

Review

# An Introduction to Aboriginal Fishing Cultures and Legacies in Seafood Sustainability

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**Abstract:** The purpose of this paper was to explore the rich legacy of Aboriginal fishing cultures through historical and contemporary records, in order to inductively identify cultural and social elements which may enhance the aquatic resource sustainability knowledge and ethos in Australia. A thorough, comprehensive and analytical literature review was conducted. The literature review explored the importance of Aboriginal Peoples' (AP) fishing cultures, and identified examples of fishing practices, ideology and sustainable philosophy, which may be beneficial in sustainably managing dwindling seafood resources. The overriding theme of Aboriginal Peoples' fishing cultures is the taking of enough fish to ease personal/community hunger, and restricted fishing based on seasons and/or stock abundance. This practice protects fish during vulnerable or important stages, such as spawning, allowing fish stocks to regenerate, and allowing fish to be caught when they are healthy and most nutritious. It is considered that the Aboriginal Peoples of Australia can contribute significant knowledge to the management of dwindling aquatic resources. Access to sacred sites and favourite fishing grounds would benefit communities, would increase the contact between Aboriginal and non-Aboriginal Peoples, and may assist in an interchange of sustainability information and philosophy. The world's aquatic resources are dangerously depleted. Without a significant shift in focus, this will continue. Rather than relegate the fishing cultures of Aboriginal Peoples to 'histories past', we can learn valuable lessons to conserve aquatic resources, and to better understand the interconnectedness with the environment inherent in their cultures. Fishing is used as a generic term for both freshwater and marine fishing in this article.

**Keywords:** fish; seafood; environment; value

## 1. Introduction

Since the dawn of humankind, fish and fishing have been integral parts of human life. Fish is the main source of dietary protein for many people globally [1,2], and is an important traditional and cultural element in many communities and societies [3,4]. Fish/fishing contributes significantly to poverty alleviation and food security in many countries [5], and is a strategic globally-marketed product [6].

In order to obtain a better understanding of the crucial role that fish/fishing has played in shaping culture/society, a multifaceted approach is needed. Therefore, historians' investigations into the role of fish/fishing in forming ancient societies is important. This traditional fishing knowledge can play an important role in the sustainable management of marine ecosystems and seafood resources. The discovery of the connectivity between the fish/fishing cultures of people from different communities is important. Finally, a greater emphasis on the ecological fragility of contemporary aquatic resources

should be comprehensively communicated, such that fish are not seen as an inexhaustible resource, but rather as highly valued and in need of urgent management. To achieve this goal, advanced scientific research and new technological progress should be inclusive of the profound lessons in sustainability that Indigenous cultures can provide. A better representation of our country's history will allow Australians to appreciate the rich legacy of sustainability that Aboriginal Peoples (AP) can provide. Giving Aboriginal Peoples a greater voice in the ways in which land and sea environments are managed will lead to more sustainable outcomes for fisheries.

## 2. Aims and Article Structure

This current introductory paper focuses on Aboriginal cultures and Peoples in order to discover what can be learnt from their cultural legacies to support sustainability in fishing. This article does not discuss the Torres Strait Islander fishing cultures, which are distinct to those of the Aboriginal Peoples of Australia. This paper aims to inductively identify a number of key cultural, social, ideological and spiritual elements related to the fish/fishing practice of the Aboriginal Peoples of Australia through a comprehensive and analytical literature review. This article also aims to demonstrate, through the use of early post-settlement historical records, the state of seafood resources in Australia under the stewardship of Aboriginal Peoples. The concepts identified and the knowledge presented in this review provide a bigger picture to illustrate the ways in which Aboriginal Peoples conceptualise the importance of fish/fishing in their culture.

This paper is conceptual; the format of it includes a clear and specific 'claim', which differs from a 'fact', supported by relevant and reliable references and authors' interpretation and analysis [7]. To present a claim, a sound argument to justify its validity and credibility must be constructed, and the 'claim' defines the aim, approach and scope throughout the paper.

This paper will first explore the importance of the Dreaming to all facets of Aboriginal Peoples' spirituality and community life, both past and present. Their reverence for aquatic resources and the esteemed place that fishing holds in Aboriginal cultures will be discussed in a historical context. Examples of the robustness of fishery resources at the point of European settlement will then be used in order to support Aboriginal Peoples' sustainable fishing practices. The restrictive policies which have limited the ability of Aboriginal Peoples to perform traditional fishing practices will be introduced, along with examples of cultural fishing practices which are being successfully integrated into contemporary ventures. The findings of this paper are expected to create productive lines of inquiry and hypotheses for future research.

## 3. Literature Search

Because many of the historical documents could not have been identified via a traditional search of academic databases, the literature search for this conceptual article did not follow the method of a typical systematic review. Charles Sturt University Wagga Wagga maintains important Australian historical records in the 'Margaret Carnegie Collection'. This collection has restricted access and can only be viewed in person. Other documents, such as the Board for the Protection of the Aboriginal Reports and other historical reports, were available at the Institute of Aboriginal and Torres Strait Islander Studies website, which has an extensive online collection of Australian historical works. Trove, a collaborative initiative of the National Library of Australia in partnership with other Australian organisations, was also an invaluable source of online historical records. In addition, Project Gutenberg, a repository for free electronic texts, provided many of the detailed historical records. The commentary on the state of seafood resources immediately post settlement was obtained from the records of early European explorers as they mapped parts of Australia. Other documents, such as the Historical Records of Australia and the *'Method for Promoting the Civilization of Aboriginals'* were obtained by interlibrary access arrangements, through CSU Wagga Wagga. Whilst some academic works cited in this manuscript were the result of a traditional literature search, the authors also frequently gathered information opportunistically from historical records. Many of these records did not contain information of direct

relevance to this manuscript, but provided all of the authors with a greater insight into the diversity and breadth of Aboriginal Peoples' cultures.

#### 4. Dreamtime/Dreaming

Aboriginal cultures are said to be 'geosophical', as opposed to God-centred (theosophical), cultures [8]. The Aboriginal writer Mudrooroo describes Aboriginal spirituality as "a oneness and an interconnectedness with all that lives and breathes, even with all that does not live or breathe" [9]. Uncle Bob Randall describes the law of Kanyini as one of responsibility to each other, connectedness, and of community rather than self. "We practise Kanyini by learning to restrict the 'mine-ness', and to develop a strong sense of 'ours-ness'" [10]. Jeannie Herbert Nungarrayi, of the Tanami Desert Warlpiri Peoples, explains the Dreaming as an "all-embracing concept that provides rules for living, a moral code, as well as rules for interacting with the natural environment" [11]. In order to understand the ways in which Aboriginal communities conceptualise the importance of fish/fishing in their culture, it is important to embrace the complex concept of Dreaming as the nexus of the individual contribution, obligatory to the proper functioning of the inhabited environment in its entirety [12]. It should be noted that, although many scholarly publications refer to Dreaming in a historical context, Aboriginal writers and scholars state that 'Dreaming' "isn't something that has been consigned to the past but is a lived daily reality" [11]. Clearly, the Dreaming still suffuses and shapes the life and spiritual beliefs of contemporary Aboriginal societies [13]. According to Randall [10], Aboriginal spirituality is connected by similar core concepts; however, there are regional differences. In a culture which relied on finding and sustainably utilising food in order to survive, it is not surprising that many Dreamtime stories involve fish. These stories, of great relevance in an age of over-exploited marine resources, guide the seasonal routines and restrictions associated with the harvest and consumption of aquatic resources. These behavioural tenets are imbued with a respect for natural resources and an implied stewardship which does not draw distinction between natural resources and "spirits of the land" [13]. A greater understanding of the Aboriginal Peoples' Dreaming may allow a gradual infusion and cross-cultural ethos exchange, a less greedy approach to the harvesting of aquatic resources, and a more widespread understanding of the custodial responsibilities we all have towards the maintenance of natural resources.

#### 5. Community Structure

Cruse [14], describing a coastal Aboriginal fishing community, weaves a picture of contentment with a synchronicity and rhythm to the described daily activities. A literal translation of the song 'Nung-Ngunun' provides insight into the perception of societal contentment and "ours-ness" with the community and the environment:

Ours is the place where the mountains cohabit with the heights  
 The eagle hawks and wallabies are happy  
 Ours are the boomerangs and waddies, they are like Snakes lying asleep  
 The kangaroos dance on the grass to smooth it down  
 Ours is the head of the fish in the water  
 The sweet honeycomb, the nectar inside the wooden bowl  
 Ours are the splendid and beautiful young women [15].

Although gender roles may have differed between groups, Cruse [14] describes men leaving camp early to hunt local game. The women, babies and children may have decamped to the beach, and at low tide collected shellfish [16], crayfish, shrimps and young fish-fry [17]. Some seafood was cooked over open-fire at the beach [13], followed by fishing at high tide whilst the children played. An eyewitness account from 'A Voyage to New South Wales, January 1788–August 1788' [18], describes a mother fishing from a shallow canoe with a young child laying in her lap. This may

provide testimony to the strong influence that women had on the inter-generational perpetuation of fishing cultures. Hunter et al. [18] commented that women mainly used canoes, with lines and hooks, which Lampert and Hughes [19] considered the domain of women. Men using a fish spear [14,18,19] in combination with women foraging and using hook and line allowed a meticulous harvesting of seafood resources. In the middens of Bass-Point, which contain fish hooks, Bowdler [20] observed—in the same echelons—a greater size variability of fish remains. Lampert and Hughes [19] credit the increased access to rich seafood bounty with a significant population enlargement in coastal communities. The development of fish hooks meant a new resource zone was available, the reflection of which can be seen in larger catches of bottom-feeding types of fish [19]. Archaeological evidence along the south coast of New South Wales suggests that there was a significant Aboriginal population, as deposits from middens (refuse pits) show heavy exploitation of local seafood during the ~60,000 years of occupancy [19,21].

In some south coast communities, children were included in bobbing for fish fry [22]. Mothers and children gathering seafood [14,16–18] predominate in descriptions of Aboriginal culture, the inference being that teaching children techniques to optimise seafood harvest may have been maternally-driven [13]. Children have a strong propensity for mimicry, which reinforces the importance and significance of Aboriginal women educating the next generation in fishing knowledge and skills. It was and still is expected for Aboriginal children to listen deeply and recite Dreamtime stories [13]. It has been considered a parental responsibility under traditional Aboriginal cultures/laws [23] to define a child's identity and their connection to all facets of life [24]. In north-west Arnhem Land, it is noted that children's songs often imitated adult versions, and described the local flora and fauna. The songs include environmental information that is important for survival. "Where you see chicken hawk, there you find kangaroo" is an example [25]. Paying attention to the details within each story and song must have been integral to the continued survival and accumulation of oral knowledge over many generations. As Graham [26] notes, "Aboriginal Law never changes". This perpetual renewal of fishing knowledge through the generations seems to be an invaluable resource which could be used to address and manage issues in aquatic resource sustainability.

## 6. Fishing Economic Currency

Australian Aboriginal Peoples reflect the varied environments they inhabited. For example, the 'Ngurunderi' is a totemic figure of lower Murray River communities, and it includes a giant cod fish Dreamtime story. Similarly, 'Barramundi Dreaming' belongs to the Peoples of the East Kimberley, and uses the fish of the region to describe the Dreamtime origins of the Barramundi Gap [27]. Regional differences are evident in fish capture methods: stake, bush, log traps, stonewall and poison have all been described [16]. Aboriginal Peoples inhabiting the south coast of Australia were considered to be the first to fabricate a fish hook from the ground edge of large turban shells. Hawks' talons were also utilized, with less success [18]. The shell fish hooks and files excavated in a Durras North Sea cave are peculiar to the area [21]. Some Aboriginal women living on missions and reserves with restricted fishing equipment even fashioned fish hooks from safety pins [28].

## 7. Fishing Culture

It is generally considered that the British colonisation of Australia significantly curtailed the ability of Aboriginal Peoples to perform their cultural fishing practices. Castle and Hagan [29] argue that "the economic position of Aboriginal Peoples in settled areas was shaped . . . by the process of land settlement, the . . . convict system and the legacy of . . . Aboriginal resistance . . . to the white alienation of their land" (p 24). Certainly, Aboriginal Peoples' cultural, religious and economic structure was founded on the 'landscape'. The community cohesion provided by daily hunting/gathering activities and sharing resources, belonging, and 'ourness', enabled the prioritization of sustainability over greediness, and provided the bedrock of a stable society. Profitable resources and sites were the first to be appropriated by settlers [30]. On the Australian south coast, traditional and bountiful fishing

grounds along river flats and lakes were seized by pastoralists during the 1820s. The best camping grounds with fresh water access, a coastline supporting plentiful shellfish and lookout-points for fish spotting were also appropriated early [14,31]. Anderson [31] describes the effect that tin mining had on the Kuku-Nyungkul community of the southeast Cape York Peninsula in 1888. Regularly-frequented campsites disappeared as the water became useless for cooking, bathing, drinking, spear fishing and/or fishing. In contemporary times, the struggle of Aboriginal Peoples to maintain 'Country' is exemplified in the fight to restrict Xstrata Zinc from expanding mining operations [32]. The expansion of the mine impacts the McArthur River, which is the Dreamtime pathway to the creator spirit, the Rainbow Serpent. The law of The Rainbow Serpent, only fishing to satiate hunger, abides in the culture of Aboriginal Peoples. The fight to save this area is not only motivated by the strong spiritual connection to the region but is also inextricably linked to environmental and aquatic animal health. Environmental impacts include high levels of mine-derived lead found in fish near the mine [33]. A Garawa leader commented that the mine had contaminated the river to an extent that "no-one fishes there anymore" [34].

Singing songs and storytelling were often humorous, and involved hunting, fishing, rain, thunder and for the rising of the sun. These differed between gender, responsibilities and age [25,35], and are immortalised in the songs of Gurrugumar, the westerly wind that was asked to flatten the sea to enable fishing, 'gathering oysters' and 'asking dolphins to herd fish into shallow water' [13,14]. The games that children played focused on their future roles within communities which utilised seasonal resources [14]. In essence, the act of fishing is a physical and spiritual affirmation of Aboriginal identity and culture which was assiduously nurtured in younger generations. The practical application of traditional fishing knowledge was and is taught and learned in an archetypic way [36]. It is clear that the loss of coastal lands to colonisers and the removal of people—particularly women and children—for use as domestic servants has had a detrimental effect on many coastal Aboriginal groups. In a report by Poiner [37], on behalf of the New South Wales (NSW) Aboriginal Land Council, it is clear that "misguided prosecution of Aboriginal People for exceeding fishing bag limits" and "the extent to which fisheries management regimes support greater participation of Indigenous Australians" is still inhibiting the ability of Aboriginal Peoples to pass on cultural fishing knowledge.

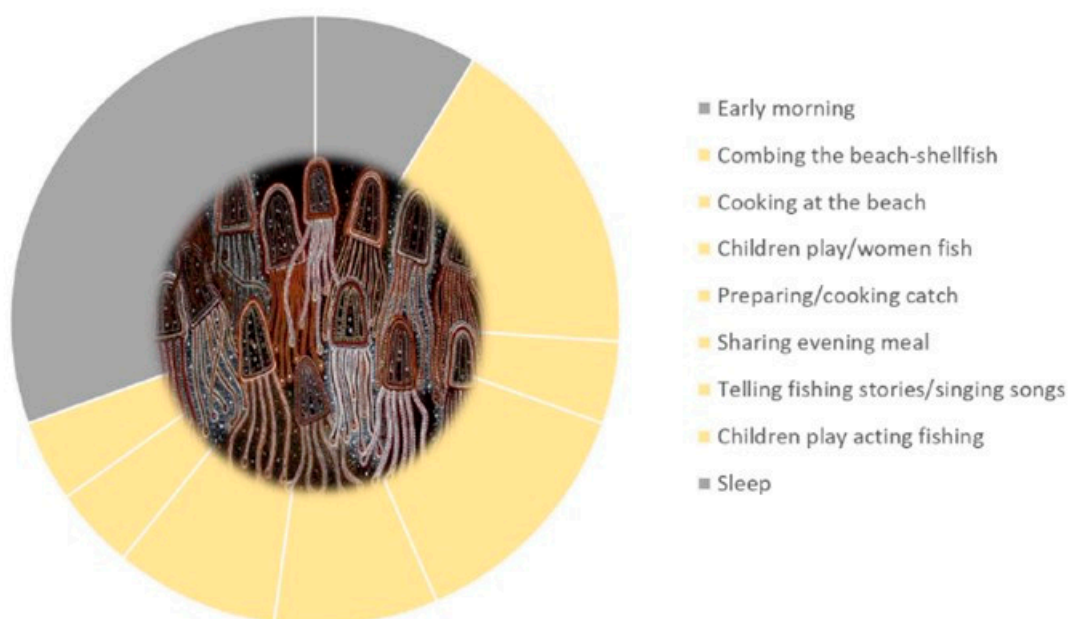
## 8. The Right to Fish

In 1837, the British House of Commons 'Select Committee on Aborigines' declared that the observation of British law by Aboriginal Peoples was absurd, and that the punishment or penalization of their non-observance was conspicuously unjust [38]. However, these views were not reflected in recommendations of future colonial policy, nor in the dispatches between Glenelg and Bourke (1837) or Lord John Russell to Sir George (1840) [39,40]. The recommendations focused on Aboriginal Peoples as British subjects, who were to receive equal protection of law, but were also subject to British law, which was expected to supersede their own. It was considered that Aboriginal Peoples, through protection, would ultimately learn the benefits associated with Christianisation and Western civilisation [41]. By 1876, the physical manifestation of the recommendations made by the British House of Commons had led to a peripheral existence around white settlements, profoundly impacting Aboriginal fishing cultures. The twelfth report of the 'Board for the Protection of the Aborigines' (1876) [42] highlights a general ignorance of the importance of Aboriginal fishing cultures, and reflects a supremacist restrictive regulatory policy curtailing Aboriginal Peoples' freedom of movement. John Bulmer, Mission Station, Lake Tyers, Gippsland, reported "the blacks were only allowed two days a week for hunting or fishing" (p. 18). Dr. Jamieson and Mr. Goodall, Framlingham Station, observed that, despite the provision of housing, Aboriginal men continued to fish every Saturday, and Mr Hagenauer, Mission Station, Ramahyurk, Lake Wellington, reported that "some, of the old blacks prefer fishing" [42].

## 9. Early Records of Seafood Resources

According to Frijlink and Lyle [43], the analysis of historical observations and data and the documentation of local ecological knowledge is used in marine ecology to understand the changes in fish populations over time. The records of early European explorers/naturalists, as they mapped/explored Australia post-settlement, provide a reliable snapshot of seafood resources under the stewardship of Aboriginal Peoples. These records also illustrate that invasive over-harvesting employed by Early European settlers, rather than human population pressure alone, may have been responsible for the rapid decline in favoured seafood species. Certainly, the ability to perform cultural fishing practices was severely curtailed for some Aboriginal Peoples (Figures 1 and 2) following European settlement. It is doubtful, from this time, that Aboriginal Peoples could have been responsible for the decline in aquatic resources. Cunningham's exploration (1827) of the Darling downs describes good fishing in the Condamine river, and an abundance of fish was described by Sturt (1829) during the exploration of the Darling–Murray river junction [44]. Gould (1870) described the abundance of Tasmanian giant freshwater crayfish (*Astacopsis gouldi*) which, according to the International Union for Conservation of Nature (IUCN), is now a critically endangered species due to overfishing [45]. In a report by Collins [46] (1798), ~4000 salmon were taken in two hauls by seine net, and a colony fishing boat caught "so many fish in the seine" that the net burst during landing. Ogilby [47] (1853), commented that "salmon make their appearance along our shores in shoals of marvelous magnitude, and are taken in large numbers by the seine, not infrequently causing a glut in the market". Reports indicate that, from the 1800s to the mid-1950s, Australian salmon were extremely abundant fish along the NSW coast. The numbers had declined north of Sydney by the 1950s [48]. In a survey of the interior of NSW Oxley [49] (1820) commented that although the "country itself is poor, the river is rich in the most excellent fish, procurable in the utmost abundance". Oxley [49] goes on to describe eighteen large fish, likely Murray cod, which were caught. Bennet [50] (1834), during an investigation of the NSW interior, wrote that large quantities of 'Native Perch' were caught in the Yass and Murrumbidgee rivers, and noted that some were enormous in size, and that one weighed one hundred and twenty pounds (54kg). Early settlers targeted Murray cod as a source of fresh food. From the 1860s, a large inland commercial fishery was established, situated mainly on the Murrumbidgee and Murray rivers. In 1883, in excess of 147 tons of Murray cod were sent to Melbourne from the port of Moama alone. There was a gradual decline of Murray cod from a peak harvest during 1918; however, by the mid-1930s, the fishery became unprofitable. Overfishing between 1800 and 1930 was clearly pivotal in [51] Murray cod (*Maccullochella peelii*) being included in the IUCN critically endangered red list [52].

## Twenty four hours in the life of coastal Aboriginal peoples before European settlement



**Figure 1.** A reconstructed twenty-four hours in the life of coastal Aboriginal peoples' pre-white settlement. Fishing or activities relating to fishing dominated the time budget. Of ~17 h of time awake approximately 88% related to activities associated with fishing (in yellow). Not only was the time spent fishing of importance to the endurance of the community but is also taught children the techniques and traditions associated with fishing. In addition, the food harvested provided for the community at large with the catch universally shared between group members. Original Figure developed from information at Cruse (2005). (Any images used in development of these figures were freely available via open access Creative Commons).

Framlingham Aboriginal Station, 31st December 1875



Church, Mission Station, Lake Tyera, Gippsland, 5th January 1876.



**Figure 2.** Reconstructed time budget for cultural fishing practices at two Stations 1875–1876. (A) By 1875 in Victoria male Aboriginals at Framlingham Station were permitted to fish only during Summer evenings. The pie diagram represents 24 h and in yellow the hours males were permitted to fish each day during summer; (B) In 1876 at Church Mission Station both men and women were only permitted to fish two days per week. The pie diagram represents seven days and in yellow the two days permitted for fishing. Original Figure developed from information at Victoria (1876). (Any images used in development of this figure were freely available via open access Creative Commons).

## 10. A Cultural Imperative

Faulkner [36] considers fishing, including the application and dissemination of traditional fishing knowledge, to be a cultural imperative which defines Aboriginal peoples' sense of identity. Therefore, it is crucial that the legitimacy of fishing as being fundamental to Aboriginal cultures is incorporated into contemporary Australian legislation. There have been a number of inquiries/regulations/studies, spanning 1991 to 2010 [53], commissioned by the federal/state governments which highlight the importance of the recognition of Aboriginal fishing as mutually inclusive of their culture [36]. Despite a greater contemporary societal conscience regarding Aboriginal Peoples, in regard to fishing rights, Aboriginal Peoples have expressed dissatisfaction with the regulations they are compelled to follow. In 1986, The Australian Government recognised that (within certain limits) Aboriginal Peoples had the right to retain their racial identity and traditional lifestyle, including the protection of Aboriginal peoples' right to hunt/gather/fish [38]. Within the same report, Aboriginal observers from Cairns/Rockhampton remonstrated that commercial fishermen were permitted to net dugong whilst non-reserve Aboriginal Peoples were not, and at Aurukun, commercial fishermen had disturbed sacred sites. A letter to the 'Productivity Commission Draft Report—Marine Fisheries and Aquaculture' in 2016 from the NSW Aboriginal Land Council [37] clearly shows that the issues surrounding the ability to perform cultural fishing practices in NSW have not "been dealt with appropriately or sufficiently" (P. 2). Pages 2–3 of the same communication provide seven key principals as a framework towards addressing the fishing rights of Aboriginal Peoples. Principal three declares the need for the "development of a framework that facilitates working together for the sustainable management of fisheries for future generations, and provide for self-regulation and management, through local decision-making". This seems to be a positive step which could be taken, which addresses the fishing cultures and rights of Aboriginal Peoples and the contribution that they could make to sustaining seafood resources. Wright [54], in a 2020 review of the corporations (Aboriginal and Torres Strait Islander) Act 2006 (cth), makes clear that "embedding Western concepts" at the "expense of Indigenous values and traditions" is still a fraught issue that is yet to be resolved.

## 11. Restrictive Government Fishing Policies

Fishing restrictions are an example of the ways in which legislation limits Aboriginal Peoples' ability to concentrate a fishing effort, which impacts and disadvantages the care of the community in which the catch would generally be shared. In a report compiled from May and November 1999 after 51 consultative meetings across 30 aboriginal communities in northern NSW [36], fishing rights, "restrictions and access to fishing spots, imposition of recreational fishing regulations, the role of fishing and collecting within their culture and identity, as well as habitat degradation and reduced fish stocks" were all issues that were still affecting communities (p. 84). Foremost were the criticism that the Government was unable to conceptualise Aboriginal fishing culture as being dissociated from recreational fishing [36], and policies such as bag size/species limits. A key feature of Aboriginal fishing cultures, past–present, is taking only what is required for family members, the community, and the elderly [14]. Australian bag limit legislation, as it applies to Aboriginal Peoples, is surely tinged with hypocrisy when overfishing is responsible for the depletion of abalone stocks [55], and is redundant when Aboriginal Peoples' fishing cultures are intrinsic for the conservation-friendly harvesting of marine resources. According to 'Uncle Doonie' of Wallaga, NSW, "I haven't had a feed of mutton fish for nearly about eight years. Can you please bring me one abalone, I don't get none" [14]. Daily bag limits in NSW, currently in December 2019, for abalone (*Haliotis rubra*) are restricted to two a day, and saltwater crayfish, a target species for Aboriginal communities [36], are also limited to two [56]. This means that, should a celebration occur, a special permit must be applied for in advance. Ty Cruse was the first to be granted a special permit from Fisheries Victoria to 'take, transport and possess' 75 abalone and 10 rock lobster for a ceremonial event, and commented that the process was protracted and punctuated with red tape [14]. Both surf clams (*Donax deltoids*) [57] and blacklip abalone (*Haliotis rubra*) are now harvested commercial species [36,53]. Vivienne Mason, the administrator for the Bega

Local Aboriginal Land Council, commented that coastal Aboriginal Peoples have used abalone as a subsistence food for thousands of years when white people did not know what they were. Since it has become a lucrative export market, Aboriginal Peoples are often chased away from gathering traditional food, and are intimidated by commercial vessels [53]. The prohibitive cost of abalone licences makes it generally impossible for the Indigenous to legally gather traditional foods [36]. The reported landings of surf clams (*Donax deltoids*), commercially harvested since the 1950s [58], have steadily decreased from 2005–2009. The bi-6-monthly seasonal closure of commercial fishing for *Donax deltoids*, implemented as a result of dwindling numbers [57], and the restrictions on where *Donax deltoids* can be collected and used [59], further inhibit the legal gathering of a favoured seafood [36]. Schedule 4, 'Fish and waters protected from recreational fishing NSW', lists 144 waters protected from recreational fishing, and a further 81 with seasonal conditions attached to target species/waters [60]. The Queensland Department of Agriculture and Fisheries lists four freshwater seafood species with seasonal catch restrictions, and 37 waters that are closed to all forms of fishing; five tidal species and four waters that are closed to netting; four that are closed to collecting gastropods and bivalve molluscs; 28 that are closed to spear fishing; and 17 that are closed to all forms of fishing [61–64].

## 12. Sea/Saltwater Country and the Inclusion of Traditional Knowledge

According to Smyth and Isherwood [65], although Aboriginal Peoples belong to contrasting groups who differ in language, culture and environment, without exception "estuaries, beaches, bays, and marine areas" ('Sea/Saltwater Country') are considered indivisible from traditional terrestrial estates. Sea/Saltwater Country is also distinctive for the culturally-important sacred sites of Aboriginal Peoples. Despite the deleterious effects that British colonisation had on the ability of Indigenous Peoples of Australia to perform traditional fishing cultural practices, according to Rist et al. [66], Aboriginal Peoples maintain an abiding cultural connection to traditional Sea/Saltwater Country. The inexorable endeavour to have their legal rights to resources of the Sea/Saltwater Country' recognised has led to a number of promising reconciliations and initiatives during the last 30 years. Smyth [67] provides a timeline account of major milestones in Aboriginal Peoples' fight to have the Commonwealth Government recognise their crucial and continuing relationship with the Sea/Saltwater Country. Smyth and Isherwood [65] detail the State initiatives to address Indigenous engagement in Marine Protected Areas, whilst Rist et al. [66] detail the evolution of the Indigenous Protected Areas (IPAs) program, in which the Australian Government supports Traditional Owners' involvement in the management of Sea/Saltwater Country. The National Indigenous Australians Agency map [68] shows the 76 current IPAs, however Sea/Saltwater Country appears to be less well-represented than terrestrial areas. Smyth [69] sets out 11 components in the 'Generic Structure of a Country-based Plan' (P. 14-15), in which a Traditional Owner group or coalition groups contribute traditional cultural, ecological values and vision amalgamated into a strategic approach to healing and sustaining 'Country'. The framework of the 'Country-based Plan' allows for affiliations between key stakeholders in the management of IPA's and for the voice of Aboriginal Peoples to be translated into 'Country' being treated as a "cultural and ecological whole" [66]. The success of the 'Country' model is evidenced in the Dhimurru Aboriginal Corporation, managed by the Traditional Owners, the Yolngu Wangu Watangu, in conjunction with commercial and recreational fishing stakeholders and relevant Commonwealth and State Government agencies. This IPA encompasses 550,000 hectares of marine estate surrounding the Gove Peninsula [70], and the initiatives include the management of marine turtles and crocodiles [66]. In addition, Anindilyakwa, Dhimurru and Nanum Rangers remove discarded ghost fish nets which threaten the critically endangered hawksbill (*Eretmochelys imbricate*), green (*Chelonia mydas*) and flatback (*Natator depressus*) turtles, and volumes of plastic debris which are a risk to fish, squid and jellyfish. [71]. These initiatives are certainly a positive step forward in having Traditional Knowledge guide the management and sustainability of Sea/Saltwater Country. However, according to Cullen-Unsworth et al. [72] the Australian High Court has deemed that the

Native Title rights must 'yield' when rights exist for commercial fishers, mariners, free passage, and public access to beaches and the sea.

### 13. Discussion

Our review shows that fish/fishing is central to the cultures of the Aboriginal Peoples of Australia, and that—under their stewardship—aquatic fish resources were bountiful. It is clear that a system of the seasonal harvesting of aquatic fish existed, which avoided spawning times and allowed fish populations to rebound. The authors hypothesize that Aboriginal Peoples' in-depth study of the ecology of Murray cod is analogous to other fish species. It is considered that much traditional knowledge of fish ecology, the central philosophy of sharing and harvesting sustainably could be gained from Aboriginal Peoples and incorporated into policies for the management of seafood resources. Our review also shows that the central philosophy of 'our-ness', sharing within the community, and the sustainable harvesting of fish is still of great cultural importance to Aboriginal Communities in Australia. In addition, the review highlighted that the sharing of the traditional fishing cultures and philosophies of Aboriginal Peoples with non-Aboriginal Peoples can only be beneficial to the sustainable management of seafood resources in Australia.

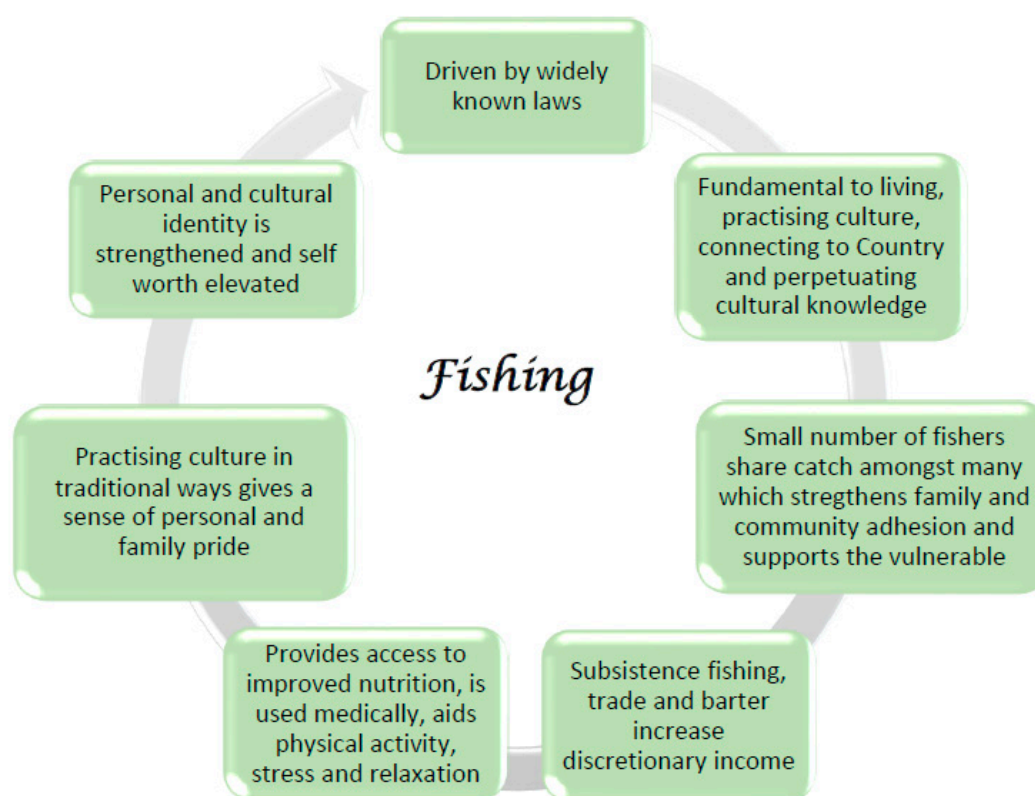
Together, the Aboriginal Peoples of Australia are the "longest surviving continuous culture in the world" [73]. A limestone cave (Riwi), in the south-central Kimberley region, Western Australia, showed occupancy ~46,000 years ago [74], and in Kakadu, Australia, the Madjedbebe rock shelter shows evidence of human activity ~60,000–50,000 years ago [75]. Scientific records of the fish and animal extinction which may have occurred preceding the European settlement of Australia are obviously limited. However, historical records show that, under the stewardship of Aboriginal Peoples, seafood resources were bountiful. Low population pressure pre-settlement history has been speculated to bias the arguments of Aboriginal Peoples as the 'perfect conservationist'. Australian salmon [48] and Murray cod [51] were major food sources of Aboriginal Peoples in some regions. Murray cod were abundant at the time of European settlement, including huge fish [50]. It is considered that the evidence of the health of the Murray cod populations in Australia during the stewardship of Aboriginal Peoples, even though the fish were a favoured food source, may be used as evidence that a local depletion did not occur, and that the fish were likely harvested sustainably. The evidence that very large Murray Cod were available in great numbers post-European settlement [50], show that this size, which is the most fecund, was not targeted by Aboriginal Peoples [51,76]. Although the extinction of the Australian megafauna has also frequently been hypothesised to coincide with the arrival and subsequent hunting actions (the overkill hypothesis) of the First Australians [77,78], this proposition is controversial and uncertain [79].

According to Pascoe [80], at the time of settlement, the British believed their success in industry, by proxy, accorded them the right and authority to civilise the world. Certainly, history appears to reflect little understanding of the custodial relationship that Aboriginal Peoples had with the natural environment, as Colonial government/settlers adopted an expansive exploitation of the natural and aquatic resources. Since the European colonisation of Australia (1788), 100 Australian endemic species have been declared extinct, although the actual number is considered to be far more [81]. Australian extinctions of endemic species represent ~6–10% of the recognised extinctions globally [81]. *The State of the World Fisheries and Aquaculture* (SOFIA) [82], released by the Food and Agriculture Organization of the United Nations (FAO), reports that 'biologically sustainable' fish stocks have declined from 90 percent (1974) to 68.6 percent (2013), 31.4 percent of fish are classified as biologically unsustainable or overfished, and 58.1 percent are totally overfished [82,83]. In Australia, catches of the iconic Australian flathead have decreased by 16.2 percent from 2015 to 2018 [84], and large fish biomass has declined 36 and 18 percent in fished reefs and marine park zones, respectively, where fishing was permitted [85]. Excessive fishing was concluded to have played a major role [86]. There has been much less research into the impact of recreational fishing on fish stocks [87]. In Australia, McIlgorm and Pepperell [88] suggested only ~50% of fishing charter operators are 'fishery logbook compliant',

and annual harvest levels may only be half of what is reported. A study in 2017 [89] showed that a significant number of aquatic species were harvested by the recreational fishery sector, and that the 150,000 aquatic organisms recorded as being harvested only represented approximately one third of the yearly harvest from recreational fisheries, inclusive of the mortality schedules of key species. It was estimated that, during 2000–2001, ~540,000 Australian salmon were harvested by recreational fishers in the waters of Victorian alone and Australia wide, with only 34% of these fish being released [48].

Aboriginal fishing cultures are of custodial responsibility/sustainability; never taking more than is required to satiate personal hunger/provide for tribal communities [3]. In essence, look after the land/sea and it will provide for you. Therefore, the health, prosperity and contentment of Aboriginal Peoples is inextricably linked to robustness of their environment as its active environmental caretakers. Dreamtime stories such as ‘The Guardian of the Rivers’, which describes ‘The Rainbow Snake’ who allows Aboriginal Peoples to fish only when hungry, not for sport, and feeds those who transgress to the river fish [90], and ‘Thukeri’, a tale of caution for those who overfish [91], epitomise the strong commitment of communities to the concept of fish conservation. This puts them in juxtaposition with non-Aboriginal Peoples who fish for sport, and appears to be a cultural chasm of great breadth. In a 1985 submission for the justification of recreational fishing within Kakadu, non-Aboriginal Peoples argued that fishing is a primal/instinctive behaviour of man, which is demonstrated in contemporary society as ‘sportsmanship.’ A Non-AP boasted that he had caught and released 700 barramundi in Kakadu National Park [3]. Catch and release fishing has become popular in recreational angling as a minimum impact conservation strategy [92]. However, great variation exists between fish in their sensitivity to the stress associated with this fishing technique [93]. It has been demonstrated that the catch and release in Winter of female critically-endangered Murray cod results in the resorption of eggs and the failure of spawning [51,76]. The practice is discouraged in Aboriginal fishing cultures as an unnecessary stress inflicted on fish that are not being utilised for food [3]. The Bardi Peoples, Western Australia, and the Yolngu Peoples, Arnhem Land, follow seasonal patterns of resource utilization, and harvest only robust/fat fish [94,95]. This practice avoids fish spawning times, does not interfere with breeding [94], and is a sound conservation strategy.

It is clear that the Aboriginal fishing economy, as recounted in the Dreamtime, must be seen within the totality of Aboriginal cultures [96]. In contemporary Aboriginal communities, the adherence to traditional fishing cultures has been widely described [3,14,94], as have calls for Aboriginal fishing cultures to be dissociated from recreational fishing [13,36]. It is intrinsic, in Aboriginal cultures, to conserve fish resources, and indications are that this culture—in recent times—has adapted to include a small but sustainable commercial fishing endeavour. Australian salmon are a cultural staple food with totemic significance to the local Yuin People, southern NSW. During consultation with the Indigenous communities of the SE coast, NSW, Stewart et al. [48] concluded that traditional ecological knowledge and environmental cues (the flowering of a tree) were used to indicate salmon availability. This translated into a well-managed, small fishery using sustainable beach haul harvesting when salmon are abundant. In this instance, the report acknowledged the recognition of Indigenous Australian fishers’ adherence to a scheme of subsistence harvesting/resource sharing, the importance of fish to spiritual and totemic values, and the value of traditional ecological knowledge in the sustainable use of marine resources. In the Cullen-Unsworth et al.’s [72] study of the integration of “Indigenous and scientific knowledge in cultural landscapes”, one of the seven key determinants was strong Indigenous governance, and this appears to be represented in small salmon fisheries run by Indigenous communities in the SE coast, NSW. Figure 3 is a summary of responses from 169 Aboriginal Peoples from three separate regions interviewed between October 2015 and July 2017. The key identified responses clearly show that cultural subsistence fishing practices—and, as Uncle Bob Randall describes, the law of ‘our-ness’ [10], remain strong motivational forces in the lives of contemporary Aboriginal Peoples.



**Figure 3.** A summary of comments provided by 169 Aboriginal People from three different regions between October 2015 and July 2017. It is clear that in relation to fishing, traditional subsistence practices are very much a part of the culture of contemporary Aboriginal Peoples of Australia. The societal, emotional, spiritual and physical health with which traditional fishing practices are associated have been clearly identified. Figure developed from information in Smyth, et al. (2018).

Although the IPAs are a positive step towards Traditional Owners making major contributions towards the conservation and management of many marine species, one must consider that these Sea/Saltwater Country IPAs are still relatively few, and perhaps the affiliations and cooperation's built may have a regional focus. Traditional Knowledge—whilst it is successfully applied to the management of existing IPAs—may not, at present, be utilised as robustly as possible in the Australian marine sustainability challenge, particularly in regard to commercial and recreational fishing, which has the highest impact on marine resources. In addition, in the present circumstances, the legislation of the access of Aboriginal Peoples to aquatic resources may not fulfil Articles 11 and 12 of the United Nations 'International Covenant on Economic, Social and Cultural Rights' (1976), which sets out the basic human right to food of 'cultural legitimacy' [97].

Graham [26], a Kombu-merri person, provides a blueprint for true reconciliation between all of the peoples of Australia. The main theme is the greater sharing of Aboriginal Peoples' spirituality with non-Aboriginal Peoples, particularly children. The author believes that this will lead to the love of the land (encompassing the aquatic concept of land). In harmony with this concept, the Burarrwanga family (Bawaka Cultural Experiences Tours) of North East Arnhem Land share their cultural heritage with visitors, who are encouraged to view fishing as an opportunity to communicate with country, share stories, and understand Aboriginal spirituality [95]. Perhaps, in addition to more widespread Indigenous governance, a greater sharing of cultural values in ventures such as that of the the Burarrwanga family may help non-AP to understand that Traditional Knowledge enhances, rather than detracts, from the engagement experience with Australian natural resources.

## 14. Conclusions

Despite the varied cultures of the Aboriginal Peoples of Australia, the overriding tenet is taking only what is needed to support personal or group hunger. This ensures that the natural resources of land and sea are looked after first, such that the needs of the community are met. A greater understanding and concerted sharing of Aboriginal Peoples' group philosophy through closer engagement may encourage a change in the way that fishing for profit and sport/recreational fishing are visualised by non-Aboriginal Peoples. Certainly, Indigenous Australians have a wealth of knowledge which we may learn from, should we choose to do so.

This paper is a contribution to the ongoing conversation about the lessons in sustainability which can be learnt from the traditional knowledge of the Aboriginal Peoples of Australia. The authors sought to build a deeper understanding of the spirituality, cultures and perspectives which guide Aboriginal Peoples' seafood resource utilisation. In the exploration of these perspectives, many historical records—which may be of a sensitive nature to some readers—were accessed, and parts were included in this paper. The authors have endeavoured to represent all cultures fairly and with sensitivity. It is hoped that this paper will open other productive lines of enquiry for future research.

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