Revista de Biología Marina y Oceanografía
Vol. 50, Nº3: 593-596, diciembre 2015

RESEARCH NOTE

First records of the leopard electric ray *Narcine leoparda* (Torpediniformes: Narcinidae) in the Ecuadorian Pacific

Primeros registros de la raya leopardo *Narcine leoparda* (Torpediniformes: Narcinidae) en el Pacífico Ecuatoriano

Colombo Estupiñan-Montaño[1] and Felipe Galván-Magaña[1]

[1]Instituto Politécnico Nacional, Centro Interdisciplinario de Ciencias Marinas, Av. I. P. N., s/n Colonia Playa Palo de Santa Rita, Apartado Postal 592, C.P. 23000, La Paz, Baja California Sur, México. galvan.felipe@gmail.com

Abstract.- The aim of this study was to report the presence of the leopard electric ray *Narcine leoparda* in Ecuadorian waters; to date, this is the southernmost report of this species in the Tropical Eastern Pacific. Thus, the geographic distribution of *N. leoparda* now extends another ca., 620 km from Cauca, Colombia (previous southernmost limit of this species' distribution) to Manta and Bahía de Caráquez, Ecuador. These 4 new records of leopard electric rays in the Ecuadorian Pacific increase the species richness of cartilaginous fishes in the region to a total of 93 species, including 58 sharks, 34 batoids, and one chimera. This report also extends the geographic distribution of *N. leoparda* in the Tropical Eastern Pacific.

Key words: Batoid fishes, electric rays, Eastern Pacific, Ecuador

INTRODUCTION

Prior to this report, a total of 92 species of cartilaginous fishes (58 sharks, 33 batoids, and 1 chimera) had been reported off the coast of Ecuador (MICIP 2006). Electric rays of the Narcinidae family inhabit sandy and muddy bottoms in tropical and temperate waters throughout the world. This family includes 9 genera and 24 species; 3 genera (*Diplobatis, Discopyge*, and *Narcine*) and 7 species have been reported (*Diplobatis colombiensis, D. guamachensis, D. ommata, Discopyge tschudii, N. bancroftii, N. entemedor, N. leoparda*, and *N. vermiculatus*) in the Eastern Pacific (Fischer *et al.* 1995, Béarez 1996, Robertson & Allen 2002, MICIP 2006, Mejía-Falla *et al.* 2007). Of these, only *D. ommata, D. tschudii*, and *N. entemedor* have been recorded previously in Ecuadorian waters (Béarez 1996, MICIP 2006).

The electric ray *Narcine leoparda* (Carvalho, 2001) is endemic to the Colombian Pacific, inhabiting shallow estuarine and coastal waters (1 to 33 m depth) off the coast of southern Colombia, from just north of the Cauca Valley (5ºN) to Nariño (1.8ºN). Prior to 2004, *Narcine leoparda* was misidentified as either *Narcine brasiliensis* or *Discopyge tschudii* (Carvalho *et al.* 2007). Considering the high fishing pressure throughout its narrow inshore range, anecdotal evidence for a decrease in abundance, and its low reproductive potential, this species was classified as Near Threatened by the International Union for Conservation of Nature (IUCN) in 2007 (Carvalho *et al.* 2007). The aim of this paper was to report 4 new records of *Narcine leoparda* in Ecuadorian waters, extending the range of this species' geographic distribution in the Eastern Tropical Pacific.

MATERIALS AND METHODS

Four leopard electric rays *Narcine leoparda* (Carvalho 2001) were reported in Ecuadorian waters in 2007 and 2008. Specimen 1 was recorded in the Bahía de Caráquez (Fig. 1) on March 19, 2007. Three other specimens were caught off the coast of Manta, Ecuador by the artisanal fishery using three 146 m long beach nets of varying mesh size (1^{st}= 5 cm, 2^{nd}= 2 cm, 3^{rd}= 5 mm); the organisms were captured at a depth of 8.2 m: Specimen 2 on May 28, 2007, Specimen 3 on September 18, 2008, and Specimen 4 on October 2, 2008. All specimens were identified following Cervigón *et al.* (1992), Fischer *et al.* (1995), Carvalho (2001), and Robertson & Allen (2002). A vernier caliper was used to record 34 measurements to the nearest mm following the procedure described by Leible (1988). The specimens were preserved in 10% formalin at the Laboratory of Marine Science at the Colegio Liceo Nacional 'Max Seidel' (Max Seidel National High School) in Tumaco, Nariño, Colombia.

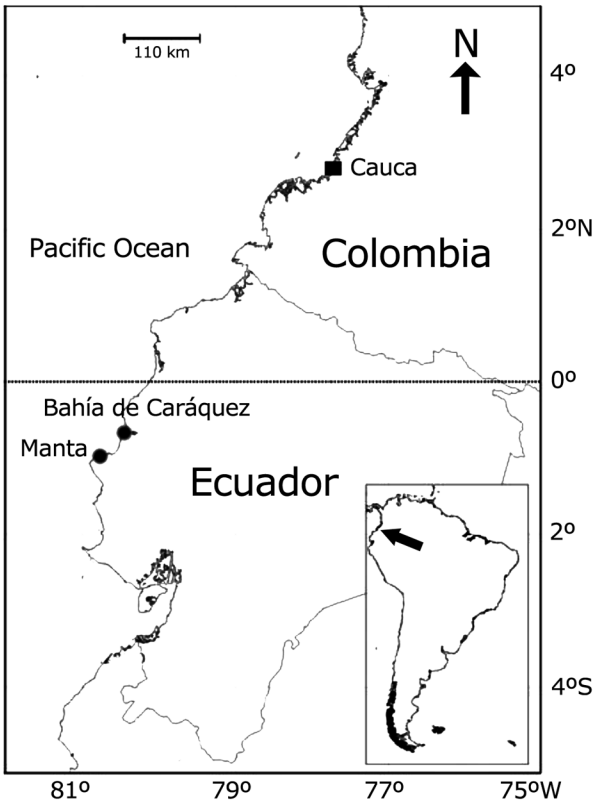

Figure 1. Prior southernmost sighting of the species in the Cauca Valley, Colombia and location of the 4 *Narcine leoparda* specimens reported off the coast of Manta and Bahía de Caráquez, Ecuador / Ubicación original (Valle del Cauca - Colombia) y nuevas ubicaciones de registro de 4 especímenes de *Narcine leoparda* en Manta y Bahía de Caráquez (Ecuador)

Table 1. Measurements of 4 leopard electric ray (*Narcine leoparda*) specimens. Specimen 1 (March 19, 2007), specimen 2 (May 28, 2007), specimen 3 (September 18, 2008), and specimen 4 (October 2, 2008) / Medidas de 4 especímenes de raya leopardo (*Narcine leoparda*). Espécimen 1 (19 marzo 2007), espécimen 2 (28 mayo 2007), espécimen 3 (18 septiembre 2008), espécimen 4 (2 octubre 2008)

	Specimen 1	Specimen 2	Specimen 3	Specimen 4
Sex	Male	Female	Female	Female
Disc width (mm)	50.6	84.4	95.3	176
Disc length (mm)	52.5	91.8	92.4	170
Total length (mm)	90.8	170	187	338
Precaudal length (mm)	78.2	141.9	163	292
Pre-orbital length (mm)	15.3	25.6	28.9	49.6
Interorbital width (mm)	8.1	15.8	13.9	29.2
Eye height (mm)	2.3	1.7	2.8	1.1
Eye length (mm)	2.5	2.7	3.2	2.5
Spiracle length (mm)	2.2	3.7	4.2	5.2
Spiracle width (mm)	2.5	3.5	3.2	5.2
Interspiracle distance (mm)	7.3	14.2	13.3	23.1
Prenarial length (mm)	13.1	22.9	25.8	41.8
Preoral length (mm)	13.3	26.8	27.6	45
Internarial space (mm)	6.3	9.8	9.6	18.2
Mouth width (mm)	10.7	7.1	8.3	12
First gill width (mm)	2.0	1.5	3.4	4.5
Second gill width (mm)	2.5	2.7	3.9	7.1
Third gill width (mm)	2.6	-	3.8	7.6
Fourth gill width (mm)	2.8	-	4.2	7.1
Fifth gill width (mm)	2.0	-	3.9	3.9
Distance between the first gills slits (mm)	14.4	24.5	26.5	48.1
Distance between the fifth gills slits (mm)	7.4	11.9	16.4	29.4
Anterior pelvic length (mm)	49.6	21.8	100.9	36
Rear pelvic length (mm)	11.7	40.5	18.9	67.9
Interior pelvic length (mm)	2.0	-	37.6	12.4
Caudal peduncle width (mm)	3.1	4.3	5.5	9.9
Caudal peduncle height (mm)	2.6	4.6	5.0	8.6
Cloaca to first dorsal fin (mm)	7.1	21.4	26.8	49.9
Cloaca to second dorsal fin (mm)	15.7	37	42.6	76.4
Base of first dorsal fin (mm)	6.6	11.1	12.8	21.1
Base of second dorsal fin (mm)	5.7	11.9	13.6	20.8
Cloaca to tail origin (mm)	26.4	-	-	110.3
Cloaca to tip of tail (mm)	38.8	74.5	85.4	153.6
Clasper length	5.2	-	-	-

RESULTS AND DISCUSSION

All *N. leoparda* specimens, along with their measurements, are listed in Table 1. Specimen 1 was discovered beached in the intertidal zone of the Bahía de Caráquez, while the other 3 individuals were caught off the coast of Manta, Ecuador (0°56'S and 80°42'W) approximately 200 m from the beach, between the surface and 7 m depth.

One female was pregnant with 16 embryos (5 female and 11 male) measuring between 46.10 mm and 52.63 mm total length (TL). The embryos did not display color patterns; rather, they were clear brown throughout with large eyes of approximately the same size as their spiracles (Fig. 2).

The leopard ray *N. leoparda* is sometimes confused with *N. brasiliensis* as both species are dark brown, dark grey, or orange on the dorsal side with irregular rings surrounding dark points (Cervigón *et al.* 1992), or dark (Smith 1997) or brown spots (Robins & Ray 1986). However, *N. brasiliensis* does not inhabit the Pacific Ocean; the species is distributed in the Atlantic Ocean from Brazil and northern Argentina to North Carolina and Florida, USA, and from the Yucatan Peninsula, Mexico, to the Antilles (Smith 1997). *N. leoparda* is also sometimes mistakenly identified as *Discopyge tschudii*. The latter is unique for having pelvic fins that merge together under the tail fin, forming a continuous fold in the midline (Chirichigno 1974); this feature is not present in *N. leoparda* (Fig. 3C).

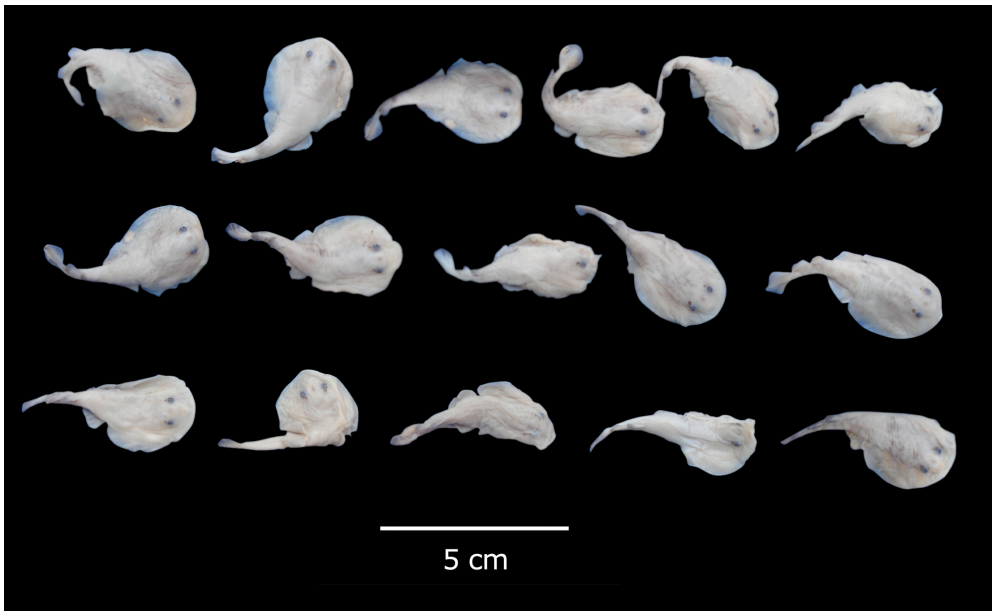

Figure 2. Embryos from one of the *Narcine leoparda* specimens captured in the Ecuadorian Pacific / Embriones de *Narcine leoparda* capturados en el Pacífico ecuatoriano

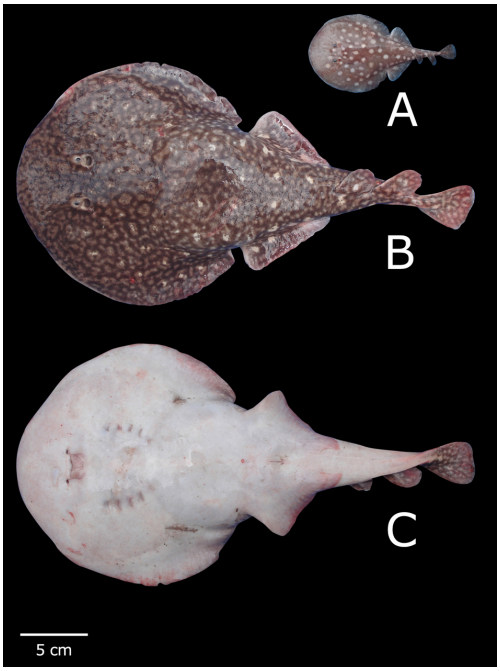

Figure 3. Leopard electric rays *Narcine leoparda* captured in the Ecuadorian Pacific: A) dorsal view of juvenile (specimen 1), B-C) dorsal and ventral view of adult female (specimen 4) / Raya eléctrica *Narcine leoparda* capturada en el Pacífico ecuatoriano: A) vista dorsal de juvenil (espécimen 1). B-C). Vista dorsal y ventral de hembra adulta (espécimen 4)

The *N. leoparda* electric ray is characterized by having an elongated disc that is approximately as wide as it is long; an electric organ that originates just in front of the eyes; pectorals that overlap slightly in front of the pelvic fins; an angular tail shorter than the disc and with a straight rear edge; spiracles without papillae on the rims; one pair of nasal openings; teeth that largely remain exposed when the tubular mouth is closed; a second dorsal fin that is slightly larger than the first dorsal fin; and lateral folds on the tail originating under the first dorsal fin, a feature found in all 4 specimens from Ecuador. The upper surface is reddish brown with numerous small cream colored round or oval spots and/or pale-centered unfused ocelli in irregular patterns. These unique spots may be lost in large specimens (Carvalho 2001). A small specimen with clear round ocelli is shown in Fig. 3A. A larger specimen with irregular spots, like those reported by Carvalho (2001), are shown in Figs. 3B and 3C; the dorsal and tail fins have white spots (Fig. 3B), while the ventral side is cream colored with a light brown edge (Fig. 3C) (Carvalho 2001).

Considering the characteristics of the specimens collected in the Ecuadorian Pacific, we confirm the presence of *N. leoparda* in Ecuador; thus, we report that the distribution of *Narcine leoparda* extends another 620 km from Cauca, Colombia to Manta and Bahía de

Caráquez, Ecuador. These are the southernmost reports of this species (Fig. 1), increasing the diversity of cartilaginous fishes in Ecuadorian waters to 93 species, including 34 batoids species.

Acknowledgments

FGM is grateful for fellowships generously offered by the Instituto Politécnico Nacional (IPN; National Polytechnic Institute), the Comisión de Operación y Fomento de Actividades Académicas (COFAA; Commission for the Advancement of Academic Activities), and the Estímulo al Desempeño de los Investigadores (EDI; Performance Incentives). Thanks to Anika Mora for pictures edition and Kristin Sullivan for English edition.

Literature cited

Béarez P. 1996. Lista de los peces marinos del Ecuador continental. Revista de Biología Tropical 44(2): 731-741.

Carvalho MR. 2001. A new species of electric ray, *Narcine leoparda*, from the tropical eastern Pacific Ocean (Chondrichthyes: Torpediniformes: Narcinidae). Proceedings of the Biological Society of Washington 114(3): 561-573.

Carvalho MR, AF Navia, PA Mejia-Falla & ME McCord. 2007. *Narcine leoparda*. In: The IUCN Red List of Threatened Species. <http://dx.doi.org/10.2305/IUCN. UK. 2007.RLTS.T63154A12624668.en>

Cervigón F, R Cipriani, W Fischer, L Garibaldi, M Hendrichx, AJ Lemus, R Márquez, JM Pountiers, G Robaina & B Rodriquez. 1992. Guía de campo de las especies comerciales marinas y de aguas salobres de la costa septentrional de Sur América, 577 pp. FAO, Roma.

Chirichigno N. 1974. Clave para identificar los peces marinos del Perú. Informe, Instituto del Mar del Perú 44: 1-271.

Fischer W, F Krupp, W Schneider, C Sommer, KE Carpenter & VH Niem. 1995. Guía FAO para la identificación de especies para los fines de pesca. Pacífico Centro-Oriental, Vol. 2. Vertebrados-Parte 1: 647-1200. FAO, Roma.

Leible MD. 1983. Revisión de métodos para estudios taxonómicos de rayas (Rajiformes, Rajidae). Gayana, Zool. 52 (1-2): 15-93.

Mejía-Falla PA, AF Navia, LM Mejía-Ladino, A Acero & EA Rubio. 2007. Tiburones y rayas de Colombia (Pisces: elasmobranchii): Lista actualizada, revisada y comentada. Boletín de Investigaciones Marinas y Costeras 36: 111-149.

MICIP. 2006. Plan de acción nacional para la conservación y manejo de Tiburones de Ecuador (PAT-Ec), 44 pp. Ministerio de Comercio Exterior, Industrialización, Pesca y Competitividad (MICIP), Quito. <http://cpps.dyndns.info/cpps-docs-web/dircient/ctcpartiburon/pans/ecuador/plan-ecuador.pdf>

Robertson DR & GR Allen. 2002. Peces costeros del Pacífico Oriental Tropical: Un sistema de información. Instituto Smithsonian de Investigaciones Tropicales. Balboa - Panamá. [CD-ROM].

Robins CR & GC Ray. 1986. A field guide to Atlantic coast fishes of North America, 354 pp. Houghton Mifflin Company, Boston.

Smith CL. 1997. National Audubon Society field guide to tropical marine fishes of the Caribbean, the Gulf of Mexico, Florida, the Bahamas, and Bermuda, 720 pp. Alfred A. Knopf, New York.

Received 27 November 2014 and accepted 23 September 2015

Editor: Claudia Bustos D.