The Species and Origin of **Shark** Fins in Taiwan’s **Fishing** Ports, Markets, and Customs Detention: A DNA Barcoding Analysis.

* To satisfy its growing demand, Asia imports roughly 10,000–20,000 tons of shark fins per year for the purpose of consumption
* Characterized by a life history of slow growth, late maturity, and low fecundity, the shark is extremely vulnerable to overexploitation and has low population resilience to overfishing
* Although shark finning has been banned in many countries [3, 20], illegal shark fishing seems to continue
* In total we identified 23 species (in 10 families) from the 231 port landings sample, 24 species (in six families) from the 316 shark fin products (Table 2), and 14 species (in five families) from the 113 detained shark fins provided by Kaohsiung customs
* Among all the species identified (N = 43), an endangered species (S. lewini) according to the IUCN Red List (www.iucnredlist.org) was found. The remains were 13 vulnerable species, 12 near threatened species, nine least concerned species, and eight species that were data deficient or not evaluated (Tables 2 and 3). Specimens categorized as threatened (endangered and vulnerable species) accounted for 22.1% (N = 146) of all the samples.
* Among the 43 species identified in this study, 14 are categorized as threatened species in the IUCN Red List
* This high proportion might be attributed to the shark-bycatching nature of long-line fisheries and to the lack of conservation concern among fishers.
  + Bycatch: unintentionally caught with target sharks

1. Large-Scale Absence of **Sharks** on Reefs in the Greater- Caribbean: A Footprint of Human Pressures.

**Quantifying Shark Distribution Patterns and Species-Habitat Associations: Implications of Marine Park Zoning.**

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* most sharks tend to use a wide variety of habitats along the continental shelf [8–11], potentially acting as energy links in the transfer of nutrients from one system to another [12]. Therefore, understanding species-specific habitat associations over large spatial scales can be a valuable approach to identify important areas for shark conservation, as well as elucidate complex ecological processes such as connectivity within and across ecosystems.
* Sharks represent approximately 60% of the GBR’s elasmobranch diversity and are thought to play a key role in the structure and functioning of marine communities through ‘‘top down’’ predation pressure on lower trophic levels.
* Moreover, increased frequency of disturbances and anthropogenic activities within the GBR are having a major impact on coral reefs [21,22], and ultimately on reef-associated sharks. Therefore, knowledge of shark species ranges and habitat associations along the GBR must be understood to assess the risk of exposure to fishing, habitat degradation and the effects of climate change [15,23].
* Approximately 33% of the GBRMP has been designated as no-take zones (areas closed to all forms of fishing), providing protection to a range of bioregions [24]. Marine reserve networks such as the GBRMP are thought to offer greater protection for mobile species by reducing their exposure to fisheries [25,26]
* Multivariate prediction and regression trees were used to identify shark assemblages and examine species-specific associations in relation to depth, habitat cover, geographic (relative distance along/across the shelf, reef proximity), and environmental (sea surface temperature and chlorophyll-a) drivers. The effects of zoning (e.g. areas open and closed to fishing), habitat and time since the 2004 re-zoning of the GBRMP on shark abundances were examined using Poisson and Negative Binomial regression models.
* Most sites surveyed had relatively few shark species (1–2 species) occurring together, particularly in the central GBR along coastal bays and inter-reef waters.
* The sliteye shark Loxodon macrorhinus was an indicator species for northern sites with high coral cover, whereas C. amblyrhynchos, C. albimargi natus, G. cuvier and T. obesus characterized the assemblages in southern sites with high coral cover
* The nearest distance to reef habitats and the percent of hard coral cover (combined relative influence: 23.6%) were also important in predicting shark species richness, which increased in response to proximity to reefs and coral cover.
* Sites with greater structural complexity (e.g. rocky shoals, coral reef environments, and habitats dominated by macro algae and marine plants), particularly on the outer half of the shelf (relative distance ‘‘across’’ .0.6) also had more species of sharks than coastal inshore habitats with lower complexity.
* Additionally, the probability of shark sightings decreased at intermediate latitudes (distance along the GBR: 0.5–0.7; between Townsville and Cairns) and increased with reef proximity
* A greater abundance of C. amblyrhynchos was observed in areas closed to fishing, which was influenced by both habitat and days since zoning. However, the overall effect of hard coral cover (Fig. 6c) was greater than the effect of time (Fig. 6d) and distance to reef (Fig. 6e).
* The abundance of C. albimarginatus was significantly greater on sites closed than open to fishing, particularly those that had high hard coral cover (Fig. 6f). There was no effect of days since zoning on the abundance of C. albimarginatus (Fig. 6g), however, there was a significant interaction between zoning and hard coral cover (Table 3c; Fig. 6h). The model predicted greater abundances of C. albimarginatus at sites that were farther from reefs, but only at non-fished sites (Fig. 6h).
* For G. cuvier the best fitting model included all possible predictors and their interactions (Table 3d) and the model showed an effect of hard coral cover
* Higher abundances of T. obesus were observed at non-fished sites, especially those with high hard coral cover (Fig. 6l) and that were closer to reefs (Fig. 6n). There was also an increase in the abundance of T. obesus at non-fished sites with time (Fig. 6m).
* Over 95% of shark species recorded by BRUVS were sighted at or near (,5 km) reef habitats, highlighting the importance of coral reefs for a large number of shark species throughout the GBR
* . Although coral reefs comprise only 5–6% of the habitats available in the GBR [53], our results showed a large number of sharks occurred near reef habitats.
* Recent studies have shown that while some G. cuvier are year-round reef residents [61,62], other individuals use coral reefs opportunistically or seasonally for feeding and reproduction
* . Our study demonstrated that C. albimarginatus is a numerically important reef-associated species, completely absent from inshore sites, and only observed at one site in the central and northern GBR. These results suggest that C. albimarginatus has a strong association with offshore habitats near the coral reef matrix.

The Ecological Role of Sharks on Coral Reefs

* . Habitats such as shallow sand flats [79], mangrove habitats [80], lagoons [80], and tidal pools [81] function to reduce predation risk and provide resources for juveniles before they undertake ontogenetic shifts towards deeper reef slope environments [56]
* Smaller sharks, such as whitetip reef sharks, are most often encountered around coral heads and ledges with high vertical relief, resting in caves, or under coral ledges during the day [82] to avoid predation from larger sharks and groupers [83].

Oceanic Sharks Clean at Coastal Seamount

* Finally, the mutualistic removal of ectoparasites by ‘cleaner fish’ (e.g., cleaner wrasse, Labroides dimidiatus) on coral reefs might play an important role in controlling shark parasite loads, reducing the incidence of skin disease and compromised respiratory efficiency associated with parasite loading [86,87].

Sharks infected with ectoparasites suffer a variety of health consequences, which may include anaemia [[13]](http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0014755#pone.0014755-Paperna1), the retarded development of reproductive organs [[14]](http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0014755#pone.0014755-Yano1), reduced respiratory efficiency [[15]](http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0014755#pone.0014755-Benz1), [[16]](http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0014755#pone.0014755-Heupel1), and chronic and debilitating skin disease. Severe infections in captive sharks have been known to catalyse behavioral modifications such as flashing and rubbing against the sides and substratum of aquaria, and interacting with cleaner fish [[17]](http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0014755#pone.0014755-Reed1).

Cleaning mutualisms within coral reef communities are well documented [[18]](http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0014755#pone.0014755-Ct1), [[19]](http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0014755#pone.0014755-Bshary1). Small fish or shrimps termed ‘cleaners’ forage on ectoparasites, tissue and mucus from larger ‘client’ reef fish. The blue streaked cleaner wrasse (Labroides dimidiatus) is among the most studied of the 130 described marine cleaner species [[19]](http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0014755#pone.0014755-Bshary1). They occupy small territories known as ‘cleaning stations’ that reef fish clients visit for ‘cleaning services’. Clients may ‘pose’ by head or tail standing to solicit a cleaner to inspect them, or the inspection may take place without a solicitation [[20]](http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0014755#pone.0014755-Ct2). Parasite infestation may be the most likely cue for clients seeking cleaners [[21]](http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0014755#pone.0014755-Grutter2), [[22]](http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0014755#pone.0014755-Sikkel1). Cleaners appear to control the parasite loads of their clients [[12]](http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0014755#pone.0014755-Grutter1), but there is less evidence to show that their services have a positive effect on client health or reproductive success [[23]](http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0014755#pone.0014755-Cheney1).

Towards protecting the Great Barrier Reef from

land-based pollution

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Towards protecting the GREAT BARRIER REEF from land based pollution

* For example, coral cover declined by 50% for the whole GBR, and by 70% along the developed central and southern GBR over the last 27 years
* Excess river sediment, nutrient and pesticide loads to the GBR lagoon are derived from (i) surface and subsurface erosion, pre-dominantly in rangeland cattle grazing settings; (ii) fertilizer applications in sugarcane and broad-acre cropping; and (iii) pesticides (particularly photosys- tem II inhibiting herbicides) primarily applied during sugarcane cultivation (Kroon et al., 2013). Signatures of increased river loads are observed in GBR coral cores for sediment since the 1900s (Mcculloch et al., 2003; Lewis et al., 2007) and for nutrients since the mid-20th century (Jupiter et al., 2008; Mallela et al., 2013) and are associated with increased soil erosion and fertilizer application.
* higher nitrogen availability that increases phytoplankton biomass and promotes outbreaks of the destructive coral-eating crown-of-thorns seastar, and proliferation of macro-algae on inshore reefs that compete with corals for space, and (ii) ﬁne sediments and associated particulate nutrient inputs, leading to reduced light availability for photosynthesis of inshore seagrasses and coral reefs. The statement recommended that ongoing effort is required to improve water quality in river run-off from the GBR catchments to enhance the resilience of GBR ecosystems to other disturbances, such as increasing sea temperatures, ocean acidiﬁcation and extreme weather events

read this later Land use impacts on GBR water quality and ecosystem condition

**Worst case scenario: potential long-term effects of invasive predatory lionfish (Pterois volitans) on Atlantic and Caribbean coral-reef communities**

Mark A. Albins & Mark A. Hixon

Lionfish possess a broad suite of traits that makes them particularly successful invaders and strong negative interactors with native fauna, including defensive venomous spines, cryptic form, color and behavior, habitat generality, high competitive ability, low parasite load, efficient predation, rapid growth, and high reproductive rates.

estimated annual fecundity of over two-million eggs per female

Growing rapidly (Albins unpublished) and measuring up to nearly 50 cm in total length (L. Akins, pers. comm.), invasive lionfish are both unique and effective predators of small fishes and crustaceans.

. Divers in the Bahamas have observed a single lionfish consume over 20 juvenile reef fish in just 30 min

Additionally, invasive lionfish appear to be effective competitors and resistant to parasitism.

A subsequent field experiment in the same location and season showed that, after 2 months, native coney grouper alone had reduced the abundance of small fish on the reefs by an average of 35%, whereas invasive lionfish alone had reduced prey fish by 90% (Albins unpublished).

Such rates of reduction in fish abundances cannot be sustained

Clearly, lionfish pose a potential threat to native reef fishes as both a predator and a competitor

In any case, the possibility that lionfish could substantially divert the biomass of small fishes otherwise destined to grow and feed higher trophic levels, including humans, is certainly conceivable.

the decline of other midsized predators via predation by or competition with lionfish, could destabilize populations of still other reef fishes.

Fish feeding and cleaning away disease

As a predator ages, theoretical models predict that it will feed on larger and potentially more dangerous prey since natural selection favors this behaviour as the reproductive value of an individual decreases with age