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Nudibranchia from the remote southern Chilean Guamblin and Ipún islands (Chonos Archipelago, 44-45° S), with re-description of *Rostanga pulchra* MacFarland, 1905

Nudibranquios de las islas Guamblin e Ipún (Archipiélago de los Chonos 44-45° S) con redescripción de *Rostanga pulchra* MacFarland, 1905

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ABSTRACT

The southern Chilean archipelago and fjordland (41-52° S) thus far is very poorly investigated also with regard to its nudibranch fauna. This study presents the first records of nudibranchs from remote islands of the Chonos archipelago exposed to the open Pacific. Collecting data and some biological observations are given for the doridoidean *Archidoris fontaini*, *Diaulula punctuolata* and *Rostanga pulchra*. Taxonomically relevant external and radular characters of *R. pulchra* are redescribed and compared with literature data on conspecifics from Argentina and California. The bipolar, cold-water adapted *R. pulchra* is critically compared with the western Atlantic, warm-water adapted *R. byga*. New distributional data indicates that the Chiloé Island area (41-43° S) does not represent a strict southern distributional barrier for warm-temperate eastern Pacific nudibranch species but is at least partly due to collecting bias.

Key words: Nudibranchia, southern Chile, zoogeography, taxonomy, *Rostanga pulchra*.

RESUMEN

Los archipiélagos y fiordos del sur de Chile han sido muy poco estudiados y particularmente la fauna de nudibranquios. En este estudio se presentan los primeros registros de nudibranquios para islas del Archipiélago de los Chonos abiertas al Pacífico. Se indican datos de recolecta y algunas observaciones biológicas para los doridáceos *Archidoris fontaini, Diaulula punctuolata* y *Rostanga pulchra*. La morfología externa y caracteres radulares de *R. pulchra* son redescritos y comparados con literatura referente a ejemplares de Argentina y California. Se comparan críticamente *R. byga* de las aguas cálidas del Atlántico occidental con *R. pulchra* , especie bipolar adaptada a aguas frías. La nueva información distribucional indica que la isla de Chiloé no representa una barrera distribucional estricta para las especies de nudibranquios del Pacífico sudeste, y es en su mayor parte debido a un vacío de recolección.

Palabras clave: Nudibranchia, Chile sur, zoogeografía, taxonomía, *Rostanga pulchra*.

INTRODUCTION

Chilean and Magellanic nudipleuran gastropods were monographically revised recently by Schrödl (2003). On this taxonomic basis, further systematic and zoogeographical analyses shall be undertaken. Earlier studies suggested a faunal change between cold-adapted Magellanic and warm-temperate "Peruvian" species at the northern end of Chiloé Island (41-42° S) (Marcus 1959, Brattström & Johannsen 1983). However, most nudipleuran species with a Magellanic distribution were shown to be widespread and extending more or less far to the north into central or even northern Chilean waters (Schrödl 1997a, 2003). In contrast, amphi-South American species such as the bipolar *Rostanga pulchra* MacFarland, 1905, as well as several nudipleuran species with a Peruvian distribution had their southernmost known geographical ranges at 41-43° S in the Pacific (see Schrödl 2003); this "Chiloé Island

area" thus may either represent a true distributional barrier, or actual distributional limits may be due to collecting artifacts (Schrödl 2003). In fact, there is a general lack of distributional data regarding remote areas of the southern Chilean archipelago and continental fjordland (41-52° S), that thus far is amongst the most poorly sampled coastal areas of the world. Within the framework of exploring opisthobranchs of the southern Chilean fjord region, a catalog of 12 nudipleuran species from the protected Comau fjord system has been published recently (Schrödl et al. in press). The present study gives new information on a small collection of nudibranchs from the remote Guamblin and Ipún islands which are exposed to the open Pacific. Since the identity of Chilean *Rostanga pulchra* specimens has been doubted by Muniaín & Valdés (2000), *R. pulchra* is redescribed in more detail from a specimen from Ipún Island. The taxonomic status of the apparently bipolar *R. pulchra* and the similar, western Atlantic *R. byga* Marcus, 1958 is re-evaluated critically.

MATERIAL AND METHODS

During a bioinventory survey at Guamblin and Ipún islands, Chonos Archipelago (Fig. 1), in January and February 2004, the junior author (JG) documented and collected nudibranchs from tide pools and the lower intertidal. Specimens were fixed in ethanol (70 %) for further taxonomic analysis. In laboratory, at least one specimen of each species from each locality was dissected under a stereomicroscope to confirm external identification. The single specimen of *Rostanga pulchra* was examined and redescribed in anatomical detail. Cuticular structures such as jaws and radula were analyzed with a scanning electron microscope. Reference specimens were deposited at the Zoologische Staatsammlung München (ZSM).

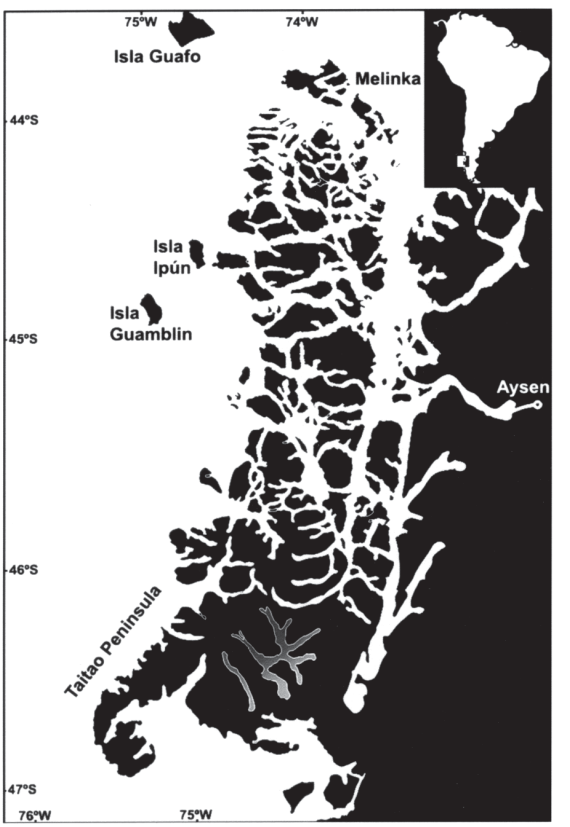

Fig. 1: Map of the southern Chilean archipelago with the collecting sites Ipún and Guamblin islands.

Mapa del archipiélago del sur de Chile mostrando los sitios de colecta, islas Guamblin e Ipún.

Doridiidae s.l., Archidoris *Bergh, 1878:* Archidoris fontaini *(D'Orbigny, 1837) (Fig. 2A and 2B)*

Material examined. One specimen (ZSM Moll 20040982; dissected), Guamblin Island (44° 46.6' S, 75° 09.8' W); tide pool, on rock. Two specimens (ZSM Moll 20040983; one dissected), Ipún Island (44° 33.1' S, 74° 48.0' W); tide pool, on rock.

Distribution. Independence Bay, 260 km south of Lima, Perú, along the entire Chilean continental coast, Argentinean Patagonia to northern Argentina (see Schrödl 2003). This is the first record of this otherwise common species from the Chonos Archipelago.

Observations. Living specimens ranged between 40 and 50 mm body length. They did not show the network of more or less dark brown pigment between the tubercles that is characteristic for most northern and central Chilean specimens (see Schrödl 2003); instead, the uniformly yellow coloured specimens externally resemble *A. fontaini* described from the Comau Fjord (Schrödl et al. in press), the Magellan Strait and Argentina (see Schrödl 2003). Yellow coloration, large tubercles, triangular, grooved oral tentacles, the arrangement of the reproductive system, and the structure of genital organs agree exactly with recent re-descriptions and diagnoses of *A. fontaini* by Schrödl (1997b, 2000, 2003). A phylogenetic analysis of cryptobranch doridoideans by Valdés (2002) indicates the genus *Archidoris* and some other traditional dorid genera may form a clade that he called Doris; however, statistic support for such a clade is still lacking, and synonymizing dorid genera thus may be premature.

Diaulula *Bergh, 1880:* Diaulula punctuolata *(D'Orbigny, 1837) (Fig. 3A and 3B)*

Material. Two specimens (ZSM Moll 20040984; both dissected), Ipún Island (44° 33.1' S, 74° 48.0' W); found in a small tide pool together with *R. pulchra*.

Distribution. Valparaíso, central Chile, to Melinka, Guaitecas Islands; Magellan Strait, Falklands and Argentinean Patagonia to northern Argentina (see Schrödl 2003). This is the first record of this otherwise common species from the Chonos Archipelago.

Observations. Living specimens measured 25 mm and 35 mm in length. External features of the specimens examined, like the uniform whitish coloration, the slender, similar sized caryophyllid tubercles, the six tripinnate to quadripinnate gills, the elevated rhinophoral and branchial sheaths, digitiform oral tentacles, and the bilabiate anterior foot edge with the upper lip notched, confirm exactly with recent redescriptions and diagnoses of *D. punctuolata* by Valdés & Gosliner (2001), Valdés & Muniaín (2002), and Schrödl (2003). While the smaller specimen was immature, the larger one had its reproductive system fully developed, except for the still relatively small-sized female gland mass.

Rostanga *Bergh, 1879:* Rostanga pulchra *MacFarland, 1905 (Fig. 4A, 4B; 5A-5D)*

Material. One specimen (ZSM Moll 20040981), Ipún Island (44° 33.1' S, 74° 48.0' W); found in a small tide pool together with *D. punctuolata*.

Distribution. Alaska to Mexico; Bahía de Coliumo to northern Chiloé; Bahía Camarones, Argentina (see Schrödl 2003). This is the first record of *R. pulchra* from the Chonos archipelago extending its known geographic range in the Pacific by approximately 300 km to the south.

Description. The single living specimen was 6 mm long and uniformly orange coloured (Fig. 4A and 4B). The preserved specimen (6 mm) shows a dorsum densely covered by slender caryophyllid tubercles with a height up to 200 μm and measuring 50-100 μm in diameter. The apical sensory knob is elongated, it measures approximately half the diameter of the corresponding tubercle. The tip of the tubercle is crown-like surrounded by five to six vertical needle-like spicules. Most of the tubercles are, however, artificially eroded apically. Within the notum there is a layer of similar shaped horizontally arranged spicules. There are 10 unipinnate gills surrounding the anal papilla. The rhinophores bear approximately 10 vertical lamellae on each side below a large knobby clavus. The notum does not bear branchial or rhinophoral sheaths. The oral tentacles are short conical. The foot is broad and anteriorly bilabiate, the upper lip is notched. The jaws are small, solid, with some rows of elongated, overlapping rodlets. The radula formula is approx. 80 x 30.30.0.30.30. The rachis is broad.

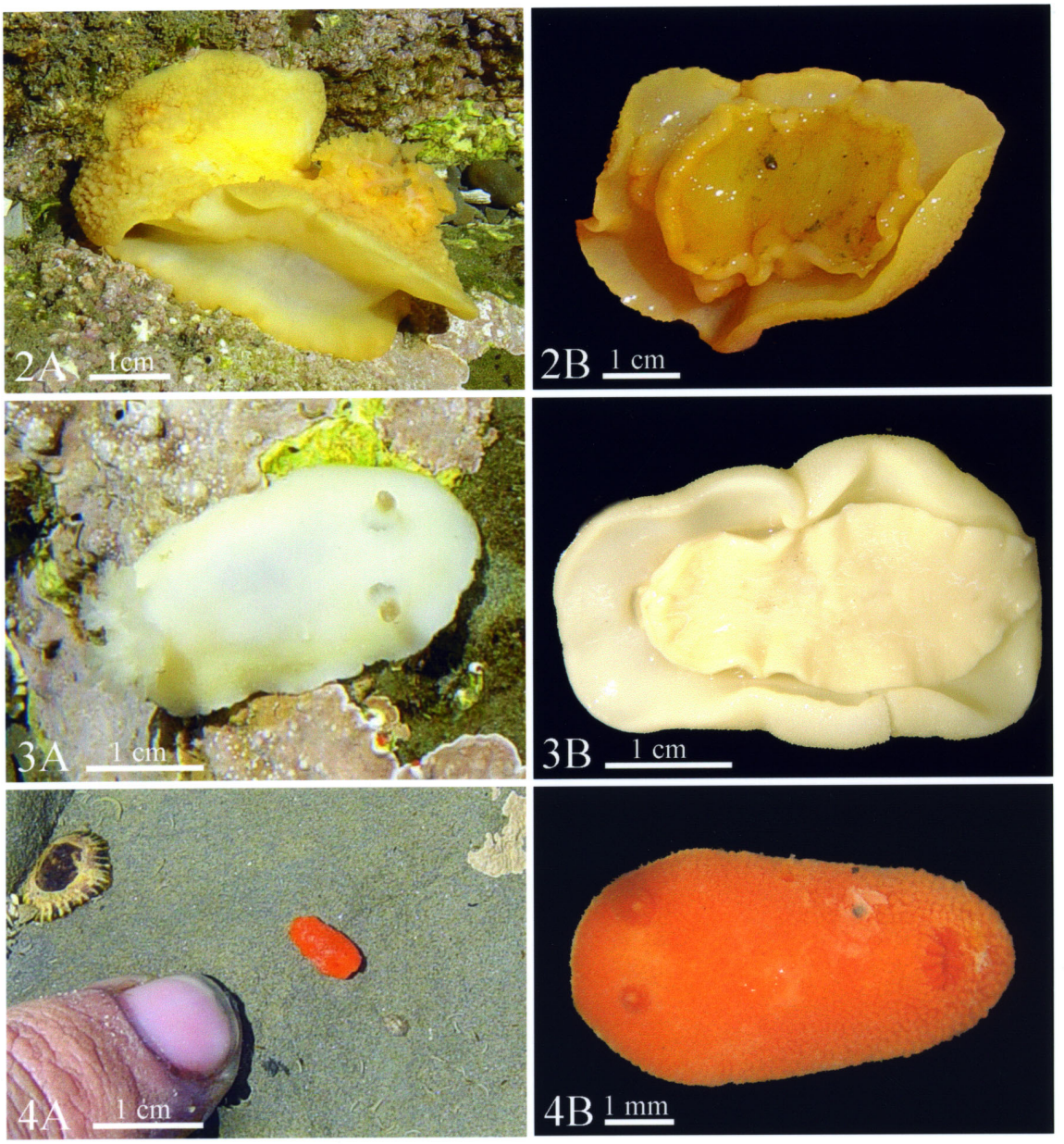

Fig. 2: Archidoris fontaini. (A) Two living specimens in its natural habitat (dorsolateral view). (B) Living specimen in ventral view.

Archidoris fontaini. (A) Dos especímenes vivos en su hábitat natural, vista dorsolateral. (B) Espécimen vivo, vista ventral.

Fig. 3: Diaulula punctuolata. (A) Living specimen in its natural habitat, dorsal view. (B) Living specimen in ventral view.

Diaulula punctuolata. (A) Espécimen vivo en su habitat natural, vista dorsal. (B) Espécimen vivo, vista ventral.

Fig. 4: Rostanga pulchra. (A) Living specimen in its natural habitat, dorsal view. (B) Close-up of living specimen, dorsal view.

Rostanga pulchra. (A) Espécimen vivo en su hábitat natural, vista dorsal. (B) Acercamiento de espécimen vivo, vista dorsal.

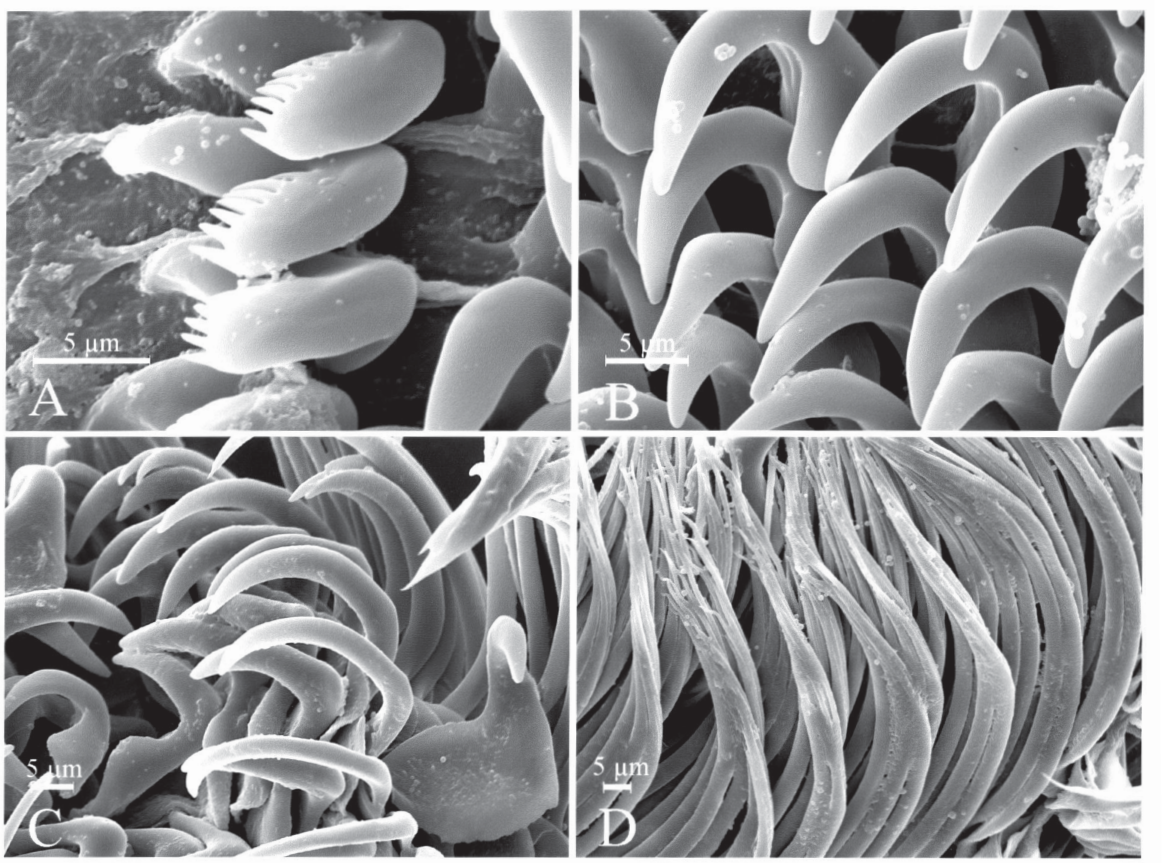

Fig. 5: Rostanga pulchra, SEM micrographs of radular structures. (A) Innermost lateral teeth. (B) Midlateral teeth. (C) Outer lateral teeth. (D) Marginal teeth.

Rostanga pulchra, fotomicrografías de las estructuras radulares. (A) Dientes laterales internos. (B) Dientes centro-laterales. (C) Dientes laterales externos. (D) Dientes marginales.

Lateral and marginal teeth are densely arranged and there is considerable overlap between different rows, thus inhibiting accurate counting of maximum teeth numbers. First lateral teeth are small, hook-shaped, with a stout cusp that is serrate with up to eight pointed denticles at its inner edge (Fig. 5A). The number, length and arrangement of denticles is variable between teeth of different rows. Inner lateral teeth are hook-shaped with a broad base bearing a blunt protuberance (denticle) (Fig. 5B). Midlateral teeth grow successively in size with the hook becoming longer and more slender. Outer laterals gradually become slender and elongate (Fig. 5C). Marginal teeth are very thin and elongate, splitting into a fine brush of several denticles in the upper third (Fig. 5D). The esophagus is a straight thin tube entering the digestive gland anteroventrally. Both stomach and caecum are embedded within the digestive gland. The intestine forms a loop and leads posteriorly towards the anal papilla as a thin tube. The preservation condition of the specimen did not allow anatomical examination of further digestive, circulatory and excretory features. The cerebropleural ganglia are completely fused. Eyes are sessile. There is a small ganglion associated to the cerebral ganglion that might be a rhinophoral ganglion. The ampulla is long tube-like and filled with sperm. The prostate is an irregularly spherically shaped granular mass. The vas deferens is thin and muscular. The genital openings, female gland mass and allosperm receptacles are poorly developed, the specimen was not fully mature.

DISCUSSION

Remarks on the taxonomy of Rostanga pulchra

Rostanga pulchra was originally described from California by MacFarland (1905). Muniaín & Valdés (2000) compared additional specimens of *R. pulchra* from the type locality, Monterey, California, with the similar, western Atlantic *Rostanga byga* Marcus, 1958; of the latter, the dissected holotype from Brazil was re-examined and additional specimens from Argentina were studied anatomically in detail. Due to a number of external and anatomical differences Muniaín & Valdés (2000) concluded that *R. pulchra* is clearly distinct from *R. byga*. However, most of these differences only refer to the specimens examined by themselves. Original descriptions of *R. pulchra* by MacFarland (1905, 1906, 1966) and *R. byga* by Marcus (1958) were not considered properly, South American specimens of *R. pulchra* were not included into their analyses. On one hand, Muniaín & Valdés (2000) considered previous records of *R. pulchra*, i.e., from Bahía Camarones (44°29' S), southern Argentina by Marcus & Marcus (1969), from the central Chilean Bahía de Coliumo, from Queule (north of Valdivia), and from the northern coast of Chiloé Island (Schrödl 1996, 1997, 2003), to be problematic due to the lack of detailed anatomical descriptions. On the other hand, Muniaín & Valdés (2000) accepted specimens from Chiloé Island described in great detail by Marcus (1959) as being *R. pulchra* due to sharing two "characteristic" radula features: (1) the innermost radular teeth having a short cusp in relation to their denticles, and (2) mid-lateral teeth having a large secondary cusp. However, the shape of innermost laterals was illustrated to be very variable by Marcus (1959: Fig. 66A and 67). There is no indication of any secondary cusps in mid-lateral teeth in Marcus' specimens (but Marcus 1959 did mention the second and third laterals to have basal swellings in his German text description). Several further radular and reproductive features (see Table 1) of Marcus' Chilean specimens were not considered by Muniaín & Valdés (2000) but also differ considerably from conditions they regarded diagnostic for (in fact only their own Monterey specimens of) *R. pulchra*. The shape of midlateral teeth of Marcus' specimens, as well as the shape of the ampulla, and the arrangement of allosperm receptacles which, according to Marcus (1959), are "like in *R. byga*", all resemble more to conditions stated for *R. byga* than to Californian *R. pulchra* examined by Muniaìn & Valdés (2000). Thus, the anatomy and taxonomy of South American *R. pulchra* was in need to be re-evaluated.

Table 1 summarizes taxonomically relevant external and anatomical knowledge of specimens assigned to *R. pulchra*, including new external and radula data presented herein. According to present, still limited knowledge, there are not any differences amongst Chilean specimens. Muniaín & Valdés (2000) in particular doubted conspecifity of a specimen collected off Bahía Camarones, Argentina, due to its many (approximately 90) radula teeth per half row. This is, however, exactly within the range of central and southern Chilean *R. pulchra* (see Marcus 1959, Schrödl 2003; Table 1).

According to Table 1, Southern American specimens of *R. pulchra* resemble northeastern Pacific *R. pulchra* described by MacFarland (1905, 1966) regarding all external, radular and reproductive features examined. The specimens from Monterey Bay described by Muniaín & Valdés (2000) differ in having (1) less radula rows and teeth per half row, (2) due to the presence (vs. absence) of a long denticle in inner and mid-lateral teeth, and (3) having marginal teeth splitted into nine to 10 (versus one to six) brush-like denticles. In addition to intraspecific variability, the exact numbers of radula rows and teeth per half-row are, however, difficult to count due to dense arrangement and considerable overlap. The specimen examined herein does not show any long basal denticles in inner lateral teeth but a broad, blunt elevation ("low denticle") at the base of midlateral teeth. Besides varying within teeth of the same individual, the exact number of brush-like denticles of marginal teeth (Fig. 5D) is difficult to count even if using SEM. With present knowledge, northern and southern hemispherical populations of *R. pulchra* cannot be consistently distinguished morphologically; radula differences amongst specimens from California include the range of variability known from Chilean specimens.

Comparision between Rostanga pulchra *and* R. byga

According to Muniaìn & Valdés (2000), *R. pulchra* and *R. byga* can be clearly distinguished. However, besides color differences (absence vs. presence of white spots on the central notum), their Table 1 does not show any consistent distinguishing feature. The radula formulae overlap with regard to number of rows and teeth per half row. Chilean and Argentinian *R. pulchra* were described to possess up to nine and seven denticles on the innermost radular teeth, respectively (Marcus 1959, Marcus & Marcus 1969), while six to 11 were mentioned for Californian *R. pulchra*, and five to 10 for *R. byga* specimens by Marcus (1958) and Muniaín & Valdés (2000). Innermost radula teeth of Chilean *R. pulchra* were already shown to be very variable in shape by Marcus (1959: figures 66A, 67). According to SEM photographs of Muniaín & Valdés (2000), we cannot see any difference between a "short" or "long" cusp of the innermost (= first) lateral teeth of *R. pulchra* and *R. byga*. The long denticle that is present in *R. pulchra* specimens from Monterey examined by Muniaín & Valdés (2000) is absent in Californian specimens described by MacFarland (1905, 1966) and in South American specimens described by Marcus (1959). A broad and low basal elevation is present in inner and mid-lateral teeth of the specimen from Ipún Island examined herein and in *R. byga* (see Muniaín & Valdés 2000). Two areas with several rows of jaw rodlets are present in all *R. pulchra* specimens studied and were described from the holotype of *R. byga* as well (Marcus 1958), while there were only few rodlets in *R. byga* studied by Muniaín & Valdés (2000). Allosperm receptacles are arranged serially in both *R. pulchra* and *R. byga*. According to Marcus (1959) and results presented in this paper, the ampulla of Chilean *R. pulchra* does not differ in its tubular shape from that of *R. byga*. The sensory knob of the caryophyllid tubercles is "extremely small" in *R. pulchra* from Monterey and "large" in *R. byga* (Muniaín & Valdés 2000), while measuring approximately half the diameter of the tubercles in *R. pulchra* from Ipún and in a specimen from the Bay of Coliumo (ZSM 19960719) re-examined herein. This character should be reinvestigated using appropriately preserved material.

Thus, with present knowledge (Table 1), the diffences between *R. pulchra* and *R. byga* are limited to (1) the absence versus presence of white dots on the central notum, (2) nine to 12 versus 12-16 (i.e., not "twice as many" as stated by Muniaín & Valdés) rhinophoral lamellae, (3) the insertion into the bursa copulatrix of the vagina and the duct leading towards the receptaculum seminis that appears to be more separated in *R. pulchra*, and, (5) the receptaculum seminis that is stalked in *R. byga* while it is not (or very shortly) stalked in *R. pulchra*. Different sizes and proportions of reproductive organs such as the apparently larger prostate of *R. byga* should be interpreted with caution since they also may depend on the maturity of individuals. We follow Marcus (1958) stating that *R. pulchra* and *R. byga* are very similar. A few minor but consistent distinguishing features listed above indicate that they are distinct species. Additional evidence comes from geographical and hydrographical indications: while *R. pulchra* appears to be a bipolar species known from cold-temperate waters of the northeastern and southeastern Pacific and from southern Argentina, *R. byga* is obviously adapted to warmer and tropical waters; it ranges from northern Brazil south to the Gulf of San José (approximately 42°20' S, Muniaín & Valdés 2000), i.e., just north of the Península Valdez, the virtual border to the Magellanic region.

Biogeography

The new records of *A. fontaini* and *D. punctuolata* from Guamblin and Ipún islands represent new localities for these widespread Magellanic species; in the Chilean archipelagos remains a gap between 45 and 52° S in their elsewhere continuous geographic record along the Chilean and Argentinean coasts (Schrödl 1997a, 2003). The finding of *Rostanga pulchra* at Ipún Island represents the southernmost record of this species in the Pacific. Schrödl et al. (in press) showed further, supposedly warm-adapted species to occur in the southern Chilean fjordland. Like *R. pulchra*, *Cadlina sparsa* (Odhner, 1921) is a bipolar eastern Pacific and amphi-South American species, with a geographic record extended south to the Comau fjord system (42.1–42.5° S) recently. The amphi-South American *Doto uva* Marcus, 1955, the Peruvian *Phidiana*

TABLE 1

Comparison of *Rostanga pulchra* MacFarland, 1905, and *R. byga* Marcus, 1958

Comparación de *Rostanga pulchra* MacFarland, 1905, con *R. byga* Marcus, 1958

Feature or character	*R. pulchra*						*R. byga*	
Reference	MacFarland (1906), (1966)	Marcus & Marcus (1969)	Marcus (1959)	Muniaín & Valdés (2000)	Schrödl (2003)	This study	Marcus (1958)	Muniaín & Valdés (2000)
Collecting locality	California, USA	Bahía de Camarones, Argentina	Northern coast of Chiloé Island, Chile	Monterey Bay, USA	Bahía de Coliumo, Queule, northern coast of Chiloé, Chile	Ipún Island, Chile	Ilhabela, Brazil	Gulf of San José, Argentina
Specimens	Many	n = 1	n = 3	n = 6	n = 18	n = 1	n = 1	n = 3
Coloration	Light yellow-red to deep scarlet, with brown or black spots on the dorsum	Preserved specimen with some dark spots	Orange red; one preserved specimen with dark subepidermal spots	Orange-yellow to bright red, some specimens with dark spots scattered on the dorsum; small white dots on mantle margin	Orange to red, some specimens with small dark spots	Orange	Bright brick red with white spots on some tubercles	Orange, lightly spotted with white dots in the middle of the dorsum and between tubercles
Arrangement and number of rhinophoral lamellae	Vertical; 10-12 lamellae		Vertical; 10-12 lamellae	Vertical, transverse; nine lamellae	Vertical; 10-12 lamellae	Vertical; approximately 10 lamellae	Vertical, 12 lamellae	Vertical, transverse; 14-16 lamellae
Dimension and shape of caryophyllid tubercles	Height up to 420 μm; up to 80 μm in diameter		Height up to 250 μm; 50-80 μm in diameter	Cup-shaped, height about 150 μm	Slender	Height up to 200 μm; 50-100 μm in diameter	Varying sizes	Height about 100 μm
Number of spicules surrounding sensory knob	"A number of"		Five-to-six	Four-to-five		Five-to-six		Six
Shape of sensory knob				Extremely small and ciliated, with small marginal cilia		Elongated, approx. half diameter of corresponding tubercle		Large, rounded, ciliated; with small marginal cilia
Body length of specimens examined anatomically		9 mm (preserved)	15 mm (preserved)	16 and 18 mm (preserved)	6 mm (preserved)	6 mm (preserved)	11 mm (preserved)	12 and 14 mm (preserved); 20 mm (alive)
Jaw rodlets	Two areas with five-to-six overlapping rows of rodlets each	Two areas with slightly rough pegs	Two areas with six rows of about 20 rodlets each	Text: "jaws solid, with few rodlets of varying lengths". SEM micrograph showing over 50 rodlets	Elongate rodlets	Two areas with several rows of elongate rodlets	Two small areas with six rows, each with about 15 rodlets	Very small; with few irregular rodlets

Radula formula	60-68 x 60-81.0.60-81	85 x approximately 90.0.90	80 x 90.0.90	50-53 x 48-51.0.48-51	68 x 85.0.85	Approximately 80 x 30.30.0.30.30	Approximately 60 x 60.0.60	45-62 x 53-62.0.53-62
Shape of 1st lateral teeth	Short, cusp serrate with 20-30 or eight-to-11 denticles (only six denticles drawn in 1966: plate 35, Fig. 1)	Usually three-to-five, up to seven denticles	Small and stout; denticles variable in shape and number: either four long comb-like apical denticles or serrate cusp with nine small denticles	Short; "short" cusp with six-to-eight denticles	Short, with four-to-eight denticles	Small and stout; up to eight more or less elongate denticles	Short; broad cusp with five-to-eight denticles	Short; rounded, "long" cusp with seven-to-10 short denticles
Inner lateral teeth	Hook-shaped, with broad base		Hook-shaped, with two basal swellings	Wide, with a long pointed primary cusp and a large pointed secondary cusp	Broad wing-like base	Hook-shaped, with broad base and broad and low denticle	Small, hook-shaped; base larger than cusp	Broad triangular base with a small lateral wing, pointed primary cusp
Mid-lateral and outer lateral teeth	Hook grows in size and becomes more slender and less curved		Second to 30th teeth growing in size and becoming more slender and erect	Teeth gradually growing in size, secondary cusp well developed but becoming smaller in relation to the long primary cusp		Second to 30th teeth growing in size and becoming slender and erect; with broad and low basal denticle	Gruadally increasing in size, cups becoming more slender and longer Marginal teeth	Gruadally increasing in size
Marginal teeth	Long and slender, distally split into one-to-six additional, very long denticles	Apical fourth split into up to six spinelike cusps	Long and slender, upper third split into one-to-four additional denticles	Thin and elongate, with a fine brush of nine-10 denticles at the end	Very thin and elongate, with brush-like apical denticles	Long and slender, upper third split into several brush-like denticles	Very thin and elongate, almost apical half forming a fine brush of five-to-nine denticles	Very thin and elongate, with a fine brush of six-to-10 denticles at the end
Ampulla			Long and slender tube			Slender tube	Long and tubular	Long and tubular
Prostate	Large		Similar sized as bursa copulatrix	Larger than bursa copulatrix		Well developed, but bursa copulatrix not yet fully developed	Large	Very large, flat, with two well-differentiated portions
Arrangement of allosperm receptacles	Vagina separated from duct leading to receptaculum seminis		Vagina separated from duct leading to receptaculum seminis	Vagina separated from duct leading to receptaculum seminis	Vagina separated from duct leading to receptaculum seminis	Gradually increasing in size, cusps becoming more slender and longer	Bursa inserted nearly jointly by vagina and duct leading to receptaculum seminis	Bursa inserted nearly jointly by vagina and duct leading to receptaculum seminis
Insertion of receptaculum seminis	Very short stalk or inserted jointly		Shortly stalked	Very short stalk or inserted jointly	Very short stalk		Long stalk	Stalked

lottini (D'Orbigny, 1837), and the central Chilean Tergipedidae sp. (Schrödl 2003) were collected from the Comau fjord as well (Schrödl et al. in press). In addition, *Doto uva* was found at Puerto Cisnes (44.7° S) (Schrödl et al. in press), and *Phidiana lottini* was photographically recorded from Guaitecas Islands close to Melinka (Schories, unpublished information). With *R. pulchra* and *D. uva*, at least two of five nudipleuran species classified as "warm (temperate) amphi-South American" (Schrödl 2003) now are known from considerably south of the Chiloé Island area, that should not be regarded as a strict distributional barrier for nudipleurans any longer. Regarding other marine invertebrates, e.g. sea anemones, the Península Taitao at 46° S appears to be an area of faunal change between cold- and warm-temperate species (Lancellotti & Vásquez 1999, Häussermann & Försterra in press). Further collects in the southern Chilean archipelago and fjordland will be necessary to unravel nudibranch diversity and their actual distributional limits.

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