

New data about the Gastropoda Doridacea *Glossodoris dalli* (Bergh, 1879)

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Abstract

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The Nudibranchia Chromodorididae species *Glossodoris dalli* (Bergh, 1879) is studied using specimens collected from the Pacific coast of Panama. The external and internal anatomy is studied and compared with those of other descriptions of this species and other similar species. Externally, These specimens show a dark ground colour and the gills curl upward into a spiral on each side. Internally, the radula has only one denticle on the inner side of the inner lateral teeth. Besides this the vaginal duct and oviduct are independent and the male duct is shorter than those described by other authors.

Key words: Nudibranchia, Chromodorididae, *Glossodoris dalli*, anatomy, Coiba Island, Panama Pacific coast.

Resumen

GARCÍA, F. J., CARMONA, P. & TRONCOSO, J. S. (1999). Nuevos datos sobre el Gasterópodo Doridáceo *Glossodoris dalli* (Bergh, 1879). *Nova Acta Científica Compostelana (Biología)*, 9: 279-284

La anatomía externa e interna del Nudibranchio Chromodorididae *Glossodoris dalli* (Bergh, 1879) es estudiada a partir de ejemplares capturados en las costas del Pacífico de Panamá. Los resultados son comparados con los de otras descripciones de la misma especie y otras especies similares. Externamente estos ejemplares muestran una coloración general oscura y las branquias se disponen alrededor de un eje ascendente a cada lado. Internamente, la rádula presenta el diente lateral interno con sólo un denticulo en su lado interno. Además, los conductos vaginal y oviducto son independientes, y el conducto masculino es más corto que el descrito por otros autores.

Palabras clave: Nudibranchia, Chromodorididae, *Glossodoris dalli*, anatomía, Pacífico, Isla Coiba, Panamá.

INTRODUCTION

Glossodoris dalli was described by BERGH (1879) based only on preserved material. Later, it was studied by Bertsch, who considered other

nominal species as a synonym of it (BERTSCH *et al.*, 1973; BERTSCH, 1978, 1979). It has been recently studied by other researchers (ORTEA *et al.*, 1992). *G. dalli* is a species found throughout the Gulf of California, the Pacific coast of Mexico

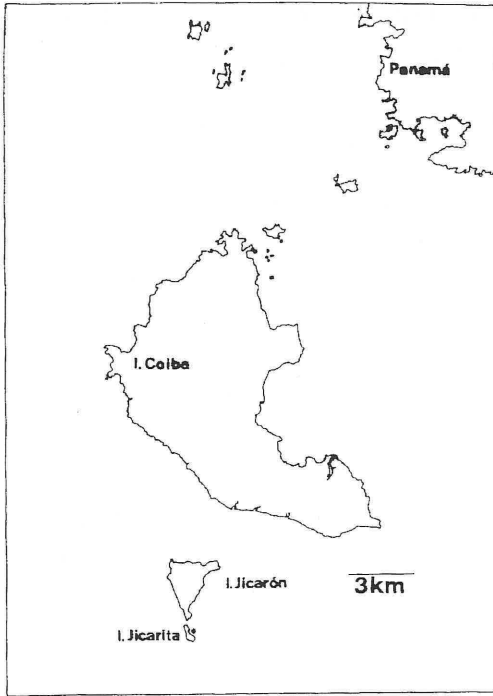


Fig. 1. Collection sites (*) in Coiba islands.

and Costa Rica (MARCUS & MARCUS, 1967; BERTSCH, 1978; BERTSCH *et al.*, 1973; FARMER, 1963, 1967, 1980), Galapagos Islands (ORTEA *et al.*, 1992). During two scientific expeditions around some islands belonging to the National Park of Coiba Island, two specimens of this species were collected. In this article a description of the anatomy of these specimens is given. Our specimens, collected in Coiba island and Jicarita island (Panama) constitutes the first record of this species in Panama.

MATERIAL AND METHODS

The specimens studied in this article were collected around the islands belonging to the National Park of Coiba (Panama), located in the Pacific Ocean. The sample locations where the specimens were collected are illustrated in Fig. 1. The specimens were fixed and preserved in 4% formaldehyde.

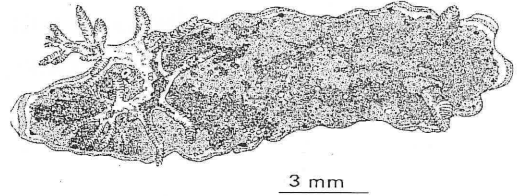


Fig. 2. External view of *Glossodoris dalli*.

Material studied: One specimen, 17 mm in length, preserved, collected under rocks at the intertidal zone of NE Coiba Island, Panama, (June, 1996). One live specimen 15 mm in length alive, collected at 7 m deep, on an oyster, at Jicarita Island, Panama (9 February 1997).

RESULTS

External anatomy (Fig. 2)

The body of the animals are elongate, with the notum scattered with small rounded protuberances projecting from the dorsal surface. The notum edge is slightly undulate, containing numerous notal glands visible on the ventral surface. The rhinophores have 11-15 perfoliations. The rhinophoral sheath is high.

The branchial tuft has 14 unipinnate gills in the smaller specimen and 24 in the bigger. In both specimens the gills form an arc around the anus, opening posteriorly. There are 4-6 anterior gills isolated from each other, while the rest forms two groups that curl upward into a spiral on each end of the arc (Fig. 2). The renal pore and anal papilla open at the center of the branchial tuft of the smallest specimen, while in the other, the anal papilla is located posteriorly, between the spiral tufts.

Coloration

The ground colour is burnt umber, with irregular dark brown spots, almost black, on the dorsal and lateral surfaces of the notum and foot. There are numerous almost black spots on the notum. These spots are clearly visible in the

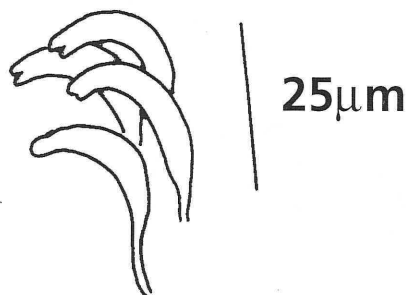


Fig. 3. Rodlets of the jaws.

preserved specimen, mainly on the dorsal marginal borders of the notum and foot. Besides these spots, there are abundant small yellowish or greenish spots scattered on the surface of the body. The apex of the dorsal tubercles of the notum are white. The edge of the notum and foot have a translucent whitish marginal band, a middle orange band and an inner white band. The notal glands are white.

The gill base and rachis are hyaline whitish or cream, with some brown spots scattered through the rachis, which changes to hyaline violet toward the apical end. The branchial perforations are red-violet. The rachis and basal middle of the rhinophores are whitish and the laminae are red violet. The anal papilla is dark brown with the border of the orifice cream.

Internal anatomy

The chitinous jaws bear numerous elongate rodlets. Their apex can be bifid although some rodlets are simple (Fig. 3). The radular formula of the bigger specimen is 138 x 36.136. The rachidian tooth is short and triangular (Fig. 4). The first lateral tooth is broad, having a central cusp with 2-3 denticles on the inner side and 5-6 on the outer one. From the second lateral tooth to the 20th, approximately, there are 5-6 denticles on their outer side, lacking denticulation on the inner side. The other teeth change shape and size toward the margins of the radula. Thus, they tend to be hooked-shaped, the lateral denticulation is absent and the size decreases gradually.

The reproductive system (Fig. 5) has a long, curved hermaphroditic duct, in which the ampulla is scarcely differentiated. At the proximal end, the hermaphroditic duct divides into a long and coiled deferent duct, with a prostate not differentiated from the ejaculatory segment. The other branch of the hermaphroditic duct becomes an oviduct, which enters the female glandular mass. The uterine duct emerges as a narrow duct going to the connection point of the seminal receptacle with the gametolytic gland. This gland is large, globular and thin-walled, while the seminal receptacle is curved and thick-walled. Also, the vaginal duct starts from the connection area of those organs and the uterine duct. The vagina is as narrow as the uterine duct in its proximal middle, swelling toward the distal portion of it. A simple vestibular gland is located next to the female gland orifice.

DISCUSSION

The coloration is an essential characteristic to classify chromodorid species (BERTSCH, 1978). Thus, many chromodorid species have been described using mainly colour features (ORTEA *et al.*, 1996). However, there is frequent intraspecific variability in the colour pattern of some species.

As was previously stated, *Glossodoris dalli* was described by BERGH (1879) based only on preserved material and re-described by Bertsch, who considered it as synonym of *G. banksi* Farmer 1963 (BERTSCH, 1978, 1979) and *G. banksi sonora* Marcus & Marcus 1967 (BERTSCH *et al.*, 1973). Although in general our specimens coincide with the descriptions of other authors, however, we have found some differences which we compare.

In regard to the coloration, *G. dalli* is considered to have a white ground colour with brown-black spots of varying size (BERTSCH, 1978; FARMER, 1963, cited as *G. banksi*). However, this ground colour changes in different specimens. Thus, BERTSCH (1978) and FARMER (1980) wrote that in larger specimens the ground colour becomes greyish around the centre of the

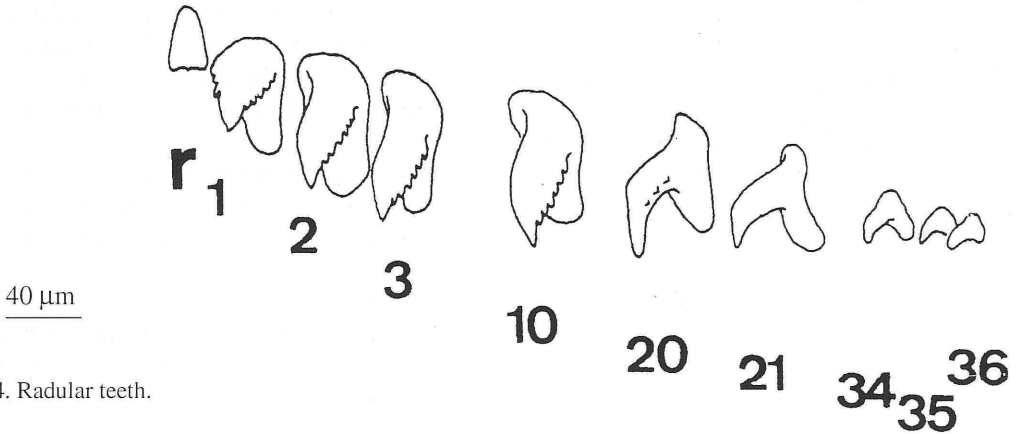


Fig. 4. Radular teeth.

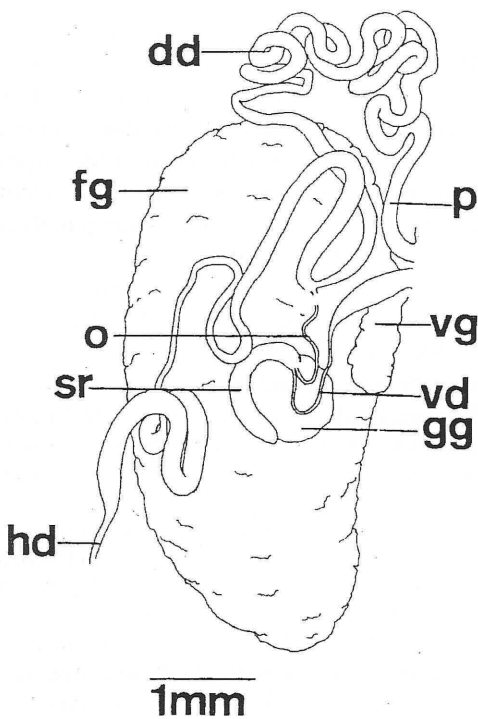


Fig. 5. Reproductive system. Abbreviations: **dd**, deferent duct; **fg**, female gland; **gg**, gametolytic gland; **hd**, hermaphroditic duct; **o**, oviduct; **p**, penis; **sr**, seminal receptacle; **vd**, vaginal duct; **vg**, vestibular gland.

notum; ORTEA *et al.* (1992) illustrated this species with a colour photograph of a specimen similar in colour to our specimens, although the colour intensity is darker in our specimens, and these authors pointed out that specimens from the Galapagos Islands, 5 and 6 mm long, have a brownish grey without orange marginal band, while larger specimens (35, 65 mm) have mainly dark brownish-grey irregular spots on the centre with yellow areas and greyish on the borders of the notum. These specimens have a marginal-red band and an inner white band around the notum. MARCUS & MARCUS (1967) described a specimens of 30 mm long (cited as *Chromodoris banksi sonora* Marcus & Marcus, 1967), showing a brownish-greyish ground colour with the notum densely set with dark spots of different size. The marginal bands around the notum also can vary. Thus, in small specimens of *G. dalli*, the bands can be white (ORTEA *et al.*, 1992), while in large specimens the border of the notum has a inner white band and an outer orange or reddish band. In both specimens collected by us, the notal margin have a inner white band, a middle orange band and a marginal translucent white band.

On the other hand, the number and disposition of the gills around the anus also vary in different specimens of *G. dalli*. The number of gills ranges from 4-5 in specimens 5-6 mm long (ORTEA *et al.*, 1992) to 34 in larger specimens (MARCUS & MARCUS, 1967). The gills form an arc around the

anus where the gills are joined at their bases in a crescent (FARMER, 1963) with the end of each leg of the arc forming two spirals (MARCUS & MARCUS, 1967), or curling upward into a spiral on each side (ORTEA *et al.*, 1992). Our specimens have a similar situation to that described by ORTEA *et al.* (1992).

Internally, we have found also some small differences. Thus, in regard to the radula, we found the inner lateral teeth with only 1 (sometimes also 1 or 2 almost un-differentiated denticles) on the inner side while MARCUS & MARCUS (1967) described 3-7 denticles.

ORTEA *et al.* (1992) and MARCUS & MARCUS (1967) described the reproductive system of *G. dalli* as having a short common duct joining the vaginal duct and uterine duct to the seminal receptacle and gametolytic gland. This situation is also drawn by BERGH (1880). However, in our specimens, these ducts are independent as in GOSLINER (1990). Besides this, the male duct of *G. dalli* is considered differentiated into a long prostatic region, and a penial duct, the two of them separated by a narrow portion (ORTEA *et al.*, 1992). The Coiba specimens have the male duct relatively shorter than described by other authors and is not anatomically differentiated in prostatic and penial portions.

A species externally similar to *G. dalli* is *G. edmundsi* (Cervera *et al.*, 1989). This is an Atlantic species found in the Canary islands (CERVERA *et al.*, 1989), Azores Islands (GOSLINER, 1990), Madeira Islands (WIRTZ, 1995; ORTEA *et al.*, 1996) and Ghana (ORTEA *et al.*, 1996).

In regard to the coloration, *G. dalli* is similar to *G. edmundsi*, although some differences can be noted. The coloration of *G. dalli* lacks an orange ring surrounding the branchial border and rhinophoral sheaths as was described by CERVERA *et al.* (1989). The notal marginal bands differ slightly in coloration. Thus, GOSLINER (1990) describes a notal margin with an orange marginal band, a middle yellow band and an inner bluish white band. In our specimens, as was described before, the marginal band is white translucent, the central band is orange and the

inner band is white. On the other hand, the jaws described by CERVERA *et al.* (1989) and GOSLINER (1990) have elongated bifid rodlets while in the specimens studied, the rodlets can be simple or bifid.

In the reproductive system of *G. edmundsi*, the uterine and vaginal duct join the gametolytic gland and seminal receptacle independently (CERVERA *et al.*, 1989; GOSLINER, 1990; ORTEA *et al.*, 1996) as in our specimens of *G. dalli*. However, both species differ because the deferent duct, vaginal duct and the seminal receptacle are longer in *G. edmundsi*.

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LITERATURE CITED

- BERGH, R. (1879). On the nudibranchiate gasteropod Mollusca of the North Pacific Ocean, with special reference to those of Alaska, part 1. *Proc. Acad. Nat. Sci. Philadelphia*, **31**: 71-132.
- BERGH, R. (1880). On the nudibranchiate gasteropod Mollusca of the North Pacific Ocean, with special reference to those of Alaska. *Scientific Results Explor. Alaska*, **1**, 6(2): 189-276.
- BERTSCH, H. (1978). The Chromodoridinae Nudibranchs from the Pacific Coast of America.- Part III. The Genera *Chromolaichma* and *Mexichromis*. *The Veliger*, **21**(1): 70-86.
- BERTSCH, H. (1979). *Chromodoris californiensis* Bergh, 1879 (May): proposed conservation over *Chromodoris glauca* Bergh, 1879 (March) (Molluscs: gastropoda). Z.N.(S.) 2253. *Bulletin of Zoological Nomenclature*, **35**(4): 253-256.

- BERTSCH, H., FERREIRA, A.J., FARMER, W.M. & HAYES, T. L. (1973). The Genera *Chromodoris* and *Felimida* (Nudibranchia: Chromodorididae) in Tropical West America: Distributional data, description of a new species, and Scanning Electron Microscopic studies of radulae. *The Veliger*, **15**(4): 287-294.
- CERVERA, J.L., GARCÍA-GÓMEZ, J.C. & ORTEA, J.A. (1989). On two rare chromodorid nudibranchs (Opisthobranchia: Chromodorididae) from the Eastern Atlantic, with the description of a new species of *Glossodoris*. *J. Moll. Stud.*, **55**: 445-453.
- FARMER, W. M. (1963). Two new Opisthobranch mollusks from Baja California. *Trans. San Diego Soc. Nat. Hist.*, **13**(6): 81-84.
- FARMER, W.L. (1967). Notes on the Opisthobranchia of Baja California, Mexico, with range extensions - II. *The Veliger*, **9**(3): 340-342.
- FARMER, W. M., (1980). *Sea-Slug gastropods*. Wesley M. Farmer Enterprises Inc., Arizona, United States of America.
- GOSLINER, T.M. (1990). Opisthobranch mollusks from the Azores Islands. I. Runcinidae and Chromodorididae. *Açoreana, Suppl.*: 135-166.
- MARCUS, E. & MARCUS, E. (1967). *American Opisthobranch Mollusks*. Studies in tropical oceanography, **6**. Institute of Marine Sciences, University of Miami, Florida.
- ORTEA, J., BACALLADO, J.J. & VALDÉS, A. (1992). Resultados científicos del proyecto Galápagos: Patrimonio de la Humanidad. *Resultados Científicos del Proyecto Galápagos, Patrimonio de la Humanidad*, **1**: 31-70.
- ORTEA, J., VALDÉS, A. & GARCÍA-GÓMEZ, J.C. (1996). Revisión de las especies atlánticas de la familia Chromodorididae (Mollusca: Nudibranchia) del grupo cromático azul. *Avicennia, Supl.* **1**: 1-165.
- WIRTZ, P. (1995). *Unterwasserführer Madeira Kanaren/Azoren*. Niedere Tiere, Verlag Stephanie Naglschmid, Stuttgart.