



NEW RECORD OF THE BLUNTNOSE SIXGILL SHARK, Hexanchus griseus (CHONDRICHTHYES, HEXANCHIDAE), IN THE SOUTHWEST ATLANTIC OCEAN

Novo registro do tubarão-de-seis-guelras, *Hexanchus griseus* (Chondrichthyes, Hexanchidae), no Oceano Atlântico sudoeste

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ABSTRACT

A new record of *Hexanchus griseus* is reported for the coast of Argentina in Patagonia (45°36'32.73" S - 67°16'33.68" W) at a depth of 19 m and with water temperature at 15.4 °C. The specimen was a female captured, tagged and released inside a Marine Protected Area by local recreational fishermen as part of a national citizen science project. The specimen was a juvenile of 284.1 cm total length and it also constitutes the first tagged individual in the Southwest Atlantic Ocean for this species.

Keywords: *Hexanchus griseus*, sixgill shark, Argentina, recreational fishery, citizen science, tagging, juvenile.

RESUMO

Um novo registro de *Hexanchus griseus* é relatado para a costa da Argentina (45°36'32.73" S - 67°16'33.68" W) a uma profundidade de 19 m, com temperatura da água de 15,4 °C. O espécime era uma fêmea capturada, marcada e solta dentro de um MPA por pescadores recreativos locais como parte de um projeto nacional de ciência cidadã. O espécime era um jovem de 284,1 cm de comprimento total e constitui o primeiro indivíduo marcado no oceano Atlântico sudoeste para essa espécie.

Palavras-chave: *Hexanchus griseus*, Argentina, pesca recreativa, ciência cidadã, marcação.

The bluntnose sixgill shark *Hexanchus griseus* (Order Hexanchiformes, Family Hexanchidae) is one of the largest carnivorous sharks reaching a maximum size of 5.5 m in total length (TL) (Weigmann, 2016; Ebert, 1994, 2015). *Hexanchus griseus* is a top predator in both coastal and deep-water ecosystems (Barnett *et al.*, 2012). Males mature between 309 and 330 cm TL and females mature between 350 and 420 cm TL (Ebert; Dando & Fowler, 2013). The species has been recently categorized as Near Threatened globally (Finucci *et al.*, 2020) and it is listed on Appendix I (Highly Migratory Species) of UNCLOS (FAO, 1994).

Hexanchus griseus has a circumglobal distribution, in tropical and temperate waters from 0 to 2,490 m but commonly found between 200 and 1,100 m (Ebert; Dando & Fowler, 2013; Griffing *et al.*, 2014; Weigmann, 2016) with juveniles distributed close inshore in general (Ebert & Stehmann, 2013). Depth distribution has been related to growth and temperature, with the shallowest records linked to juveniles' specimens and from colder, poleward regions (Compagno, 1984; Last & Stevens, 1994; Crow; Lowe & Wetherbee, 1996; Mundy, 2005).

In the Western Atlantic, it is distributed from USA to Argentina in a patchily distribution (Compagno, 1984; Ebert & Stehmann, 2013). The last known record of the species in the region is a male captured in Ceará, Brazil, at 140 m depth and with 179.2 cm in TL, a juvenile with no signs of maturation (Santander-Neto *et al.*, 2007).

Lahille (1906) reported a specimen of *H. griseus* (sub *H. cinereus*) for the first time in Argentina. It was found dead on the coast, at Miramar (38°16'17" S - 57°50'20" W). Later, this species was included in numerous lists of chondrichthyan species in Argentina (Pozzi & Bordinale, 1935; Bigelow & Schroeder, 1948; Ringuelet & Arámburu, 1960; Stehmann, 1978; Compagno, 1984; Menni; Ringuelet & Arámburu, 1984; Menni & Lucifora, 2007; Pan-Tiburones, 2011; Par-Condriactos, 2018; Figueroa, 2011, 2019) in a nominal way, without reference material.

Ninety years after the first report for Argentina, Coscarella *et al.* (1997) reported in Patagonia two specimens, an immature male of 219 cm TL and 51.50 kg of weight, and an immature female of 174.5 cm TL and 22.50 kg of weight. Both individuals were caught by a bottom trawl vessel targeting Argentine Hake (*Merluccius hubbsi*) at San Jorge Gulf (46°20' S, 66°20' W and 45°20' S, 64°20' W). This report, becomes the second record for the species in Argentina, extending its southern distribution in the Western Atlantic to 1,000 km southward in central Patagonia (Coscarella *et al.*, 1997). Here we report a new record of *H. griseus* more than two decades after its last documented record in Argentinean waters. One female was caught at La Tombola islet in Rocas Coloradas Marine Protected Area, Chubut (45°36'32.73" S 67°16'33.68" W) during austral summer on February 7th in 2021 (Figure 1 and 2). The islet sector matches with the area reported as the southern limit for the species in the Southwest Atlantic (Coscarella *et al.*, 1997). The specimen was captured from kayak by local recreational fishermen, using rod and reel and Patagonian blennie (*Eleginops maclovinus*) and Atlantic chub mackerel (*Scomber colias*) as bait. The juvenile specimen measured 284.1 cm in total length (Figure 2) and was fished at a depth of 19 m and with a surface temperature of 15.4 °C. Juveniles specimens of the same range size (1.35-3.54 m) have also been found in similar shallow waters reef depths (20-40 m) during summer in Flora Islets, British Columbia (Dunbrack & Zielinski, 2003).

Figure 1 – Study area of *Hexanchus griseus* record. ▲ tagging site: La Tombola Islet, Rocas Coloradas MPA.

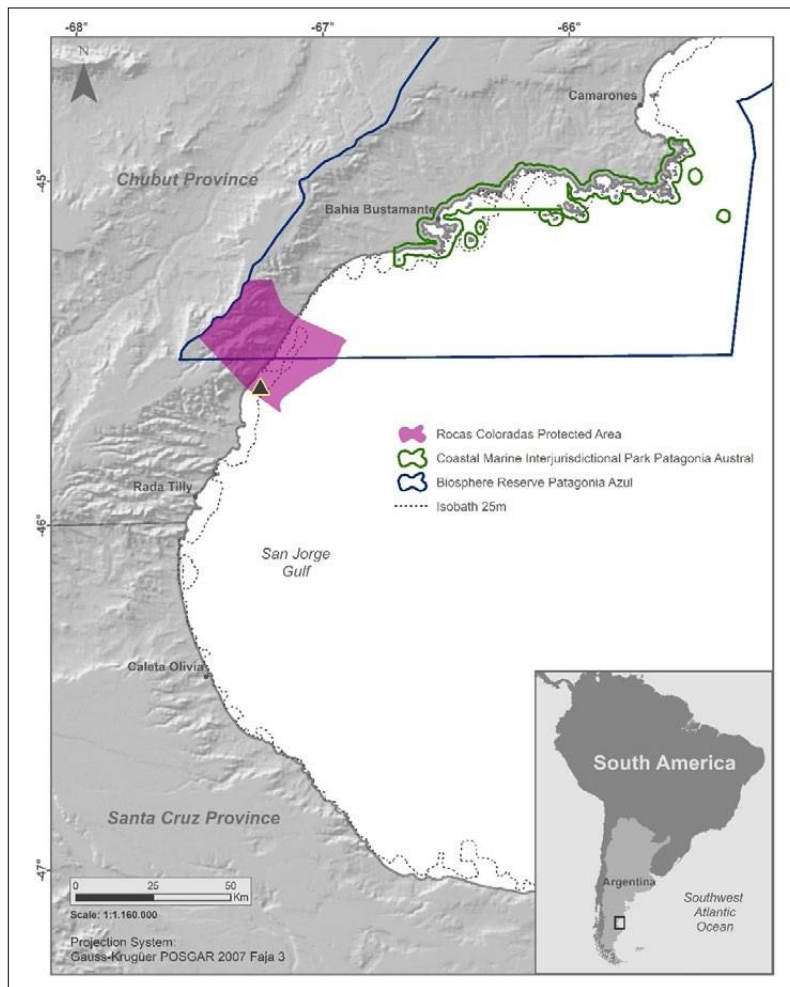


Figure 2 – Specimen of *Hexanchus griseus* captured and tagged in Rocas Coloradas MPA, Chubut Province, Argentina.



The specimen was tagged and release alive as part of the national citizen science project “Conservar Tiburones de Argentina” (Cuevas, 2016). Tagging procedures followed the code of good practice for sustainable recreational fisheries recommended by the Shark Tagging Manual of Argentina (Cuevas; Cedrola & Chiaramonte, 2013). Other complementary measures were taken as well by using an image analysis system – KLONK Image Measurement software version 20.4.6.0 (Andersen, 1993; Table I) for comparison with previous works.

Identification of the specimen was performed at the species level using Ebert *et al.* (2013) and Ebert and Stehmann (2013). Morphometric measures were more similar (in proportion) between subadult female individuals from the same region than from other region except for the left pectoral anterior margin that was different between all sites (Table I).

Although the information provided here relative to *H. griseus* is still deficient to conduct a subpopulation assessment of its conservation status in the Southwest Atlantic Ocean, it supplements with new distribution ranges and habitat uses of a juvenile that can be integrated with global data in the future. In conclusion, this record is the third report of the species in the Southwest Atlantic Ocean with reference material for the southern limit of its distribution in the region, is also the largest specimen reported for Argentina and the first tagged specimen for this area.

Table I – Morphometry comparison between females of *Hexanchus griseus*. Becerril-García *et al.* (2017): data from the Northeast Pacific (Mexico). Coscarella *et al.* (1997): data from the Southwest Atlantic (Argentina).

Measurement	Becerril-García <i>et al.</i> (2017)		Coscarella <i>et al.</i> (1997)		Present study	
	cm	%	cm	%	cm	%
Total length	107.2		174.5		284.1	
Fork length	84.6	78.9	120	68.8	197.0	69.4
Preanal length	63.4	59.1	90	51.6	-	-
Dorsal caudal margin	10.3	9.6	54	30.9	87.0	30.6
Predorsal length	-	-	97	55.6	148.3	52.2
Dorsal anterior margin	-	-	11.8	6.8	27.2	9.6
Right pectoral anterior margin	-	-	19.8	11.3	-	-
Left pectoral anterior margin	5.4	5.0	19.5	11.2	56.9	20.0
Head length	22.4	20.6	-	-	56.2	19.8
Head width	-	-	-	-	82.3	29.0
Eye diameter	1.6	1.5	-	-	6.3	2.2

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REFERENCES

- Andersen, C. *KLONK image measurement*. 1993. Available at: <https://www.imagemasurement.com/>. Accessed on: 1 Nov. 2018.
- Barnett, A.; Braccini, J.M.; Awruch, C.A. & Ebert, D.A. An overview on the role of Hexanchiformes in marine ecosystems: biology, ecology and conservation status of a primitive order of modern sharks. *J. Fish Biol.*, v. 80, p. 966-990, 2012.
- Becerril-García, E.; Aguilar-Cruz, C.; Jiménez-Pérez, A. & Galván-Magaña, F. New record and morphometry of the bluntnose sixgill shark *Hexanchus griseus* (Chondrichthyes: Hexanchidae) in Baja California Sur, Mexico. *Lat. Am. J. Aquat. Res.*, v. 45, n. 4, p. 833-836, 2017. DOI: 10.3856/vol45-issue4-fulltext-20.
- Bigelow, H.B. & Schroeder, W.C. Fishes of the Western North Atlantic. *Sears Found. Mar. Res.*, v. 1, n. 1, p. 576, 1948.
- Compagno, L.J.V. FAO Species Catalogue. V. 4. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Part 1 - Hexanchiformes to Lamniformes. *FAO Fish. Synop.* Rome, v. 125, n. 4/1, p. 1-249, 1984.
- Coscarella, M.; García, N.; Crespo, E.; Mariotti, P.; Koen Alonso, M. & Dans, S. Presence of the bluntnose sixgill shark *Hexanchus griseus* (Chondrichthyes: Hexanchidae) in Patagonian waters. *Neotrópica*, v. 43, n. 109-110, p. 116, 1997.
- Crow, G.L.; Lowe, C.G. & Wetherbee, B.M. Shark records from longline fishing programs in Hawaii with comments on Pacific Ocean distributions. *Pacific Science*, v. 50, n. 4, p. 382-392, 1996.
- Cuevas, J.M. Herramientas para la conservación de los condriictios costeros del Mar Argentino. Tesis (doctorado), Ciencias Naturales, Universidad Nacional de La Plata, 248 p., 2016.
- Cuevas, J.M.; Cedrola, P. & Chiaramonte, G.E. Manual de Marcado de Tiburones de Argentina (Shark Tagging Manual of Argentina). 1st ed. Ciudad Autónoma de Buenos Aires. Proyecto Conservar Tiburones en Argentina. Advance online publication. Disponible en: <https://www.researchgate.net/publication/258565077>, 2013.
- Dunbrack, R. & Zielinski, R. Seasonal and diurnal activity of sixgill sharks (*Hexanchus griseus*) on a shallow water reef in the Strait of Georgia, British Columbia. *Can. J. Zool.*, v. 81, p. 1107-1111, 2003.
- Ebert, D.A. Diet of the Sixgill shark *Hexanchus griseus* off southern Africa. *South African Journal of Marine Science*, v. 14, n. 1, p. 213-218. 1994.
- Ebert, D.A.; Dando, M. & Fowler, S. *Sharks of the world: a complete guide*. Plymouth: Wild Nature Press, 2013.
- Ebert, D.A. *Deep-sea cartilaginous fishes of the southeastern Atlantic Ocean*. Rome: FAO, p. 251, 2015.
- Ebert, D.A. & Stehmann, M. *Sharks, batoids and chimaeras of the North Atlantic*. Rome: Food and Agriculture Organization of the United Nations, 2013.

FAO. Fisheries Department. World review of highly migratory species and straddling stocks. *FAO Fish. Tech. Pap.*, Rome, n. 337, p. 70, 1994.

Figuerola, D.E. Clave ilustrada de agnatos y peces cartilaginosos de Argentina y Uruguay, p. 25-74, in Wöler, O.C.; Cedrola, P. & Cousseau, M.B. (ed.). *Contribuciones sobre biología, pesca y comercialización de tiburones en la Argentina*. Aportes para la elaboración del Plan de Acción Nacional de Acción. Consejo Federal Pesquero, Buenos Aires, 2011.

Figuerola, D.E. Clave de peces marinos del Atlántico Sudoccidental, entre los 33°S y 56° S. 1er ed. INIDEP, Mar del Plata, p. 365, 2019.

Finucci, B.; Barnett, A.; Bineesh, K.K.; Cheok, J.; Cotton, C.F.; DharmadiGraham, K.J.; Kulka, D.W.; Neat, F.C.; Pacoureau, N.; Rigby, C.L.; Tanaka, S. & Walker, T.I. *Hexanchus griseus*. The IUCN Red List of Threatened Species 2020, e.T10030A495630. <https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T10030A495630.en>. Downloaded on 19 August 2021.

Griffing, D.; Larson, S.; Hollander, J.; Carpenter, T.; Christiansen, J. & Doss, C. Observations on abundance of bluntnose sixgill sharks, *Hexanchus griseus*, in an urban waterway in Puget sound, 2003-2005. *PLoS One*, 2014.

Lahille, F. La pesca en la República Argentina. *An. Minist. Agric.*, v. 3, n. 1, p. 1-212, 1906.

Last, P.R. & Stevens, J.D. *Sharks and rays of Australia*. Australia: CSIRO, p. 513, 1994.

Menni, R.C.; Ringuelet, R.A. & Arámburu, R.H. *Peces marinos de la Argentina y Uruguay*. Buenos Aires: Editorial Hemisferio Sur, p. 359, 1984.

Menni, R.C. & Lucifora, L.O. *Condrictios de la Argentina y Uruguay: lista de trabajos*. ProBiota, FCNyM, UNLP, La Plata, Serie Técnica y Didáctica, n. 11, p. 14, 2007.

Mundy, B.C. Checklist of the fishes of the Hawaiian Archipelago. *Bishop Mus. Bull. Zool.*, n. 6, p. 1-706, 2005.

Pan-Tiburones. Plan de Acción Nacional para la Conservación y el Manejo de Condrictios (tiburones, rayas y quimeras) en la República Argentina. Subsecretaría de Pesca y Acuicultura (SSPyA), Secretaría de Ambiente y Desarrollo Sustentable y Ministerio de Relaciones Exteriores, Comercio Internacional y Culto, República Argentina, p. 1-66. 2011.

Par-Condrictios. Plan de Acción Regional para la Conservación y Pesca Sustentable de los Condrictios del área del Tratado del Río de la Plata y su Frente Marítimo. Com. Téc. Mixta del Frente Marítimo, p. 1-154, 2018.

Pozzi, A.J. & Bordinale, L.F. Cuadro sistemático de los peces marinos de la Argentina. *An.Soc. Cient. Argent.*, v. 120, n. 1 p. 145-189, 1935.

Ringuelet, R.A. & Arámburu, R.H. Peces marinos de la República Argentina. Clave de familias y géneros y catálogo crítico abreviado. *Agro*, v. 2, n. 5, p. 141, 1960.

Santander-Neto, J.; Jucá-Queiroz, B.; Nascimento, F.; Basílio, T.; Medeiros, R.; Furtado-Neto, M. & Faria, V. On the occurrence of sevengill and sixgill sharks (Hexanchiformes: Hexanchidae) off Ceará State, Brazil, Western equatorial Atlantic. *Arq. Ciên. Mar*, v. 40, n. 2, p. 59-63, 2007.

Stehmann, M. Illustrated field guide to abundant marine fish species in Argentine waters. *Mitteilungen Inst. See Fisch.*, Hamburg, v. 23, p. 114, 1978.

Weigmann, S. Annotated checklist of the living sharks, batoids and chimaeras (Chondrichthyes) of the world, with a focus on biogeographical diversity. *Journal of Fish Biology*, v. 88, n. 3, p. 837-1037, 2016.