

SHORT COMMUNICATION

Soft corals (Cnidaria, Alcyonacea) from the Gulf of Nicoya estuary, Pacific of Costa Rica: a checklist

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ABSTRACT. Introduction: The Gulf of Nicoya is the most important estuary on the Pacific coast of Costa Rica. Information on the presence of soft corals is scattered in the literature and in museum collections. **Objective:** To provide a list of soft corals reported for the estuary. **Methods:** We compiled the literature (2002-2020) and of the specimens deposited at the Museum of Zoology, University of Costa Rica. **Results:** Thirty species have been reported for the estuary (Clavulariidae, Gorgoniidae and Plexauridae). Most were collected on the eastern coast of the Nicoya Peninsula, and several species were described based on estuary specimens. **Conclusion:** The 30 species represent 79 % of those reported for Costa Rica. Despite this relatively high percentage, the sampling effort has been modest and other sites within the estuary should be explored.

Keywords: Octocorallia, *Adelogorgia*, *Carijoa*, *Leptogorgia*, *Muricea*, *Pacifigorgia*, Eastern Tropical Pacific.

RESUMEN. “Lista de corales blandos (Cnidaria, Alcyonacea) en el estuario del Golfo de Nicoya, Pacífico de Costa Rica.”. **Introducción:** El Golfo de Nicoya es el estuario más importante de la costa del Pacífico de Costa Rica. La información sobre presencia de corales blandos se encuentra dispersa en la literatura y colecciones de museo. **Objetivo:** Proporcionar una lista de corales blandos reportados para el estuario. **Métodos:** Recopilamos datos de la literatura (2002-2020) y de los especímenes depositados en el Museo de Zoología de la Universidad de Costa Rica. **Resultados:** Se ha informado de treinta especies en el estuario (Clavulariidae, Gorgoniidae y Plexauridae). La mayoría fueron recolectadas en la costa oriental de la Península de Nicoya y se describieron varias especies con base en especímenes del estuario. **Conclusión:** Las 30 especies representan el 79% de las especies conocidas en Costa Rica. A pesar de este porcentaje relativamente alto, el esfuerzo de muestreo ha sido modesto y se deben explorar otros sitios dentro del estuario.

Palabras clave: Octocorallia, *Adelogorgia*, *Carijoa*, *Leptogorgia*, *Muricea*, *Pacifigorgia*, Pacífico Tropical Este.

Information on the presence of soft corals in estuarine environments is scarce. The Gulf of Nicoya is the most important estuary on the Pacific coast of Costa Rica (Voorhis et al., 1983; Vargas, 2016). Information on soft corals from the Gulf of Nicoya is scattered in the literature and in museum collections. The availability of updated lists of species is essential in future studies aiming at the evaluation of the impact of local, regional and global stressors on the biodiversity of ecosystems such as the Gulf. Thus, the objective of this report is to list the species of soft corals collected in the estuary.

The species reported within an area north of a line across the estuary from Montezuma Beach on the western shore to Herradura Bay on the eastern shore (Fig. 1), were selected. The reviews by Breedy and Guzmán (2002, 2003, 2005, 2007, 2011, 2015, 2016, 2018, 2020) and Breedy,

et al. (2009) were consulted. In addition, species from the Gulf deposited in the collection of the Museum of Zoology of the University of Costa Rica (MZUCR), were included.

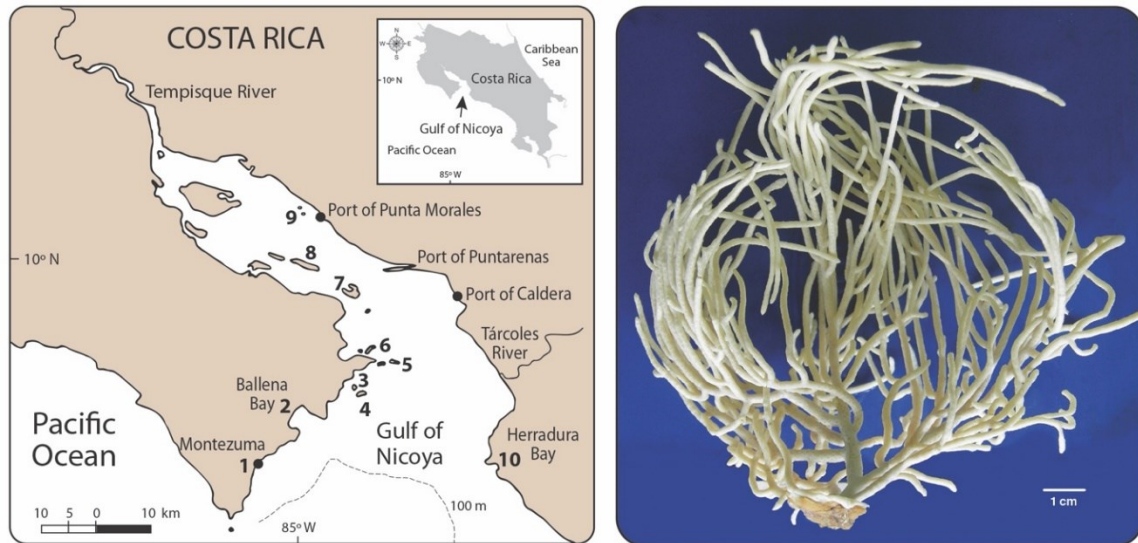


Fig. 1. Gulf of Nicoya estuary, Pacific coast of Costa Rica. *Left:* Location of collecting sites for soft corals: 1. Montezuma, 2. Ballena Bay, 3. Tolinga Island, 4. Tortuga Island, 5. Negritos islands, 6. Cedros Island, 7. San Lucas Island, 8. Caballo Island, 9. Cortezas islets, 10. Herradura Bay. *Right:* A dry complete specimen of *Leptogorgia alba*, the most frequently collected and widespread species.

A total of 30 species of soft corals (Alcyonacea) are reported for the Gulf of Nicoya (Table 1 and Table 2) belonging to three families: Clavariidae (*Carijoa*), Gorgoniidae (*Eugorgia*, *Leptogorgia*, *Pacifigorgia*) and Plexauridae (*Adelogorgia*, *Heterogorgia*, *Muricea*, *Psammogorgia*). The genera *Leptogorgia* and *Pacifigorgia* were the most diverse, with eight species each. *Leptogorgia alba* (Fig. 1) was the most common species. Several taxa have been described based on material collected in the Gulf of Nicoya (Table 1). Most collections were made by diving on the western shore of the lower estuary while only two species were recorded from sites in the mid upper estuary: *Carijoa* sp from the Cortezas islets and *L. laxa* from Caballo Island (Fig. 1, Table 2). A total of 16 species are represented in the collection of the Museum of Zoology (Table 2).

The study by Núñez-Flores et al. (2019) reports that the shallow water gorgonian fauna of the Eastern Tropical Pacific (ETP) is made up of 111 taxa, with a peak of species richness between 7° N to 10° N including the coast of Costa Rica. Cortés et al. (2017) provides data for 11 localities along the ETP, from Mexico to Peru and the Galapagos and Coco islands. They found 38 octocoral (Clavariidae, Gorgoniidae, Plexauridae) species for the Pacific coast of Costa Rica and higher numbers in Mexico (46) and Panama (64). *C. riisei* and *L. alba* were the only two species found at the 11 localities. *E. bradleyi*, *H. tortuosa*, *P. eximia*, *P. rubicunda* and *P. samarenis* were reported only for Costa Rica. The 30 species found in this study in the Gulf of Nicoya represent 79% of those for the Pacific coast of Costa Rica. This percentage is relatively high despite the modest sampling effort that has focused on the eastern coast of the Nicoya Peninsula. This coast has more open ocean than estuarine characteristics and salinities are higher (Voorhis et al., 1983) which may provide a suitable habitat for corals. The most recent collections were made nearly two decades ago. Thus, a new survey is needed in the estuary, particularly north of Herradura Bay and on the mid upper Gulf to obtain a better assessment of the soft coral fauna of this tropical embayment.

C. riisei has been reported as an invasive species growing on top of other soft corals such as *L. alba* and others (Sánchez & Ballesteros, 2014). However, we are not aware of this behaviour in the Gulf of Nicoya.

TABLE 1

Soft corals (Alcyonacea) reported from the Gulf of Nicoya estuary and included in recent taxonomic reviews of the genera¹

Species	Catalog code, collection site, depth, year *
<i>Adelogorgia osculabunda</i> ^{2a}	UCR 750. Ballena Bay, 65 m, 1993, trawl ³
<i>Eugorgia bradleyi</i>	YPM 5147-5150. USNM 44206, 1931
<i>Eugorgia daniana</i>	YPM 5146, USNM 49387. San Lucas Island, 1930
<i>Eugorgia nobilis</i>	USNM 44207, 1931
<i>Heterogorgia tortuosa</i>	UCR 1854, 11 m, 2002
<i>Heterogorgia verrucosa</i>	UCR 1880, Tolinga islet, 20 m, 2002
<i>Leptogorgia alba</i>	MCZ 7008, 1866
<i>Leptogorgia cofrini</i> ^{2a,b}	UCR 398A. Tortuga islands, 1.5 m, 1985 UCR 398B. MCZ 62065. Tolinga Islet, 2 m, 2000 UCR 1526, 129. Negritos islands, 11 m, 2002
<i>Leptogorgia exigua</i>	YPM 5155
<i>Leptogorgia diffusa</i> ⁴	MCZ 7081. YPM 5151. 1866-1867 UCR 1582. Tolinga Islet, 15 m, 2002 UCR 1551. Punta Aguja, 15 m, 2002
<i>Leptogorgia laxa</i>	USNM 50615, 1952
<i>Leptogorgia pumila</i>	UCR 1587. Punta Aguja, 13 m, 2002
<i>Leptogorgia regis</i>	UCR 1594. 44-46 m, 2005, trawl ⁵
<i>Leptogorgia rigida</i>	UCR 1548, UCR 1667. Negritos islands, 6 - 12 m, 2002
<i>Muricea hispida</i>	USNM 49386. San Lucas Island, 1930
<i>Pacifigorgia adamsi</i>	UCR 488. Herradura Bay
<i>Pacifigorgia eximia</i>	USNM 44214, 49381
<i>Pacifigorgia firma</i> ^{2a}	USNM 44215, 1931; USNM 49382, 1927
<i>Pacifigorgia irene</i> ^{2a}	USNM 33611, 49379, 1927; UCR 487 Herradura Bay 1983
<i>Pacifigorgia tabogae</i>	USNM 44215
<i>Pacifigorgia samarensis</i> ^{2a}	UCR 480. Herradura Bay, 9 m, 1983
<i>Pacifigorgia senta</i> ^{2a}	MCZ 51923. Ballena Bay, 36 m, 1993, trawl ³
<i>Pacifigorgia stenobrochis</i>	UCR 771. Montezuma, 10 m, 1993
<i>Psammogorgia arbuscula</i>	MCZ 7009, 1866-1867, pearl divers

*Data from the museum catalogue label.

¹ Data from: Breedy & Guzmán (2002, 2003, 2005, 2007, 2011, 2015, 2018, 2020), Breedy et al. (2009), Breedy & Cortés (2014).

^{2a} Paratype designated based on material collected in the Gulf of Nicoya.

^{2b} Holotype designated based on material collected in the Gulf of Nicoya.

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⁴ Gulf of Nicoya, type locality.

⁵ R/V Urraca (Smithsonian Tropical Research Institute, Panama).

UCR: University of Costa Rica. YPM: Yale Peabody Museum. USNM: United States National Museum.

MCZ: Museum of Comparative Zoology, Harvard University.



TABLE 2

Soft corals (Alcyonacea) from the Gulf of Nicoya estuary deposited in the collection of the Museum of Zoology, University of Costa Rica (MZUCR)

Catalog	Species	Locality and date *
478	<i>Leptogorgia alba</i>	Gulf of Nicoya, 1984
520	<i>Muricea fruticosa</i>	Gulf of Nicoya, 1967
605	<i>Carijoa</i> sp.	Upper Gulf, Cortezas islets, 1991
750	<i>Adelogorgia osculabunda</i>	Ballena Bay, 1993
837,838,839	<i>Muricea fruticosa</i>	Ballena Bay, 1993
928	<i>Pacifigorgia senta</i>	Ballena Bay, 1993
1526,1529,1605	<i>Leptogorgia cofrini</i>	Negritos Islands, 2002
1536, 1548	<i>Leptogorgia rigida</i>	Eastern tip of Negritos islands, 2002
1549	<i>Pacifigorgia cairnsi</i>	Eastern tip of Negritos islands, 2002
1550	<i>Pacifigorgia firma</i>	Eastern tip of Negritos islands, 2002
1582	<i>Leptogorgia diffusa</i>	Tortuga Island, 2002
1587	<i>Leptogorgia pumila</i>	Gulf of Nicoya, 2002
1594	<i>Leptogorgia regis</i>	Gulf of Nicoya, 2005
1602	<i>Leptogorgia alba</i>	Cedros Island, 2002
1603,1604,1611	<i>Leptogorgia alba</i>	Negritos islands, 2002
1606	<i>Leptogorgia alba</i>	East of Tolinga Islet, 2002
1667, 1727	<i>Leptogorgia rigida</i>	West and East Negritos Island, 2002
1728	<i>Carijoa riisei</i>	West Negritos Island, 2002
1729	<i>Carijoa riisei</i>	Cedros Island, 2002
1765	<i>Leptogorgia laxa</i>	SW of Caballo Island, 2001
1785,1826	<i>Pacifigorgia rubicunda</i>	Gulf of Nicoya, 2002
1823	<i>Pacifigorgia senta</i>	Gulf of Nicoya, 2002
1829	<i>Pacifigorgia firma</i>	Gulf of Nicoya, 2001
1830	<i>Pacifigorgia irene</i>	West Negritos Island, 2002
2148, 2271	<i>Leptogorgia laxa</i>	West Negritos Island, 2002
2687	<i>Pacifigorgia senta</i>	Gulf of Nicoya, 2005
2688	<i>Psanmogorgia</i> sp	East of Tolinga Islet, 2002
2701	<i>Muricea fruticosa</i>	Gulf of Nicoya, 2002
3163, 3164	<i>Carijoa riisei</i>	Islets South of San Lucas Island, 1999
3165	<i>Leptogorgia alba</i>	Islets South of San Lucas Island, 1999

*Data from the museum catalogue label.

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ETHICS, CONFLICT OF INTEREST, AND FUNDING STATEMENT

The authors declare that they have complied with all pertinent ethical and legal requirements, both during the study and in the production of the manuscript; that there are no conflicts of interest of any kind, and agree with the final edited version. A signed document has been filed in the journal archives. The contribution of each author was: J.V. Original idea, writing, editing. O. B. Data collection, taxonomic review, editing.



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