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New species and new records of Cumacea (Crustacea: Peracarida: Cumacea) from mesophotic reefs of Puerto Rico and U.S. Virgin Islands, Caribbean Sea

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Table of contents

Abstract	4
Introduction	4
Material and methods	5
Systematics	5
Family Bodotriidae T. Scott, 1901	5
Subfamily Vaunthompsoniinae G. O. Sars, 1878	6
Genus <i>Vaunthompsonia</i> Bate, 1858	6
<i>Vaunthompsonia cristata</i> Bate, 1858	6
<i>Vaunthompsonia floridana</i> Băcescu, 1971	6
Family Nannastacidae Bate, 1866	7
Genus <i>Cubanocuma</i> Băcescu & Muradian, 1977	7
<i>Cubanocuma gutzui</i> Băcescu & Muradian, 1977	7
Genus <i>Cumella</i> G. O. Sars, 1879	8
Subgenus <i>Cumella</i> G. O. Sars, 1879	8
<i>Cumella andri</i> Petrescu & Iliffe, 1992	8
<i>Cumella clavicauda</i> Calman, 1911	8
<i>Cumella gurui</i> Petrescu, Chatterjee & Schizas, 2014	9
<i>Cumella tourmalinae</i> sp. nov.	9
<i>Cumella multisetosa</i> sp. nov.	11
<i>Cumella longiseta</i> sp. nov.	13
<i>Cumella tricornuta</i> sp. nov.	17
<i>Cumella ponceledgensis</i> sp. nov.	20
<i>Cumella nodulata</i> sp. nov.	22
<i>Cumella hexadentata</i> sp. nov.	24
<i>Cumella medeeae</i> Petrescu, Iliffe & Sarbu, 1994	26
<i>Cumella amiti</i> sp. nov.	26
<i>Cumella tuberculata</i> sp. nov.	30
<i>Cumella seticaudata</i> sp. nov.	34
<i>Cumella croixensis</i> sp. nov.	37
<i>Cumella portoricensis</i> sp. nov.	40
<i>Cumella maxiproa</i> sp. nov.	43
<i>Cumella reticulata</i> sp. nov.	45
<i>Cumella longirostrum</i> sp. nov.	48
<i>Cumella enriqueensis</i> sp. nov.	50
<i>Cumella ruxandrae</i> sp. nov.	54
<i>Cumella nastasescui</i> sp. nov.	58
<i>Cumella banarescui</i> sp. nov.	60
<i>Cumella curvicauda</i> sp. nov.	62
<i>Cumella</i> sp. 1	64
Key to subgenus <i>Cumella</i> from western tropical Atlantic	66
Subgenus <i>Cumewingia</i> Băcescu, 1971	68
<i>Cumella biserrata</i> Petrescu, 2002	68
<i>Cumella antipai</i> Petrescu, Iliffe & Sarbu, 1994	68
<i>Cumella murariui</i> Petrescu, 2002	69
<i>Cumella ocellata</i> Băcescu, 1992	69
<i>Cumella garrityi</i> Băcescu & Muradian, 1977	69
<i>Cumella gomoiui</i> Băcescu & Muradian, 1977	70
<i>Cumella baraschi</i> sp. nov.	70
<i>Cumella sancristobalensis</i> sp. nov.	72
Key to subgenus <i>Cumewingia</i> from western tropical Atlantic	74
Acknowledgements	75
References	76

Abstract

The cumacean fauna of the Caribbean mesophotic reefs is remarkably rich but understudied. Herein, we present the description of 22 new species of the family Nannastacidae, including one from shallow reefs, 20 of them belonging to *Cumella* (*Cumella*) and two new species belonging to the subgenus *Cumewingia*. We have also included range extensions and new locations for ten previously known species of *Cumella*, two species in the genus *Vaunthompsonia* (family Bodotriidae) and one species in the genus *Cubanocuma* (family Nannastacidae). Taxonomic keys are provided for the western tropical Atlantic species of *Cumella* (*Cumella*) and *Cumella* (*Cumewingia*), separately for the adult males and females. Large sampling efforts and careful systematic studies, even in relatively well-characterized regions such as the Caribbean, can yield a surprising number of new discoveries. Our current findings emphasize our previous assertion that the mesophotic reefs are treasure troves of undiscovered benthic fauna and might be qualified as biodiversity hotspots.

Key words: Cumacea, biodiversity, Puerto Rico, Nannastacidae, *Cumella*, new species

Introduction

The Caribbean Sea is a large sea, closed off to the West and to the South by the American continents, and bordered to the North and to the East by the island chains of the Greater and Lesser Antilles (Spalding, 2004). Its area is about 2,754,000 km², it has a volume of 6.5 x 10⁶ km³, borders over 13,500 km of coastline, and borders 12 island countries, nine continental countries, and 12 island dependencies (to France, the Netherlands, UK and USA) (Martin *et al.*, 2013).

The Caribbean Sea is famous for its beautiful, extensive shallow water reefs but there is another striking yet understudied reef system found on its insular and continental slopes, the mesophotic coral ecosystem (Sherman *et al.*, 2010). Mesophotic coral reef ecosystems (MCEs) are warm water, photosynthesis-dependent reef communities starting at 30–40 m and depending on the water clarity they may extend down to 150 m in some regions (Kahng *et al.*, 2010). Mesophotic coral reef ecosystems remain poorly understood mainly because of safety issues of working near or below the depth limits of SCUBA diving with air or NITROX (Menza *et al.*, 2008). New diving technology that combines Tri-Mix Diving and Rebreathers allows divers to safely collect from these depths. Recent MCE studies revealed widely distributed reef communities and highlighted their significant differences from the shallow-water reefs, yet, we are lacking basic information on the biodiversity and ecology of MCE species compared to those of shallow-water reefs (Kahng *et al.*, 2010). It is hypothesized that the mesophotic zone may be qualified as a biodiversity hotspot inhabited by a transitional fauna between the shallow and deeper zones (Petrescu *et al.*, 2013).

Among the least studied metazoans of the Caribbean benthos are the microcrustaceans and especially the cumacean fauna, which is only known from haphazard samples from rare expeditions of the past. Jones (1969) described a new species *Ceratocuma amoena* from the Puerto Rico Trench, 2,840 m depth, based on specimens collected during the second Galathea expedition in 1952. Subsequently, there were no other records of cumaceans from the U.S. Caribbean (Puerto Rico and U.S. Virgin Islands), although there were several contributions to the knowledge of cumacean fauna from the islands of Cuba (Zimmer, 1944; Petrescu, 2004), Jamaica (Petrescu *et al.*, 1993, 1994), Martinique (Zimmer, 1944) and the Bahamas (Petrescu & Iliffe, 1992; Petrescu, 1996, 2003). To fill this void, the present authors, since 2012, have initiated systematic collections and taxonomic studies of cumacean fauna associated with MCEs.

Since 2012, eight new species of the genera *Cumella* and *Nannastacus*, one new species of *Campylaspis* and one new genus *Cumellana*, all belonging to the family Nannastacidae (Petrescu *et al.*, 2012, 2013, 2014a, b, 2015) have been described from Puerto Rico. In addition, three new species and new records of the genera *Cyclaspis* and *Vaunthompsonia* of the family Bodotriidae (Petrescu *et al.*, 2014c) have been reported from Puerto Rico. One species, *Cumella solomoni*, has been described from the mesophotic reefs of St. Croix, U.S. Virgin Islands (Petrescu *et al.*, 2013).

In this paper we are describing 22 new species, 20 of them belonging to *Cumella* (*Cumella*) and two belonging to *Cumella* (*Cumewingia*). The vast majority of the new crustacean species were collected from the mesophotic reefs from Puerto Rico and U.S. Virgin Islands. This work also includes range extensions for ten species of *Cumella*, two species in the genus *Vaunthompsonia* and one species in the genus *Cubanocuma*. Our studies over the last 5 years (aquatic mites—Pešić *et al.*, 2012, 2014; cumaceans—Petrescu *et al.*, 2012, 2013, 2014a, b, c,

2016; amphipods—Senna *et al.*, 2014; Guerra-Garcia *et al.*, 2015; harpacticoid copepods—Corgosinho & Schizas, 2013; Schizas *et al.*, 2015) are emphasizing the faunal uniqueness of the Caribbean mesophotic reefs.

Material and methods

Numerous cumaceans collected from different habitats of Puerto Rico and U.S. Virgin Islands (Fig. 1) between 2008–2012 were studied. All samples were collected by snorkeling, conventional SCUBA or technical diving using tri-mix Rebreathers from 0.5 m to 73.1 m depth. The vast majority of the specimens were collected from mesophotic depths during 3 NOAA—funded cruises (2010–2012) organized by the University of Puerto Rico at Mayagüez (UPRM), the Caribbean Coral Reef Institute (CCRI) and the Department of Marine Sciences (DMS) of UPRM (Sherman *et al.*, 2013). Divers collected various substrata (rubble, corals, sponges, macroalgae, rhodoliths, etc.) and returned to the laboratory within 1 hour of collection. The substrata were placed on a 1 mm sieve and washed with filtered seawater. Any fauna that passed through the 1 mm sieve and was retained in the 0.125 mm sieve was extracted, preserved in 100% ethanol and examined under the microscope. Cumacea were sorted out of the samples and prior to further light microscopic examination, specimens were cleared, dissected in lactic acid and mounted on slides with glycerine. Drawings were prepared using a *camera lucida* on an Olympus CH-2 microscope. All specimens are deposited in the Crustacean Collection of the “Grigore Antipa” National Museum of Natural History in Bucharest (Muzeul Național de Istorie Naturală “Grigore Antipa” Bucharest—MGAB).

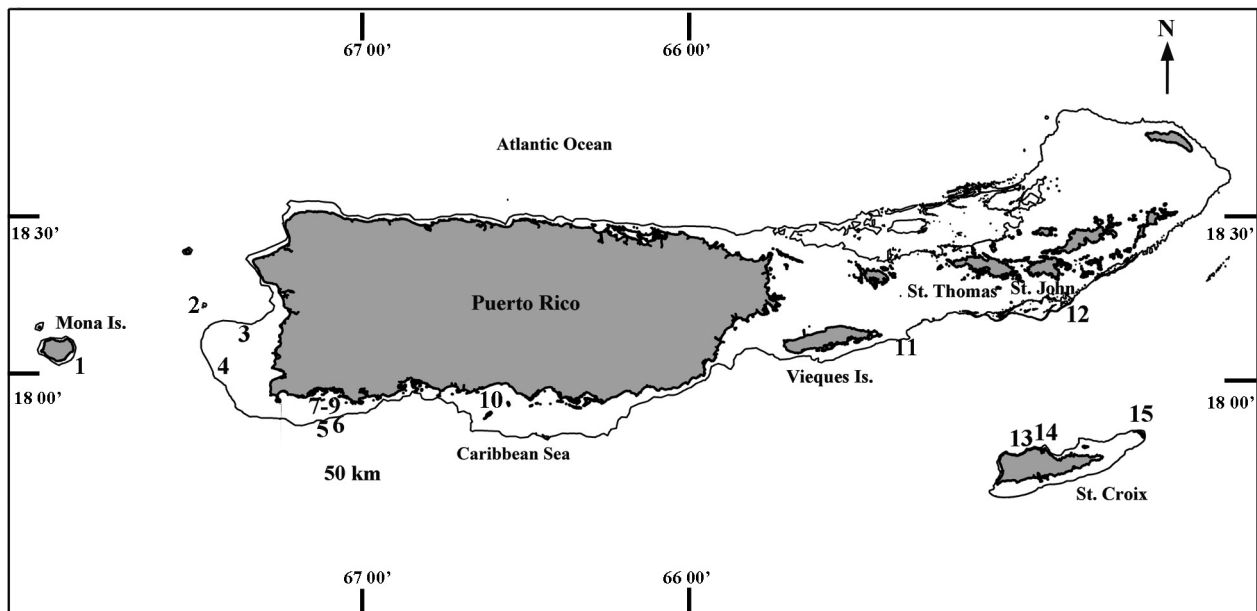


FIGURE 1. Map of Puerto Rico and the U.S. Virgin Islands showing collection areas. The extended continental shelf is included and noted by a thinner black line. Numbers indicate the sampling locations of specimens mentioned in the manuscript. 1 = Mona, 2 = Bajo de Sico, 3 = Tourmaline reef, 4 = North of Buoy 4, 5 = Hole-in-the-Wall, 6 = Weinberg, 7 = Collado reef, 8 = San Cristobal reef, 9 = Enrique reef, 10 = Ponce Ledge, 11 = El Seco, 12 = St. John, 13 = North Star, 14 = Salt River Canyon, 15 = Lang Bank. Locations 7–9 are shallow water reefs in La Parguera.

Systematics

Family Bodotriidae T. Scott, 1901

Diagnosis. Telson fused with last pleonite as pleotelson; males with 5, occasionally 3, 2, 0 pairs of pleopods; uropodal endopod with 1 or 2 articles.