



Marine Mammals in Asian Societies; Trends in Consumption, Bait, and Traditional Use

Lindsay Porter^{1*} and Hong Yu Lai²

¹ Sea Mammal Research Unit, Scottish Oceans Institute, University of St. Andrews, St. Andrews, UK, ² SMRU Consulting Asia Pacific, Hong Kong, Hong Kong

In Asia many marine mammal species are consumed as food or for other purposes. The prevalence of this exploitation appears to increase from west to east. An escalating use of marine mammals and the emergence of commercialization of a trade in marine mammals is supported by:

- Regular documentation of both open and covert trade;
- A shift in focus in some diminishing traditional hunts to other marine mammal species;
- A possible revival in some targeted hunts, which had previously ceased;
- The recent implication of some cultures, which have little history of marine mammal consumption previously, in targeted hunts; and
- The growing importation of marine mammal parts from outside of Asia.

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*Correspondence:

Lindsay Porter
lp48@st-andrews.ac.uk

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The factors that may drive marine mammal use include population reductions in species that have been traditionally targeted; diminishing returns from traditional fisheries; and an increase in market demand for marine mammal products. Lessons from similar studies in terrestrial wildlife trade will better focus future studies of marine mammal use in Asia.

Keywords: Asia, marine mammals, hunting, bycatch, bait, consumption, medicine

INTRODUCTION

“Fisherman I knew in Hong Kong believed petty creatures like barnacles were too small to bother with (except in times of famine) and avoided sawfish, sturgeons, whales, and porpoises because these were “divine fish,” tabooed by the gods. But elsewhere in China all of these have been used.”

(Andersen, 1988)

Localized beliefs, such as those described above by Anderson, can result in neighbors having profoundly different culinary cultures. These traditional preferences may, however, change over time as either environmental or social drivers change. For example, food item availability can alter, as can demand from a growing population and, likewise, trends in popular food culture. During the twentieth century, the hunting and harvesting of the oceans' animals increased dramatically with widespread and often indiscriminate industrial fishing practices being increasingly used. In addition, as human populations migrated to coastal areas, this also increased the need for aquatic resources (Jackson et al., 2001; O'Connor et al., 2011).

The increased hunting of terrestrial wildlife for food and other uses is of global concern and many studies have been conducted on the extent of consumption (e.g., Fa et al., 2002; Bowen-Jones et al., 2003; Lee et al., 2014) and the driving forces behind trade (e.g., Bowen-Jones and Pendry, 1999; Brashares et al., 2004; Rowcliffe et al., 2005; Lindsey et al., 2013).

Similar concerns have emerged for the utilization of marine mammals, and other aquatic species, for consumption, bait, and traditional use (Alfaro-Shigueto and Van Waerebeek, 2001; Clapham and Van Waerebeek, 2007; Costello and Baker, 2011). In 2011, a thorough review of existing literature, media reports, and local knowledge documented the global extent of marine mammal consumption (Robards and Reeves, 2011) and compared this information with earlier datasets (i.e., Mitchell, 1975a,b; Brownell et al., 1978). This review highlighted several key points:

- i. That marine mammals caught unintentionally in fishing gear had been increasingly utilized for consumption;
- ii. That diminished food resources in developing areas had led to both targeted hunting of marine mammals and the deliberate killing of bycaught individuals; and
- iii. That there is a growing commercial trade in marine mammal meat.

This paper builds on the excellent work of Robards and Reeves (2011) using published information and other information gleaned since 2010 and aims to evaluate what is known of all marine mammal consumption for food and other uses in Asia. We also consider the factors that motivate this consumption.

TRADITIONAL USE OF MARINE MAMMALS IN ASIA

There is a long written and spoken history in Asian societies about marine mammals. The Chinese character for “whale” was first printed as early as 179 BC (Le Blanc, 1985) and there are myriad myths throughout Asia that are based on the belief that most marine mammals bring good fortune and that harming them can bring bad luck (Perrin et al., 1996). However, not all cetacean species elicit the same good will. For example, according to Chinese mythology, the Baiji (*Lipotes vexillifer*), which is now extinct, is the reincarnation of a young maiden who had been forced to leap into the Yangtze River to escape her evil stepfather. The stepfather is subsequently turned into a finless porpoise (*Neophocaena phocaenoides*). It is claimed that reverence for the Baiji stemmed from this legendary act of courage. The species was not eaten and only parts from stranded or by-caught individuals were used in Traditional Chinese Medicine (TCM). By contrast, the dislike of the stepfather is manifested in disregard for the finless porpoise, which, is both historically and currently hunted and consumed (Wang, 1965; Zhou, 1991). In southern China, marine mammal bones can sometimes be found in the temples dedicated to *Tin Hau* or *Mā Zǔ* (媽祖), the favored goddess of the fishermen (Andersen, 2009). In particular, some fishermen consider the “Chinese white dolphin” (*Sousa chinensis*) divine as this species is often perceived as “paying homage” to the goddess as groups of dolphins often occur near the shores upon which her temples are built (Andersen, 1971). Festivals in honor of *Mā Zǔ* in Fujian Province traditionally culminated with the consumption of dolphin meat, although this practice is now prohibited (Huang et al., 1997). In Vietnam, whale temples occur along the entire coastline and the religion that stems from the worship of whales

is still very much practiced (Lantz, 2009). Vietnamese people mourn the death of marine mammals and bury those found floating or stranded. After some years, the bones are exhumed and then placed in dedicated temples (Nguyen and Ruddle, 2010). In India, fishermen also revere marine mammals and believe that the presence of dolphins enhances fishing catches (D’Lima et al., 2014) and that some dolphins even chase fish into fishermen’s nets (Bijukumar and Smrithy, 2012).

There is anecdotal information about the use of marine mammal parts in traditional medicines and tinctures. For example, in both Cambodia and Malaysia, dugong (*Dugong dugon*) tears are used in love potions (Perrin et al., 1996) but only in TCM pharmacopeia is there a comprehensive list of the use made of specific marine mammal parts. TCM originated over 5,000 years ago (Xie and Huang, 1984) and modern pharmacopeia include over 11,500 ingredients originating from animals, plants, and minerals (Chen, 2011; Alves et al., 2013). Several studies have investigated the active components of TCM and some (non-marine mammal) ingredients are now regularly incorporated into both western and veterinary medicine (Nadkarni, 1976; Jiang et al., 1979; Hagey et al., 1993; Normile, 2003). Derivatives from at least 20 marine mammal species are detailed in Chinese pharmacopeia and are recommended for a variety of maladies (Read, 1982; Zhai, 1989; Zhao, 1990; Han, 1992; Li and Lin, 1992; Bensky and Gamble, 1993). The most commonly listed ingredients derived from cetaceans are oil, pancreas, and liver. These are prescribed for intestinal disorders, inflammation, and a variety of skin conditions. Dugong oil and ground bone are believed to have haemostatic properties. Pinnipeds and mustilids are generally used as either an enhancer or suppressor of various human appetites. There is little information on how prevalent the current use of marine mammal parts are in TCM but an agreement between Canada and China in 2011¹, allowing the import of Canadian seal parts to China, plus a proposal to increase trade in 2015², indicates that a market certainly exists.

RECENT USE OF MARINE MAMMALS IN ASIA

Over 60% of the world’s population live in Asia³ and, by its sheer mass and needs, the Asian population has a profound impact on global protein resources (Curran et al., 2002). The food needs of Asia puts extreme pressure on both agriculture and fisheries, exacerbated by the coastal location of most of Asia’s mega cities (Hinrichsen, 1999; Tibbetts, 2002). Indeed, Asia’s fishing fleet accounts for the majority of global fish landings (Watson and Pauly, 2013). Small-scale fishing in Asia is less well documented but certainly outweighs industrial fisheries (Kittinger, 2013). Global fish stocks are in rapid decline (Pauly

¹<http://www.economist.com/blogs/americasview/2012/02/canada-and-china> (Accessed 2016 April, 25).

²http://www.vice.com/en_ca/read/proposal-could-see-newfoundland-selling-asia-a-bunch-of-seal-dicks (Accessed 2016 April, 25).

³United Nations Statistics Division standard geographical regions recommended for statistical use; Western Asia, Eastern Asia, South-Eastern Asia, Southern Asia (Accessed 2016 April, 25).

et al., 2005; Pauly and Zeller, 2016) and studies outside Asia indicate that as fisheries resources become reduced, efforts can shift to other protein sources, including terrestrial bushmeat (Brashares et al., 2004; Rowcliffe et al., 2005). Marine mammal consumption has already featured in most Asian cultures, with 24 Asian countries having a history of consuming marine mammals (e.g., Prematunga et al., 1985; Leatherwood and Reeves, 1989; Andersen and Kinze, 1995; Perrin et al., 1996, 2005; Mills et al., 1997; Rudolph et al., 1997; Baker et al., 2010; Acebes, 2014). Robards and Reeves' (2011) review revealed several new trends in the consumption of marine mammals in Asia and they concluded that the pressure to feed human populations where hunger and poverty prevail, is increasing both the deliberate and opportunistic utilization of marine mammals as food.

Western Asia

In Western Asia (Turkey, Qatar, Saudi Arabia, United Arab Emirates, Oman, Bahrain, Yemen, and Georgia), all countries utilize individuals that are found opportunistically but only three countries (Turkey, Oman, and Yemen) record deliberate killing of such opportunistic finds. Only Oman reports directed catches of four species. The number taken per country per year is at most in the tens of individuals, but generally numbers <1 individual.

South Asian

In South Asia (Nepal, Pakistan, India, Sri Lanka, and Bangladesh), only one country does not have directed hunts but it does utilize opportunistically found marine mammals, both live and deceased (Bangladesh). Two countries (Nepal and Pakistan) deliberately catch the occasional riverine dolphin, although this has not been reported in recent years. The remaining two countries have larger scale directed takes and these comprise at least 15 different species and total thousands of individuals per year (Sri Lanka and India).

Southeast Asia

All the countries of Southeast Asia (Vietnam, Cambodia, Myanmar, Philippines, Indonesia, Malaysia, and Thailand) report directed hunts for marine mammals and most utilize individuals that are opportunistically found. Three countries (Cambodia, Thailand, and Vietnam) report that very limited numbers of individuals are taken, <10 per annum, of only 2–3 species. The remaining countries (Myanmar, Philippines, Indonesia, and Malaysia) document at least 23 species of marine mammals, which are consumed by the 100s–1,000s per annum in each country. Of these countries, only the Philippines used to conduct commercial whaling, although never at the scale of other Asian countries. The Philippines also reports imports and Malaysia reports exports of marine mammal products.

East Asia

In East Asia (South Korea, Taiwan, Japan, and China) all four countries document directed takes, as well as utilizing opportunistically encountered live and dead marine mammals. All the countries previously hunted whales commercially and Japan currently allows regulated hunts within the jurisdiction of national waters. At least 32 species are utilized for consumption

in East Asia. Data are not available for China but the other nations take tens to thousands of individuals each year. All of these countries also import marine mammal products. Overall, Robards and Reeves (2011) report that at least 38 cetacean species and four pinniped species are consumed across all Asian countries.

Further Information

A review of recent publications and online media sources was conducted. For China, a short investigation of Chinese language social media, using a keyword search in the Chinese characters' equivalent of "marine," "mammal," and "food," resulted in 16 independent incidences of marine mammals for sale, both cooked and uncooked, in fish markets. That is, 16 different posts were noted with marine mammal parts clearly displayed in market settings. Several species were identified from these images and, as social media often contained location and date information, some fishing markets would appear to have had marine mammals for sale at different times.

In East Asia, the main use of marine mammals is for consumption and for traditional use, and some markets appear to be a focus for trade. Indonesia allows traditional hunting for sperm whales (*Physeter macrocephalus*), although this is largely restricted to two islands, Lamakera and Lamelera. One island no longer relies on this practice and in recent years, Lamelera islanders have increasingly targeted small cetaceans to supplement the diminishing catch of sperm whales (Mustika, 2006; Mustika et al., 2014). A detailed comparison of two culturally distinctive communities elsewhere in Indonesia (West Kalimantan and East Nusa Tenggara) showed that in one area, fishermen who incidentally caught marine mammals were more likely to discard them unused or pass them to others, whereas the second community kept nearly all individuals caught and utilized them within the community (Mustika et al., 2014). In another area of Indonesia (Bali), market and social surveys show that an open trade in dugong parts, from both opportunistic finds and deliberate hunting, is ongoing although this was largely for traditional or other use, and not for consumption (Lee and Nijman, 2015).

Opportunistic hunting was previously thought to be in decline in the Philippines (Dolar et al., 1994) but it now appears that, in some areas at least, marine mammals are increasingly and deliberately caught if they are sighted (Acebes, 2014). Communities in eastern Malaysia have always utilized marine mammal parts for traditional medicines and tinctures and the practice of consuming some species of salvaged marine mammals is ongoing (Ling and Porter, 2011), as is opportunistic hunting (Rajamani, 2013). Traditionally, Vietnamese people have revered cetaceans but there have been recent reports of Vietnamese fishermen catching marine mammals in Thailand's waters. It has been speculated that this is indicative of an increasing need for resources outweighing traditional practices (Pattaya Times, 2016a,b). In Southeast Asia, deliberate capture, both opportunistic and directed, occurs and, in some areas, marine mammals are increasingly targeted. Marine mammals are used for food, medicine, and ornaments and differing cultural attitudes may dictate specific uses.

The recent cessation of conflict in Sri Lanka has led to new fishing freedoms and social development and has thus, apparently, re-vitalized the traditional market for marine mammals. Recent observation of Sri Lanka fishing ports indicates that there is a clandestine trade in dolphins for bait in shark longlining fisheries and for consumption by people who live in non-coastal areas⁴. In both India and Pakistan, the deliberate capture of marine mammals still occurs although is reducing as these populations become smaller and law enforcement becomes stricter. Opportunistically found individuals are still utilized for food and bait and the oil is sometimes used to waterproof boat hulls (Sivakumar and Nair, 2013; Kiani and Van Waerebeek, 2015).

Information is summarized **Table 1**. In most Asian areas, little is known of either the number of individuals being removed or what impacts the loss of these individuals may have on populations. The scale of research required to quantify the prevalence of marine mammal use in Asia is daunting. However, as concerns mount, practical and rapid investigative tools must be utilized to elucidate this urgent issue more clearly and determine trends and impacts.

LESSONS AND CONCLUSIONS FROM TERRESTRIAL WILDLIFE TRADE STUDIES

Emerging studies indicate that some forests in Asia, unlike in Africa, are becoming devoid of wildlife as a consequence of over-hunting rather than deforestation (Harrison et al., 2016). In a region where the bulk of the human population occupies coastal areas and relies heavily on aquatic resources, it can be assumed that this loss is likely being mirrored in the marine environment. Terrestrial studies that have focused on understanding wildlife use provide useful tools and techniques that may well increase our understanding of this issue in the aquatic realm.

Terrestrial bushmeat studies generally rely upon a multi-disciplinary, socio-economic approach that can either collect novel data or use existing socio-demographic information to understand what drives use (Bowen-Jones and Pendry, 1999; Wilkie et al., 2005). Spatial models and the novel application of production/commodity analyses have successfully identified key areas of concern and likely consumers (Bowen-Jones et al., 2003; Schlesinger et al., 2015). Economic sustainability models have also been utilized to target potential markets (Fa et al., 2002). The illicit nature of illegal wildlife use has led to the successful adaptation of rapid assessment techniques that maintain the participant's confidentiality while still capturing key information (Conteh et al., 2015). Focused ethnological studies appear useful in both understanding the drivers of wildlife use and also in providing a foundation for future conservation and education activities that aim to establish sustainable use through changes in human practices (Nekaris et al., 2010; Scheffers et al., 2012).

Gavin et al. (2010) provide a comprehensive review of socio-economic methodology based on 100 studies. This provides

⁴<http://www.sundayobserver.lk/2016/03/20/fea08.asp> (Accessed 2016 July, 13).

useful guidelines for the improvement of study accuracy and may help to address the lack of data common to illegal wildlife trade and use activities (Gavin et al., 2010). In general, these modeling tools do not rely on quantitative data and may be applied without the need to collect primary data from market surveys and community interviews. Modeling and mapping exercises may, therefore, be most useful in discerning potential locations of concern for marine mammal species where future, focused studies may be directed.

There are also a wide variety of forensic tools available that allow better identification and analyses of wildlife parts (e.g., Ogden et al., 2009; Alacs et al., 2010; Linacre and Tobe, 2011). Some of these have already been utilized to reveal discrepancies in reported marine mammal bycatch, to determine the magnitude of trade and to develop kits that rapidly identify marine mammal species *in situ* in Asian markets (Baker et al., 2006, 2007; Lukoschek et al., 2009; Lo et al., 2013). These tools, designed specifically for non-specialists, will allow quantitative data collection both on type and volume of marine mammal parts in Asian markets. Such information will reveal the extent of marine mammal trade in key markets and, thus, allow identification of populations that may be unsustainably impacted. The use of social and online media has also been remarkably successful as a tool in identifying and, by working with law enforcement agencies, obstructing illegal trade (Krishnasamy and Stoner, 2016). In addition, short online searches conducted for this mini-review resulted in new information on marine mammals for sale in markets. Comprehensive searches may reveal which markets or locations persistently trade marine mammal parts and help to focus on site studies.

In many countries, the use of marine mammals for any purpose is illegal but legislation appears inconsistent and a lack of public awareness of the relevant laws has likely contributed to the continued illegal use of some aquatic species. A clearer integration of old and new laws has been shown to reduce marine megafauna use (Humber et al., 2015). In the many developing countries of Asia, limited government resources are often focused on laws that relate more directly to humans than to wildlife. In some countries, however, and Malaysia in particular, wildlife task forces have been established that investigate wildlife trade chains and have already reduced the level of open trading, as well as making progress in uncovering illegal trade routes⁵. Empowerment of management authorities and clear guidance and education on wildlife law may also assist in the reduction of marine mammal trade and use.

Investigative tools and methods, ranging from on-site market testing to online data mining, will be useful in discerning the scope of marine mammal use and trade and the factors that drive it. What will be more challenging for the marine realm is establishing a better understanding of trade or exchange of marine mammals at sea rather than through centralized markets, which is thought to be a common practice in some areas.

⁵<http://www.nst.com.my/news/2016/07/158692/filipino-smugglers-found-19000-turtle-eggs-sabah-coast> (Accessed 2016 September, 01).

TABLE 1 | A summary of marine mammal species utilized in Asia for consumption, traditional or other uses.

Species	Common name	Consumed	Traditional	Hunted	Other ^a
<i>Eubalaena glacialis</i>	North Atlantic right whale		Y		
<i>Eubalaena japonica</i>	North Pacific right whale	Y		Y	
<i>Eschrichtius robustus</i>	Gray whale	Y	Y	Y	
<i>Balaenoptera acutorostrata</i>	Minke	Y	Y	Y	
<i>Balaenoptera</i> spp.	Unspecified minke whale	Y	Y	Y	
<i>Balaenoptera bonaerensis</i>	Antarctic minke whale	Y		Y	
<i>Balaenoptera borealis</i>	Sei whale	Y	Y	Y	
<i>Balaenoptera edeni</i>	Bryde's whale	Y		Y	
<i>Balaenoptera musculus</i>	Blue whale		Y		
<i>Balaenoptera omurai</i>	Omura's whale	Y		Y	
<i>Balaenoptera physalus</i>	Fin whale	Y	Y	Y	
<i>Megaptera novaeangliae</i>	Humpback whale	Y	Y	Y	
N/A	Blue/fin hybrid whale	Y		Y	
<i>Physeter macrocephalus</i>	Sperm whale	Y	Y	Y	
<i>Kogia sima</i>	Dwarf sperm whale	Y		Y	
<i>Berardius bairdii</i>	Baird's beaked whale	Y		Y	
<i>Mesoplodon densirostris</i>	Blainville's beaked whale	Y		Y	
<i>Mesoplodon ginkgodens</i>	Ginkgo-toothed beaked whale	Y		Y	
<i>Ziphius cavirostris</i>	Cuvier's beaked whale	Y		Y	
Family Platanistidae	South Asian river dolphin	Y		Y	
<i>Lipotes vexillifer</i>	Baiji (Yangtze river dolphin)		Y		
<i>Delphinus delphis</i>	Common dolphin	Y	Y	Y	
<i>Feresa attenuata</i>	Pygmy sperm whale	Y		Y	
<i>Globicephala macrorhynchus</i>	Short-finned pilot whale	Y		Y	
<i>Grampus griseus</i>	Risso's dolphin	Y		Y	
<i>Lagenodelphis hosei</i>	Fraser's dolphin	Y		Y	
<i>Lagenorhynchus obliquidens</i>	Pacific white-sided dolphin	Y		Y	
<i>Lissodelphis borealis</i>	Northern right whale dolphin	Y		Y	
<i>Orcaella brevirostris</i>	Irrawaddy dolphin	Y		Y	
<i>Orcinus orca</i>	Killer whale	Y	Y	Y	
<i>Peponocephala electra</i>	Melon-headed whale	Y		Y	
<i>Sousa chinensis</i>	Indo-pacific humpback dolphin	Y		Y	Y
<i>Stenella attenuata</i>	Pantropical spotted dolphin	Y		Y	
<i>Stenella coeruleoalba</i>	Striped dolphin	Y		Y	
<i>Stenella longirostris</i>	Spinner dolphin	Y		Y	
<i>Steno bredanensis</i>	Rough-toothed dolphin	Y		Y	
<i>Tursiops truncatus</i>	Bottlenose dolphin	Y	Y	Y	
<i>Pseudorca crassidens</i>	False killer whale	Y		Y	
<i>Neophocaena phocaenoides</i>	Finless porpoise	Y	Y	Y	
<i>Phocoenoides dalli</i>	Dall's porpoise	Y		Y	
<i>Phocoena phocoena</i>	Harbor porpoise	Y	Y		
<i>Dugong dugon</i>	Dugong	Y	Y	Y	Y
<i>Cystophora cristata</i>	Hooded seal		Y		
<i>Erignathus barbatus</i>	Bearded seal	Y			
<i>Callorhinus ursinus</i>	Northern fur seal		Y		
<i>Halichoerus grypus</i>	Gray seal	Y		Y	
<i>Histiophoca fasciata</i>	Ribbon seal	Y		Y	
<i>Pagophilus groenlandicus</i>	Harp seal	Y	Y	Y	
<i>Phoca vitulina</i>	Harbor seal		Y		

^a"Other" is souvenirs for tourists for the two species listed.

Finally, and in conclusion, the available information indicates that social, economic, cultural, and ecological aspects of marine mammal use are intimately linked and should be considered together if a pathway is to be mapped toward sustainability in Asia. Lessons and tools developed for terrestrial bushmeat studies will assist in making progress in investigating marine mammal use for consumption, bait and other purposes and can help to direct studies and activities to areas where impact is likely to be unsustainable.

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AUTHOR CONTRIBUTIONS

LP reviewed and summarized all reference material and wrote the manuscript. HL conducted the literature search and the Chinese language online media review.

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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