line, area II = two oblique rows of paragnaths, area III = an oval patch, area IV = a wedge of more than paragnaths (Fig. 9a, b, c). Parapodia with two subequal notopodial lobes rounded in the anterior parapodia and conical in the posterior ones; neuropodium with two conical lobes and a prominent inferior lobe (Fig. 9d). Posterior notochoetae include one homogomph falciger characterized by a fairly long and finely serrated blade with a knobbed tip attached back by a tendon (Fig. 9e, f). The size is 60 mm for 90 chetigers.

The diagnostic characters of *N. falsa* correspond to those reported for *N. splendida* Grube, 1840 by Viéitez *et al.* (2004).

*Nereis falsa* is widely distributed in the Atlantic and the Indo-Pacific oceans from high to tropical latitudes and in the Mediterranean Sea, with North Adriatic as type locality. It has been frequently recorded along the Italian coast (Giangrande, 1988; Somaschini, 1988; Ardizzone *et al.*, 1989). This species is common on rocky substrates with algae, mussels and calcareous bioconstructions, from meso- to circalittoral bottoms, both in photophilous and sciaphilous habitats. We collected many specimens of *N. falsa* on *Sabellaria spinulosa* reefs, while Viéitez *et al.* (2004) reported *N. splendida* among *Sabellaria alveolata* reefs.



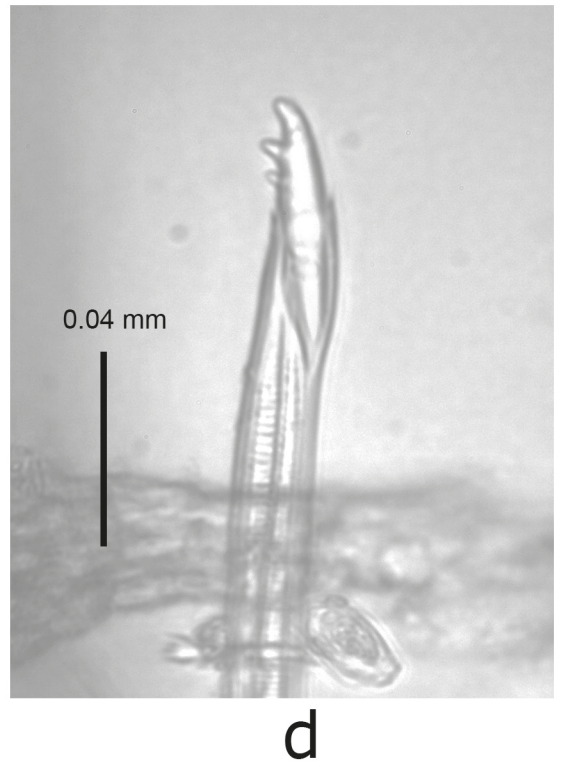
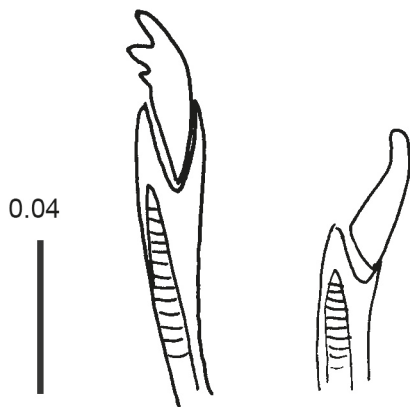
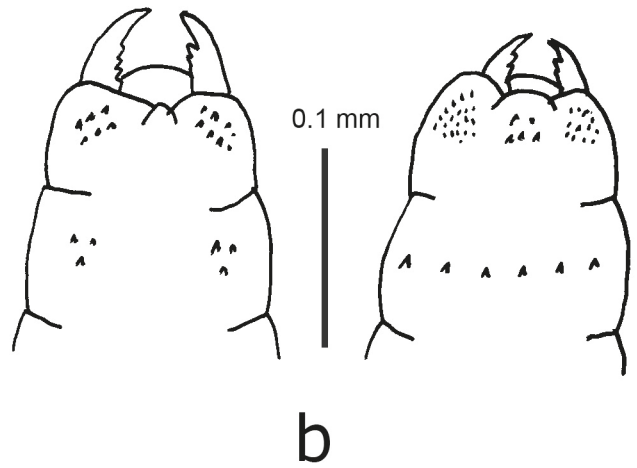
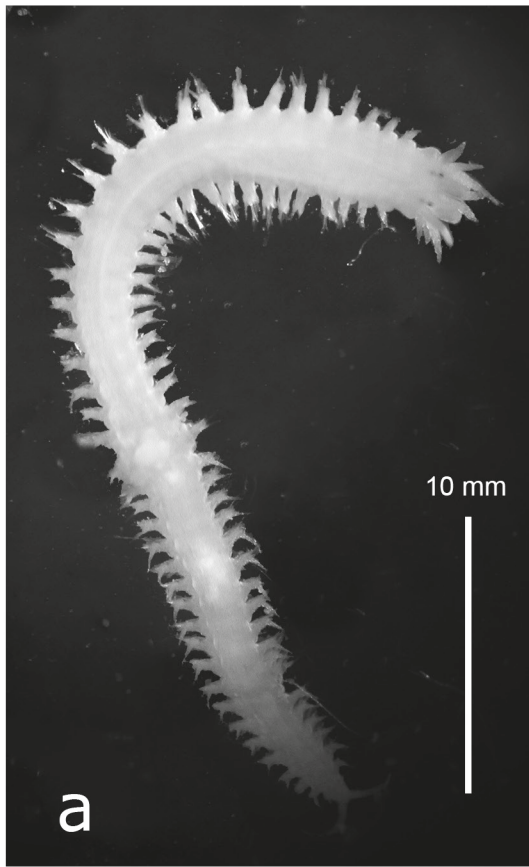


Fig. 6 - *Nereis jacksoni* a) entire worm; b) dorsal and ventral views of the pharynx; c) drawing of homogomph falciger in lateral view and heterogomph falciger from last segments; d) photo of homogomph falciger in lateral view.



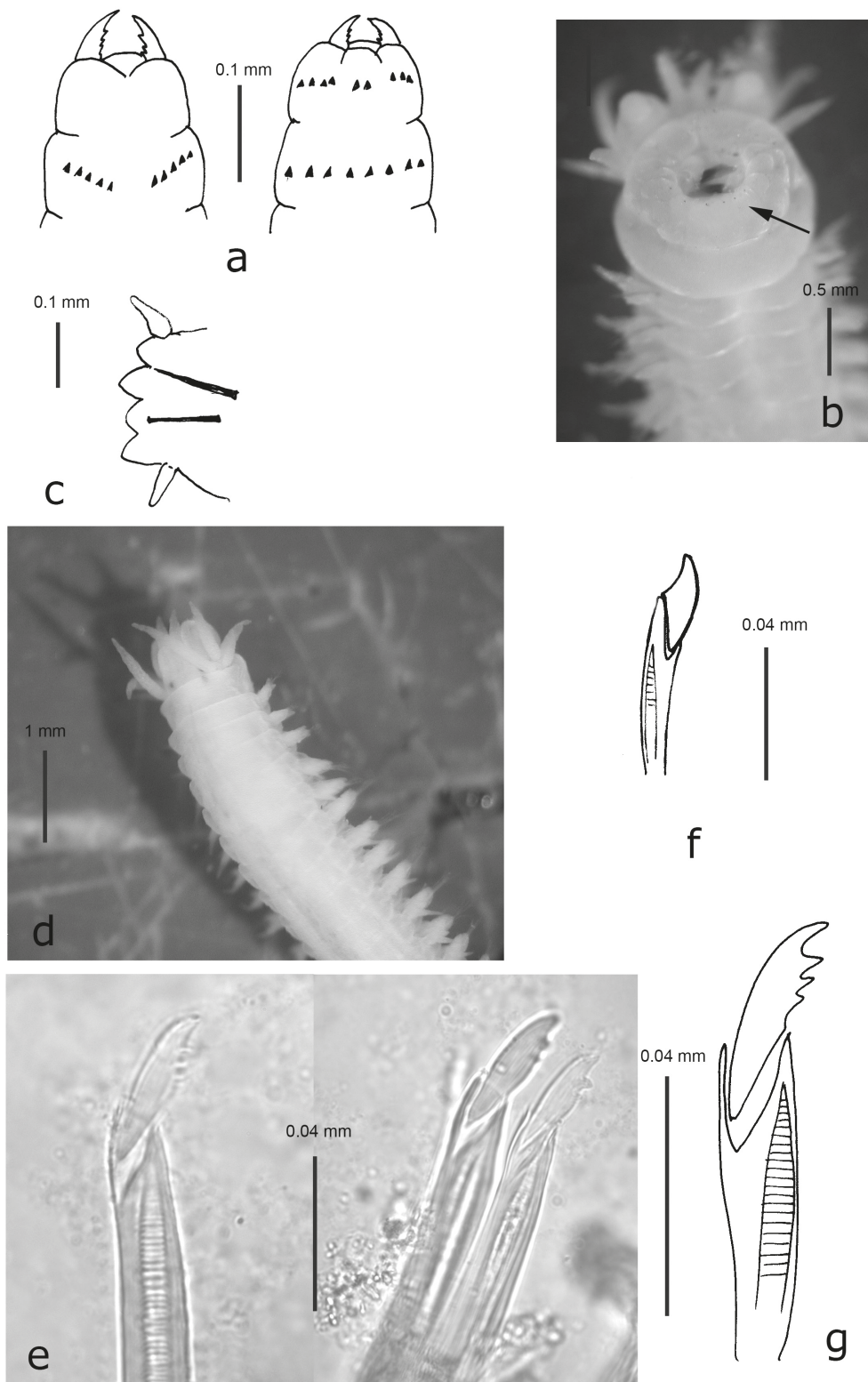


Fig. 7 - *Nereis usticensis* a) dorsal and ventral views of the pharynx; b) anterior end ventral view; c) parapodium from last segments; d) anterior end dorsal view; f) heterogomph falciger from last segments; e) photos of homogomph falciger in lateral view; g) drawing of homogomph falciger in lateral view.

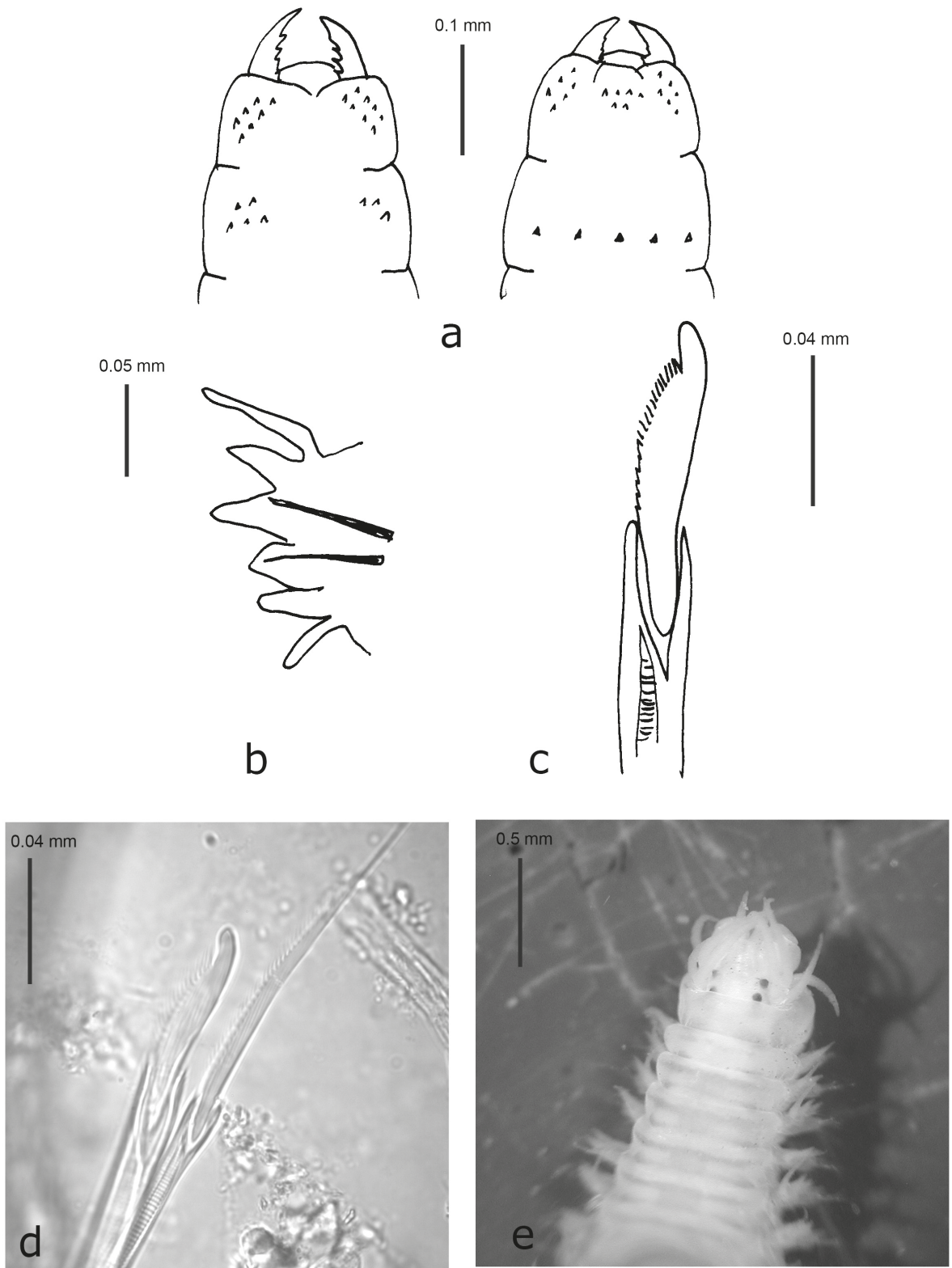


Fig. 8 - *Nereis rava* a) dorsal and ventral views of the pharynx; b) parapodium from last segments; c) drawing of homogomph falciger in lateral view; d) photo of homogomph falciger in lateral view; e) anterior end dorsal view.

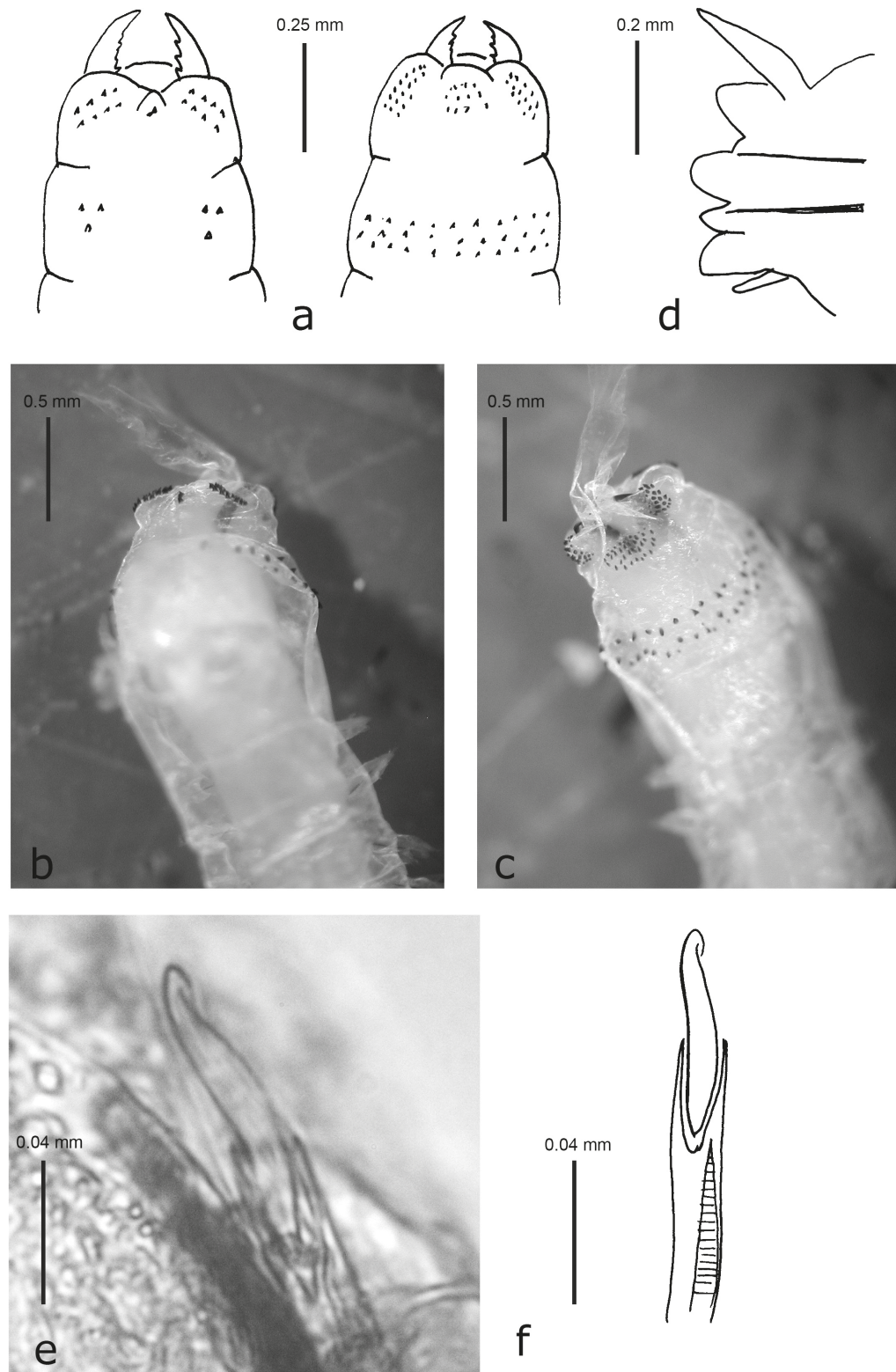


Fig. 9 - *Nereis falsa* a) dorsal and ventral views of the pharynx; b) photo showing the anterior end dorsal view; c) photo showing the anterior end ventral view; d) parapodium from last segments; e) photo of homogomph falcigers; f) drawing of homogomph falciger in lateral view.



*Nereis lamellosa* Ehlers, 1864

Material examined from the Adriatic Sea Croazia 31-37 m 14 spec.; Apulian coasts (Brindisi) 10-20 m 4 spec.. Oral ring of the pharynx with area V = 0, area VI = group of small conical paragnaths, areas VII and VIII = a row of large paragnaths plus irregular rows of small paragnaths (Fig. 10 a, c, d). Anterior parapodia with three notopodial lobes; from the midbody to the posterior parapodia the intermediate lobe decreases and then is lost, while the superior lobe becomes expanded and lamellate bearing the dorsal short cirrus in a notch near its end (Fig. 10b). Notochaetae homogomph including falcigers in middle and posterior parapodia, with elongate and lightly serrate blade tapered with a hooked end, (Fig. 10 e, f). Size 40 mm for about 70 chaetigers.

This species is a common inhabitant of soft bottom along the Italian coast (Cantone *et al.*, 2003); it is also distributed in the north-western and eastern Atlantic ocean, along the South Africa coast and in the Pacific ocean (California) (Campoy, 1982).

## CONCLUDING REMARKS

In light of the available data, in the Mediterranean sea the genus *Nereis* comprises at least 10 species: namely, *N. pelagica* L., 1761, *N. zonata* Malmgren, 1867, *N. perivisceralis* Claparède, 1868, *N. persica* Fauvel, 1911, *N. funchalensis* (Langerhans, 1880), *N. jacksoni* Kinberg, 1865, *N. usticensis* Cantone *et al.*, 2003, *N. rava* Ehlers, 1864, *N. falsa* Quatrefages, 1866 and *N. lamellosa* Ehlers, 1864. Excluding *N. persica*, all species have been recorded along the Italian coasts.

*Nereis* spp. can be distinguished according to the characters mentioned above and grouped especially according to the shape of the posterior homogomph falcigerous chaetae. A first group includes the species characterized by homogomph falcigers with short and smooth or slightly serrated blade. They are *N. pelagica*, *N. perivisceralis* and *N. zonata*. As regards *N. pelagica*, some discrepancies refer to the description of chaetal shape by various authors. According to the variability of the blade of the falcigerous homogomph chaetae reported by various authors (Fig. 2 a, b, c, d), probably the taxon was confused with *N. zonata*, at least for the specimens whose teeth arrangement cannot be clearly examined. Although *N. pelagica* has been cited by several authors in the Mediterranean Sea (Bellan, 1964), we have never found this taxon in our own studies and in our opinion *N. zonata* should be considered the most abundant species of the genus *Nereis* in hard bottom assemblages along the Italian coasts.

*N. zonata*, clearly described by various authors (Fauvel, 1923; Campoy, 1982), is commonly found on hard

substrates in the Western Mediterranean Sea (Bellan, 1969; Fresi *et al.*, 1984; Giangrande, 1988; Abbiati *et al.*, 1991). On the other hand, it was recently considered as synonymous with *N. pulsatoria* by Viéitez *et al.* (2004). However, no type material was examined by these authors nor was mention made of the original description of *N. pulsatoria*. In addition, some discrepancies between the text description and the figures of the rings of the pharynx emerged. The authors reported one anterior row of large teeth followed by irregular rows of smaller ones in the description of the oral ring, while the anterior row of large teeth is lacking in the figure. In fact a high variability in number of paragnath rows, as well as paragnath size, exists in particular in the ventral part of the oral ring of *N. zonata* according to the size of the organism. At present *N. pulsatoria* (Savigny, 1822) is considered an accepted taxon with a North Atlantic distribution, while *N. pulsatoria* Audouin and Milne Edwards, 1834 is reported as an unaccepted taxon and considered to be synonymous with *N. zonata* (Read and Fauchald, 2014). In our opinion the taxonomic status of *N. pulsatoria*, as well as its presence in the Mediterranean sea, remain dubious; moreover, we do not agree in considering *N. zonata* as synonymous with *N. pulsatoria*, because their chaetal shape is very different. Therefore, for the reasons mentioned above, the latter species is not considered in the present paper.

The other species belonging to the first group is *N. perivisceralis*, whose diagnostic feature consists in the notopodial homogomph falcigers having straight elongated blades clearly serrated near the base. *N. perivisceralis* has long been a neglected taxon; only recently has it been reported by Viéitez *et al.* (2004) as frequent in photophilous and sciaphilous algal communities from intertidal to circalittoral biotopes. Probably in the past this species was confused with *N. zonata*, due to strong similarities in the chaetal shape. On the other hand, the species is clearly identifiable by highlighting the typical spines near the base of the blade and the different arrangement of the paragnaths on the oral ring. However, concerning this last feature, in very few specimens of *N. perivisceralis* did we observe a second line of very small paragnaths on oral ring, as in the case of *N. zonata*.

The second group includes the species characterized by the presence of few large, blunt teeth on the blade of the notopodial falcigers. They are *Nereis persica*, *N. funchalensis*, *N. jacksoni* and *N. usticensis*. Unfortunately some difficulties remain in the identification of these species, due to the variability in size and number of the teeth on the blade of the falcigers. Therefore, within this group of species, the main diagnostic character for the identification of the species is the arrangement of paragnaths on the oral ring.

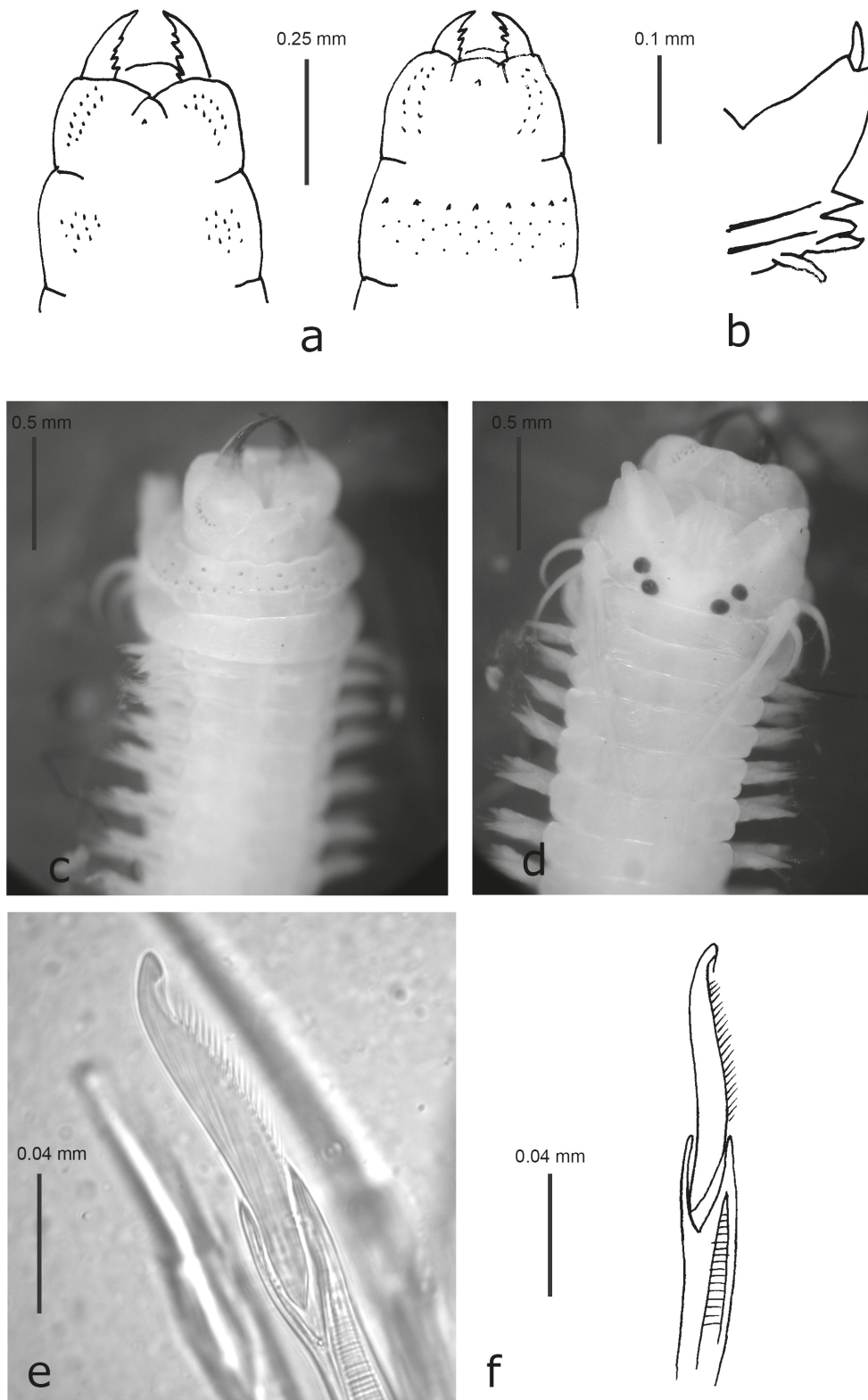


Fig. 10 - *Nereis lamellosa* a) dorsal and ventral views of the pharynx; b) photo showing the anterior end ventral view; c) photo showing the anterior end dorsal view; d) parapodium from last segments; e) photo of homogomph falcigers; f) drawing of homogomph falciger in lateral view.

However, *N. persica* shows a paragnath arrangement similar to *N. zonata*, and can be distinguished in the shape of notopodial falcigers with large teeth on the blade. At present this species is not reported for the Italian fauna (Castelli *et al.*, 2008), its being a Lessepsian migrant confined to the Eastern Mediterranean Sea (Ben-Eliahu, 1972; Çinar, 2010).

*Nereis funchalensis* was a neglected taxon. However, Vieitez, *et al.* (2004), reporting this species from the Mediterranean Iberian coasts, underlined the confusion about the identification of *N. jacksoni* and *N. funchalensis*, stating that the Mediterranean reports of juveniles of *N. jacksoni* should be referred to as *N. funchalensis*. According to these authors the finding of *N. jacksoni* by San Martin *et al.* (1982) should be referred to as *N. funchalensis*. However, the two taxa show evident differences in the paragnath arrangements and in the shape and dimension of the blades of the homogomph and heterogomph falcigers (Figg. 5e, 5f, 6c). Finally, the species *N. usticensis* is a very peculiar form endemic to the Mediterranean for the absence of dorsal paragnaths on the maxillary ring.

The third group embraces the species easily marked by the typical homogomph falcigers with finely serrated and hooked blunt-ended blades. In this group, the species *N. falsa* is easily distinguishable for its falcigers with the ends bent and attached by a ligament.

Vieitez *et al.* (2004) considered *N. splendida* Grube, 1840 in synonymy with *N. falsa*. However, in this case also, these authors did not mention any examination of type material and made no comparison with *N. falsa*. Moreover, in the literature there is reported *Nereis splendida* Blainville, 1825, although this taxon, being homonymous of *N. splendida* Grube, 1840, would automatically invalidate Grube's taxon. For these reasons we confirm the presence of *N. falsa* along the Italian coasts and in the Mediterranean Sea.

*Nereis lamellosa* is easily distinguishable by the anterior notopodia with three lobes and the large and lamellate superior lobes of the posterior parapodia bearing a short dorsal cirrus in a terminal notch. This species, characterized by such a feature of the posterior notopodia, is the only species of the genus *Nereis* which typically dwells in soft-bottom biotopes of the Mediterranean Sea.

Finally, no doubt exists over the identification of *N. rava*, included in this group of species, since it is characterized by VII and VIII areas of the pharynx bearing a single row of paragnaths. However, juveniles of *N. zonata* and *N. pelagica* can also have only one well-defined row of paragnaths in the ventral part of the oral ring; in this case the examination of the blades of homogomph falcigers solves the problem. This taxon is one of the most abundant *Nereis* species in sciaphilous Mediterranean hard bottom environments.

Key to Mediterranean *Nereis* species

- 1a Posterior homogomph falcigers characterized by a fairly long and finely serrate blade ..... 2



- b Posterior homogomph falcigers with short unidentate or multidentate blade ..... 4



- 2a Superior lobe of last parapodia expanded and lamellate bearing the dorsal short cirrus in a notch near its end ..... *Nereis lamellosa*



- b Posterior parapodia with not highly developed superior lobe ..... 3

- 3a Blade of the homogomph falcigers with a blunt slightly hooked end ..... *Nereis rava*



- b serrate blade with a knobbed tip having a well marked tendon tip ..... *Nereis falsa*



- 4 a posterior homogomph falcigers unidentate ..... 5
- posterior homogomph falcigers multidentate .. 7



- 5a Homogomph falcigerous with few serrated teeth at the base ..... *Nereis perivisceralis*



- b Homogomph falcigerous notochaetae without teeth at the base ..... 6



- 6a area VI of the pharynx with 4-5 large conical paragnaths in a circle ..... *Nereis pelagica*

- b area VI of the pharynx with 9-11 small conical paragnaths ..... *Nereis zonata*

- 7a Homogomph falcigers notochaetae with two large teeth plus a smaller one ..... 8



- b Homogomph falcigers notochaetae with three-four teeth of similar size ..... 9



- 8a areas VII-VIII of the pharynx with a single row of small paragnaths ..... *Nereis jacksoni*

- b areas VII and VIII of the pharynx with one anterior row of large paragnaths and two-three rows of small paragnaths ..... *Nereis persica*

- 9a areas V and VI and VII-VIII with an almost continuous band of small teeth ... *Nereis funchalensis*

- b areas VII-VIII with a single row of large paragnaths ..... *Nereis usticensis*

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