



Sea Swallowers and Land Devourers: Can Shark Lore Facilitate Conservation?

Frédéric Torrente^{1,2} · Tamatoa Bambridge^{1,3} · Serge Planes^{1,3} · Jean Guiart⁴ · Eric G. Clua^{1,3} 

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Abstract

Polynesians' detailed observations of shark behaviour encompass the notion of a divinity, the fleeting image of a sky god, as well as potential source of food and valued tools. Due to prevailing cosmogony, sharks benefited from being a taboo species, historically limiting their exploitation. We examine how the reputedly fierce warriors of 'Anaa (an atoll in Tuamotu archipelago, French Polynesia) came to be symbolically identified with a marine predator, being called "Parata," the vernacular name of the oceanic whitetip shark *Carcharhinus longimanus*. Both sharks and indigenous cultures are currently under threat in the East Pacific and we propose that an understanding of these sacred relationships could be used to help protect them.

Keywords Pacific Ocean cultures · Tuamotu archipelago · Polynesian religion · Oceanic whitetip shark (*Carcharhinus longimanus*) · Zoomorphism · Traditional ecological knowledge (TEK)

Introduction

Polynesian island traditions, as in a number of other societies (Ingold 1989; Hviding 2003; Descola 2005, 2011;), integrate nature and culture, linking the spiritual world to the human universe in which people are simply one element of the whole (Rigo 2010; Torrente 2012; Saura 2013). In Polynesia, visible and invisible worlds are linked quasi-genealogically (Stimson 1937). All marine elements are said to be descendants of Tangaroa, a god common to Polynesia and Micronesia (Williamson 1937), which allowed for the first life on atolls (Stimson 1933; Torrente 2012). The larger marine species are believed to be the physical manifestation of gods, the guardian spirits and messengers from the invisible world. In this context sharks are particularly important (Firth 1967; Torrente 2012).

Sharks occupied the Western Central Pacific long before the arrival and dispersal of the Lapita people (1600–550 B. C.). Their prey ranges from plankton, crustaceans, and benthic invertebrates to pelagic cephalopods, small to large bony fishes, other sharks and rays, marine mammals, and other marine and terrestrial vertebrates (Compagno 1984). The Eastern-Central Pacific has a moderately diverse shark fauna of about 57 species, including the coastal species found inshore on reefs, off beaches, and in shallow enclosed bays, as well as pelagic species (Compagno 1984, 2001). The discovery of shark teeth in archaeological sites dated from the Holocene (Allen and White 1989) suggests that the relationship between these marine predators and humans was not always defined by taboo.

In spite of the critical role of sharks in Pacific societies, few researchers have examined the historical interaction between them and humans. Sharks are mentioned in Micronesia (Luomala 1985; Johannes 1981), Melanesia (Codrington 1891; Leenhardt 1930, 1947; Hviding 2003; D'Arcy 2006; Clua and Guiart 2015; Guiart (1956, 2016), Tonga (Bataille-Benguigui 1996, 2003), and Tikopia (Firth 1967, 1970, 1981), where the population of mixed Melanesian, Micronesian and Polynesian cultural influences highly regarded them (Dunis 2009, 2016). Sharks in French Polynesia are mentioned by western sailors (Beechey 1831; Tyerman and Bennet 1831; Lucett 1851; Christian 1895; Porter 1814), missionaries (Orsmond in Henry 1928; Ellis 1972; Crook 2007), and scholars (Williamson and Firth 1924; Gudger 1927; Handy 1930; Emory 1975; Conte 1987;

✉ Frédéric Torrente
torrentefrederic@gmail.com

¹ Centre de Recherches Insulaires et Observatoire de l'Environnement (CRIOBE), USR3278 EPHE-CNRS-UPVD, BP 1003, 98729 Papetoai, Moorea, French Polynesia

² Maison des Sciences de l'Homme du Pacifique, USR2003 CNRS-Université de la Polynésie française, Faaa, French Polynesia

³ Labex CORAIL, Laboratoire d'Excellence, CRIOBE Moorea and Perpignan, Moorea, French Polynesia

⁴ Department of Ethnology, National Museum of Natural History, Paris, France

Kirch 2000; Torrente 2012). In our study area, the ‘Anaa atoll in the Tuamotuan archipelago, warriors were called “Parata,” the vernacular name of the oceanic whitetip shark (*Carcharhinus longimanus*), presumably linked to the ferocity of this species (Stimson and Marshall 1964; Emory and Ottino 1967; Nolet 2006).

Based on the results of a early ethnological study of pre-contact ‘Anaa society (Torrente 2010, 2012) we i) analyse the critical role that sharks played in ancient Polynesia, ii) explain why these fierce and feared warriors were specifically labelled with the vernacular name of the oceanic whitetip shark, and iii) suggest the value of this sacred human-elasmobranchii relationship in protecting both sharks and indigenous Pacific cultures.

Study Site

The Tuamotu archipelago comprises 76 low islands (of which 42 are inhabited) of the 84 in French Polynesia. The island of ‘Anaa (or Ganā in Tuamotuan) is located in western Tuamotu, about 72 km from two neighbouring atolls (Faaite and Tahanea) and roughly 400 km from Tahiti and the other atolls at the far extreme of the Tuamotuan archipelago (Fig. 1a). ‘Anaa is 30 km long and 6 km wide, slightly elevated (+6 m) with a terrestrial area of 37 km². ‘Anaa’s shallow lagoon (89 km²), lacks a pass, but is linked to the sea by several deep channels (*hoa*) that allow for permanent exchanges between the lagoon and the open ocean, as well as for the passage of large fishes such as sharks (Fig. 1b). Some of these *hoa* are composed of several parallel channels forming a complex structure that can span several kilometres in width and length (Fig. 1c).

In the pre-Christian era ‘Anaa atoll was the most populated of the Tuamotu archipelago, with about 5000 people divided among three different chiefly systems and its warriors dominated the archipelago. Many of its inhabitants were slaves captured in the course of warlike operations (Emory and Ottino 1967; Nolet 2006; Torrente 2012). In addition to their formidable warriors, the ‘Anaa people were famous as *vaka* (canoe) constructors and sailors (Emory and Ottino 1967). Even in the face of difficult seafaring conditions the ‘Anaa warriors dominated an area spanning a radius of more than 400 km, including the island of Tahiti (Fig. 1a).

The *parata* Shark

Linguistically, the name “*parata*,” derived from its proto-Polynesian form “Central Eastern Polynesian” (Pollex online database), refers to the oceanic whitetip shark, (*Carcharhinus longimanus*), as well as the tiger shark *Galeocerdo cuvier* in certain Polynesian islands. It is likely that *parata* (*pe’ata* in the Marquesas islands) refers to several different species of man-

eating sharks.¹ But in the Tuamotu, Stimson and Marshall (1964) describe the *parata* as a specific “variety of large and ferocious man-eating shark; it is black in colour” (Fig. 2a, Lesson 1831). In fact, the shark *Carcharhinus longimanus* is a uniform grey with extended white tips on the rounded pectoral and dorsal fins that allow for ready identification (Fig. 2b).

This species plays an important role in Maori mythology, where the *parata* is classified in the *tanihwa* group of water monsters, a designation also typically reserved for the more powerful chiefs or individuals with supernatural powers (Tregear 1891). In addition, the *parata* is a shark-god living deep in the ocean, son of Tangaroa, a gigantic creature who controls the tides with his breathing (Tregear 1891; Orbell 1996). The Maori call breakers Te-waha-o-te-parata, “the mouth of the parata,” which also means “any dangerous enterprise at sea bringing about destruction” (Orbell 1996). And the giant vortex that nearly destroyed the high seas canoe Te Arawa is referred to as Te-korokoro-o-te-parata, the “whirl of the parata shark” (Tregear 1891).

In some regions of Polynesia, the *parata* shark was a taboo species - none of the so-called man-eating sharks (*mago kai tagata*) were consumed (Firth 1967). However, by the end of the eighteenth century, the oceanic whitetip shark, which was quite abundant along the steep coasts of the Marquesas islands, came to be intensively fished in the open ocean, with goats as bait and lassoed from large 8-person sailing canoes (Bouge 1928). This practice probably coincides with the termination of the pre-Christian taboo by the Christian chief Vaekehu.

Methods and Preliminary Analysis

The study site was chosen based on the quantity and accuracy of the documentation available. The extended ethnographical corpus compiled between 1924 and 1934 by two researchers from the Bernice Pauahi Bishop Museum, F. Stimson and K. Emory, based on the observations of Paea-a-avehe and Teave-a-Karaga, two elders knowledgeable in the traditional lore (*vanaga*) of the ‘Anaa atoll, was translated with the assistance of three people familiar with the local dialect Pūtahi (or Parata) that was historically spoken on ‘Anaa (Torrente 2010).² This material, which includes myths and chants as well as information on the every day life of the atoll in pre-Christian times, has since been linked through more than 3800 place names with current oral traditions and traditional ecological knowledge (TEK) of the inhabitants of the atoll and archaeological sites, in field work conducted between 2005 and 2008. We also discovered previously unknown

¹ In the Hawaiian islands the term “*niuhi*” was used for the great white shark (*Carcharodon carcharias*) and the tiger shark (Randall 2010), both man-eaters.

² Data were retrieved from microfilms available at the library of the University of French Polynesia, at the Peabody Museum of Salem, and at the Bishop Museum in Hawaii.

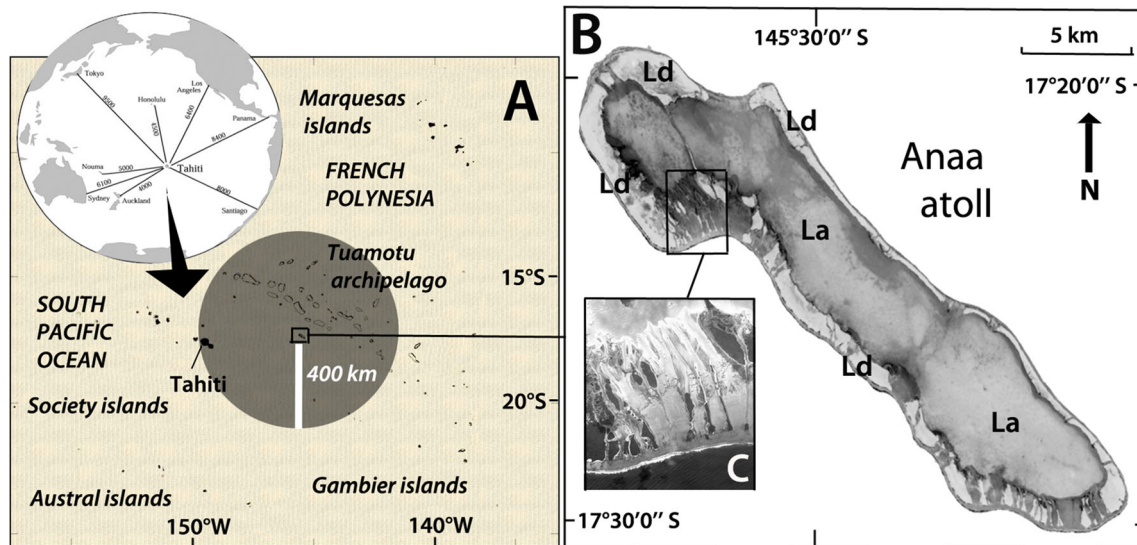


Fig. 1 Location of 'Anaa atoll in the western Tuamotu, French Polynesia. (A): The Tuamotuan group is a central archipelago among the French Polynesia Economic Exclusive Zone. From the 'Anaa atoll (southwest of the archipelago), the warriors were able to reach by sea any island in a perimeter of 400 km. (B): The 'Anaa atoll has an elongated design (from

North-West to South-East), without any real reef passage but several hoā (shallow water channels allowing water exchange between the lagoon (La) and the open ocean) cutting the land area (Ld). (C): A specific part of the barrier reef, including several hoā, was called Te-vaha-o-te-mago (the shark's mouth)

archaeological remains and compiled a detailed atlas of the ancient settlement of the atoll (Torrente 2010, 2012).

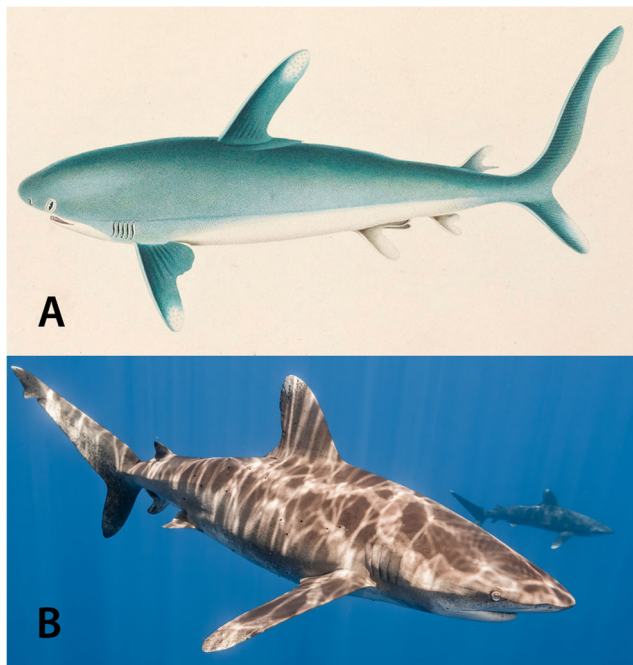


Fig. 2 (A): a painting of the Oceanic Whitetip as it was named *Squalus maou*, Lesson, 1831 (Atlas Duperrey. Voyage de la Coquille). Although it may globally appear blackish as stated by Stimson and Marshall (1964), the constant external characteristic for its identification remain the large white (usually speckled) tips that lay at the end of the two pectoral and dorsal fins. (B): Underwater photography of the Oceanic Whitetip currently named *Carcharhinus longimanus* (Poey, 1861). It was historically described in Polynesia by the naturalist R.P. Lesson (1831) as *Squalus maou*. The extended white speckled tips are characterizing the large pectoral and dorsal fins

In this study, we identified all areas where sharks are historically linked to the 'Anaa way of life. Firstly, we compiled all of the material uses for sharks and shark products: weapons, clothes, tools, drums, etc. Secondly, we describe the role of sharks in local beliefs, including religion, cosmology, main mythological themes, and space characterization. Thirdly, we examine the role played by the sharks in Tuamotuan warfare. All of these data indicate that the 'Anaa warriors adopted the vernacular name *Parata* in the eighteenth century. Finally, we show how this ethno-ecological data could contribute to both the conservation of sharks and of indigenous Polynesian culture.

Material Culture and Sharks

Shark fishing in Tuamotu (*tautai mago*) was usually accompanied by complex rites, often involving incantations and “stone manipulation” (*puna ika*) to enhance abundance of the catch (Conte 1985). In 'Anaa, some fishermen specialized as shark callers (*tahuga mago*) (Torrente 2015; see also Clua and Guiart 2015). The specific propitiatory rituals were carried out in special, confined sacred places “*marae tiore*” (little fisherman sanctuary) or collectively in temples “*marae vaiga katiga*” (temple of food offerings) (Paea a Avehe, in Torrente 2012). As in many places in Polynesia, sharks were fished either with large hooks (*matau mago*) or lassoed (*here mago*). The hooks were made of a special wood from a tree called *mikimiki* (*Pemphis acidula*), either in V form (*numi*) or in U form (*numi kao*), with a sharp point usually made from bone (Emory 1975).

On 'Anaa atoll, only specific species were fished with hooks and lines: the lemon shark *Negaprion acutidens* (called *mago*

arava), the gray reef shark *Carcharhinus amblyrhynchos* (*mago raira*), the blacktip shark *Carcharhinus melanopterus* (*mago vaki*), and the tiger shark *Galeocerdo cuvier* (*tagutukao* or *mago toretore*) (Fig. 3). In the 1980s, the nurse shark *Nebrius ferrugineus* (*mago rohoi*), hunted for its liver, was still being caught by wrangling its tail (*mahiga*) with a lasso (see Conte 1987 for a detailed description of traditional shark fishing techniques for Napuka atoll). It may be significant that when a shark was taken from the sea, no capture song (*toinoino*) was sung as it was for the turtle (Emory 1947). Only lagoonal and coastal sharks were actually fished and consumed in Tuamotu, while pelagic species were considered man-eaters (*mago kai tagata*) and benefitted from a ban as sacred and protected (*tapu*) species (Firth 1981). These alimentary taboos covered both shark species that were potential man-eaters (*kaore e kai mago kai tagata* - one should not eat a shark that can eat a man) and other shark species that embodied an ancestor or a group of descendants.

Many shark parts were put to a variety of uses. Because of their sharpness, the teeth (*niho mago*) of several species were used as in making knives (*oreore*) and daggers (*paeho*), specific tools for ritual supercision (*tehe*), for tattooing (*nanako*), and, of course, in weapons such as cutlasses and spears (*komore*), and ceremonial spears belonging to the chiefs (*ariki*). The priests in charge of funeral rituals (*heva tupapaku*) used a spear-club adorned with shark teeth (*paeho*), supposed to kill any person found in their way (Babadzan 1993). During periods of serious illness or a war or raids between clans, women the customarily cut their scalps with a shark tooth to induce strong bleeding (*tagi* - screaming). The blood obtained from these lacerations was called *toto pao* (blood from incision). Shark teeth on wooden sticks were used as medical

scalpels (*pao*) for battle wounds (Figs. 4 and 5). Shark teeth were also used as protection on the forearms of warriors. Finally, shark teeth were part of the heraldry of chiefs, worn as pendants or on their chest (*taumi*).

Secondly, shark skin (*goragora mago*), composed of microscopic abrasive denticles, was used for scrapers as well as for polishers used to carve mother-of-pearl or wood (Emory 1975; Conte 1987). It was also used to make drums (*pahu*), whose rhythmic sound accompanied daily ritual activities. Lastly, shark skin served Pa'umotu warriors as body armour called *kahu mago*. Captain Cook and King (1784) described the traditional costumes on Meetia – a neighbouring island under the control of 'Anaa warriors - "The men of Mataia [Meetia] also wear their hair very long; and when they fight, cover their arms with a substance which is beset with shark teeth, and their bodies with a sort of shagreen, being skin of fishes [sharks, as the tradition attests]. At the same time, they are adorned with polished pearl shells, which make a prodigious glittering in the sun; and they have a very large one that covers them before, like a shield or breastplate." The oral tradition of Hao atoll specifies that "it was impossible to stab the warrior hero Fakahau, as his clothes were made of shark skin; but this same warrior was however hit by his adversary's spear which found a way through the jointure of two pieces of skin constituting the armour (*kahu mago*)" (translated from Caillot 1914). The warriors' appearance, as noted by D'Arcy (2006) "was clearly designed to set them apart," and in addition "their ferocity and arrogance also set them apart."

Finally, the shark liver and fat provided shark oil (*hinu mago*) that was used in funeral rites, particularly for the high-ranking chiefs (Montiton 1878; Caillot 1932; Conte and Dennison 2009). In 'Anaa, deceased chiefs were covered with oil and exposed to the sun on a mobile stretcher-like structure (*hokirikiri*) before being stored at night in a small house for

Fig. 3 (A): Capture of a tiger shark *Galeocerdo cuvier* which its remarkable teeth were particularly demanded for the setting up of cutting tools or weapons. (B): After the fishing a small wooden stick (y) was placed across the mouth for maintaining the two jaws apart and prevent any unfortunate bite of the fishers (adapted from a photo by film author F. Quilici)



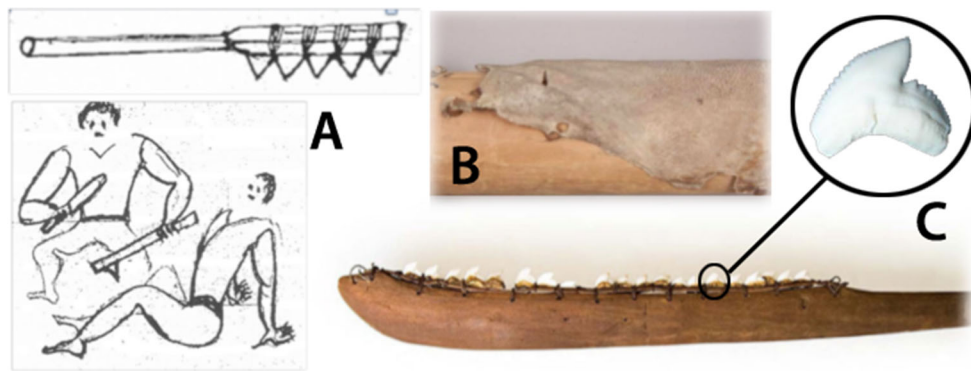


Fig. 4 Tools and weapons based on shark by-products. (A): Drawings of a pao made of a wooden stick with one or several teeth that was used for piercing bruises, sometimes with a little mallet (drawing by Paea a Avehe, in Torrente 2012). (B): Scraper made from a piece of shark's skin fixed on

a piece of wood (Wilkes's U.S. Exploring Expedition collections). (C): End of a traditional spear named paehe, composed of tiger shark teeth incrustated in the wood (Wilkes's U.S. Exploring expedition collections)

protection, the *hare tupapaku* (Torrente 2012). On 'Anaa sharks are also thought to hold the spirit of dead ancestors, similar to beliefs in other areas of Oceania (see Clua and Guiart 2015).

Shark parts, mainly teeth, held wide-ranging symbolic dimensions and were used as ornamental objects to enhance the power and prestige of chiefs (*ariki*), warrior-chiefs (*kaito*), and funeral priests (*heva tupapaku*). Sharks' teeth were also represented in tattoos (in triangular shapes, called *niho mago* or *niho parata*) and were thought to summon protection from the

ancestors. These elements were supposed to concentrate the "unearthly power" (*mana*) of ancestors and gods after a series of preparatory rites performed in their « *marae kaito* » (warriors's temple) by a special officer (*tahuga*), to become "*hakamanahia*" (full of a powerfull *mana*).

Sharks in Mythical Beliefs

Sharks benefit from a place of privilege in the 'Anaa cosmic order.³ They are not only kings of the depths, but reign symbolically over the three levels of ocean, earth, and sky. In 'Anaa mythology, a shark called Tumu-mago (origin-shark)⁴ represents the concrete aspect of a masculine principle that starts the chain of life and is associated with a feminine principle belonging to the earth called Tumu-rito (origin-vegetal growth). This symbolism represents the shark not only as the uncontested Lord of the Ocean of which he is the guardian (*tiaki*) or medium (*arai*), but also as the sole male principle at the origin of life.

A shark-god called Te-mago-Purotu (Ma'o-purotu in Tahitian, "the god shark blue ocean") resides in the upper part of the heavens Te-ragi-reva (sky invisible to humans), the home of the god Tane, whom he serves as messenger, appearing to men in the guise (*ata*) of a blue shark, *Prionace glauca*. This shark species was considered sacred and could neither be fished nor eaten. The shark himself had a messenger, the *atoti* fish or remora (Henry 1928). Moerenhout (1837) claims that he was propitiated to calm his potentially

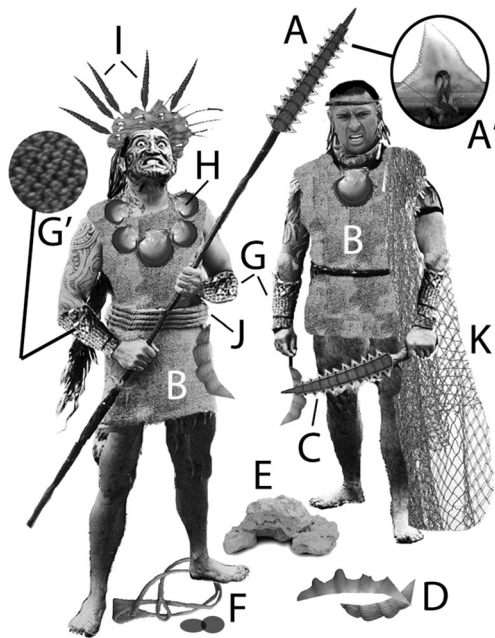


Fig. 5 Virtual representation of two Parata warriors with their sharkmade armors and weapons. A: *Komore* (spear with shark teeth- A'); B: *Kahu mago* (armor made from shark skin); C: *Paehe* (shark teeth knife); D: *Taheahea* (Projectiles made from giant clam shell); E: *Konao* (coral stones); F: *Maka* (sling with slingstones); G: Arm protection made of adjusted shark teeth. H: *Kanaenae*, insign of chief warriors made of pearlshell; I: *Heikura* (Chief headress of sacred red feathers), J: *Hitiki* (Sennit made belt); K: *Kupega* (Sennit made net)

³ In Polynesian myths, the first appearance of the islands, of the biodiversity and of the human race results from four creation mechanisms: a birth (*fanaura'a*), a concrete making (*hamanira'a*), a spell (*rahura'a*), and the upwards push towards the light concluded by the emergence (*tupura'a*) in human world of light (Saura 2013).

⁴ In the Society Islands, we found the name Tu'u-ma'o (Ellis 1972), which is probably a bad transcription of Tumu-ma'o. Further, another shark-god, Ari (Moerenhout 1837, Williamson 1924), symbolizes the same idea of 'the first appeared in this world' (*ari*).

dangerous anger. The image of an *atua ma'o*,⁵ shark-god, appeared on the *marae* close to that of Tagaroa in the shape of a whale (Henry 1928). Sharks were considered the executive arm of the gods in case of transgression of a taboo when being eaten or bitten by a shark was just punishment (Clua and Guiart 2015).

In the inferior heavens of 'Anaa called Te-ragi-marama (the visible sky), the abode of the god Atea, there is a giant shark called Te-mago-roa (the long shark) which personifies the Milky Way⁶ (Stimson 1933). Te mago-roa is found in 'Anaa mythology under other attributes: Te-mago-roa-'ai-ata (the long shark eating clouds), Te-mago-tu-heiava (the shark stand in the world of light), Te-mago-roa-heikapu (the long shark crowned by shells) (Torrente 2012). There are a number of other shark-gods in Tuamotuan mythology, as well elsewhere throughout Polynesia.

A classic comparison between the predatory animal and the character of a chief or *ariki* is illustrated by the Hawaiian tradition: "The shark going inside the land is my chief, this is a very powerful shark, able to eat all on the land, a shark with dark red fins which is the chief, he has a mouth able to absorb the whole island without choking" (Fornander 1916; Kirch 2010, 2012). In the same way, the prestige of a chiefly line is enhanced through a shark ancestor, for example Varimatāuhoe, a shark-god of Ra'iatea who is claimed to be the father of the first ancestor of the prestigious Teva lineage of Tahiti (Marau Taaroa, in Adams 1964). Other authors record that in the Society Islands (Ellis 1818; Henry 1928) and Hawaii (Fornander 1920; Kirch 2010) a chief's investiture would follow a symbolic fight between the new chief and a shark. In Tuamotu, several chiefs kept pet sharks (*fagai mago*) in a large enclosure in the lagoon (*tipua*). Sometimes, these chiefs were so familiar with the sharks that they became shark callers (*tahuga mago*) (Torrente 2012), which further added to their prestige (Leslie 2007).

Sharks and Spatial Representation

Sharks are often the symbolic wardens of different marine areas or territorial limits (*oti'a moana*), such as great oceanic currents (*au*, *opape*) on which seagoing canoes let themselves

drift (*torire*) for great ocean journeys — the northern current towards Baja California and the southern current returning. These shark wardens were sometimes called *arai moana* ("mediators of the ocean"). They would accompany the canoes and protect them. According to Te-Arapo (1997), the current between Tahiti and Moorea, called "Te-'o-'ana," was guarded by two sharks: Apu-ari'i-tahi and Tinorua, the latter being able to appear either as a man or as a shark, and the current between Tahiti and Aotearoa (New Zealand), called "Te-au-horo-o-te-ti'a-vā," was under the care of the Ma'opurotu, the favourite shark of Tāne. Some authors also hypothesised that the pelagic sharks may represent human migrations (Ellis 1972; Williamson 1924). A myth describing Tahiti island as a "fish," sometimes identified as a shark, that was pulled closer from Ra'iatea by Maui is cited as a migration metaphor of high rank groups from Ra'iatea to Tahiti (Smith 1903; Leverd 1910).

Sharks in 'Anaa Place Names

Shark toponyms also serve as anchoring myths and mark the paths of mythical heroes. The Maori myth of the Parata monster described above was also known in the north west of 'Anaa, home the Tutavake and Tuhoe lineages, who migrated to New Zealand (Torrente 2012). Toponymic transfers from Tuamotu or the Society Islands to Aotearoa (New Zealand) are well-known, attesting to these migrations. For instance, the island of Tuhua (Mayor island in the bay of Plenty) was named after an island in French Polynesia, which is Meetia island, the little volcano close to 'Anaa (Torrente 2003). Place names on this island sometimes alluded to sharks, particularly in certain lagoon locations: Te-vaha-o-te-mago (the shark's mouth), which refers to Te-vaha-o-te-Parata, the place in the lagoon near a channel (*hoa*) opening in the ocean (Fig. 1c). Nearby, a little islet is called "Havana," the 'Anaan name for the caudal fin of sharks. In 'Anaa, the place name O-taruri refers to the way that sharks swim, circling in smaller and smaller circles (Stimson and Marshall 1964). Finally, "Te ana o te mago", literally "the cave of the shark," refers to the inside of the shark in which Porama, the 'Anaan fisherman hero, is held prisoner (Paea-a-avehe Mss). At the end of the third day, Porama managed to cut the belly of the monster with the help of a shark tooth that he kept in his ear, and escaped. The mnemonic string figure (*fai*) "Te ana o te mago" (Paea-a-avehe Mss) illustrating this shark myth, and the song that goes with it, are still well known today by the elders of the atoll.

Sharks as a Metaphor for Warfare

All Polynesian societies had warriors, but those of the 'Anaa atoll exerted an unprecedented hegemony on more than a half the Tuamotuan archipelago a century before Christian conversion. They bear the name of the pelagic man-eating shark

⁵ Using the instance of sharks, Oliver (1975, 1:58) states that there "have been three types of divinity (*atua*) manifestations: (1) permanent shark-gods, grouped into the term of *atua-ma'o*, (2) gods occasionally changed into sharks, alternately with others animals, and (3) specific gods entered into sharks." With respect to the animal incarnation forms, it should be remembered, as Firth (1931) indicated for Tikopia, that the *atua* is supposed to "enter in" (*tomo*) into the animal and to possess it (*uru*) without becoming the animal directly. This embodiment concerns only a single animal and not the whole species, which serves as a vehicle (*vaka*) to a god or spirit, but this relationship is only transitory. The Hawaiian concept of Kinolau ("many bodies") expresses the multiple embodiment of a god in his *ata* or visible manifestation (Valeri 1985).

⁶ Te-mano-ai-ata in the Marquesas (Von den Steinen 1898), and Te-mango-roa for the Maori (Best 1982).

parata, an important connection given the importance of naming in Polynesian societies: “to name is to own.” It is likely not a coincidence that they wore sharkskin and other shark materials, given that religious beliefs held that the container is more important than the content (Handy 1930). Since invisible gods were supposed to fight alongside humans, the sharkskin worn by the ‘Anaa warriors was above all sacred rather than protective armour.

Discussion

Our results demonstrate the heterogeneous roles that sharks played in the ancient Polynesian way of life. However, the link between these marine predators and human warriors is even more complex and intimate, and warrants further discussion. Although a warrior society with similar cultural features was described for the atoll of Tabiteuea in Kiribati (Luomala 1985; Drew et al. 2013; Camus 2014), these warriors were not associated with sharks and we conclude that the Parata warriors from ‘Anaa atoll is probably unique in ancestral Polynesia (Emory and Ottino 1967; Nolet 2006). However, no description was provided about these atypical fighters and the main justification for such a name was their ‘ferocity’ (Emory and Ottino 1967: 49).

In a very general way, traditional societies often show an anthropomorphic view of non-human behaviours (De Castro 1998; Descola 2005; Ingold 2012). In the particular context of violence and war (Kellett 2013) in the Tuamotu islands, the warrior disguises himself as a shark, making good use of the shark’s teeth and covering himself with a shark skin, thus identifying with a feared marine animal. The symbolic interplay is between *huru*, the physical shape, and *tino*, the corporality.

The oceanic whitetip shark is a large, stocky species, with a short and broadly rounded snout, grey-bronze above and white below, with white mottling usually present on fins that have a large white end. The first dorsal fin is very large and distally expanded, with a broadly rounded apex. Pectoral fins are also very large and elongated, with broadly rounded apices (Compagno 1984, 2001). The pectoral fins are proportional to body length and much longer than those of any other species of shark. Through a long-term study (1967 to 1995) conducted in the Pacific, Seki et al. (1998) reported their largest specimen to be 3.5 m TL (250 cm PL). This species is large enough to constitute a significant potential threat for humans.

‘Anaa warriors were described as tall and very strong (Torrente 2012), and thus comparable to the *parata* rather than other shark species that would be either too small (such as the blacktip shark *vaki* or the grey reef shark *raira*) or too thin (such as the blue shark, Te-mago-Purotu). While the *mako* shark (*Isurus oxyrinchus*) is of a comparable size, this species

does not appear at the surface as often as the oceanic whitetip, and is not as numerous in the open ocean as the *parata*. These two factors, which also apply to the tiger shark, could explain why the oceanic whitetip, which was probably much more familiar to sailors, was chosen as reference rather than the *mako* shark. Also, being more powerful than quick and aggressive, the tiger shark would not appear such as a good candidate for a comparison with fierce Tuamotuan warriors as the oceanic whitetip, particularly active while collectively feeding.

Usually solitary, the oceanic whitetip shark may aggregate in numbers around a food source (Compagno 1984, 2001). This shark is slow moving but quite active equally during the day and at night. It often cruises slowly at or near the surface but can suddenly dash for a short distance when greatly disturbed or attracted by a potential prey. The oceanic whitetip is far more aggressive than other pelagic species such as the silky shark (*C. falciformis*) or the blue shark (*Prionace glauca*), especially when competing for food. It is very bold and incredibly persistent in pursuit of prey (Compagno 1984). Although an oceanic whitetip shark might be witnessed quietly feeding on large baitballs of small fishes (Bullis 1961) or quietly swimming in small groups (Gallagher et al. 2014), this species is more commonly known for its fierce behaviour towards humans, chiefly responsible for repetitive feeding frenzies following shipwrecks or sea landings of planes.

These characteristics and behaviour of the oceanic whitetip shark were well known by all societies in the Tuamotuan archipelago. The ferocity and behaviour of the ‘Anaa warriors led their contemporary vanquished and potential targets to nickname them “*parata*” based on a behavioural analogy between these marine and terrestrial predators (Emory and Ottino 1967). Once named *parata*, these warriors would likely strengthen their fierce image to increase the psychological pressure and terror that such a comparison would generate. The first example, where the ‘Anaa warriors would circle around their target before the final strike, stems from the way sharks would approach castaways in the open ocean; such behaviour was termed “*taruri*”. The fact that, in Tuamotuan ideology, the territorial conquest (*kai henua*) was conceived in terms of concentric circles or spirals like a whirlwind (Stimson and Marshall 1964) may be inspired by the shark circles *taruri*.

Furthermore, the ferocity of the strikes by the oceanic whitetip shark, particularly those in association with ship wrecks and crashed airplanes, is usually exacerbated by the “feeding frenzy” of extremely aggressive competition among several sharks to feed on a common prey (Clua et al. 2013). When they initiate a feeding frenzy, the animals are in a sort of daze and act in absolute disorder, striking the victims, biting everything in proximity, metamorphosed into killing machines that are boosted by the smelling of large quantities of blood. We can hypothesise that the analogy between shark and

warrior behaviour was used as a metaphor in the 'Anaa traditions and in cultural representations of Tuamotuan warfare.

Moreover, Tuamotuan warriors have been described as practising war cannibalism, like the Maori fighters (Best 1924). According to several authors, such practises were meant for the winner to ingest the *mana* of the loser (Bowden 1984; Barber 1992). Although no irrefutable evidence exists thus far, the possibility that the *parata* warriors practiced cannibalism is evoked both in tradition and in European historical sources (Denning 1982), and existed in the Tuamotuan language under "*kai tagata*" (man eating), although this could be a figurative expression used as an insult. Cannibalism is well known among sharks, particularly for large species (Clua et al. 2014) including the oceanic whitetip shark (Poisson 2007). Whatever the extent and reality of the analogy with oceanic whitetip shark behaviour, the negative notoriety of the 'Anaa warriors created an understandable terror, killing men and forcing women and children to leave their native atolls, ultimately resulting in the desertion of 38 atolls and including the population of western Tuamotu (Mihiroa people) who took refuge along the Tahitian peninsula (Ottino 1965; Nolet 2006; Torrente 2012).

Conclusion

The study of traditional ecological knowledge (TEK) and conservation biology interact at the nexus of the social and natural worlds, yet historically there have been major impediments towards integrating the two. As shown by Drew (2005) in Micronesia, the TEK involving, for example, folk taxonomy or fish species knowledge of local communities constitutes a critical support for conservation. There is undoubtedly a role for the ethno-ecological data presented in this study to contribute to shark conservation in Polynesia or even at the Pacific scale.

Focusing on the oceanic whitetip shark, Strasburg (1958) suggested it was the second most abundant carcharinoid in the North Pacific in the 1950s. In the 1970s, the whitetip accounted for 61% of all hooked sharks. By the end of the century, however, catch rates for this species had declined by 99% in the Eastern Pacific (Baum and Myers 2004). Standardised catch rates of longline fleets declined significantly from 1995 to 2010 for oceanic whitetip sharks in Pacific tropical waters (by 17% per year) (Clarke et al. 2013). These figures suggest a dark future shark species that are under threat in the Pacific (Polidoro et al. 2011).

In French Polynesia, all sharks have been protected since 2006 (Ministers' Council statement n°396, 28 April 2006), except the Mako shark *Isurus spp*, which was added to the list in 2011 (Ministers' Council statement n°1506, 29 September 2011). However, this legislation is not fully understood nor is

it fully implemented, and some fishing practices (such as culling sharks when they accidentally get trapped in traditional bonyfish traps) are still jeopardising shark conservation French Polynesia. While local fishermen do not pay attention to ecological arguments aimed at protecting sharks based on the critical role they play in the ecosystem functioning (Heithaus et al. 2008), they would likely be more inclined to not kill an animal that may host their ancestors' soul (as *vaka*) or that may potentially protect their family (as *tāura*) (Torrente 2012). Therefore, the recovery of TEK (Drew and Henne 2006) from Polynesia that demonstrates the strong ancestral links that used to exist between sharks and humans would likely strengthen the argument for the conservation of sharks for ecological, economical and cultural benefit – in Polynesia and the Pacific in general. In addition, besides the unacceptable ecological loss, the extinction of sharks would definitely be synonymous of the collapse of a great part of Polynesian culture. We hope our results presented here will give communities, conservationists, policy makers, and ecologists a new way of perceiving and conceiving the value of contemporary marine governance and conservation efforts within the context of plummeting global shark populations and the resulting devastating ecological effects.

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