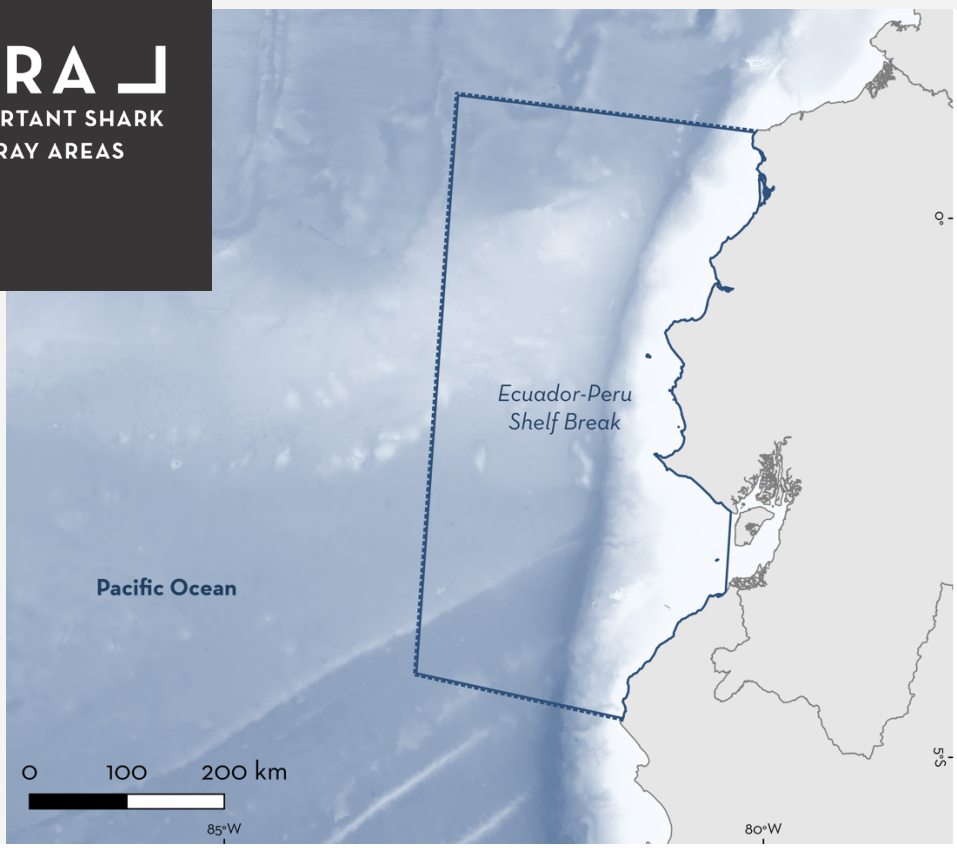
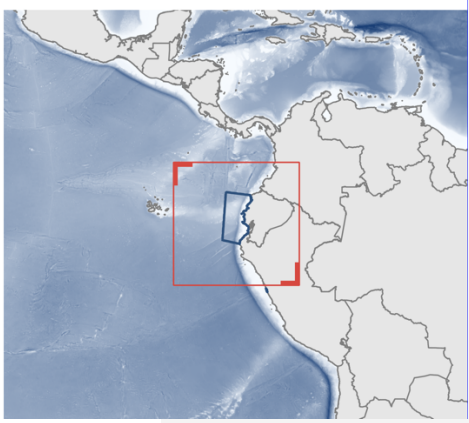
ISRA
IMPORTANT SHARK AND RAY AREAS





Blue lines indicate the area meeting the ISRA Criteria; dashed lines indicate the suggested buffer for use in the development of appropriate place-based conservation measures

ECUADOR-PERU SHELF BREAK ISRA

Central and South American Pacific Region

SUMMARY

Ecuador-Peru Shelf Break stretches from Atacames in northern Ecuador to Punta Balcones in northern Peru. The shelf break runs along the entire area, with the widest part of the shelf off Machala in Ecuador and its narrowest off Cabo Blanco in Peru. The area includes two Ecologically or Biologically Significant Marine Areas, 10 marine protected areas, two Key Biodiversity Areas, and two Wetland of International Importance (Ramsar sites). It contains unique oceanographic and bathymetric conditions resulting in high biodiversity and exceptionally high marine productivity. Within this area there are: **threatened species** (e.g., Whale Shark *Rhincodon typus*); **feeding areas** (Whale Shark); areas important for **movement** (Oceanic Manta Ray *Mobula birostris*), and **undefined aggregations** (Oceanic Manta Ray).

CRITERIA

Criterion A – Vulnerability; Sub-criterion C2 – Feeding Areas; Sub-criterion C4 – Movement; Sub-criterion C5 – Undefined Aggregations

ECUADOR
PERU

0–1,928 metres

186,691.3 km²

DESCRIPTION OF HABITAT

Ecuador-Peru Shelf Break stretches from Atacames in northern Ecuador to Punta Balcones in northern Peru. It encompasses the Guayas, Santa Elena, Manabi, southern Esmeraldas regions of Ecuador and the Tumbes and Piura regions of Peru. Situated within the Pacific Central-American Coastal Large Marine Ecosystem, the area includes two Ecologically or Biologically Significant Marine Areas, the Carnegie Range-Equatorial Front and Gulf of Guayaquil (CBD 2020). Ten marine protected areas have been designated in the area (all located in Ecuador) including Machalilla National Park, Cantagallo – Machalilla, and Bajo Cope. Of these protected areas, two are designated as Wetlands of International Importance (i.e., the Ramsar sites of Isla Santa Clara and Machalilla) and two are Key Biodiversity Areas (Isla de la Plata and Isla Santa Clara).

Ecuador-Peru Shelf Break includes many important habitats. The underwater Carnegie Ridge, an aseismic ridge of volcanic origin, is located between the coasts of Ecuador and the Galápagos Islands at depths <2,500 m and includes at least five seamounts. The Equatorial Front is a transitional zone between two marine currents with high biological productivity. Isla de la Plata is a small island, ~25 km from mainland Ecuador, and is part of Machalilla National Park, located in the Equatorial Front. This island sits ~5 km from the east of the continental shelf, where the shelf depth drops sharply (~200 m).

The Gulf of Guayaquil is the largest estuary on the southeast Pacific coast with the largest area of mangroves in Ecuador (1,210 km^2) (Stevenson 1981). It contains high biological productivity due to the oceanographic conditions associated with the development of the Equatorial Front, coastal outcrops, and interaction of various types of water masses (i.e., oceanic and fresh water transporting organic materials from the estuary's interior). In the gulf, 23 hydrographic basins are discharged in which the Guayas River Basin constitutes the most important fluvial system of the entire western slope of the Andes. The dry season is from June to November and the rainy season from January to April, coinciding with greatest river discharge.

This Important Shark and Ray Area is delineated from the surface (0 m) to 1,928 m based on the global depth range of the Qualifying Species.

ISRA CRITERIA

CRITERION A – VULNERABILITY

Two Qualifying Species considered threatened with extinction according to the IUCN Red List of Threatened Species™ regularly occur in the area. These are the Endangered Whale Shark (Pierce & Norman 2016) and the Endangered Oceanic Manta Ray (Marshall et al. 2022).

SUB-CRITERION C2 – FEEDING AREAS

Ecuador-Peru Shelf Break is an important feeding area for one shark species. Northern Peru has been identified as one of the 25 global Whale Shark aggregations (Araujo et al. 2022). Juvenile Whale Shark (2–10 m in total length) use this area seasonally (austral spring and summer) for feeding purposes. Between 2014 and 2018, in Tumbes (northern coastal Peru), most of the 191 juvenile Whale Shark, predominately males, were recorded feeding (Maguiño et al. 2016, 2019). Furthermore, 185 interviews with fishers, on-board observers, captains, and diving companies provided information on 272 Whale Shark observations where most individuals were reportedly observed feeding (Maguiño et al. 2016). The probability of Whale Shark presence in northern Peru increases at high chlorophyll-

a (4-6 mg/m^3) and high sea surface temperature values (25–28°C). Whale Sharks appear to aggregate seasonally potentially exploiting rich foraging grounds when biological productivity is highest (Gonzalez-Pestana et al. 2020).

SUB-CRITERION C4 – MOVEMENT

Ecuador-Peru Shelf Break is an important movement area for one ray species. There is evidence of connectivity between coastal Ecuador (Isla de La Plata, Bajo Copé) and northern Peruvian waters for Oceanic Manta Rays.

Between 2010–2015, 11 Oceanic Manta Rays were tagged with satellite tags at Isla de la Plata with results indicating that these animals undertake considerable journeys (hundreds or thousands of kilometres) in relatively short periods of time (Hearn et al. 2014; Guerrero & Hearn 2017). Most tagged animals travelled between coastal Ecuador and northern Peru, and none of them travelled in a northerly direction. Between 2017–2019, 46 Oceanic Manta Rays were tagged (16 individuals using satellite tags and 30 individuals using acoustic tags) in Isla de la Plata and Bajo Copé (Palomino et al. 2020). The trajectories show a constant displacement between the mainland coast of Ecuador and Peru, especially on the edge and within the continental shelf. In Ecuador, movement analysis showed that this species has a greater residency in Isla de La Plata (68.5%), the Cantagallo-Machalilla (15.1%), and the Bajo Copé (13.0%) (Palomino et al. 2020). Kernel density descriptive analysis showed that hotspots for this species are mainly around Isla de la Plata and Tumbes region (Palomino et al. 2020). Three tagged Oceanic Manta Rays also moved between coastal Ecuador and northern Peru (Peñaherrera-Palma et al. 2018). Furthermore, an additional satellite telemetry study in 2018 showed that two individuals tagged in northern Peru moved in the area between northern Peru and Ecuador (Andrzejaczek et al. 2021). These results are supported by a genetic diversity and population structure studies that show a low gene flow between mainland Ecuador and Galápagos Islands (Rojas Lopez et al. 2022) suggesting that Oceanic Manta Rays moved mainly along the mainland coast.

SUB-CRITERION C5 – UNDEFINED AGGREGATIONS

Ecuador-Peru Shelf Break is an important aggregation area for one ray species. Isla de la Plata and Bajo Copé hold the largest known global population of Oceanic Manta Rays. Using photo-identification data, 2,803 Oceanic Manta Rays were recorded between 2005–2018, with an estimated population of 22,316 individuals (Harty et al. 2022). Individuals from mostly mature, male-biased aggregation, use this area seasonally between June to October (Harty et al. 2022). This population is located seasonally between coastal Ecuador and Peru due to a low resighting rate at Isla de la Plata and Bajo Cope and satellite tracks of tagged Oceanic Manta Ray from Peru and Isla de la Plata that have shown that the home range appears to be considerably larger than the sampling area covered by their survey efforts (Hearn et al. 2014; Guerrero & Hearn 2017; Peñaherrera-Palma et al. 2018; Palomino et al. 2020; Andrzejaczek et al. 2021). In Tumbes (northern Peru), Oceanic Manta Ray are most common between June to September (Planeta Oceano unpubl. data 2022).

Oceanic Manta Rays might be occupying this seasonal area mainly for reproductive and feeding purposes. Between 2017–2019, around Isla de la Plata, male and female individuals have been reported with evidence of recent copulation (mating scars) along with potential pregnant females due to an extended abdomens (Guerrero & Hearn 2017; Palomino et al. 2020). In 2018, the first

ultrasound was successfully conducted on an Oceanic Manta Ray in Isla de La Plata confirming pregnancy (Guerrero 2020). Off Tumbes, northern Peru, Oceanic Manta Rays, captured as bycatch, have been reported pregnant (Avila et al. 2014; Cabanillas-Torpoco et al. 2019; MINAM 2021). Stable isotope and fatty acid analyses showed that Oceanic Manta Rays around Isla de la Plata are not feeding predominantly on surface zooplankton; instead, the majority of dietary intake is mesopelagic in origin (Burgess et al. 2016, 2018). In northern Peru (Tumbes), coastal vertical movements of three tagged rays were motivated by a combined foraging and thermal recovery strategy in which the water column was highly stratified for sea temperature (Andrzejaczek et al. 2021); this suggests that Oceanic Manta Rays dive to forage on vertically migrating zooplankton at night and return to surface waters to rewarm between dives. Between 2008–2014, the three individuals tagged in coastal Ecuador showed vertical diving behavior at night (C. Peñaherrera unpubl. data 2022). Similar results were found for 11 Oceanic Manta Rays tagged in coastal Ecuador where they spent significantly more time at the surface during the day and more time at depth (50–200 m) during the night (Guerrero 2016). This suggests that Oceanic Manta Rays use the Ecuador-Peru Shelf Break area to feed in mid-water. In other parts of the world, this species uses deep waters to feed (Stewart et al. 2016).

Acknowledgments

Alex Hearn (Universidad San Francisco de Quito, MigraMar), Eduardo Espinoza (Galápagos National Park Services), Jenifer Suarez (Galápagos National Park Services), César Peñaherrera (MigraMar), Michel Guerrero (Fundacion Megafauna Marina del Ecuador), Alejandra Mendoza (ecOceanica), Rossana Maguiño (ecOceanica), Mariano Cabanillas (Planeta Oceano), Mark Priest (IUCN SSC Shark Specialist Group - ISRA Project), and Adriana González-Pestana (IUCN SSC Shark Specialist Group - ISRA Project) contributed and consolidated information included in this factsheet. We thank the participants of the 2022 ISRA Region 12 – Central and South American Pacific workshop for their contributions to this process.

This factsheet has undergone review by the ISRA Independent Review Panel prior to its publication.

This project was funded by the Shark Conservation Fund, a philanthropic collaborative pooling expertise and resources to meet the threats facing the world's sharks and rays. The Shark Conservation Fund is a project of Rockefeller Philanthropy Advisors.

Suggested citation

IUCN SSC Shark Specialist Group. 2023. Ecuador-Peru Shelf Break ISRA Factsheet. Dubai: IUCN SSC Shark Specialist Group.

QUALIFYING SPECIES

Scientific Name	Common Name	IUCN Red List Category	Global Depth Range (m)	ISRA Criteria/Sub-criteria Met								
				A	B	C1	C2	C3	C4	C5	D1	D2
SHARKS												
Rhincodon typus	Whale Shark	EN	0–1,928	X			X					
RAYS												
Mobula birostris	Oceanic Manta Ray	EN	0–1,000	X					X	X		

SUPPORTING SPECIES

Scientific Name	Common Name	IUCN Red List Category
SHARKS		
Megachasma pelagios	Megamouth Shark	LC
Carcharhinus brachyurus	Copper Shark	VU
Mustelus dorsalis	Sharptooth Smoothhound	VU
Mustelus mento	Speckled Smoothhound	CR
Mustelus whitneyi	Humpback Smoothhound	CR
Nasolamia velox	Whitenose Shark	EN
Notorynchus cepedianus	Broadnose Sevengill Shark	VU
Sphyrna lewini	Scalloped Hammerhead	CR
Sphyrna zygaena	Smooth Hammerhead	VU
Squatina armata	Chilean Angelshark	VU
RAYS		
Aetobatus laticeps	Pacific Eagle Ray	VU
Hypanus dipterurus	Diamond Stingray	VU
Hypanus longus	Longtail Stingray	VU
Mobula mobular	Spinetail Devil Ray	EN
Mobula munkiana	Munk's Pygmy Devil Ray	EN
Mobula thurstoni	Bentfin Devil Ray	EN
Myliobatis chilensis	Chilean Eagle Ray	VU
Myliobatis longirostris	Longnose Eagle Ray	VU
Myliobatis peruvianus	Peruvian Eagle Ray	VU
Narcine entemedor	Cortez Numbfish	VU
Pristis pristis	Largetooth Sawfish	CR
Pseudobatos leucorhynchus	Whitesnout Guitarfish	VU
Pseudobatos planiceps	Pacific Guitarfish	VU
Pseudobatos prahli	Gorgona Guitarfish	VU
Rostroraja equatorialis	Equatorial Skate	VU
Rostroraja velezi	Rasptail Skate	VU
Urobatis tumbesensis	Tumbes Round Ray	VU
Zapteryx xyster	Southern Banded Guitarfish	VU

IUCN Red List categories: *CR, Critically Endangered; EN, Endangered; VU, Vulnerable; NT, Near Threatened; LC, Least Concern; DD, Data Deficient.*

SUPPORTING INFORMATION

There are additional indications that Ecuador-Peru Shelf Break is an important area for reproductive, feeding, and resting purposes.

Along the Ecuadorian coast, between 2012–2016 (Guerrero & Hearn 2017) and 2017–2019 (Palomino et al. 2020), several sightings of Whale Shark have been reported, and maps of occurrence show most of these individuals are juveniles (A. Hearn unpubl. data 2022).

During 20 field trips in Los Organos Bay, Piura region (Peru), in 2016, 2017, and 2019, 22 individuals of Southern Banded Guitarfish were recorded resting on the sea floor at depths between 1–6 m. All individuals encountered were adult females measuring between 51–75 cm TL (average: 60.1 cm TL). Some females had extended abdomens on both the dorsal and ventral surfaces, and it is possible they were pregnant as one of them gave birth to six individuals after being captured and transported to an aquarium (Gonzalez-Pestana et al. in press). This indicates that this area might be important for reproductive purposes.

Female and male Tumbes Round Rays are commonly observed and have been recorded through videos and photographs in Canoas de Punta Sal, Tumbes region, northern Peru. This species has been observed swimming, resting in groups under crevices, and feeding (A. González-Pestana pers. obs. 2022). Some females were also observed with extended abdomens on the dorsal surface which suggests that this area might be important for the reproduction of this species.

REFERENCES

Andrzejaczek S, Schallert RJ, Forsberg K, Arnoldi NS, Cabanillas-Torpoco M, Purizaca W, Block BA. 2021. Reverse diel vertical movements of oceanic manta rays off the northern coast of Peru and implications for conservation. *Ecological Solutions and Evidence* 2(1): e12051. https://doi.org/10.1002/2688-8319.12051

Araujo G, Agustines A, Bach SS, Cochran JEM, Parra-Galván Edl, Parra-Venegas Rdl, Diamant S, Dove A, Fox S, Graham RT, et al. 2022. Improving sightings derived residency estimation for whale shark aggregations: A novel metric applied to a global data set. *Frontiers in Marine Science* 9: 775691. https://doi.org/10.3389/fmars.2022.775691

Avila J, Forsberg K, Purizaca W, Harding W, Stewart J. 2014. Distribución y pesquería de la manta raya (*Manta birostris*) en la costa norte de Perú. IV Congreso Nacional de Ciencias del Mar, Perú.

Burgess KB, Couturier LI, Marshall AD, Richardson AJ, Weeks SJ, Bennett MB. 2016. *Manta birostris*, predator of the deep? Insight into the diet of the giant manta ray through stable isotope analysis. *Royal Society Open Science* 3: 160717. https://doi.org/10.1098/rsos.160717

Burgess KB, Guerrero M, Marshall AD, Richardson AJ, Bennett MB, Couturier LIE. 2018. Novel signature fatty acid profile of the giant manta ray suggests reliance on an uncharacterised mesopelagic food source low in polyunsaturated fatty acids. *PLoS ONE* 13(1): e0186464. https://doi.org/10.1371/journal.pone.0186464

Cabanillas-Torpoco M, Forsberg K, Siccha-Ramirez R, Cisneros P, Luque C, Purizaca W, Asmat R, Ampuero C, Rubin R, Vera M. 2019. First description of a giant manta ray fetus *Mobula birostris* (Walbaum 1792) from Tumbes, Peru (Southeast Pacific). *Zootaxa* 4603: 397–400. https://doi.org/10.11646/zootaxa.4603.2.12

Gonzalez-Pestana A, Maguiño R, Mendoza A, Kelez S, Ramírez-Macías, D. 2020. Distribution of whale shark (*Rhincodon typus*) off northern Peru based on habitat suitability. *Aquatic Conservation: Marine and Freshwater Ecosystems* 30(7): 1325–1336. https://doi.org/10.1002/aqc.3330

González-Pestana A, Molina-Salgado P, Ponce A. In press. Assemblage of coastal batoids in northern Peru: preliminary knowledge. *Revista de Biología Marina y Oceanografía*

Guerrero M. 2016. The status of the Giant Manta Ray (*Manta birostris*) in Ecuador. Report from Fundación Megafauna Marina del Ecuador and Proyecto Mantas Ecuador.

Guerrero M. 2020. Resumen de resultados obtenidos en los estudios sobre Manta Rayas Oceánicas (*Mobula birostris*) en Ecuador. Informes técnico presentado por Fundación Megafauna Marina de Ecuador al Ministerio de Ambiente de Ecuador.

Guerrero M, Hearn A. 2017. Manta rayas gigantes (*Manta birostris*) como indicador de la salud del ecosistema marino en el Parque Nacional Machalilla, Ecuador. Fundación Megafauna Marina del Ecuador, Ecuador.

Harty K, Guerrero M, Knochel AM, Stevens GM, Marshall A, Burgess K, Stewart JD. 2022. Demographics and dynamics of the world's largest known population of oceanic manta rays *Mobula birostris* in coastal Ecuador. *Marine Ecology Progress Series* 700: 145–159. https://doi.org/10.3354/meps14189

Hearn AR, Acuna D, Ketchum JT, Penaherrera C, Green J, Marshall A, Guerrero M, Shillinger G. 2014. Elasmobranchs of the Galapagos Marine Reserve. In: Denkinger J, Vinueza L, eds. *The Galapagos Marine Reserve: A dynamic social-ecological system*. New York: Springer, 23–60.

Lopez KER, Guadalupe JJ, Gordillo-Romero M, Montero-Oleas A, Pazmiño DA, Guerrero M, de Lourdes Torres M. 2022. Exploring the genetic diversity and population structure of *Mobula birostris* in two key aggregation zones in the Eastern Tropical Pacific. *Marine Ecology Progress Series* 699: 75–89. https://doi.org/10.3354/meps14171

Jimenez R, Bonilla D. 1980. Composición y distribución de la biomasa del plancton en el Frente Ecuatorial. INOCAR. Acta Oceanoógrafica del Pacífico 1(1).

Maguiño R, Mendoza A, Kelez S, Vélez-Zuazo X, Ramírez-Macías D. 2016. Unveiling a new foraging area for the threatened whale shark. QScience Proceedings (The 4th International Whale Shark Conference). http://dx.doi.org/10.5339/qproc.2016.iwsc4.32

Maguiño R, Mendoza A, Kelez S, Ramírez-Macías D. 2019. El norte de Perú se convierte en una nueva área de agregación para los tiburones ballena. Primer congreso latinoamericano de tiburones, rayas y quimeras. Mexico.

Marshall A, Barreto R, Carlson J, Fernando D, Fordham S, Francis MP, Derrick D, Herman K, Jabado RW, Liu KM, et al. 2022. *Mobula birostris* (amended version of 2020 assessment). *The IUCN Red List of Threatened Species* 2022: e.T198921A214397182. https://dx.doi.org/10.2305/IUCN.UK.2022-1.RLTS.T198921A214397182.en

Ministerio del Ambiente (MINAM). 2021. Diagnóstico situacional de las "Mobulas" en el Perú. MINAM, Lima

Palomino A, Guerrero M, Hearn A. 2020. Informe final sobre monitoreo de megafauna marina (*Mobula birostris* y *Rhincodon typus*) usando métodos satelitales y acústicos para entender los patrones de distribución poblacional y movimientos migratorios para optimizar las medidas de conservación. Proyecto IKU. Fundación Megafauna Marina del Ecuador and World Wide Fund, Ecuador.

Peñaherrera-Palma C, Arauz R, Bessudo S, Bravo-Ormaza E, Chassot O, Chinacalle-Martínez N, Espinoza E, Forsberg K, García-Rada E, Guzmán H, et al. 2018. Justificación biológica para la creación de la MigraVía Coco-Galápagos. Portoviejo, Manabí, Ecuador: MigraMar and Pontificia Universidad Católica del Ecuador Sede Manabí.

Pierce SJ, Norman B. 2016. *Rhincodon typus. The IUCN Red List of Threatened Species* 2016: e.T19488A2365291. https://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T19488A2365291.en

Secretariat of the Convention on Biological Diversity (CBD). 2020. Ecologically or Biologically Significant Marine Areas (EBSAs). Special places in the world's oceans. Volume 5: Eastern Tropical and Temperate Pacific Ocean. Available at: https://www.cbd.int/marine/ebsa/booklet-05-ettp-en.pdf Accessed September 2022.

Stewart JD, Hoyos-Padilla EM, Kumli KR, Rubin RD. 2016. Deep-water feeding and behavioral plasticity in *Manta birostris* revealed by archival tags and submersible observations. *Zoology* 119(5): 406–413. https://doi.org/10.1016/J.ZOOL.2016.05.010

Stevenson M. 1981. Variaciones estacionales en el golfo de Guayaquil, un estuario tropical. Boletín Científico Técnico 4(1).