

# MARIO ESPINOZA

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PhD candidate 2013 to 2015

School of Earth and Environmental Sciences  
NERP (National Environmental Research  
Program)

Endeavour Award

NSW fishery department

Australian Animal Tagging and Monitoring  
System (AATAMS)

AIMS@JCU

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**Movements, habitat use and trophic ecology  
of reef-associated sharks**

In 2005, Mario completed his BSc at the University of Costa Rica (UCR), throughout which he was involved in projects with the Centro de Investigación en Ciencias del Mar y Limnología; The Mote Marine Laboratory; and The Great Lakes Institute of Environmental Research. In 2006, he was awarded with a Fulbright Scholarship to complete a MSc at California State University, investigating how elasmobranchs used newly restored estuarine habitats. Mario returned to UCR as a researcher, looking at the distribution, diversity, reproduction and feeding ecology of elasmobranchs associated with the commercial trawling fishery of Costa Rica.

Recent studies have reported large declines of reef-associated sharks in the Caribbean and the Indo-Pacific region, adding to global concern. Marine protected areas (MPAs) have become a common tool in the management of coral reefs. The effectiveness of MPAs for the protection of sharks will depend on their mobility, with sharks displaying a higher degree of reef association benefiting more. Therefore, a better understanding of the spatial ecology and behaviour of reef-associated sharks is imperative for successful management. Additionally, detailed information of the feeding ecology of reef-associated sharks is essential in understanding connectivity and energy links within and across ecosystems and will increase understanding of the role sharks play in coral reef systems.

Mario's current research will examine the movements, site fidelity, habitat use and trophic ecology of reef-associated sharks.



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Since April 2012, Mario has tagged grey reef, silvertip, blacktip and bull sharks with acoustic transmitters. He is using an array of 56 underwater listening stations to monitor their movements and habitat use in the central Great Barrier Reef. Collaborative efforts with the AATAMS have extended the tracking range to include the entire coast of Queensland and New South Wales. Mario has found that:

- Reef resident species like grey reef sharks spend most of their time on a single reef.
- Other shark species like silvertips and bull sharks are more mobile and typically have large home ranges; however, some individuals spend up to 40% of their time in or near reefs. ,
- Female bull sharks often move between offshore reef environments and inshore coastal habitats, possibly for breeding.
- Some Bull sharks migrate between Sydney, Brisbane and Townsville, travelling up to 2200 km along the coast in winter. Although the reason for this is still unclear, temperature change may be a factor.

## Publications

- Clarke, T.M., Espinoza, M. & Wehrtmann, I.S., *In press*. Elasmobranch bycatch associated with the shrimp-trawling fishery, Pacific of Costa Rica, Central America. *Aquatic living resources*.
- Clarke, T.M., Espinoza, M. & Wehrtmann, I.S., *In press*. Reproductive ecology of elasmobranchs from a data-deficient fishery, Pacific of Costa Rica, Central America. *Fisheries Research*.
- Espinoza, M., 2013. Contrasting movements and patterns of habitat use in reef-associated sharks: implications for management and conservation. Oral presentation. In *AIMS@JCU Seminar Day*. Townsville.
- Espinoza, M. et al., 2013. Diet composition and diel feeding behaviour of the banded guitarfish *Zapteryx xyster* along the Pacific coast of Costa Rica, Central America. *Journal of fish biology*, 82(1), pp.286–305. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/23331151>.
- Espinoza, M., Heupel, M.R. & Simpfendorfer, C.A., 2013. Predicting MPA utilization for reef-associated sharks: an individual-based simulation approach. In *9th Indo-Pacific Fish Conference. Okinawa, Japan, June 24-28*. Okinawa, Japan.
- Simpfendorfer, C. et al., 2013. The role of non-resident sharks in shaping coral reef communities. In *9th Indo-Pacific Fish Conference. June 24-28*. Okinawa, Japan.
- Espinoza, M. et al., 2012. Ontogenetic dietary shifts and feeding ecology of the rasptail skate *Raja velezi* and the brown smoothhound shark *Mustelus henlei* along the Pacific coast of Costa Rica, Central America. *Journal of fish biology*, 81(5), pp.1578–95. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/23020562>.

## Publications cont.

Simpfendorfer, C. et al., 2012. The role of non-resident sharks in shaping coral reef communities. In *12th International Coral Reef Symposium*. Cairns, Australia.

Espinoza, M., Farrugia, T.J., Webber, D.M., et al., 2011. Testing a new acoustic telemetry technique to quantify long-term, fine-scale movements of aquatic animals. *Fisheries Research*, 108(2-3), pp.364–371. Available at: <http://linkinghub.elsevier.com/retrieve/pii/S0165783611000300>

Espinoza, M., Farrugia, T.J. & Lowe, C.G., 2011. Habitat use, movements and site fidelity of the gray smooth-hound shark (*Mustelus californicus* Gill 1863) in a newly restored southern California estuary. *Journal of Experimental Marine Biology and Ecology*, 401(1-2), pp.63–74. Available at: <http://dx.doi.org/10.1016/j.jembe.2011.03.001>

Farrugia, T.J., Espinoza, M. & Lowe, C.G., 2011. Abundance, habitat use and movement patterns of the shovelnose guitarfish (*Rhinobatos productus*) in a restored southern California estuary. *Marine and Freshwater Research*, 62(6), pp.648–657. Available at: <http://www.publish.csiro.au/?paper=MF10173>.

Espinoza, M. & Wehrtmann, I.S., 2008. Stomach content analysis of the deep-water fish *Lophiodes spilurus* (Lophiiformes: Lophiidae) associated to commercial shrimp trawls, Pacific Coast of Costa Rica. *Revista de Biología Tropical*, 56(4), pp.1959–1970.

Mario Espinoza Mendiola, 2008. Sondeo ecologico rapido de las comunidades de peces tropicales en un area de explotacion minera en Costa Rica (Rapid ecological assessment of tropical fish communities in a gold mine area of Costa Rica). *Revista de Biología Tropical*, 56(4), pp.1971–1990.

Mario Espinoza Mendiola, 2007. Composición y estructura de las comunidades de peces del río La Cañaza, Pacífico Sur de Costa Rica (Composition and community structure of stream fishes in La Cañaza River, Pacific of Costa Rica). *Brenesia*, 67, pp.35–43.

Espinoza, M. & Salas, E., 2005. Estructura de las comunidades de peces de arrecife en las Islas Catalinas y Playa Ocotol, Pacífico Norte de Costa Rica (Structure of reef fish community in Catalina's Island and Ocotol beach, North Pacific of Costa Rica). *Revista de Biología Tropical*, 53(3-4), pp.523–536.

Tobin AJ, Mapleston A, Harry AV, Espinoza M. 2013. Big fish in shallow water; use of an intertidal surf-zone habitat by large-bodied teleosts and elasmobranchs in tropical northern Australia. *Environmental Biology of Fishes*. DOI: 10.1007/s10641-013-0182-y

Farrugia TJ, Espinoza M, Lowe CG. 2013. The fish community of a newly restored southern California estuary: ecological perspective after three years of restoration. *Environmental Biology of Fishes*. DOI: 10.1007/s10641-013-0203-x.