

THREE NEW RECORDS OF NUDIBRANCHIA (MOLLUSCA, GASTROPODA) – ADDITIONS ON THE BRAZILIAN BIODIVERSITY

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ABSTRACT

Three species of aeolid nudibranchs are reported for the first time on the Brazilian coast: *Aeolidiella alba* Risbec, 1928, *Berghia creutzbergi* Marcus & Marcus, 1970 and *Flabellina engeli* Marcus & Marcus, 1968. The specimens have been collected in the south coast of Pernambuco state (Brazilian northeast coast), north coast of Rio de Janeiro state and north coast of São Paulo state (Brazilian southeast coast). Intraspecific variations are commented based in comparison with past descriptions.

Key words: Nudibranchia, Gastropoda, Western Atlantic, Brazil, new record.

RESUMO

Três novos registros de Nudibranchia (Mollusca, Gastropoda) – adições à biodiversidade brasileira

Três espécies de nudibrânquios aeolidáceos são reportados pela primeira vez para a costa brasileira: *Aeolidiella alba* Risbec, 1928; *Berghia creutzbergi* Marcus & Marcus, 1970 e *Flabellina engeli* Marcus & Marcus, 1968. Os espécimes foram coletados no litoral sul do estado de Pernambuco (nordeste do Brasil), e no litoral norte do estado do Rio de Janeiro e do estado de São Paulo (sudeste do Brasil). São discutidas variações intraespecíficas, comparando-se com descrições já existentes na literatura.

Palavras-chave: Nudibranchia, Gastropoda, Atlântico Oeste, Brasil, novo registro.

INTRODUCTION

Several species of nudibranchs are reported for the Brazilian coast. However, the number of species is relatively small if compared to other more studied regions or countries. In total, 26 species of aeolid nudibranchs, consisting of 21 genera are cited for Brazil (RIOS, 1994; GARCÍA; TRONCOSO; DOMINGUEZ, 2002; GARCÍA; TRONCOSO, 2003, 2004; PADULA; ABSALÃO, 2005). In this country, the most important works about these animals were done in the last century by Ernst Marcus and Eveline Marcus from the 50 to 80 decades, mainly on the north coast of São Paulo state, and few at isolated areas of the Brazilian northeast coast (MARCUS, 1955; MARCUS; MARCUS, 1963; MARCUS, 1970).

The present paper reports for the first time three aeolid nudibranchs on the Brazilian coast. Two of them, *Berghia creutzbergi* and *Flabellina engeli* are known for the Caribbean Sea and the other, *Aeolidiella alba*, is a mysterious species with cosmopolitan distribution and only few specimens were collected in the Indian Ocean, Pacific Ocean and Caribbean Sea. These records are some additions to the Brazilian mega biodiversity.

MATERIAL AND METHODS

The material examined was collected in the intertidal zone on the south coast of Pernambuco state in July 2005, north coast of Rio de Janeiro state from November 2004 to June 2005, and on the north coast

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of São Paulo in January 2005. Specimens were photographed and measured alived, fixed in 10% formalin and transferred to 70% ethanol. All identifications were made by comparisons with the original descriptions and posterior papers, based in the external morphology, color standard, radula and jaw morphology. The material is deposited in the malacological collection of the Museu Nacional do Rio de Janeiro (MNRJ) and malacological collection of the Instituto de Biologia, Universidade Federal do Rio de Janeiro (IBUFRJ).

RESULTS

Order Nudibranchia de Blainville, 1814

Suborder Aeolidina Odhner, 1934

Family Aeolidiidae Gray, 1827

Genus Bergh, 1867

Risbec, 1928

Figs. 1-3

Aeolidiella alba Risbec, 1928: 261, fig. 87, plt. X, fig. 9; Burn (1966: 107); Gosliner (1985: 234, fig. 2; 1991: 300, fig. 15).

Spurilla alba Edmunds (1969: 465, fig. 9); Sphon (1971: 369; 1978: 305); Edmunds & Just (1983: 200, fig. 8A and 11).

Material examined: MNRJ 10501: 1 specimen (9 mm, long alive), Praia das Conchas, Cabo Frio, Rio de Janeiro state, depth: 1 m, 14/XI/2004, Vinicius Padula col.

Distribution: Western Atlantic: Barbados (EDMUNDS & JUST, 1983); Brazil (Rio de Janeiro; present study). Indo-Pacific: southern Africa (GOSLINER, 1985); Tanzania (EDMUNDS, 1969); Papua New Guinea (GOSLINER, 1991); Australia (BURN, 1966); New Caledonia (type locality; RISBEC, 1928); Galápagos (GOSLINER, 1991) and Mexico (SPHON 1971, 1978).

Diagnosis: Animal 9 mm long, slender. Cerata distributed in the latero-dorsal body region. Ovoid head with short oral tentacles and rinophores with bulbous swellings. Rinophores present two more outstanding bulbous and are translucent brown color in the lower half and yellowish in distal portion. Cream pigment covering almost the entire body. Reddish concentrate mark behind the base of rinophores (Fig. 1). Radula with 14 curved plates, each tooth strongly emarginated with a prominent central cusp and diminute denticles, about 26 on each side (Fig. 2). The

median denticles on the each side of the central cusp are greater. Jaw strong with smooth masticatory border (Fig. 3). Rinophores move rhythmically backwards and forwards when the animal crawls.

Remarks: *Aeolidiella alba* is easily recognized for the bulbous swelling in the oral tentacles and rinophores, for the whitish body and for the reddish mark behind the rinophores. There is a variation for the pattern of the reddish mark situated behind the rinophores. In some specimens this mark is diffuse, able to extend in an orange coloration to half of the rinophores length. It's occur in Tanzanian (EDMUNDS, 1969) and Sonoran (Mexico) slugs (SPHON, 1978). On another hand, the specimens from Barbados (EDMUNDS; JUST, 1983) and Nayarit (Mexico) (SPHON, 1978) the mark are more concentrate. In our material the mark is present in a small area behind the base of rinophores (Fig. 1). Based on these informations we agree with Sphon (1978) and Edmunds and Just (1983) in relation with intraspecific color variation of *Aeolidiella alba*. Gosliner (1985, 1991) showed scanning electronic microscopy pictures of the radula from specimens from South Africa and Galapagos, respectively, and they are very similar to our material. We suggest that the ritmic moviment of rinophores is one ethological characteristic for this species.

Genus Trinchese, 1877

Marcus & Marcus, 1970

Figs. 4-7

Berghia creutzbergi Marcus & Marcus, 1970: 87, figs. 145-147; Edmunds & Just (1983: 201, fig. 8C); Espinosa & Ortea (2003: 118) not illustrated, species list.

Spurilla creutzbergi Redfern (2001: 181, plt. 120, fig. 745); Valdés et al. (2006: 272).

Material examined: IBUFRJ 14728: 1 specimen (15 mm long alive), Praia do Paraíso, Cabo de Santo Agostinho, Pernambuco state, intertidal, 19.VII.2005, Gilberto Faustino col. MNRJ 10500: 1 specimen (13 mm long alive), Praia da Tartaruga, Armação de Búzios, Rio de Janeiro state, depht: 1 m, 25.II.2005, Vinicius Padula col. IBUFRJ 14727: 1 specimen (10 mm long alive), Praia das Conchas, Cabo Frio, Rio de Janeiro state, depht: 1 m, 14.XII.2004, Vinicius Padula col.

Distribution: Western Atlantic: Barbados (EDMUNDS & JUST, 1983); Bahamas (REDFERN, 2001); Costa Rica (ESPINOSA & ORTEA; 2003); Curaçao (type locality; MARCUS; MARCUS, 1970); Brazil (Pernambuco and Rio de Janeiro; presente study).

Diagnosis: Animal 15 mm long, slender, with posterior region of the foot enough elongated. Head indistinct, small in comparison with the body length. Yellowish body with white spots, large translucent-brown foot, with greater anterior projections (Figs. 4-5). Elongated oral tentacles, first 1/3 brown and the distal part cream. Rinophores little flatten laterally, covered with tubercles. Five spaced groups of ceratas are observed in arcs at the latero-dorsal region of body. The most anterior group has its origin below the line of rinophores. Radula with 22 curved plates, each tooth bipectinated and not centrally emarginated, with alternation between greater and lesser denticles, being 36 on each side (Figs. 6-7). All appendages move side to side when the animal crawls.

Remarks: *Berghia creutzbergi* has its distribution, until the moment, restricted to the Caribbean Sea. This species is easily recognized by the pattern of yellowish body color, with white spots on the dorsal region; the translucent-brown foot; distribution of the cerata in very distinct groups, being the first more outstanding; prominent anterior projections of foot; and the movement of the appendices of body side to side, as also observed by Edmunds and Just (1983).

It was observed an intraspecific variation between our specimens and the young specimen portrayed by Redfern (2001) whose cerata are more swelled and the oral tentacles are reduced. The reduction of the oral tentacles was observed in one of three slugs collected. We observed autotomy of cerata during the study.

Family Flabellinidae Bergh, 1889

Genus Voight, 1834

Marcus & Marcus, 1968

Figs. 8-14

Flabellina engeli Marcus & Marcus, 1968: 139, figs. 1-5; Edmunds & Just (1983: 185; fig. 1); Ortea & Espinosa (1998: 138, fig. 1); Calado, Ortea & Caballer (2005: 666, fig. 4A-4C); Valdés et al. (2006: 241).

Material examined: MNRJ 10498: 3 specimens (20-23 mm long alive), Praia das Conchas, Cabo Frio, Rio de Janeiro state, dept: 1 m, 29.V/2005, Vinicius Padula col. IBUFRJ 14730: 4 specimens (15-20 mm long alive), Praia das Conchas, Cabo Frio, Rio de Janeiro state, dept: 1 m, 23.VII.2005, Vinicius Padula col. IBUFRJ 14731: 5 specimens (12-17 mm long alive), Praia das Conchas, Cabo Frio, Rio de Janeiro state, intertidal, 24.V.2005, Vinicius Padula col. MNRJ 10497: 1 specimen (10 mm long alive), Praia do Forno, Arraial do Cabo, Rio de Janeiro state, dept: 1 m, 16.IV.2005, Vinicius Padula col. IBUFRJ 14729: 7 specimens (7-20 mm long alive), Praia do Forno, Arraial do Cabo, Rio de Janeiro state, dept:

1 m, 26.VI.2005, Vinicius Padula and Franklin Santos col. MNRJ 10499: 2 specimens (15-21 mm long alive), Ilha do Farol, Ilhabela, São Paulo state, dept: 1 m, 15.I.2005, Vinicius Padula col.

Distribution: Western Atlantic: Florida (MARCUS, 1976); Barbados (EDMUNDS; JUST, 1983); Cuba (ORTEA; ESPINOSA, 1998); Puerto Rico (MARCUS, 1976); Curaçao (type locality; MARCUS; MARCUS, 1968); Costa Rica (CALADO et al., 2005); Brazil (Rio de Janeiro and São Paulo; present study).

Diagnosis: Animal 23 mm long, slender, translucent blue. Head not prominent with long oral tentacles and perfoliate rinophores with 24 lamelas. The blue translucent foot is slender, with small anterior projections. Sometimes small yellow stains occur in the foot lateral. Ceras with the same origin are arranged in isolated ceratal groups. They are white with a central orange band. Yellow stains occur at the interspaces of cerata groups, between the oral tentacles, between then and rinophores and on the sides of the body (Figs. 8-9). Radula with 20 plates. Base of the each plate with not filled central area and in form of “drop”, with strong longitudinal concavity that accomodates the lump of the previous plate (Fig. 12). Rachidian teeth emarginate with strong cuspid, 7-10 slender denticles on each side. Lateral teeth pointed with 6-7 denticles on the internal side (Fig. 12). Very thin jaw, reddish in living animals, light yellow preserved in formalin, with denticulate masticatory border (Figs. 13-14). Spiral egg mass with white small eggs (Fig. 11), wich probably develop in planctotrophic larvae.

Remarks: *Flabellina engeli* can be recognized for the very lean body; for the ceras of varied sizes with the same origin and with an orange-brown ring; for the white-yellowish spots between the oral tentacles, between ceratas, on the sides of the body and the foot, and in the back of the tail. The radula has good morphologic similarity with specimens reported in the papers already existing. The jaw of the examined material is similar to the description for the type and to the material of Calado et al. (2005) from Costa Rica, differing from the material of Ortea and Espinosa (1998) who mentioned the absence of denticles in the masticatory border of the jaw in one specimen from Cuba. Certain differences exist in relation to the coloration of our specimens and that described by Marcus and Marcus (1968). The coloration of the body is similar, but the rings of the ceras are brown in their described specimens (orange in our material). Ortea and Espinosa (1998) described a translucent blue

specimen similar to our material and Edmunds and Just (1983) described some specimens from Barbados that present white spots instead of yellow spots at the body. All our specimens present yellow spots, same the minors.

DISCUSSION

Distribution with a wide pattern, as happen on *Aeolidiella alba*, is relatively common and accepted for nudibranch species. Some species can disperse for many weeks and long distances (EDMUNDS, 1977), having a capacity to colonize new and distant regions. Little is known if these cosmopolitan species are well distributed only by larvae dispersion or vicariant events. Another way is attributed to anthropic actions, like boats and ship transports of larvae or adult specimens (EDMUNDS, 1975; EDMUNDS; JUST, 1983; ZENETOS et al., 2003).

On another hand, some of these species that are considerate cosmopolitan are probably different, but morphologically very similar. For this fact, news studies about cosmopolitanism are necessary. Global revisions including more accurate anatomical studies and molecular analysis can confirm the real identity and distribution of some taxa.

The present study and other papers suggest that can exist a strong correlation between the Caribbean and Brazilian nudibranch fauna (see MARCUS; MARCUS, 1960 and EDMUNDS, 1964). Eveline and Ernst Marcus (1960) made a comparison between the opisthobranch fauna, including aeolid species, from Miami and São Paulo, in the southeast of Brazil, and concluded that they are very similar. In 1960 the knowledge about the nudibranch fauna in the others regions of the Caribbean Sea was poor and with posterior studies the similarity between Caribbean and São Paulo nudibranch fauna was confirmed (MARCUS; MARCUS, 1962; MARCUS, 1972). Examples of nudibranchs that occur in Caribbean Sea and Brazilian waters include *Berghia creutzbergi*, *Flabellina engeli* and other aeolids as *Flabellina marcusorum* Gosliner & Kuzirian, 1990, *Favorinus auritulus* Marcus, 1955 and *Phidiana lynceus* Bergh, 1867, or dorids as *Cadlina rumia* Marcus, 1955, *Diaulula greeleyi* (MacFarland, 1909) and *Tyrinna evelinae* (Er. Marcus, 1958).

What is not known is if these species have a continuous distribution at the long distance from Florida to São Paulo, because the data about nudibranch fauna in some regions of the Caribbean Sea, at the

coast of Venezuela, Guyana, Suriname, French Guyana and in the most part of the Brazilian coast are poor. Furthermore, the possible influence of the estuary of the Amazon River in the dynamic and distribution of nudibranch species at the north coast of Brazil was never studied. Another question is about the southern limit of distribution of these Caribbean-Brazilian species. Apparently, São Paulo region is this southern limit, but the few data about the nudibranch fauna from this region to Uruguay, a distance with about 2000 kilometers, can not confirm this hypothesis. Only new studies will be able to answer this and the others cited questions.

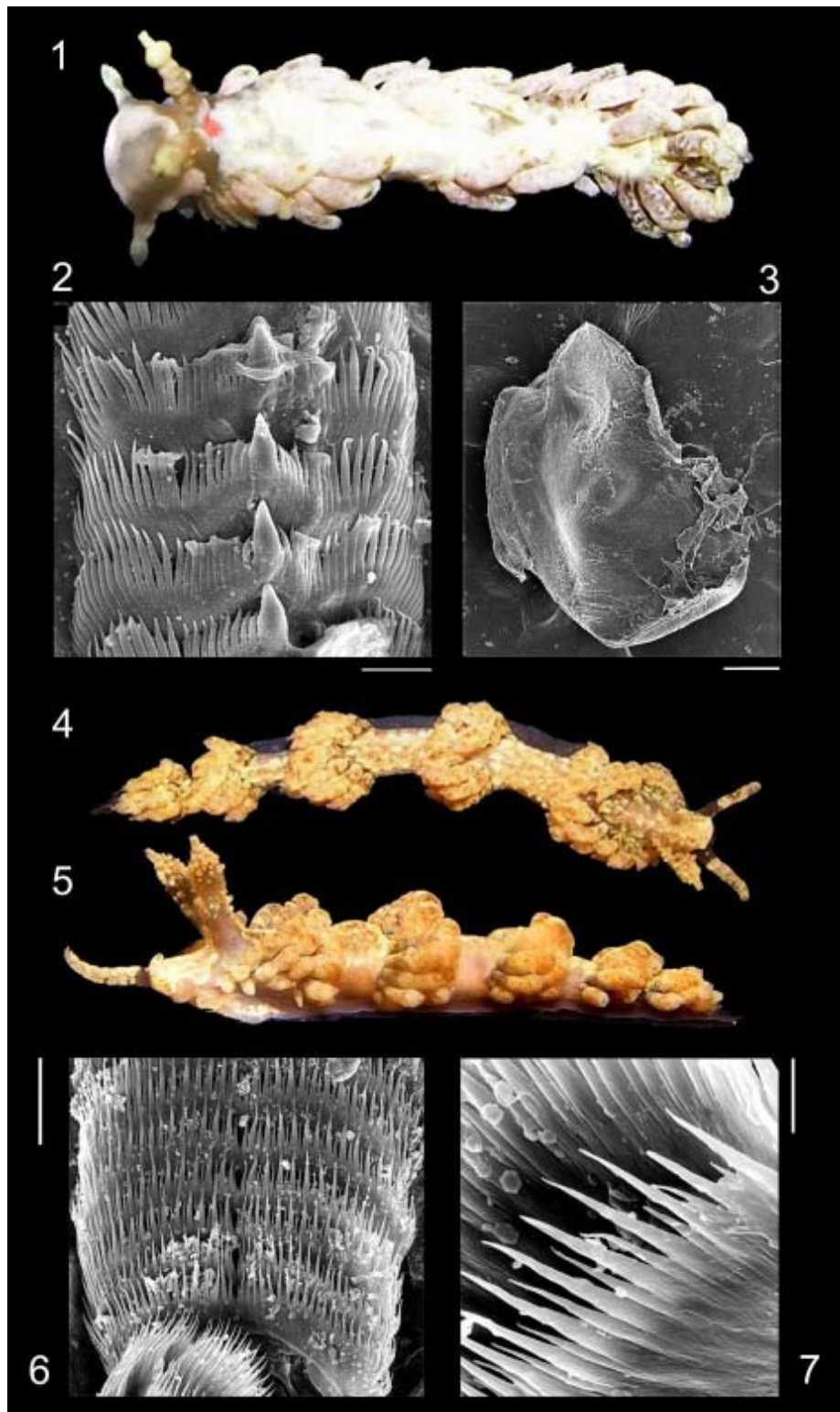
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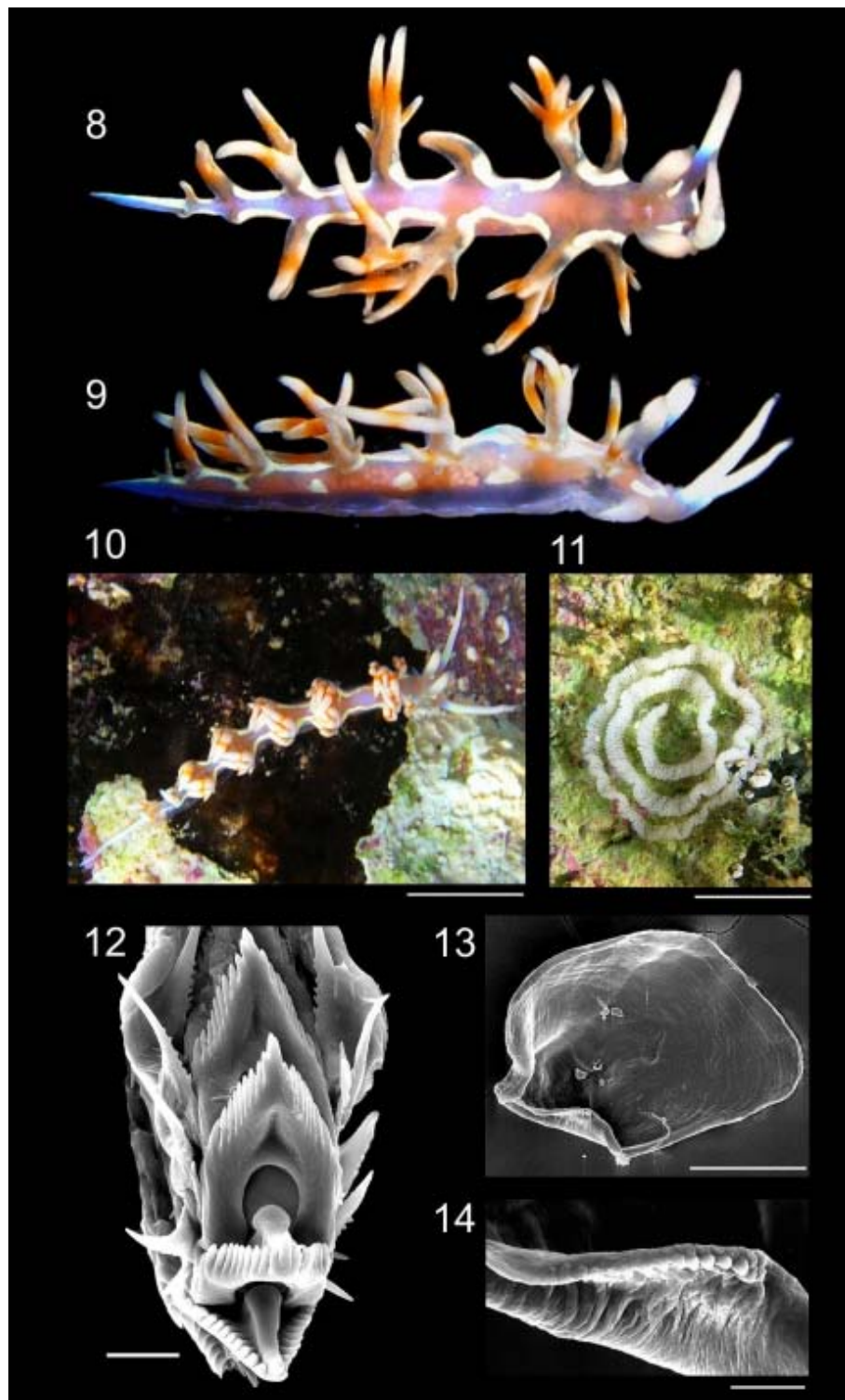
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Figs. 1-3. *Aeolidiella alba*. 1. dorsal view of living animal, 9 mm long; 2. radular plate; 3. internal view of jaw. Scale bar: 2. 20 μ m; 3. 100 μ m.



Figs. 4-7. *Berghia creutzbergi*. 4. dorsal view of living animal, 15 mm long; 5. lateral view animal living; 6. radular plate; 7. detail of radular plate. Scale bar: 6. 50 μ m; 7. 10 μ m. **Figs. 8-14.** *Flabellina engeli*. 8. dorsal view of living animal, 23 mm long; 9. lateral view animal living; 10. animal in natural habitat; 11. egg mass; 12. radula; 13. internal view of jaw; 14. detail of masticatory process on the border of the jaw. Scale bar: 10. 6 mm; 11. 12 mm; 12. 20 μ m; 13. 200 μ m; 14. 10 μ m.