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RANGE EXTENSION

New records of *Branchiostoma californiense* (Amphioxiformes: Branchiostomatidae) in El Salvador, Central America

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ABSTRACT. **Introduction:** Cephalochordates are benthic organisms that represent an important link in the evolution of chordates. Coastal human communities use them as food in some Asian countries. **Objective:** To register the presence of *B. californiense* in El Salvador. **Methods:** We collected specimens during different benthic surveys at Jiquilisco and La Unión Bays in April 2018 and November 2019, with a Petite Ponar grab and core in subtidal as well as intertidal sediments, respectively. **Results:** Ten specimens were collected from sandy-muddy sediments at Jiquilisco and La Unión bays. **Conclusion:** *B. californiense* inhabits estuarine areas in El Salvador.

Keywords: bentos, cephalochordata, estuary, lancelet, Pacific Ocean.

RESUMEN. “Registros nuevos de *Branchiostoma californiense* (Amphioxiformes: Branchiostomatidae) en El Salvador, América Central” **Introducción:** Los cefalocordados son organismos bentónicos que representan un eslabón importante en la evolución de los cordados. Comunidades humanas costeras los usan como alimento en algunos países asiáticos. **Objetivo:** Registrar la presencia de *B. californiense* en El Salvador. **Métodos:** Capturamos especímenes durante diferentes censos bentónicos en las bahías de Jiquilisco y La Unión en abril de 2018 y noviembre de 2019, con una draga Petite Ponar y un nucleador en sedimentos submareales, así como intermareales, respectivamente. **Resultados:** Recolectamos diez especímenes en sedimentos arenosos-fangosos en bahías de Jiquilisco y La Unión. **Conclusión:** *B. californiense* habita áreas estuarinas en El Salvador.

Palabras clave: bentos, cephalochordata, estuario, lanceta, océano Pacífico.

Subphylum Cephalochordata includes marine and estuarine organisms known as lancelets (Branchiostomidae Bonaparte 1846), which inhabit sandy-muddy bottoms sometimes mixed with shell particles, as well as coarser sediments (Vargas & Dean, 2010). Currently there are about 29 species of cephalochordates that live in temperate and tropical marine environments in shallow and deep areas all over the world and usually experience a planktonic early stage and later becomes part of the benthic community (Subirana et al., 2020). These species are important for studying the evolution of chordates and coastal human communities harvest them as food in shallow soft bottoms in China and other Asian countries (Karleskint et al., 2013).

The presence of *Branchiostoma californiense* Andrews 1893 in the eastern Pacific has been documented in different marine areas of Mexico (Campos-Dávila et al., 2019; Galván-Villa et al., 2017; Velázquez-Velázquez, 2021). Also, its occurrence was documented in Nicaragua (Poss & Boschung, 1996) and Costa Rica (Vargas & Dean, 2010). Moreover, the genus *Branchiostoma* was registered at La Unión Bay sediments (Hartmann, 1959) and as planktonic larva at Los Ranchos area,

Jiquilisco Bay (Galdámez, 2014). Probably it was *B. californiense* in both cases. The present study documents and confirms the existence of this species within two estuaries in El Salvador.

La Unión Bay is an important estuarine body located within the Gulf of Fonseca on the eastern part of El Salvador. It receives important freshwater discharges during rainy season and in the dry period salinities are higher than the adjacent ocean due to oceanographic processes (Valle-Levinson & Bosley, 2003). These salt concentrations causes that mangrove trees reach low heights (Barraza, 2017). Jiquilisco bay is located on the southeastern part of El Salvador and was declared Ramsar site in 2005. Salinity varies from 0 to 34 parts per thousand approximately, according to season and area. It is the largest estuary within the country and species richness is high. There are some touristic activities in the area.

Both bays present important biodiversity that sustain fisheries and shellfish extraction as well as habitat for permanent and migrating species including endangered ones, such as sea horses (*Hippocampus ingens*), hawksbill turtle (*Eretmochelys imbricata*), crocodile (*Crocodylus accutus*) and others.

Specimens were collected during different benthic surveys at Jiquilisco and La Union Bays (Fig. 1.) in April 2018 and November 2019, respectively. These organisms were preserved in ethanol 90% in labeled jars. Size parameters were determined using a caliper (+ 0,01mm accuracy). Photographs were taken using a stereo microscope (LEICA EZ4E). Morphological characteristics were compared to the description of del Moral-Flores et al. (2016) allowed species confirmation. Two specimens were deposited at the Natural History Museum of El Salvador with codes 40 -1095 MUHNES and 40 – 1096 MUHNES.

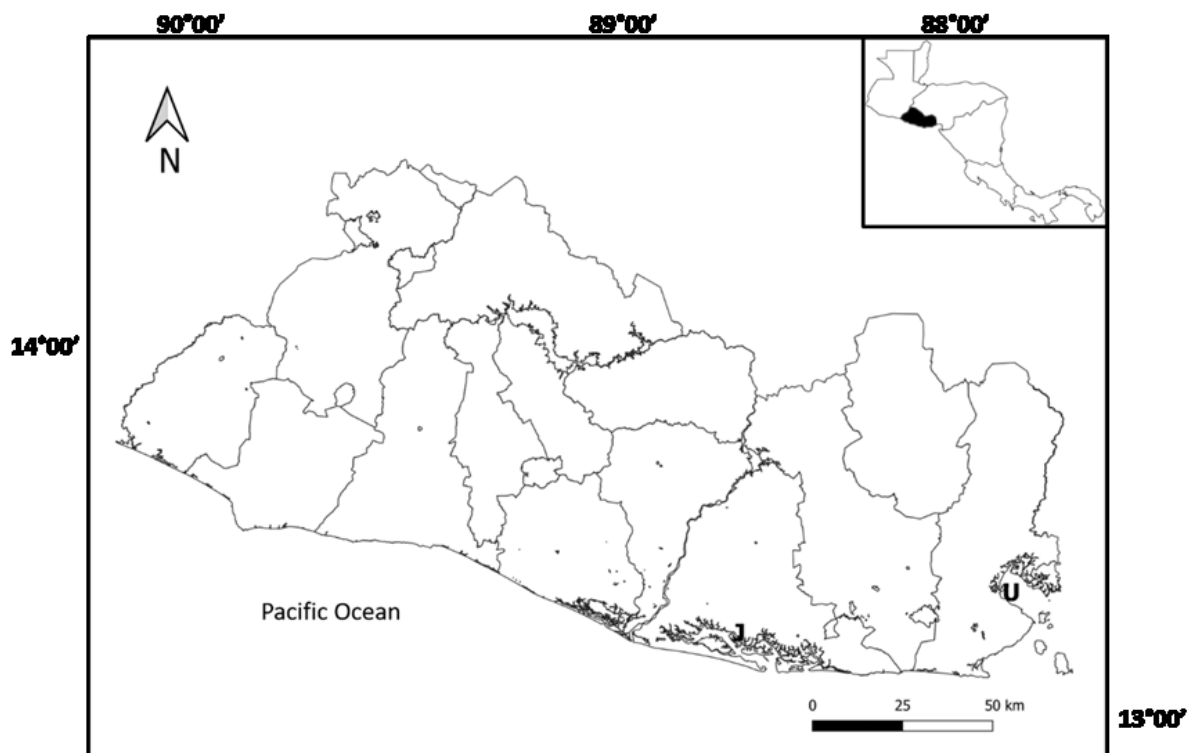


Fig. 1. Sampling áreas in El Salvador: Puerto El Triunfo, Jiquilisco Bay (J) and Perico island at La Unión Bay (U).

The taxonomic data of this species is detailed below:

Phylum Chordata Haeckel, 1874
Subphylum Cephalochordata Haeckel, 1866
Class Leptocardii Müller, 1845
Family Branchiostomatidae Bonaparte, 1846
Genus *Branchiostoma* Costa, 1834
Species *Branchiostoma californiense* Andrews, 1893

Material examined. Seven specimens were collected with a Petite Ponar Grab at Puerto El Triunfo, Jiquilisco Bay ($13^{\circ} 15' 58.3''$ N, $-88^{\circ} 33' 8.2''$ W) from two samples of sediments at a depth of 7 meters in April 2018. Length oscillated from 14,9 to 34,2mm (average (\bar{X}) = 24,8; SD = 6,8). Also, three specimens were taken from intertidal mixed sediments at Perico island, La Unión Bay ($13^{\circ} 15' 59.1''$ N, $-88^{\circ} 33' 8.2''$ W) during November 26th, 2019. Length varied from 24,8 to 28,6mm (\bar{X} = 27,0; SD = 2,1mm). In both cases sediments were sandy-muddy. Figures 2 and 3 present respectively a fresh specimen collected at Perico island, and the sand flat of the same island.



Fig. 2. Specimen of *B. californiense* collected at a sand flat at Perico island, La Unión Bay. Length: 12,5mm (each square: 3mm). 19-October-2020



Fig. 3. Sampling place (sand flat) at Perico island

Description. Body white, elongate and thin. Presence of notochord. Rostral process evident on the anterior zone. Oral area with segmented cirri (30-39). Rostral, dorsal, and ventral fins present. Gonad pouches in the ventral region (26-31). Caudal fin as extension of the latter two. Whitish fins (Figures 4, 5 and 6, Specimen 40 -1095 MUHNES).



Fig. 4. Anterior part of *Branchiostoma californiense*



Fig. 5. Central part of the body of *B. californiense* showing gonad pouches.



Fig. 6. Posterior area of *B. californiense*

Distribution. From California (USA) to Panama in sandy or mixed sediments (Poss & Boschung, 1996).

Previous documentations about lancelets for El Salvador included specimens collected from soft bottom at La Unión Bay and a planktonic larva at Jiquilisco Bay (Galdámez, 2014; Hartmann, 1959; Galdámez, 2014) respectively, therefore this third record allowed to confirm the presence of *B. californiense* in the same places in intertidal and subtidal muddy sand. Galván-Villa et al. (2017) mentioned that this species presents a wide distribution in the eastern tropical Pacific and suggested more sampling efforts in northern Central America.

Our data proved that this species present a continued occurrence from Mexico to El Salvador, and south to other central American countries (Meek & Hildebrand, 1925; Poss & Boschung, 1996; Vargas & Dean, 2010). Although its occurrence in Guatemala requires corroboration.

This species is not used as food for humans or domestic animals in El Salvador, as in other world regions (Karleskint et al., 2013). Probably it is an important energetic source for other marine fauna, such as benthic fishes (Ruppert et al., 2000) in this tropical area.

Other fauna present in Jiquilisco Bay sediment samples were mostly polychaetes. Similar trend occurred in the sandy sediments mixed with mud and fragmented shell from Perico island, where also small crustaceans and gastropods were abundant.

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ETHICAL, CONFLICT OF INTEREST AND FINANCIAL STATEMENTS

The authors confirm that they have fulfilled all ethical and legal requirements during sampling and manuscript redaction. J.E.B proposed the research idea, did taxonomic review, writing. V.E.M. analyzed samples. Both authors participated in sampling and editing. Collecting and research permits (MARN-DEV-GVS-AIMA-006-2017 and MARN-DEV-GVS-108-2018) were granted by the Ministry of the Environment and Natural Resources.

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