Marine Biodiversity Hub

National Environmental Science Programme

Indigenous knowledge and cultural values of hammerhead sharks in Northern Australia

Karin Gerhardt

Project A5 - Establishing the status of Australia's hammerhead sharks

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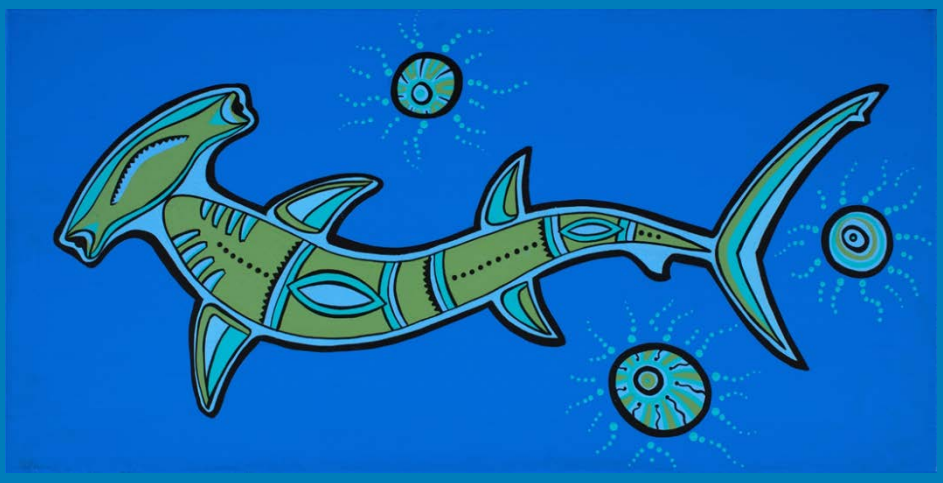

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Artwork by Safina Stewart, Mabuiag Island and Wuthathi Country, www.artbysafina.com.au
Title: Hammerhead (Date: 2016)

This powerful and majestic Hammerhead Shark swims healthy and free in the beautiful Torres Strait. The sea urchins are a reminder of the Torres Strait Islander people who are the custodians of its islands and waters.
"It is significant to place the urchins with the hammerhead. Together they are saying, 'Come, let us all come together, despite our differences, and look after our ocean brothers.'" – Safina Stewart

Enquiries should be addressed to:
Karin Gerhardt
Karin.gerhardt@my.jcu.edu.au

Project Leader's Distribution List

Lesley Gidding-Reeve Department of the Environment and Energy, Biodiversity Conservation Division
Ivan Lawler Department of the Environment and Energy, Biodiversity Conservation Division
David Wachenfeld Great Barrier Reef Marine Park Authority

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Important Disclaimer

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EXECUTIVE SUMMARY

Sharks and rays are culturally significant animals for many Aboriginal and Torres Strait Islander groups. The roles they play in the lives of saltwater people are bound in the Indigenous knowledge that has been passed down from generation to generation.

Hammerhead sharks are perhaps one of the sharks most easily recognised as having cultural significance for Indigenous people in Australia. The Indigenous knowledge that is available about hammerhead sharks is predominantly from the Torres Strait and that outcome may be attributed to the charismatic displays of hammerheads in art pieces, dances and stories that Torres Strait Island people share with the wider community.

Indigenous knowledge (IK) is a place-based knowledge system, so IK from one island or mainland community is relevant only to that area, and rarely scales up to cover multiple language groups. IK is also predominantly an oral form of knowledge and is managed (or protected) through a complex lore system that may restrict its sharing or retelling to certain groups (e.g. women only, or young men going through initiation).

There are two main language systems within the straits (Meriam mer and Kala Lagaw Ya) with 6 different dialects spoken at an island level. Torres Strait creole (Ailen tok) is a common language spoken across all parts of the Torres Strait to allow for trade and communication. IK from the Torres Strait is often shared through artwork, dance and songs. Many of the hammerhead references within these media not only have a spiritual base but involve descriptions of ecological processes e.g. hunting behaviours, seasonal timing, predator-prey interactions.

Projects that seek to understand the breadth of knowledge that sits within local communities should aspire to meaningful and genuine collaboration and engagement with Traditional Owners.

A major strength of the NESP Hammerhead project was recognising that Traditional Owner priorities may not align with the project objectives, timeline or research outcomes. In recognising this, multiple options for involvement and engagement were developed to ensure that Traditional Owners were aware of what research was going on in their sea country, and that there were a range of opportunities for involvement, and skill and knowledge transfer between all parties.

The Indigenous communication and engagement component of the project was very successful. Involving Indigenous rangers in tagging field trips on their sea country was considered respectful and beneficial for both the scientists and rangers involved (e.g. skill exchange and relationship building). The detailed local knowledge that rangers were able to provide to the researchers in the Dunk Island area was extremely beneficial and resulted in successful tagging trips.

Detailed observations from Torres Strait Islander people would have benefit to any future tagging/ecological studies that might be conducted in the Torres Strait.

INTRODUCTION

Hammerhead sharks are known to swim large distances, so it is possible that sharks from Australia may move into areas of Papua New Guinea, Indonesia and elsewhere. Given some of the small sea-country areas for Traditional Owners within Australia, it is very likely that hammerhead sharks swim through and use multiple sea country estates. Understanding how hammerheads move through areas and the way populations may be connected, is important for informing Australian and international conservation and management initiatives. It is also important information that Traditional Owners could use to assist their people in implementing their sea country plans and achieving their sea country aspirations.
The NESP hammerhead connectivity project used tagging, parasite surveys, and genetic sampling to see how hammerhead shark populations are connected across northern Australia. The findings were combined with biological, ecological and fisheries data to assess the potential stock structure and population status of hammerhead sharks in Australian waters.

The project brief also included a component to explore the cultural values, traditional uses and Indigenous knowledge (IK) of hammerhead sharks in Queensland and the Torres Strait where these species are an iconic totem animal. Where appropriate, support from Traditional Owners was sought for on-country advice about hammerhead shark movements, behaviour, and distribution.

During the establishment phase of the project, there was high level support for the enquiry and documentation of Indigenous knowledge about hammerhead sharks, but also for engaging Traditional Owners in the research that was occurring on their sea country. This component was designed with the intention that knowledge sharing, skill exchange and respectful relationships would (hopefully) be fostered through meaningful engagement.

Project Objectives:

Explore the cultural significance of hammerhead sharks to Torres Strait Islander and Aboriginal peoples of Northern Australia, and (where appropriate) document examples of Indigenous knowledge and its potential to inform science and management projects for hammerhead sharks

Engage and communicate the NESP Hammerhead connectivity project to saltwater Traditional Owners (in Queensland).

BACKGROUND

1.1 About Country, Indigenous Knowledge and Cultural Significance

What Indigenous people know (their knowledge) and why something is important to them (significance or value) are two very different things – but they are inextricably linked for Aboriginal and Torres Strait Islander people to their country.

1.2 Country

Country is a fundamental concept. The term 'country' is commonly used to denote the traditional land/seas that belong to an Aboriginal or Torres Strait Islander cultural group. Indigenous peoples identify each other by their country, and 'caring for country' is a term used to denote the traditional and ongoing management of Indigenous land and seas. Country is a holistic concept that prescribes ways of seeing and doing for Indigenous peoples and is underpinned by a belief that all things are connected, and that Indigenous peoples belong to and are part of their own country (Nursey-Bray and Palmer 2018).

1.3 Indigenous Knowledge

Many Traditional Owner groups within Australia describe an intimate understanding of their country, gained through inter-generational knowledge transfer and their close connection to their environment (Burgess *et al.* 2009; Gray and Zann 1988; Weir 2013). Often referred to as Indigenous knowledge (IK) or Traditional Ecological knowledge (TEK), these terms refer to the cumulative body of knowledge, practice, and belief that describes the relationships between living beings and their environment. Indigenous knowledge is recognised as being adaptive, as it is handed down over generations (Berkes *et al.* 2000). Appropriate terminology (IK or TEK) is often debated in scientific literature (Agrawal 2009; Nadasdy 1999; Sillitoe and Marzano 2009), however Indigenous knowledge is used throughout this report as it is more commonly used in the Australian context.

Indigenous knowledge exists in many different forms. In Australia, it is most often embodied in oral forms such as stories and songs, however it is also held or transferred in other ways such as in customary activities, dance and art (Janke 2009). For Indigenous Australians that are 'Saltwater People', much Indigenous knowledge is embedded in their association with their sea country (George *et al.* 2004). This knowledge may describe species occurrence, seasonal patterns, animal behaviour and movements, as well as ecological relationships such as predator-prey linkages (Green *et al.* 2010). The localised knowledge that people acquire about species, their life histories, occurrence, and behaviours are nested within traditional resource management frameworks, tools, and techniques. In turn, these are embedded within the social institutions and customs required to implement these management systems (Butler *et al.* 2012)

1.4 Cultural Significance (or Value)

Biophysical scientists are familiar with discussions that species have 'ecological significance', and from a social science perspective we can also examine how species interact with people at a socio-ecological level.

Culturally significant species or cultural keystone species are terms that refer to those culturally remarkable species that play key roles in shaping the cultural identity of a people, as reflected in the fundamental roles these species have in diet, materials, medicine, and/or spiritual practices (Garibaldi and Turner 2004). Additionally, such cultural keystone species may be featured in stories and songs or have important ceremonial or spiritual roles. They are also likely be highly represented in a culture's language and vocabulary (Cuerrier *et al.* 2015). The more 'important' a species is within a cultural setting, the more IK appears to be available for the species (Butler *et al.* 2012).

Garibaldi and Turner (2004) have suggested that "cultural keystone species" may facilitate linkages between Indigenous knowledge systems and western science knowledge systems. They also suggest that the detailed knowledge of such species can bring a better appreciation of and respect for Indigenous knowledge systems by western scientists and can provide the 'window' through which mutual understanding can be achieved.

With this in mind, we must also consider that the ways in which an animal is valuable to a culture may vary considerably between different communities and locations. Thus, it is always important to link information and understanding about a culturally significant species back to people and their country.

It is also important to note that people and their connection with 'country' are interrelated and cannot be considered as separate entities. Even while we recognise that some species may hold more cultural significance than others, the Aboriginal worldview is that all things are connected, meaning that everything within the ecosystem or environment ('place or country') has an important role in underpinning Traditional Owner existence and belief. Regardless of whether the hammerhead is a cultural keystone species or not, this report recognises the relevance of all marine creatures that inhabit sea country as being important to Traditional Owners.

1.5 WHY is it important to understand IK and the cultural significance of animals?

(1) By recognising the animal – we are acknowledging rights and interests in country.

There is widespread agreement that a fundamental aspect of Aboriginal peoples' past and ongoing relationships with the ocean are situated within the complex rights and interests over their sea estates and the adjoining coastal lands (Australian Government 2004). The application of IK in the management of marine species (whether they be cultural keystone species or not) is therefore closely tied to the expression and continuation of Indigenous culture and traditional marine resource use rights. This can be clearly seen in the management of turtles and dugongs in the Great Barrier Reef Marine Park where Traditional Owners are exacting their hunting rights and interests (for their sea country) through the Native Title Act (section 223 and 211).

(2) IK can contribute to the knowledge base about a species.

Understanding IK improves our knowledge and understanding of species, which in turn, can better inform management decisions and planning. In keeping with the growing body of research in which ecological systems and social systems are conceptually linked (Berkes 2004; Folke 2006), we find that identifying and focusing on culturally significant species can enhance environmental management and biodiversity conservation (Garibaldi and Turner 2004). In fisheries management for example, IK has been documented as supporting western scientific knowledge by providing long-term baselines for stock assessments, local knowledge of species ecology, behaviour, and habitat conditions, as well as any customary management systems in place (Haggan *et al.* 2007; Johannes *et al.* 2000).

In the Australian setting, Traditional Owners and scientists have been working together for many years on culturally significant species. This has been facilitated by the interest (from both sides) in turtles and dugongs. However, when considering other marine species – specifically sharks and rays - there is a definite absence of information, and very few examples of researchers and Traditional Owners are working together. From the information ascertained from desktop study, information provided through research and provided anecdotally, sharks, particularly hammerheads, appear to be very important to Torres Strait Islanders and saltwater Aboriginal people. Thus, successfully engaging Traditional Owners in this project could facilitate transfer of important information on hammerhead distribution, movement, behaviour and ecology to both parties.

2. METHODS

Investigating the cultural values and IK for hammerhead sharks in the northern parts of Australia required a mixed methods approach. A comprehensive desktop study (see Attachment A for full description) was done in conjunction with face to face discussions as part of scope setting for the project (this provided anecdotal information). Targeted interviews, as part of a PhD project investigating the Indigenous knowledge of sharks and rays for Yuku Baja Muliku Traditional Owners in Cape York (JCU ethics approval H6578) was also used as a source of information.

3. FINDINGS

Caveat: *A well-documented feature of IK is that western classification systems for reporting and recording, are not a good fit for the depth and interconnectedness of Indigenous Knowledge, and that in trying to code/categorise the knowledge into western thinking we risk losing context and the depth of the knowledge. We acknowledge this and propose that the way forward to applying and using IK, is to work with and involve the owners of the knowledge in a mutually beneficial relationship that recognizes the context, complexity and intellectual property rights of the information. In the best way available to us currently, we present the IK of hammerheads in the following section.*

The saltwater Traditional Owner groups that sit across the Northern parts of Australia are as numerous and as diverse as they are in their languages, customs and culture. This diversity is reflected in the knowledge/stories that exists for hammerhead sharks.

3.1 The Torres Strait

The Torres Strait contains more than 150 small islands that lie between the tip of Queensland (Australia) and the western province of Papua New Guinea. Culturally the islands are divided into five groups which are represented by the five-pointed star on the Torres Strait Island flag.

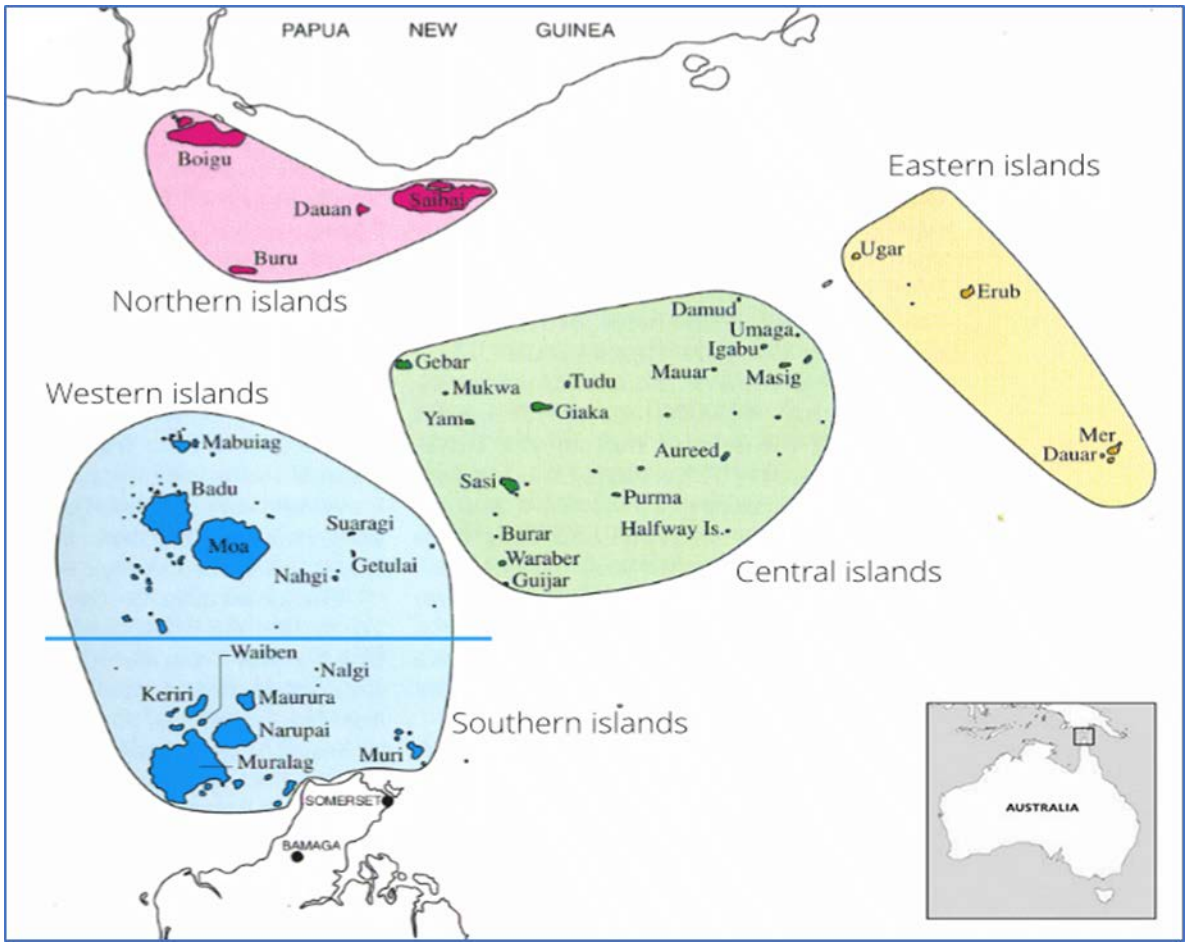

Figure 1 Map showing the five Torres Strait Island groups

Linguistically however, the islands are separated by two main language groups: (1) Meriam Mir and (2) Kala Lagaw Ya.

It is important to understand the language constraints that apply across this project, since not only is IK mainly oral in its transmission, but there are complex language barriers to navigate.

Meriam Mir is the language of the Eastern Islands of the Torres Strait. It is connected to the Papuan languages and there are two regional dialects. Kala Lagaw Ya is the language owned by the western and central islands of the Torres Strait. It is linguistically connected to the Aboriginal languages of mainland Australia. There are four distinct regional dialects associated with specific island groups (Dudgeon *et al.* 2010).

The connections of Torres Strait islanders to the marine environment is expressed in the diversity of languages, mythologies, ceremonies, and customary tenure systems that form Ailan Kastom (McNiven 2004).

There is also another language expressed throughout the Torres Strait: Torres Strait Creole. This language was developed from a pidgin and is known as Ailian tok or Yumplatok. It is a mixture of Australian English and traditional languages; however, each island has its own version of creole.

There could be many different variations of traditional 'language' names for hammerhead sharks. The most common language names identified during this project are listed in Table 1.

Table 1 Torres Strait language names for hammerhead sharks

Traditional Name	Word	Island reference
Beizam	Hammerhead or shark	Erub (Darnley Island), Mer (Murray Island)
Kurrs	Hammerhead (singular)	Western and central islands, Badu Island
Kursi	School of hammerheads	As above
Irawapap	Hammerhead	Keriri (Hammond Island) (western language)
krosak	Hammerhead	Broken Creole (Cross shark)

3.1.1 Cultural significance of hammerhead sharks and implications for IK

Torres Strait Islanders have a maritime saltwater culture, and this is reflected in the predominantly marine clan totems: crocodile, eel, dugong, hammerhead shark, stingray, turtle, frigate bird, octopus, and shark. Totems are objects that form part of the cultural identity of Islanders and are often features in art and ceremonies (Fuary 2009). Hammerhead sharks are identified as a totem for many of the Torres Strait Island clans or families across

the islands. As such, they can be found in many of the lino cut art works that are unique to the Torres Strait, and there are many stories, customs and shark behaviours depicted by the artists. The traditional nature of storytelling remains a contemporary practice and the IK about hammerheads retains its place in island culture.

3.1.2 Examples of totemic representation

"For the Central Torres Strait, hammerhead sharks are the southeast (Sager) season which blows from May to December (dry season). The Sager season is associated with rough seas" (Fuary 2009)
"On Masig Island, clan totems include turtle, hammerhead shark[5]."
"Hammerhead is my family totem" Ken Thaiday (Darnley Island)[6]
"I look at the totem of Beizam as a strong figure. As a Meriam woman from Mer (Murray Island) my totem is Beizam (hammerhead)[7]".
"Kirriri (Hammond Island) Totems: My Mother – Hammerhead Shark (Irwapap)[8]"

3.1.3 Seasonal patterns

From the literature available and anecdotal accounts, it is reported that large schools of hammerheads congregate regularly to the east of the Torres Strait islands. These groups are observed 'migrating' through the middle section of the straits during the wet season. People have shared accounts of hammerheads cruising in close to the shoreline (high tides) at those same times. This in-shore behaviour seems to be linked to hunting.

3.1.4 Examples

At Yam Island, on the high tides during the wet season – hammerhead sharks come in close to shore (Fuary 1991).
"*Hammerheads migrate in large groups through the middle section of Torres in the months of January to March. See them moving past Murray Island then"*[9].
"*East of Torres Strait – large schools of hammerheads congregate. Really big sharks schooling together. We see them from the helicopter when we are doing compliance flights usually before the wind starts*"[9]

3.1.5 Behaviour

Shark behaviours have been reported on several different scales. It has already been noted that hammerheads travel 'through' Torres Strait in big schools, however there are some other finer scale behaviours described. The big schools travel out in deep water and then seem to break into smaller groups. Two or three sharks head into the shallows at a time, 'working' the flats for mullet and stingray. Many people have described the stingray as one of the hammerheads favourite foods [3,6,12].

Human shark interactions are reported during fishing events. Net fishing (drag nets from the shore) is done during a rising tide, but the thrashing fish in the nets attract the sharks. Having a shark caught in a net 'makes a mess'. While spear fishing, if people observe

'schooling trevally', they immediately surface and jump back in the boat. Hammerhead sharks hunt the trevally, and nobody wants to encounter the shark during a 'hunt'[10].

Ken Thaiday, a well-known artist from the straits recalls the way the shark camouflages in the water. Using brown, grey and blue tones to blend into its surroundings. When in the deep blue water, the shark takes on a blue hue to blend, but when it emerges near a reef it has a 'colour change' into the brown and grey colour spectrum [6].

3.1.6 Examples

On Yam Island and the islands of Mukar, Gebar, Tudu, Zegey and Awridh, tiger sharks and hammerhead sharks are feared. During daytime high tides during the wet season, sharks may sometimes be seen cruising in the lagoon near the village and children are warned not to swim at this time (Fuary 1991).

"*Because they come in big schools the shark, not only three, maybe half a dozen, maybe eight. When you see them, they go deep water, they come back, maybe only two or three work in the shallow water……And you know hammerhead shark when you see the long tail, because of the way the tail goes* [6]."

"*The shark is camouflaged three times in the water, Brown, grey and blue* [6]"

Relationship with Torres Strait Islander people

Hammerhead sharks are a culturally significant animal for Torres Strait Islanders and their relationship with the shark comes from a place of respect. The strength and grace of the shark are reported in many of the stories and environmental observations, and while people have admiration for them, there is a healthy dose of respect for their place in the ocean as a 'hunter'. Hammerhead sharks are seen as a symbol or law and order. The shark has an important role in the ocean and in island life as they have a pivotal role in ceremonial events that reflect the Malu-Bomai spirituality of pre-colonial times (Art Gallery of New South Wales 2004).

3.1.7 Art

Many Torres Strait Islander artists are renowned for their use of hammerhead sharks in their art pieces. Perhaps one of the most famous artists is Ken Thaiday whose best-known works are his hammerhead shark dance headdresses. Dancers are able to pull on strings to make the jaws of the shark snap open as if swimming in search of food (Fig 2).

While this is artwork is a contemporary expression of traditional masks, these objects are still seen as vital for the maintenance and transmission of traditional culture to future generations.

Figure 2 Black Bamboo Hammerhead Shark Headdress 2010

There are numerous other artists including Glen Mackie, Billie Missie and Gehmat Nona who incorporate the stories and Indigenous knowledge of hammerhead sharks into their work. Some of their work can be viewed on line at the following sites.

https://www.fireworksgallery.com.au/kursi-245
https://www.fireworksgallery.com.au/coming-sagai
https://www.baduartcentre.com.au/artists/gehmat-nona/tupmul
https://www.cairnsartgallery.com.au/collections/ur-wayai-incoming-tide

3.2 Findings – mainland Australia

The Indigenous knowledge that could be identified for hammerhead sharks on mainland Australia (northern areas only) is extremely limited when compared to the Torres Strait. There are several reasons why this information has been difficult to obtain, including the fact that many Indigenous communities are in very remote and often difficult-to-access locations. As in the Torres Strait, many communities do not speak English as a first language and there are often cultural protocols that need to be recognised and observed before meeting and sharing information (Saunders and Carne 2010). It is also because a number of groups (especially along the east coast) don't have much contact with hammerheads.

The only accounts of hammerhead sharks that were collected from Traditional Owner groups along the eastern coastline, were reports of small (baby) hammerheads in close to the shore during the summer months (wet season reported for up north). There are very few accounts of larger animals being seen inshore. In general, many Traditional Owners expressed their

fear of sharks and explain that they are not keen to swim in the ocean due to their presence [1,2,3].

With the introduction of the Indigenous Protected Area (IPA) programme, several documents are publicly available on the internet. Traditional Owner groups who take part in the programme, are required to record their country management aspirations and describe the cultural importance of their country. For salt water Traditional Owners, this usually involves writing down descriptions of sea animals that are important to them. From a review of the available IPA plans for saltwater groups across the Northern parts of Australia, the Anindilyakwa people from the Northern territory and the Pilbara Traditional Owners from Western Australia both mention hammerhead sharks.

3.2.1 Examples

Hammerhead shark (mungwarra) is one of the main totem species for the Anindilyakwa people in Northern Territory (Saunders and Carne 2010), while the Pilbara Traditional Owners report lots of kurnururru (hammerheads) around the Port Headland region (Yamatji Marlpa Aboriginal Corporation 2010).

Although this information seems limited, it identifies Traditional Owners who might be interested in working with scientists on hammerhead research.

Outcomes – engagement and communication

The NESP Hammerhead project recognized that many saltwater Traditional Owner groups have formalised sea country management priorities and as such, identified that providing opportunities for Indigenous rangers and community members to be involved in this project was paramount.

Indigenous engagement and communication plans were developed to map the processes that project staff could follow to best establish a meaningful two-way relationship with Traditional Owner groups interested in taking part or hearing about the project outcomes. They also detailed how staff could engage with Traditional Owners in a culturally respectful manner that recognized the interests, rights and IK in land and sea country.

Table 2 Traditional Owner groups engaged in the project

Traditional Owner group	Tagging site	Contact engagement outcome
Girringun	Dunk Island and Hinchinbrook area	Indigenous rangers participated in all tagging trips conducted in and near Dunk Island. Aboriginal elders came out on the Girringun ranger vessel to observe and discuss hammerheads with research team.

Traditional Owner group	Tagging site	Contact engagement outcome
Jabalbina	Northern Batt Reef	Contact made with EO and rangers. Opportunity for Indigenous rangers to take part in tagging trip made.
Yirrygandji	Southern Batt Reef	Indigenous rangers participated in two Batt Reef tagging trips.
Yuku Baja Muliku	NA	Ranger co-ordinator participated in the first Batt Reef trip.
Kyburra Munda Yalga	Bowen	Email and phone contact attempted. No response received. Follow-up made through GBRMPA. No response received.
Djunbunji	Cairns South	Meeting to discuss possible trips on sea country (nb. Tagging didn't occur on their sea estate).

How were Traditional Owners and Indigenous rangers involved in the Hammerhead project?

Table 3 Traditional Owners and their involvement in the project

Purpose of engagement	Date	Who was involved with the engagement?	What resulted from engagement?
Project introduction to Girringun Aboriginal corporation (Hinchinbrook); information and fact sheets provided; formal letter requesting a meeting to discuss the project sent to Girringun TUMRA staff.	14 Feb 2017 28 Feb 2017 31 Mar 2017	Girringun Indigenous rangers and Traditional Owners (3)	• Project officer has expressed interest, we are currently waiting for an opening to present at a community meeting.
Project introduced to Kyburra Munda Yalga (Juru Traditional Owners – Bowen region), fact sheet sent with formal letter seeking a meeting and further engagement.	28 Feb 2017	Chair of the Prescribed Body Corporate	• Awaiting feedback from Chair
Trip to Yuku Baja Muliku community in Cape York; present project at TUMRA meeting facilitated by Great Barrier reef Marine Park Authority	6-10 Feb 2017	Yuku Baja Muliku Traditional Owners YBM Indigenous Rangers	• YBM Rangers are engaged in the project, interviews regarding cultural knowledge and values have been conducted.
Engaged Indigenous artist Safina Stewart (Wuthathi and Torres Strait Island Traditional Owner) to produce artwork for the project shirts as per Indigenous Communication Plan. IP Agreements in place.	Final artwork received Feb 2017 Shirts received 7 April 2017	Safina Stewart	Shirts have been distributed to some team members, with distribution to team members and participating Traditional Owners ongoing. Feedback on shirts has been extremely positive.

Purpose of engagement	Date	Who was involved with the engagement?	What resulted from engagement?
			
Meeting with Yirrganydji Indigenous Rangers (Cairns) to formally present the project	15 Feb 2017	Yirrganydji Indigenous Rangers	• Agreement from Yirrganydji to engage in the project, commitment to have a Ranger participate in the next tagging expedition.
Attended Laura Dance Festival on invitation of Yuku Baja Muliku rangers to engage Cape York Indigenous communities about the project, establish connections and seek information	29 Jun – 1 July	Karin Gerhardt and Andrew Chin hosted by Yuku Baja Muliku rangers Cape York Indigenous communities QPWS Indigenous Ranger Cape York Natural Resource Management	• Promoted project through project t-shirts and fact sheets • Talked to stall holders and artists about hammerheads, identified that one group from the western Cape has noticed hammerhead declines Informed Indigenous rangers working with Qld parks and Wildlife Service about the project, discussed opportunities for QPWS Indigenous rangers to participate in tagging trips
Rangers from Yuku Baja Muliku (Cape York) and Yirrganydji (Cairns) participated in a hammerhead tagging expedition offshore Port Douglas	21-29 July 2017	(Yirrganydji) (Yuku Baja Muliku ranger)	• Meaningful participation by Indigenous Rangers with project • Rangers trained in shark tagging and handling Transfer of knowledge regarding Traditional values and scientific understanding of sharks and Sea Country
Meeting with Djunbunji group (Cairns south) to introduce the project and gain support for further engagement	21 and 30 July 2017	Executive Officer	• Established contact point for project communication • Open invitation to visit the rangers and discuss the project Exploring opportunities to have a Djunbunji ranger come out on a future tagging trip
Introduce the project and establish relationship with Jabalbina Aboriginal Corporation to foster ranger participation for information exchange	26-30 June 2017	Jabalbina CEO IPA Manager	• Established contact point for project communication • Invitation to speak with rangers in Mossman Exploring opportunities to have a Jabalbina ranger come out on a future tagging trip
Meeting with Girringun Aboriginal Corporation to introduce the project and gain support for further engagement	8 August 2017 24 August 2017	Ranger Coordinator Ranger	• Established contact point for project communication • Ranger interest and support secured, a Girringun ranger will participate in the Hinchinbrook tagging trip in September

Purpose of engagement	Date	Who was involved with the engagement?	What resulted from engagement?
Rangers engaged to locate satellite tag deployed off Bowen that washed ashore near Lucinda			• Rangers mobilised to search for tag
Yuku Baja Muliku rangers engaged to locate satellite tag deployed off Cairns that washed ashore near Cooktown	22 August 2017	Ranger Coordinator CEO	• Rangers informed of tag needing retrieval
Rangers from Girringun Aboriginal Corporation (Cardwell) participated in a hammerhead tagging expedition offshore Dunk Island and the Hull River, visit by a Jiru elder to see tagging work in progress	10-14 September 2017	Ranger Coordinator senior ranger Jiru elder	• Meaningful participation by Indigenous Rangers with project • Rangers trained in shark tagging and handling • Transfer of knowledge regarding Traditional values and scientific understanding of sharks and Sea Country • Met with a highly respected elder from the region, broadened cultural understanding
Rangers from Girringun Aboriginal Corporation (Cardwell) participated in a second hammerhead tagging expedition offshore Dunk Island and the Hull River.	4-10 Nov 2017	Ranger Coordinator senior ranger ranger	• Meaningful participation by Indigenous Rangers with project • Rangers trained in shark tagging and handling • Transfer of knowledge regarding Traditional values and scientific understanding of sharks and Sea Country
Yuku Baja Muliku visited AIMS and JCU as part of a career pathway trip to Townsville. Andrew Chin and Karin Gerhardt were present at AIMS and JCU and organised the JCU day.	1-4 Dec 2017	24 YBM junior rangers 14 YBM adults (including 11 rangers and/or Traditional Owners)	• Providing reciprocal learning and knowledge exchange with YBM group • Presented career advice and showcased opportunities for rangers and YBM youth to engage in research Wide engagement with community about hammerhead project and other research at AIMS and JCU
Visit to Yuku Baja Muliku group Cape York	April 2018	6 Yuku Baja Muliku Indigenous rangers, 4 Yuku Baja Muliku Traditional Owners	• Continuing to work with Traditional Owners and rangers on cultural values of sharks and rays.
Visit to Mungulla Station (near Ingham)	May 2018	Various Traditional Owner groups (2 people from each group) from along the eastern and western coast of Queensland that gathered for compliance training.	• Met with and fostered existing relationships with Traditional Owners who have worked with scientists on the hammerhead project (or people who had expressed interest and wanted an update on the project).
Visit to Yuku Baja Muliku group Cape York	June 2018	6 Yuku Baja Muliku Indigenous rangers, 4	Doing evaluation on the Indigenous engagement side of the Hammerhead project.

Purpose of engagement	Date	Who was involved with the engagement?	What resulted from engagement?
		Yuku Baja Muliku Traditional Owners	
Email to Yuku Baja Muliku, Girringun, Yirrganydji, DjuBunji, and Jabalbina Indigenous rangers to update the groups on the tagging program and project.	25 June 2018	Ranger coordinators from five Indigenous ranger groups	Ranger coordinators updated on project progress.
Ongoing….			

3.3 Feedback

A number of check- points were built into the Indigenous engagement and communication plans to enable reflection and improvement opportunities. Formal feedback was sought after tagging trips and after communicating the results of the project. Informal feedback was also collected during the project rollout to assist in project review and reflection points.

3.3.1 Feedback summaries

During project set up and initial contact

Although Traditional Owner groups were very supportive of the research topic (and questions), many of the groups expressed their concern that the research projects are set up before people talk to Traditional Owners. It is only after they (scientists) have permits and funding that they come and talk to the owners of the country. It is not seen as a fair or respectful process.

There is a strong desire by Traditional Owners to be involved in research.

Quotes

> "General feeling of not being involved in development of projects and then have scientists approaching the group for support or involvement"[1].
>
> Scientists know there are 'boxes' to tick for funding providers. "Don't like it. Start discussions early. Build TOs into projects and map the funding accordingly"[1].
>
> "Incorporate early feedback when contacting TOs. Good and bad. The questions that researchers are asking about the hammerhead population structure are important to Traditional Owners. People have been looking after their sea country for thousands of years. They aren't just relying on IK to support their contemporary management – science is important to them. Remember though – that people may have questions they want answered too. It's frustrating to only look at the questions you want answered [2].

"Traditional Owner are moving into a space where their research needs are being documented and prioritised. Scientists and managers need to be aware of this."[3]
"I'm disappointed that funding for ranger involvement is never planned into these projects. I'm glad you are here and asking about our country before you go out. Sometimes we only hear about researchers been out there after they're finished"[1]

During tagging trips

The rangers who took part in the tagging trips all reported very positively about the event. The research crew were very supportive, and they were excited to be 'actually involved' in the tagging tasks. One participant reported that 'Andrew was unreal[1]' and that 'it was easy to work with him[1]'.

Quotes

"We like to know what is going on in our sea country. Sometimes we learn from you, sometimes you learn from us"[1]

"I loved working with the sharks. That was so cool."[1]

From Dr. Andrew Chin: "the YBM, Yirrganydji and Girringun rangers were fantastic in the field, hard-working, enthusiastic, great with boats and the water, and really great in working as part of the field crew."

4. SUMMARY

There were numerous challenges presented by this project, but most of them concerning Indigenous knowledge collection were anticipated. Accessing and documenting Indigenous knowledge for a scientific (western) project was always going to be difficult and the project timeline for involving Traditional Owners in the larger cultural knowledge project was a mismatch (from a PhD project perspective anyway). Even with existing community relationships in place, it would be good to start project communications with Traditional Owners 12-18 months before the project start date.

In Australia, which is a world leader in marine fisheries research, there is very little Indigenous knowledge recorded on the hammerhead shark. In communities where sharks hold cultural significance and in places where sharks play an important role in Indigenous fishing, there is opportunity for collaborative research or planning approaches between Traditional Owners, scientists and fisheries managers. There are a myriad of outcomes that could be achieved from a collaborative approach between Indigenous peoples and scientists. The challenge (and opportunity) moving forward is that it will take a lot of thought and consideration in developing research that is ethically and culturally appropriate.

In Australia there is growing support for the inclusion of IK holders in science and whether it is through the development of tools or an improvement in the cultural competency of scientists, shark management and research could provide an avenue to enable the full and equitable participation of Indigenous knowledge holders in research and management.

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Subscript references

	Source	Link or location
1	Girringun	De-identified participant. Records with Karin
2	Jabalbina	De-identified participant. Records with Karin
3	Yuku Baja Muliku	De-identified participant. Records with Karin
5	Masig Island	http://www.tsra.gov.au/__data/assets/pdf_file/0007/4498/Masig_Biodiversity_Profile_January_2013.pdf
6	Ken Thaiday Interview	https://australianmuseum.net.au/blogpost/science/triple-beizam-hammerhead-shark-headdress-an-interview-with-ken-thaiday
7	Djon Mundine interview	http://www.abc.net.au/radionational/programs/earshot/indigenous-cultural-views-of-the-shark/6798174
8	Gabtitui Newsletter	http://www.gabtitui.com.au/__data/assets/pdf_file/0003/8166/gab-titui_newsletter_issue3_jul2014.pdf
9	TRSA	De-identified participant. Records with Karin
10	Badu, Saibai and Thursday Island.	Joey Laifoo artwork http://umiarts.com.au/resources/exhibition-catalogue 2010 artist profile with paintings (Dragnet)
11	Hammond	http://umiarts.com.au/resources/exhibition-catalogue Ceferina Sabatino artwork Small Trevally (Gai Gai), 2009
12	Badu	https://www.baduartcentre.com.au/artists/gehmat-nona/tupmul Gehmat Nona artist- Tupmul lino cut

APPENDIX A

4.1 Desktop study

Several methods were used to locate literature that was relevant to this review. In the first instance, searches were conducted across a number of databases (including the Web of Science™ , AIATSIS Indigenous studies bibliography, Annual reviews on-line, Cambridge journals on-line and Indigenous collection 1997- via Informit) using a wide variety of search terms in various positions. In each of the searches conducted, the words Traditional Knowledge, Traditional Ecological Knowledge, Traditional Indigenous Knowledge and Indigenous Knowledge were coupled with one of several expressions, which included 'cultural value', 'conservation', 'shark/s', and 'shark fisheries', 'shark management' and 'hammerhead'. These databases provided interdisciplinary coverage of the literature topic and ensured that the database search was as comprehensive as possible.

Secondly, searches for literature were carried out within the Google Scholar™ Internet search engine, again using the terms listed above.

Thirdly, searches for grey literature were conducted using the Google Chrome Internet search engine using same terms listed above but also including any traditional language names for the hammerhead that had been previously found (so 'kurrs', 'kursi', 'beizam', 'Irwapap')

In addition to web-based searches, requests for information regarding the topic of the literature review were sent to a number of people currently working in related fields to identify any recent (potentially unpublished) or significant work that they felt was relevant.

To be as comprehensive as possible in the literature search phase, the 'snowball method' of sourcing literature (Greenhalgh and Peacock 2005) was applied by scanning bibliographies of references already retrieved from other searches.

Artwork was another important source of information for this project. Searches of art studios (online), galleries and artist profiles provided by Island art centres were also reviewed for Indigenous knowledge about hammerheads.

Traditional Owner groups from the northern part of Australia were identified through TUMRA, IPA and WoC lists. Review of any management plan type documents for groups were also word searched for the term 'hammerhead' and 'shark'. This was an important step, because none of these documents appeared in the google searches, and yet hammerhead sharks were included in the descriptions. In these instances, key word searches were not effective and searching for people by place was the only option.

www.nespmarine.edu.au

Contact
Karin Gerhardt
James Cook University

email | Karin.gerhardt@my.jcu.edu.au