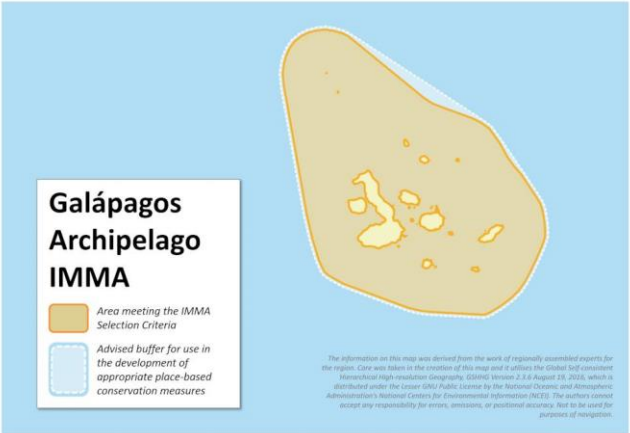

Area Size

139 517 km²

Qualifying Species and Criteria

Galápagos fur seal – *Arctocephalus galapagoensis*

Criterion A; B (1)

Galápagos sea lion – *Zalophus wollebaeki*

Criterion A; B (1)

Blue whale – *Balaenoptera musculus*

Criterion A; C (1, 2)

Bryde's whale – *Balaenoptera edeni*

Criterion B (2)

Humpback whale – *Megaptera novaeangliae*

Criterion C (1)

Sperm whale – *Physeter macrocephalus*

Criterion A; B (2)

Killer whale – *Orcinus orca*

Criterion B (2)

Marine Mammal Diversity

Criterion D (2)

Globicephala macrorhynchus, Grampus griseus, Risso's dolphin, Tursiops truncatus, Delphinus delphis delphis, Stenella coeruleoalba, Ziphius cavirostris, Kogia sima, Stenella attenuata, Stenella longirostris

Galápagos Archipelago IMMA

Summary

Oceanographic conditions around the Galápagos Archipelago IMMA are conducive to high levels of biological productivity, species diversity, and marine endemism. These waters have been designated as a marine reserve by the government of Ecuador and as a Natural World Heritage Site by UNESCO. Numerous scientific expeditions and other research in the last 40 years have demonstrated the importance of the Galápagos Archipelago for marine mammals. The islands feature populations of two endangered and endemic pinnipeds, the Galápagos fur seal (*Arctocephalus galapagoensis*) and the Galápagos sea lion (*Zalophus wollebaeki*). The unique local habitats created by these oceanic islands are also breeding and feeding grounds for endangered blue whales (*Balaenoptera musculus*) migrating from Chile and California, and Southern humpback whales (*Megaptera novaeangliae australis*) migrating from the Antarctic Peninsula. The archipelago also hosts aggregations of Bryde's whales (*Balaenoptera edeni brydei*), vulnerable sperm whales (*Physeter macrocephalus*), and killer whales (*Orcinus orca*) inhabiting the eastern tropical Pacific. The rich oceanic waters surrounding the archipelago also support aggregations of a high diversity of medium and small cetacean species.

Description:

The Galápagos Archipelago (Islas Galápagos/ Archipiélago de Colón) is an oceanic insular ecosystem situated in the eastern tropical Pacific 1,000 km west of Ecuador. Owing to its location on the equator, the archipelago is subject to strong

seasonal and interannual climatic variability at the regional scale (Palacios, 2004; Palacios et al., 2006; Sweet et al., 2007; Forryan et al., 2021), and to marked environmental zonation at the local scale (Harris, 1969; Wellington et al., 2001; Schaeffer et al., 2008), which give rise to distinctive biogeographic patterning across the islands (Edgar et al., 2004; McKinley et al., 2022). The archipelago is surrounded by narrow shelves and abrupt slopes, increasing in depth rapidly to 3,000 m or more, particularly in the western and southern regions. A complex system of currents bathes the archipelago, including the South Equatorial Current, the North Equatorial Countercurrent, and the Equatorial Undercurrent. The Equatorial Undercurrent, in particular, strongly influences the western region, increasing primary productivity and creating favorable conditions for a high abundance and diversity of marine mammals for a low-latitude environment (Palacios & Salazar 2002; Palacios, 2003; Palacios et al., 2004; Palacios & Forney, 2008; Denkinger et al., 2013; Palacios & Cantor, 2023).

The waters surrounding the Galápagos Archipelago are legally protected by the 133,000 km² Galápagos Marine Reserve (GMR) and are also designated as a UNESCO Natural World Heritage Site in recognition of the astonishingly rich and diverse marine communities inhabiting them (Palacios & Cantor, 2023). Acknowledging the urgent conservation crisis faced by many megafauna species due to fishing pressures outside the GMR, in early 2022, Ecuador's government announced it would create an additional marine protected area within its Exclusive Economic Zone, named "Reserva Marina Hermandad," a 60,000 km² corridor adjacent to the GMR, as part of a regional initiative that seeks to connect the insular marine protected areas of Ecuador, Costa Rica, Panama, and Colombia (Palacios & Cantor, 2023).

Criterion A: Species or Population Vulnerability

The Galápagos Archipelago IMMA contains habitat important for the survival and recovery of four marine mammal species whose conservation status is of concern under the IUCN Red List of Threatened species. The population of Galápagos fur seals (*Arctocephalus galapagoensis*), listed as Endangered (EN), is estimated at about 10,000 mature individuals and considered to be declining (Trillmich, 2015a). Similarly, the population of Galápagos sea lions (*Zalophus wollebaeki*), listed as Endangered, is also estimated at about 10,000 mature individuals and considered to be declining (Trillmich, 2015b). Subsequent to these IUCN assessments, more recent data suggest that the populations of both species have somewhat increased, but they continue to be subject to strong inter-annual fluctuations associated with El Niño and La Niña events (Páez-Rosas et al., 2021).

Figure 1: A male Galápagos sea lion (*Zalophus wollebaeki*) at Plaza Sur Island, Galápagos Islands. Photo: Daniel Palacios.

Blue whales (*Balaenoptera musculus*) have also been assessed as Endangered (EN) on the IUCN Red List of Threatened species (Cooke, 2019). The global estimate for the number of mature blue whales is thought to be in the range 5,000-15,000 individuals, with an increasing trend, while the Chilean blue whale subpopulation is thought to be in the low hundreds (300-450 individuals), with an uncertain population trend (Cooke, 2019). Sperm whales (*Physeter macrocephalus*) are listed as Vulnerable (VU) on the IUCN Red List (Taylor, 2019). The current global mature population size is thought to be in the 100,000's, with considerable uncertainty in population trend (Taylor, 2019). The population of sperm whales inhabiting the eastern tropical Pacific was estimated at 22,666 individuals in 1993 (Wade & Gerrodette, 1993) and the number of animals using Galápagos waters was estimated at 1,254 in 1990 (Whitehead et al., 1997). However, the Whitehead et al. (1997) study, as well as a more recent study spanning the period 1985-2014 (Cantor et al., 2017), revealed strong inter-decadal fluctuations in the number of animals that visit Galápagos as a result of movements in and out of the archipelago.

Criterion B: Distribution and Abundance
Sub-criterion B1: Small and Resident Populations

The Galápagos Archipelago encompasses the primary breeding and feeding habitat for both Galápagos fur seals and Galápagos sea lions (Salazar, 2002). As noted prior, however, oceanographic events such as El Niño and La Niña result not only in strong interannual fluctuations in the populations of these pinnipeds but also in their distribution at sea. Indeed, distant haul-outs and even small temporary breeding colonies of both species have been reported outside Galápagos during anomalous years (e.g., Palacios et al., 1997; Félix et al., 2007; Aurioles-Gamboa et al., 2004; Ceballos et al., 2010; Quintana-Rizzo et al., 2017; Páez-Rosas et al., 2017). Similarly, an influx of atypical pinniped species has been reported in Galápagos during these strong perturbations (e.g., Páez-Rosas et al., 2020; Alava et al., 2022). In all cases, these redistributions appear to be temporary.

Figure 2: Aerial photo of a blue whale (*Balaenoptera musculus*) seen southeast of Isabela Island, Galápagos Islands, in August 1998. Photo: Daniel Palacios.

Sub-criterion B2: Aggregations

A quantitative analysis of cetacean community structure in the Galápagos demonstrated that a combination of physical and biological factors results in a variety and persistence of ecological niches for a set of species that are numerically abundant within the archipelago (Palacios, 2003 Palacios & Cantor, 2023). Among these, the Bryde's whale (*Balaenoptera edeni brydei*) is seen in feeding aggregations especially on the western part of the archipelago (Palacios et al., 2002; Denkinger et al., 2013), as well as off San Cristóbal Island, in the eastern part (Biggs et al., 2017). Aggregations of female and immature sperm whales (*Physeter macrocephalus*) are seen in the deeper waters of the archipelago, although their

numbers wax and wane over the years as groups of animals move in and out of the area (Whitehead et al., 1997; Cantor et al., 2017).

Killer whales (*Orcinus orca*) have naturally low abundance and roam broadly in the eastern tropical Pacific. However, they are regularly seen off the Galápagos, and most encounters include observations of feeding. Galápagos harbours abundant populations of prey for killer whales, including teleost and elasmobranch fishes, sea turtles, pinnipeds, and cetaceans, that are otherwise sparsely distributed in the broader eastern tropical Pacific region (Denkinger et al., 2020). Killer whales are commonly seen on the western side of the archipelago, where they have been reported preying on a very wide variety of marine species, but they are also regularly observed off Baltra, Santa Cruz, and the San Cristóbal Islands (Denkinger et al., 2020).

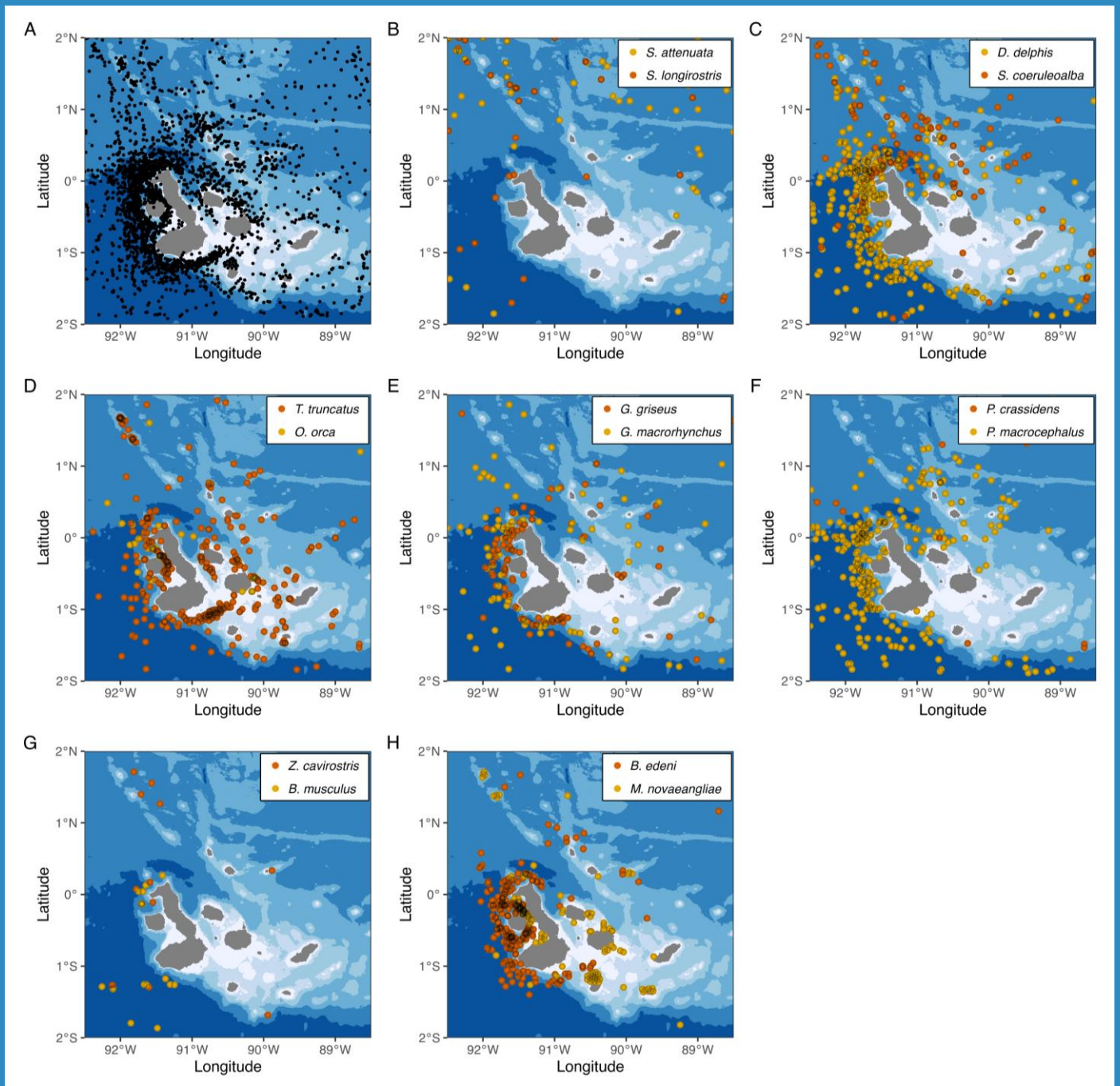

Figure 3: Maps depicting the distribution of 14 cetacean species commonly seen in Galápagos waters (reproduced from Palacios & Cantor, 2023).

Criterion C: Key Life Cycle Activities
Sub-criterion C1: Reproductive Areas

The Galápagos Archipelago is part of the low-latitude range of Chilean blue whales, where they are observed to breed annually during the austral winter (Palacios, 1999; Biggs et al., 2017; Hucke-Gaete et al., 2018; Denkinger et al., 2023). Blue whales are also increasingly seen in Galápagos in the boreal winter, suggesting a connection to the California population (Denkinger et al., 2023). The Galápagos Archipelago is also part of the low-latitude range of Southern Hemisphere humpback whales from IWC Breeding Stock G, where they breed annually during the austral winter (Félix et al., 2011; Biggs et al., 2017).

Sub-criterion C2: Feeding Areas

The Galápagos Archipelago is part of the low-latitude range of Chilean blue whales, where they are observed to feed annually during the austral winter (Palacios, 1999; Biggs et al., 2017; Hucke-Gaete et al., 2018). The increasing number of blue whales seen in Galápagos in the boreal winter suggests that the productive waters around the archipelago may also used for feeding by the California population (Denkinger et al., 2023).

Figure 4: A group of short-beaked common dolphins (*Delphinus delphis*) porpoising at high speed on the western part of the Galápagos Islands in April 2000. Photo: Daniel Palacios.

Criterion D: Special Attributes
Sub-criterion D2: Diversity

The Galápagos Archipelago IMMA supports an important diversity of marine mammal species with twelve regularly occurring marine mammal species. An analysis of community structure based on cetacean sightings data demonstrated that the high diversity of species regularly present in Galápagos is supported by a combination of physical and biological factors that result in a variety and persistence of ecological niches (core habitats) around the archipelago (Palacios, 2003; Palacios & Cantor, 2023). A separate study of cetacean strandings in Galápagos indicated a pattern consistent with the sighting record (Palacios et al., 2004). Additional studies have documented cetacean species occurrence in Galápagos waters (Day, 1994; Smith & Whitehead, 1999; Palacios et al., 2002; Denkinger et al., 2013). In addition to the species already discussed, mentioned prior, under the previous criteria descriptions, short-finned pilot whales (*Globicephala macrorhynchus*) and Risso's dolphins (*Grampus griseus*) are commonly found in offshore waters, especially along the steep slopes of the western side of the archipelago (Palacios et al., 2002; Palacios & Cantor, 2023). Common bottlenose dolphins (*Tursiops truncatus*) are the most commonly sighted species in nearshore waters of the archipelago, with aggregations being reported from the waters between Isabela and Floreana Islands, north of Santa Cruz Island, in the Bolivar Channel between Fernandina and Isabela Islands, between Santiago and Pinzón Islands, and around the islets of Roca Redonda, Wolf, and Darwin (Palacios et al., 2002; Palacios & Cantor, 2023). This coastal distribution is consistent with the island-associated ecotype that has been reported around other oceanic islands, and it is possible that with more research, common bottlenose dolphins may qualify for Criterion B1 (Small and Resident Populations) in a

future assessment.

Finally, large aggregations of short-beaked common dolphins (*Delphinus delphis*) and striped dolphins (*Stenella coeruleoalba*) are common in offshore waters of the archipelago, especially in the western and northern parts where topographic upwelling of the Equatorial Undercurrent is strongest (Palacios et al., 2002; Palacios, 2003; Palacios & Forney, 2008; Palacios & Cantor, 2023). It is also probable that at least half a dozen beaked whale species occur in Galápagos waters but these are reported only infrequently due to their cryptic behaviour and difficulty in identifying species at sea. While the relative sighting frequency of each species may vary between studies, they all conclude that the Galápagos Archipelago is an area that attracts and sustains an outstanding diversity of marine mammals (Palacios & Cantor, 2023).

Figure 5: Common bottlenose dolphins (*Tursiops truncatus*) riding the bow of a research vessel in the Galápagos Islands. Photo: Daniel Palacios.

Supporting Information

Alava, J.J., Riofrío-Lazo, M., Reygondeau, G., Rosero, P., Avila, I.C., Lara, D., Gil, F., Yaipen-Llanos, C.F., Elorriaga-Verplancken, F.R. and Páez-Rosas, D. 2022. 'Southern elephant seals (*Mirounga leonina*) in the Galapagos Islands and the eastern tropical Pacific amid ocean environmental changes: towards a habitat suitability index'. Aquatic Mammals, 48(5): 418–431.

Aurioles-Gamboa, D., Schramm, Y. and Mesnick, S. 2004. 'Galapagos fur seals, *Arctocephalus galapagoensis*, in Mexico'. Latin American Journal of Aquatic Mammals, 3(1):77–80.

Biggs, D.C., Durkacz, S.M., Martin, L.M., Narvaez, M., De La Garza, A., Lombraña, Z. and Santos, M. 2017. 'Bryde's whales (*Balaneoptera brydei*) in an area of upwelling off Isla San Cristóbal, Galápagos'. Neotropical Biodiversity, 3(1):189–195.

Cantor, M., Eguiguren, A., Merlen, G. and Whitehead, H. 2017. 'Galápagos sperm whales (*Physeter macrocephalus*): waxing and waning over three decades'. Canadian Journal of Zoology, 95(9), 645–652.

Ceballos, G., Pompa, S., Espinoza, E. and García, A. 2010. 'Extralimital distribution of Galapagos (*Zalophus wollebaeki*) and northern (*Eumetopias jubatus*) sea lions in Mexico. Aquatic Mammals, 36(2):188–194.

Cooke, J.G. 2018. '*Balaenoptera musculus* (errata version published in 2019)'. The IUCN Red List of Threatened Species 2018: e.T2477A156923585. https://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T2477A156923585.en. Accessed on 13 September 2022.

Day, D. 1994. List of Cetaceans seen in Galápagos. Noticias de Galápagos, 56:5–6.

Denkinger, J., Oña, J., Alarcón, D., Merlen, G., Salazar, S. and Palacios, D.M. 2013. 'From whaling to whale-watching: cetacean presence and species diversity in the Galapagos Marine Reserve'. In: S.J. Walsh and C.F.

Mena (eds) Science and Conservation in the Galapagos Islands: Social and Ecological Interactions in the Galapagos Islands, vol. 1, pp. 217–235. New York: Springer Science+Business Media, LLC.

Denkinger, J., Alarcón, D., Espinosa, B., Fowler, L., Manning, C. and Palacios, D.M. 2020. 'Social structure of killer whales (*Orcinus orca*) in a variable environment, the Galápagos Archipelago'. Marine Mammal Science, 36(3):774–785.

Denkinger, J., Douglas, A.B., Biggs, D., Sears, R., Narvaez, M. and Alarcon, D.E. 2023. Year-round presence of northern and southern hemisphere Blue Whales (*Balaenoptera musculus*) at the Galapagos Archipelago. J. Cetacean Res. Manage., 24(1), 63–76. https://doi.org/10.47536/jcrm.v24i1.387.

Edgar, G.J., Banks, S., Fariña, J.M., Calvopiña, M. and Martínez, C. 2004. 'Regional biogeography of shallow reef fish and macro-invertebrate communities in the Galapagos archipelago'. Journal of Biogeography, 31:1107–1124.

Félix, F., Palacios, D.M., Salazar, S.K., Caballero, S., Haase, B. and Falconí, J. 2011. 'The 2005 Galápagos Humpback Whale Expedition: A first attempt to assess and characterize the population in the archipelago'. Journal of Cetacean Research and Management (Special Issue 3):291–299.

Félix, F., Jiménez, P., Falconí, J. and Echeverry, O. 2007. 'New records and first births of the Galapagos fur seal, *Arctocephalus galapagoensis* (Heller, 1904), from the mainland coast of Ecuador'. Revista de Biologa Marina y Oceanografía, 42(1):77–82.

Forryan, A., Naveira Garabato, A.C., Vic, C. Nurser, A.J.G. and Hearn, A.R. 2021. 'Galápagos upwelling driven by localized wind–front interactions'. Scientific Reports, 11:1277.

Harris, M.P. 1969. 'Breeding seasons of sea-birds in the Galapagos Islands'. Journal of Zoology, 159:145–165.

Hucke-Gaete, R., Bedriñana-Romano, L., Viddi, F.A., Ruiz, J.E., Torres-Florez, J.P. and Zerbini, A.N. 2018. 'From Chilean Patagonia to Galapagos, Ecuador: novel insights on blue whale migratory pathways along the Eastern South Pacific'. PeerJ, 6(2):e4695–22.

McKinley, S.J., Saunders, B.J., Rastoin-Laplane, E., Salinas-de-León, P. and Harvey, E.S. 2022. 'Functional diversity of reef fish assemblages in the Galapagos Archipelago'. Journal of Experimental Marine Biology and Ecology, 549:151695.

Páez-Rosas, D., Valdovinos, L.A. and Elorriaga-Verplancken, F.R. 2017. 'Northernmost record of the Galapagos fur seal (*Arctocephalus galapagoensis*): A consequence of anomalous warm conditions around the Galapagos Archipelago'. Aquatic Mammals, 43(6):629–634.

Páez-Rosas, D., Pazmiño, D.A. and Riofrío-Lazo, M. 2020. 'Unprecedented records of Guadalupe and Juan Fernández fur seals in the Galapagos Archipelago'. Aquatic Mammals, 46(6):549–555.

Páez-Rosas, D., Torres, J., Espinoza, E., Marchetti, A., Seim, H. and Riofrío-Lazo, M. 2021. 'Declines and recovery in endangered Galapagos pinnipeds during the El Niño event'. Scientific Reports, 11(1):8785.

Palacios, D.M., Félix, F., Florez-González, L., Capella, J.J., Chiluiza, D. and Haase, B. 1997. 'Sightings of Galápagos sea lions (*Zalophus californianus wollebaeki*) on the coasts of Colombia and Ecuador'. Mammalia, 61(1):114–115.

Palacios, D.M. 1999. 'Blue whale (*Balaenoptera musculus*) occurrence off the Galápagos Islands,

1978-1995'. Journal of Cetacean Research and Management ,1(1):41–51.

Palacios, D.M. and Salazar, S. 2002. 'Cetáceos'. In: E. Danulat, and G.J. Edgar (eds.), Reserva Marina de Galápagos, Línea Base de la Biodiversidad, pp. 291–304. Santa Cruz (Galápagos, Ecuador): Fundación Charles Darwin/Servicio Parque Nacional Galápagos.

Palacios, D.M. 2003. Oceanographic conditions around the Galapagos Archipelago and their influence on cetacean community structure. Ph.D. Dissertation. Corvallis: Oregon State University.

Palacios, D.M. 2004. 'Seasonal patterns of sea-surface temperature and ocean color around the Galápagos: regional and local influences'. Deep-Sea Research II: Topical Studies in Oceanography, 51(1–3):43–57.

Palacios, D.M., Salazar, S.K., and Day, D. 2004. 'Cetacean remains and strandings in the Galápagos Islands, 1923-2003'. Latin American Journal of Aquatic Mammals, 3(2):127–150.

Palacios, D.M., Bograd, S.J., Foley, D.G. and Schwing F.B. 2006. 'Oceanographic characteristics of biological biological hot spots in the North Pacific: A remote sensing perspective'. Deep-Sea Research II: Topical Studies in Oceanography, 53(3–4):250–269.

Palacios, D.M. and Forney, K.A. 2008. 'Cetacean abundance on the western side of the Galápagos Islands during April 2000'. Paper SC/60/SM7 presented to the IWC Scientific Committee Annual Meeting, June 2008, Santiago, Chile. 12 pp.

Palacios, D.M., Bograd, S.J., Foley, D.G. and Schwing, F.B. 2006. 'Oceanographic characteristics of biological hot spots in the North Pacific: A remote sensing perspective'. Deep-Sea Research II: Topical Studies in Oceanography, 53(3-4):250–269.

Palacios, D. M. & Cantor, M. (2023). Priorities for ecological research on cetaceans in the Galápagos Islands. Frontiers in Marine Science, 10, https://doi.org/10.3389/fmars.2023.1084057.

Quintana-Rizzo, E., Garcia, L., López, R.J., Tobar-Hurtado, S. and López-Roulet, A. 2017. 'First record of a Galapagos fur seal (*Arctocephalus galapagoensis*) in Guatemala'. Marine Biodiversity Records, 10(1):1–8.

Salazar, S. 2002. 'Lobo marino y lobo peletero'. In: E. Danulat, and G.J. Edgar (eds.), Reserva Marina de Galápagos, Línea Base de la Biodiversidad, pp. 267–290. Santa Cruz (Galápagos, Ecuador): Fundación Charles Darwin/Servicio Parque Nacional Galápagos.

Schaeffer, B.A., Morrison, J.M., Kamykowski, D., Feldman, G.C., Xie, L., Liu, Y., Sweet, W., McCulloch, A. and Banks, S. 2008. 'Phytoplankton biomass distribution and identification of productive habitats within the Galapagos Marine Reserve by MODIS, a surface acquisition system, and in-situ measurements'. Remote Sensing of Environment, 112(6):3044–3054.

Smith, S.D. and Whitehead, H. 1999. 'Distribution of dolphins in Galápagos waters'. Marine Mammal Science, 15(2):550–555.

Sweet, W.V., Morrison, J.M., Kamykowski, D., Schaeffer, B.M., Banks, S. and McCulloch, A. 2007. 'Water mass seasonal variability in the Galapagos Archipelago'. Deep-Sea Research I, 54:2023–2035.

Trillmich, F. 2015a. '*Arctocephalus galapagoensis*'. The IUCN Red List of Threatened Species 2015: e.T2057A45223722. https://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T2057A45223722.en. Accessed on 13 September 2022.

Trillmich, F. 2015b. '*Zalophus wollebaeki*'. The IUCN Red List of Threatened Species 2015: e.T41668A45230540. https://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T41668A45230540.en. Accessed on 13 September 2022.

Taylor, B.L., Baird, R., Barlow, J., Dawson, S.M., Ford, J., Mead, J.G., Notarbartolo di Sciara, G., Wade, P. and Pitman, R.L. 2019. '*Physeter macrocephalus* (amended version of 2008 assessment)'. The IUCN Red List of Threatened Species 2019: e.T41755A160983555. https://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T41755A160983555.en. Accessed on 13 September 2022.

Torres-Florez, J.P., Olson, P.A., Bedriñana-Romano, L., Rosenbaum, H., Ruiz, J., LeDuc, R. and Hucke-Gaete, R. 2015. 'First documented migratory destination for eastern South Pacific blue whales'. Marine Mammal Science, 31(4):1580–1586.

Wade, P.R. and Gerrodette, T. 1993. 'Estimates of cetacean abundance and distribution in the eastern tropical Pacific'. Reports of the International Whaling Commission, 43:477–493.

Wellington, G.M., Strong, A.E. and Merlen, G. 2001. 'Sea surface temperature variation in the Galápagos Archipelago: a comparison between AVHRR night-time satellite data and in-situ instrumentation (1982–1988)'. Bulletin of Marine Research, 69:27–42.

Whitehead, H., Christal, J. and Dufault, S. 1997. 'Past and distant whaling and the rapid decline of sperm whales off the Galapagos Islands'. Conservation Biology, 11(6):1387–1396.

Acknowledgements

We would like to thank the participants of the 2022 hybrid IMMA Regional Expert Workshop for the identification of IMMAs in the South East Tropical and Temperate Pacific Ocean. Funding for the identification of this IMMA was provided by the Global Ocean Biodiversity Initiative funded by the German government's International Climate Initiative (IKI). Support was also provided by Whale and Dolphin Conservation, the Promar Foundation, and the Tethys Research Institute.

Suggested Citation: IUCN-MMPATF (2023) Galápagos Archipelago IMMA Factsheet. IUCN Joint SSC/WCPA Marine Mammal Protected Areas Task Force, 2023.

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