

## HIGHLY MIGRATORY SPECIES MANAGEMENT TEAM REPORT ON ESSENTIAL FISH HABITAT REVIEW

The Highly Migratory Species Management Team (HMSMT) revisited guidance on the HMS Essential Fish Habitat (EFH) review from the March 2020 Council meeting, including the action plan ([Agenda Item I.2, Attachment 1](#)) and the Habitat Committee statement ([Agenda Item I.2.a, Supplemental HC Report 1](#)). The HMSMT additionally found it helpful to review the November 2010 Coastal Pelagic Species Management Team's report on the coastal pelagic species EFH review conducted in 2010 ([Agenda Item I.4.a, Attachment 1](#), November 2010).

The HMSMT heard an update at their July 27, 2020 webinar on the literature review that is being conducted by Southwest Fishery Science Center Fisheries Resources Division (SWFSC FRD) Life History Program staff as the initial step in completing Phase I of the review (see appended References). A substantial body of new research has been produced and published since EFH was initially described for HMS in 2003, which focuses on diet, movement, and habitat utilization of HMS. The studies documented in the SWFSC literature review indicate that an update to the existing EFH description may be warranted.

Changes in HMS fisheries since the adoption of the original EFH provisions in the HMS Fishery Management Plan (FMP), both in management and fishery behaviors, may warrant additional updates to the existing EFH description. Such changes include the removal of pelagic thresher shark and bigeye thresher shark from the list of management unit species, a substantial decline in the number of participating large mesh drift gillnet (DGN) fishing vessels and related fishing effort, and Council authorization of deep-set buoy gear as a method for targeting swordfish.

The HMSMT further notes that the maps in the existing EFH description are out of date and should be updated to better convey the required habitat information.

The HMSMT worked with SWFSC FRD staff to implement the Habitat Committee's suggestion to create a table highlighting potential changes necessary to update the HMS FMP. The HMSMT intends to submit a final version of the table as part of a supplemental September 2020 Council briefing book report, along with more detailed recommendations regarding potential updates needed in the EFH sections of the HMS FMP.

If the Council decides to move on to Phase II, the HMSMT could provide a scope and schedule for making revisions, and a markup version of the HMS FMP EFH indicating proposed revisions in advance of a future Council meeting.

PFMC  
08/13/20

## References

Aalbers, S.A., Bernal, D. and Sepulveda, C.A., 2010. The functional role of the caudal fin in the feeding ecology of the common thresher shark *Alopias vulpinus*. *Journal of Fish Biology*, 76(7), pp.1863-1868.

Abecassis, M., Dewar, H., Hawn, D. and Polovina, J., 2012. Modeling swordfish daytime vertical habitat in the North Pacific Ocean from pop-up archival tags. *Marine Ecology Progress Series*, 452, pp.219-236.

Aires-da-Silva, A., Valero, J.L., Maunder, M.N., Minte-Vera, C., Lennert-Cody, C., Román, M.H., Martínez-Ortiz, M., Torrejón-Magallanes, E.J. and Carranza, M.N., 2017. Exploratory stock assessment of dorado (*Coryphaena hippurus*) in the southeastern Pacific Ocean. In 7th Meeting of the Scientific Advisory Committee of the IATTC, 9-13 May 2016, La Jolla, California. Document SAC-07-06a (i).

Armas, R.G., Sosa-Nishizaki, O., Rodríguez, R.F. and Pérez, V.A.L., 1999. Confirmation of the spawning area of the striped marlin, *Tetrapturus audax*, in the so-called core area of the eastern tropical Pacific off Mexico. *Fisheries Oceanography*, 8(3), pp.238-242.

Au, D.W., Smith, S.E. and Show, C., 2008. Shark productivity and reproductive protection, and a comparison with teleosts. In (M.D. Camhi, E.K. Pikitch and E.A. Babcock, eds) *Sharks of the open ocean: biology, fisheries and conservation*, pp.298-308.

Boustany, A.M., Matteson, R., Castleton, M., Farwell, C. and Block, B.A., 2010. Movements of Pacific bluefin tuna (*Thunnus orientalis*) in the Eastern North Pacific revealed with archival tags. *Progress in Oceanography*, 86(1-2), pp.94-104.

Cartamil, D.P., 2009. Movement patterns, habitat preferences, and fisheries biology of the common thresher shark (*Alopias vulpinus*) in the Southern California Bight. Doctoral Dissertation, UCSD: California Sea Grant College Program.

Available from: <http://www.escholarship.org/uc/item/3908d6cv>.

Cartamil, D., Wegner, N.C., Aalbers, S., Sepulveda, C.A., Baquero, A. and Graham, J.B., 2010. Diel movement patterns and habitat preferences of the common thresher shark (*Alopias vulpinus*) in the Southern California Bight. *Marine and Freshwater Research*, 61(5), pp.596-604.

Cartamil, D.P., Sepulveda, C.A., Wegner, N.C., Aalbers, S.A., Baquero, A. and Graham, J.B., 2011. Archival tagging of subadult and adult common thresher sharks (*Alopias vulpinus*) off the coast of southern California. *Marine Biology*, 158(4), pp.935-944.

Cartamil, D., Wraith, J., Wegner, N.C., Kacev, D., Lam, C.H., Santana-Morales, O., Sosa-Nishizaki, O., Escobedo-Olvera, M., Kohin, S., Graham, J.B. and Hastings, P., 2016. Movements and distribution of juvenile common thresher sharks *Alopias vulpinus* in Pacific coast waters of the USA and Mexico. *Marine Ecology Progress Series*, 548, pp.153-163.

- Childers, J., Snyder, S. and Kohin, S., 2011. Migration and behavior of juvenile North Pacific albacore (*Thunnus alalunga*). *Fisheries Oceanography*, 20(3), pp.157-173.
- Dewar, H., Prince, E.D., Musyl, M.K., Brill, R.W., Sepulveda, C., Luo, J., Foley, D., Orbesen, E.S., Domeier, M.L., Nasby-Lucas, N. and Snodgrass, D., 2011. Movements and behaviors of swordfish in the Atlantic and Pacific Oceans examined using pop-up satellite archival tags. *Fisheries Oceanography*, 20(3), pp.219-241.
- Domeier, M.L., Kiefer, D., Nasby-Lucas, N., Wagschal, A. and O'Brien, F., 2005. Tracking Pacific bluefin tuna (*Thunnus thynnus orientalis*) in the northeastern Pacific with an automated algorithm that estimates latitude by matching sea-surface-temperature data from satellites with temperature data from tags on fish. *Fishery Bulletin*, 103(2), pp.292-306.
- Domeier, M.L., 2006. An analysis of Pacific striped marlin (*Tetrapturus audax*) horizontal movement patterns using pop-up satellite archival tags. *Bulletin of Marine Science*, 79(3), pp.811-825.
- Domeier, M.L., Ortega-Garcia, S., Nasby-Lucas, N. and Offield, P., 2019. First marlin archival tagging study suggests new direction for research. *Marine and Freshwater Research*, 70(4), pp.603-608.
- Goldman, K.J., 2005. Thresher Shark *Alopias vulpinus* (Bonnaterre, 1788). Sharks, rays and chimaeras: the status of the chondrichthyan fishes. IUCN (The World Conservation Union), IUCN/SSC Shark Specialist Group, Gland, Switzerland, pp.250-252.
- Griffiths, S., Sepulveda, C. and Aalbers, S., 2020. Movements of swordfish (*Xiphias gladius*) in the northeastern Pacific Ocean as determined by electronic tags (2002-2019). ISC Billfish Working Group. ISC/20/BILLWG-01/10
- Holts, D.B., Wilson, C. and Lowe, C.G., 2001. Blue shark. California's Living Marine Resources: A Status Report. University of California Agriculture and Natural Resources, Davis, pp.342-344.
- Holts, D., 2001a. Striped marlin. California's Living Marine Resources: A Status Report, Calif. Dept. Fish Game, pp.334-335.
- Holts, D., 2001b. Swordfish. California's Living Marine Resources: A Status Report. Sacramento, CA: California Department of Fish and Game. p, pp.322-324.
- ISC Billfish Working Group, 2014. North Pacific swordfish (*Xiphias gladius*) stock assessment in 2014. International Scientific Committee for tuna and tuna-like species in the North Pacific Ocean 16-22 July 2014. Taipei, Chinese-Taipei.
- ISC Billfish Working Group, 2018. Stock assessment for swordfish (*Xiphias gladius*) in the Western and Central North Pacific Ocean through 2016. International Scientific Committee for tuna and tuna-like species in the North Pacific Ocean 11-16 July 2018. Yeosu, Republic of Korea.

Fujinami, Y., Semba, Y., Okamoto, H., Ohshimo, S., Tanaka, S., 2017. Reproductive biology of the blue shark (*Prionace glauca*) in the western North Pacific Ocean. Mar. Freshw. Res. doi:10.1071/MF16101

Lu, C-P. 2014. Bayesian analyses of genetic variation and population differentiation in Pacific swordfish (*Xiphias gladius* L.) and the development of high resolution melting assays for species identification and potential sex-linked marker survey in istiophorid billfish [Unpublished dissertation]. Texas A&M University.

Lyons, K., Preti, A., Madigan, D.J., Wells, R.J.D., Blasius, M.E., Snodgrass, O.E., Kacev, D., Harris, J.D., Dewar, H., Kohin, S. and MacKenzie, K., 2015. Insights into the life history and ecology of a large shortfin mako shark *Isurus oxyrinchus* captured in southern California. Journal of Fish Biology, 87(1), pp.200-211.

Madigan, D.J., Carlisle, A.B., Gardner, L.D., Jayasundara, N., Micheli, F., Schaefer, K.M., Fuller, D.W. and Block, B.A., 2015. Assessing niche width of endothermic fish from genes to ecosystem. Proceedings of the National Academy of Sciences, 112(27), pp.8350-8355.

Markaida, U. and F. Hochberg. 2005. Cephalopods in the Diet of Swordfish (*Xiphias gladius*) Caught off the West Coast of Baja California, Mexico. Pacific Science, 59(1): 25-41.

Moteki, M., Arai, M., Tsuchiya, K. and Okamoto, H., 2001. Composition of piscine prey in the diet of large pelagic fish in the eastern tropical Pacific Ocean. Fisheries Science, 67(6), pp.1063-1074.

Muhling, B., Brodie, S., Snodgrass, O., Tommasi, D., Dewar, H., Childers, J., Jacox, M., Edwards, C.A., Xu, Y. And Snyder, S., 2019. Dynamic Habitat Use of Albacore and Their Primary Prey Species in the California Current System. California Cooperative Oceanic Fisheries Investigations Reports, 60, Pp.79-93.

Nakano, H. and Seki, M.P., 2003. Synopsis of biological data on the blue shark, *Prionace glauca* Linnaeus. Bulletin-Fisheries Research Agency Japan, 2003, pp.18-55.

Nakano, H. and Stevens, J.D., 2008. The biology and ecology of the blue shark, *Prionace glauca*. In (M.D. Camhi, E.K. Pikitch and E.A. Babcock, eds) Sharks of the open ocean: Biology, fisheries and conservation (Vol. 1, pp. 140-151). Blackwell Scientific Publications: Oxford.

Nasby-Lucas, N., Dewar, H., Sosa-Nishizaki, O., Wilson, C., Hyde, J.R., Vetter, R.D., Wraith, J., Block, B.A., Kinney, M.J., Sippel, T. and Holts, D.B., 2019. Movements of electronically tagged shortfin mako sharks (*Isurus oxyrinchus*) in the eastern North Pacific Ocean. Animal Biotelemetry, 7(1), p.12.

Nosal, A.P., Cartamil, D.P., Wegner, N.C., Lam, C.H. and Hastings, P.A., 2019. Movement ecology of young-of-the-year blue sharks *Prionace glauca* and shortfin makos *Isurus oxyrinchus* within a putative binational nursery area. Marine Ecology Progress Series, 623, pp.99-115.

- Olson, R.J. and Galván-Magaña, F., 2002. Food habits and consumption rates of common dolphinfish (*Coryphaena hippurus*) in the eastern Pacific Ocean. *Fishery Bulletin*, 100(2), pp.279-298.
- Preti, A., Smith, S.E. and Ramon, D.A., 2001. Feeding habits of the common thresher shark (*Alopias vulpinus*) sampled from the California-based drift gill net fishery, 1998-1999. California Cooperative Oceanic Fisheries Investigations Report, pp.145-152.
- Preti, A., Smith, S.E. and Ramon, D.A., 2004. Diet differences in the thresher shark (*Alopias vulpinus*) during transition from a warm-water regime to a cool-water regime off California-Oregon, 1998-2000. California Cooperative Oceanic Fisheries Investigations Report, 45, p.118.
- Preti, A., Soykan, C.U., Dewar, H., Wells, R.D., Spear, N. and Kohin, S., 2012. Comparative feeding ecology of shortfin mako, blue and thresher sharks in the California Current. *Environmental Biology of Fishes*, 95(1), pp.127-146.
- Preti, A., 2020. Trophic ecology of nine top predators in the California Current. PhD dissertation, University of Aberdeen, Scotland, UK.
- Quesnell, V.A. 2018. Nursery origin and connectivity of swordfish (*Xiphias gladius*) in the North Pacific Ocean [Unpublished thesis]. Texas A&M.
- Reeb, C.A., Arcangeli, L. and Block, B.A., 2000. Structure and migration corridors in Pacific populations of the Swordfish *Xiphias gladius*, as inferred through analyses of mitochondrial DNA. *Marine Biology*, 136(6), pp.1123-1131.
- Runcie, R.M., Muhling, B., Hazen, E.L., Bograd, S.J., Garfield, T. and DiNardo, G., 2019. Environmental associations of Pacific bluefin tuna (*Thunnus orientalis*) catch in the California Current system. *Fisheries Oceanography*, 28(4), pp.372-388.
- Sepulveda, C.A., Knight, A., Nasby-Lucas, N. and Domeier, M.L., 2010. Fine-scale movements of the swordfish *Xiphias gladius* in the Southern California Bight. *Fisheries Oceanography*, 19(4), pp.279-289.
- Sepulveda, C.A., Heberer, S.A., Aalbers, N., Spear, M., Kinney, D., Bernal and S. Kohin (2014). Post-release survivorship studies on common thresher sharks (*Alopias vulpinus*) captured in the southern California recreational fishery. *Fisheries Research*. 161:102–108.
- Sepulveda, C.A. and Aalbers, S.A., 2018. Exempted Testing of Deep-set Buoy Gear and Concurrent Research Trials on Swordfish, *Xiphias gladius*, in the Southern California Bight. *Marine Fisheries Review*, 80(2), pp.17-29.
- Sepulveda, C.A., Aalbers, S.A., Heberer, C., Kohin, S. and Dewar, H., 2018. Movements and behaviors of swordfish *Xiphias gladius* in the United States Pacific Leatherback Conservation Area. *Fisheries Oceanography*, 27(4), pp.381-394.

Sepulveda, C.A., Wang, M., Aalbers, S.A. and Alvarado-Bremer, J.R., 2020. Insights into the horizontal movements, migration patterns, and stock affiliation of California swordfish. *Fisheries Oceanography*, 29(2), pp.152-168.

Smith, S.E., Rasmussen, R.C., Ramon, D.A. and Cailliet, G.M., 2008a. The biology and ecology of thresher sharks (*Alopiidae*). In (M.D. Camhi, E.K. Pikitch and E.A. Babcock, eds) *Sharks of the open ocean: biology, fisheries and conservation*, pp.60-68.

Smith, S.E., Au, D.W. and Show, C., 2008b. Intrinsic rates of increase in pelagic elasmobranchs. In (M.D. Camhi, E.K. Pikitch and E.A. Babcock, eds) *Sharks of the open ocean: biology, fisheries and conservation*, pp.288-297.

Taylor, V.B. and Bedford, D.W., 2001. Shortfin mako shark. *California's Living Marine Resources: A Status Report*, pp.336-337.

Trejo, T., 2005. Global phylogeography of thresher sharks (*Alopias* spp.) inferred from mitochondrial DNA control region sequences: a thesis.

Tripp-Valdez, A., Galvan-Magaña, F. and Ortega-Garcia, S., 2015. Food sources of common dolphinfish (*Coryphaena hippurus*) based on stomach content and stable isotopes analyses. *Marine Biological Association of the United Kingdom. Journal of the Marine Biological Association of the United Kingdom*, 95(3), p.579.

Torres-Rojas, Y.E., Hernandez-Herrera, A., Ortega-Garcia, S. and Soto-Jiménez, M.F., 2014. Feeding habits variability and trophic position of dolphinfish in waters south of the Baja California Peninsula, Mexico. *Transactions of the American Fisheries Society*, 143(2), pp.528-542.

Urbisci, L.C., Stohs, S.M. and Piner, K.R., 2016. From sunrise to sunset in the California drift gillnet fishery: an examination of the effects of time and area closures on the catch and catch rates of pelagic species. *Mar. Fish. Rev.*, 78(3-4), pp.1-11.

Varela, J.L., Lucas-Pilozo, C.R. and González-Duarte, M.M., 2017. Diet of common dolphinfish (*Coryphaena hippurus*) in the Pacific coast of Ecuador. *Marine Biological Association of the United Kingdom. Journal of the Marine Biological Association of the United Kingdom*, 97(1), p.207.

Yokoi, H., Fujinami, Y., Semba, Y., 2017. Brief summary of biological parameters for the stock assessment of blue shark (*Prionace glauca*) in the North Pacific (No.SC/17/SHARKWG-1/03). National Research Institute of Far Seas Fisheries.