

# 1 The Whale Pilgrimage

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In the late autumn of 1812, after a week of travel, the fifty-six-year-old Ōtsuki Gentaku (1757–1827) reached the sacred island Kinkazan in northeastern Japan.<sup>1</sup> Three days of heavy rain and rough sea almost caused Gentaku's little pilgrimage to come to a premature end. However, when the weather cleared on the fourth day, he found a fisherman willing to bring him to the fishing village Ayukawa near the eastern tip of the Oshika Peninsula. From Ayukawa, Gentaku traversed the eastern hill to reach a little hut at the beachfront from where the misty shores of the nearby Kinkazan island could be seen. Ringing a bell at the hut summoned a small ferry. It took less than half an hour to reach Kinkazan. Before Gentaku was allowed to set foot on the sacred island, however, he had to discard his filthy straw sandals and put on new ones. After visiting the main shrine dedicated to the Goddess Benzaiten, Gentaku followed his local guide, a thirteen-year-old monk apprentice, to the 445-metre-high peak of Kinkazan mountain. From here, Gentaku had a panoramic view over the roughed coastline of the Sanriku Coast to the west and the endless Pacific Ocean to the east.

While pilgrims like Gentaku were frequently seen on Kinkazan, they were not the only visitors. Each year between March and October, thousands of whales and dolphins migrated to the Sea of Kinkazan, earning it its nickname 'the castle of sperm whales'.<sup>2</sup> However, when Gentaku made his pilgrimage in the early nineteenth century, fewer whales were visiting the region every year. As a passionate whale enthusiast, Gentaku was always keen on seeing whales. However, he did not record any whale sightings in his travel monologue to Kinkazan. While the lack of whales might have been slightly disappointing for Gentaku, for the local fishing population, the recent disappearance of the giants from the Sea of Kinkazan was a troubling sign.

<sup>1</sup> Ōtsuki, 'Muyū Kinkazanki'. Ōtsuki Gentaku's role as a whale scholar will be explored in more detail in Chapter 4.

<sup>2</sup> Oshika chōshi hensan iinkai, *Oshika chōshi: jōkan*, 218.

Fishing was the main occupation for the inhabitants of the Oshika Peninsula. Gentaku notes that from his high vantage point on the peak of Kinkazan, he could see hundreds of small fishing vessels from all nearby coves and villages bustling about, looking for octopus, sardines, and sea bream to hunt. The sea around the island was considered the best fishing ground in all of northeastern Japan. As Gentaku looked down, so did the fishermen always look up to the small mountain. The island's peak, the highest elevation in the region, could be seen from far away and was believed to be the residing place of a benevolent female water dragon goddess, who protected the island goddess Benzaiten. When the local fishermen departed to the open sea to hunt bonito and other fish, they would never lose sight of Kinkazan mountain to find their way back to land. In this border zone between coast and open sea, where the fishermen could barely make out the silhouette of Kinkazan, humans entered the domain of the whales. The presence of these majestic creatures indicated to the fishermen the whereabouts of nearby fish schools. Because of this, the Oshika fishermen often thought of the whales as the helpers of the dragon goddess, who were sent to assist the humans.<sup>3</sup> In other stories, whales were brought in association with the god Ebisu, the god of fishing and wealth, who was also revered on Kinkazan.

The yearly arrival of the whales to northeastern Japan was also religiously connotated. A popular belief was that whales, not unlike human pilgrims, were travelling thousands of kilometres to visit famous shrines and attend religious festivals, as the following source from Karakuwa, around sixty kilometres north of Kinkazan, shows:

On the fifteenth day of the first month, the Osaki Myōjin festival is held in Motoyoshi in the northern part of Karakuwa village. [I] have heard that whales come in great numbers to the surrounding sea in order to make a pilgrimage to the shrine. Until this year, I wondered about that, but on the fifteenth day of the first month in Tenpō 4 (1832), Yashichi and Matakichi from Imaizumi and Aramachi went to the shrine for a pilgrimage and saw great numbers of whales come close to the shore and play around. The two said it was undeniably very curious, and [I] listened to them attentively. [We] discussed and thought about this together, but that the whales visit the shrine on the fifteenth day of the first month every year is truly beyond human comprehension.<sup>4</sup>

Similar legends of whale pilgrimages also existed in western Japan, as we will explore in Chapter 2. In this first chapter, we will follow the whales on their yearly pilgrimage around the Japanese Coast, to see how the cetosphere influenced marine ecosystems and coastal communities alike. Along our way, we will meet the first Japanese whalers from the central

<sup>3</sup> Ishida, *Nihon gyominshi*, 15–16. <sup>4</sup> Watanabe, *Kadoyashiki kyūsuke oboechō*, 259–60.

Kii domain and how they followed the migrating whales along the Japanese Archipelago.

### The Sanriku Coast

Standing together with Gentaku on the peak of Kinkazan mountain, we can see that the small island is only one kilometre off the Oshika Peninsula, a mountainous stretch of land reaching into the Pacific Ocean. Like the fishing port Ayukawa, all settlements are located in one of the many coves and bays, with no villages farther inland. To the west, the peninsula ends near the mouth of the Kitakami River, where the harbour town Ishinomaki is situated. The Oshika Peninsula is the most southern point of the so-called Sanriku Coast, which ends some 350 kilometres farther north at the cape of Same-ura near Hachinohe, another port city and the place where the anti-whaling riots would break out in 1911.<sup>5</sup> The southern part of the Sanriku Coast is marked by its characteristic V-shaped 'rias', tubular bays with shallow depths resembling miniature fjords. During tsunamis the water level rises quickly in these bays making them extremely dangerous. On the other hand, as fish and other marine animals are often swimming into the bays, they are good places to install fixed shore nets. The fishing towns Onagawa, Kesenuma, Yamada, and Miyako are all situated inside such bays (and are often destroyed during tsunamis, the last being the 2011 tsunami). Towards the inland, the coast is disconnected from the agricultural zone and the inland cities through the Kitakami mountain range. While not notably high, the range still served as a natural boundary that limited direct contact and prevented intensive farming. Farther north, around the town Kuji, the rias coastline becomes less complex, before ending near the flat coast of the fishing town Hachinohe.

During Gentaku's lifetime the Sanriku Coast, situated in northeastern Honshu (Figure 1.1), was politically separated into the three domains: Sendai, Morioka, and Hachinohe.<sup>6</sup> Contemporaries often imagined these

<sup>5</sup> *Sanriku* literally means 'three shores' and refers to the three short-lived Meiji period prefectures of Rikuzen, Rikuchū, and Mutsu (can also be read as *rikuō*). I use the term 'Sanriku' here to highlight the common cultural space the coastal communities of this coast, even though the name itself is ahistorical to the early modern period. See also Wilhelm, 'Ressourcenmanagement in der japanischen Küstenfischerei', 150; Takimoto and Nasukawa, *Sanriku kaigan to hamakaidō*, 2–5.

<sup>6</sup> Under the Tokugawa Shogunate (1600–1868; also referred to as Edo period), which was established after the warlord Tokugawa Ieyasu (1543–1616) unified most of the Japanese archipelago in 1600, some 200 daimyos (feudal lords) ruled over their respective domains with relative political autonomy.

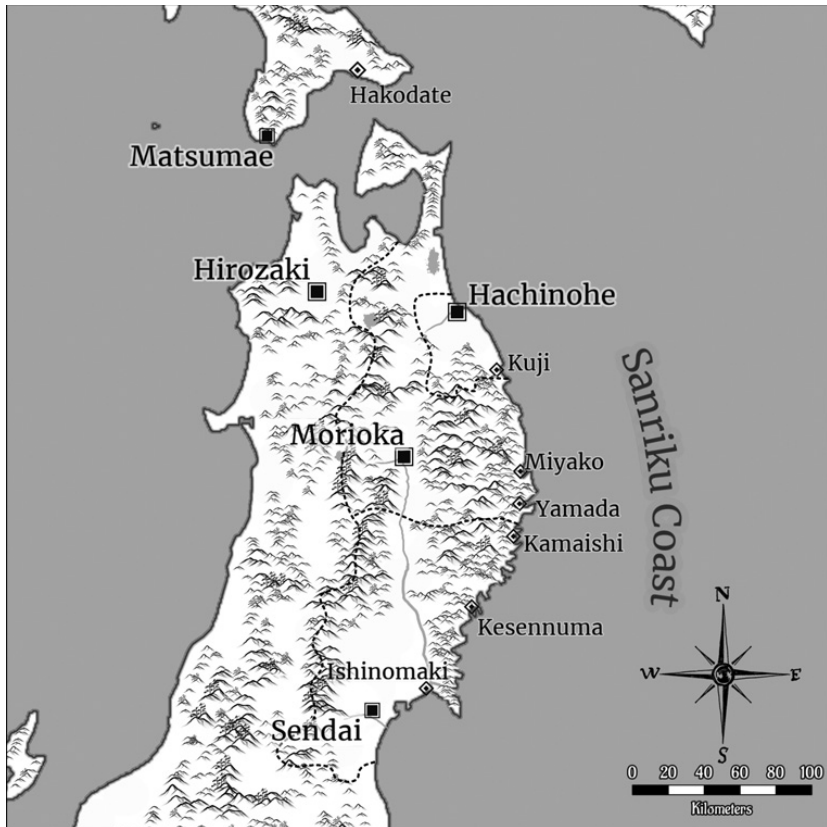


Figure 1.1 Map of the Sanriku Coast in northeastern Honshu in the Early Modern Period

northern domains as backward and poor.<sup>7</sup> During the summer, the *yamase* winds from the continent would sometimes bring wet and cold weather, destroying crops and causing famine. Nevertheless, the Sendai domain, one of the largest domains in Tokugawa Japan, was critical in producing agricultural products for the capital Edo (today Tokyo). Moreover, the Sanriku Coast itself not only connected the capital with the border region of Ezo (today Hokkaido) in the north, where the important herring fertiliser was produced, but was one of the main fish fertiliser producers itself. Especially sardines were caught in large

<sup>7</sup> Kawanishi, *Tōhoku*.

quantities and made into fertiliser for the cash crop fields in western Japan. We will explore the importance of these fishing proto-industries in the following chapters. For now, it is sufficient to say that the Sanriku Coast is even today considered among the best fishing places in the world, producing almost 15 per cent of all fishing products worldwide.<sup>8</sup>

The reasons for this wealth of marine resources are the geological and oceanographic characteristics of the Sanriku Coast. Coasts are ecotones, an ecological transitional zone where two ecosystems – terrestrial and oceanic – come into contact. It is the meeting place of many species that would otherwise not have contact with each other, while also hosting several species that have completely specialised to live here. Coastal ecosystems boast some of the highest degrees of biodiversity on this planet, with river systems bringing nutrients from inland and coastal upwelling bringing nutrients up from the deeper ocean.<sup>9</sup> The case of the Sanriku Coast is here especially interesting: in the ocean before the coast two ocean surface currents, the Kuroshio and Oyashio, meet and intermingle, creating the perturbed region, one of the most highly biotic productive places on earth (Figure 1.2).<sup>10</sup>

The warm but nutrient-poor Kuroshio (lit. ‘black current’) originates in the Philippines and passes Taiwan on the eastern coast and advances towards the south of the Japanese Archipelago. The smaller Tsushima Current breaks off south of Kyushu and flows in the Sea of Japan (East Sea), while the Kuroshio continues along the Pacific Coast of Kyushu, Shikoku, and southern Honshu. The Kuroshio goes offshore near the cape of Chōshi and meanders into the Pacific Ocean. Near the Sanriku Coast the Kuroshio Current not only reunites with parts of the Tsushima Current but also meets the Oyashio Current (lit. ‘parent current’) that brings cold, nutrient-rich water from the Bering Strait. The intermingling of these currents creates the so-called perturbed region. The mixing of the warm, nutrient-poor Kuroshio Current and the cold, nutrient-rich Oyashio Current allows plankton to thrive, thus attracting many marine animals, some of them using the currents for their yearly migrations.<sup>11</sup>

<sup>8</sup> Tameishi et al., ‘Present State and Future about Application of Satellite Remote Sensing for Fisheries around Japan’, 1775.

<sup>9</sup> Gillis, ‘Not Continents in Miniature’.

<sup>10</sup> Surface currents cover about 10 per cent of the ocean’s water and flow horizontally in the uppermost 400 metres of the ocean’s surface. Mainly driven by wind and shaped by the topography of the continents and the ocean basins, these currents are distributing the tropical heat to colder regions and vice versa. Therefore, warm water flows to higher latitudes, where it cools down and then moves back to low latitudes to absorb heat again. See Garrison, *Essentials of Oceanography*, 172–89.

<sup>11</sup> For example, tuna, sardines, bonito (skipjack tuna), and cuttlefish migrate on the Kuroshio Current along the Japanese Coast. Among the migratory fish that use the cold-water Oyashio Current are salmon and herring. See Tajima, *Kinsei Hokkaidō gyogyō to kaisan butsu ryūtsū*, 410–11.

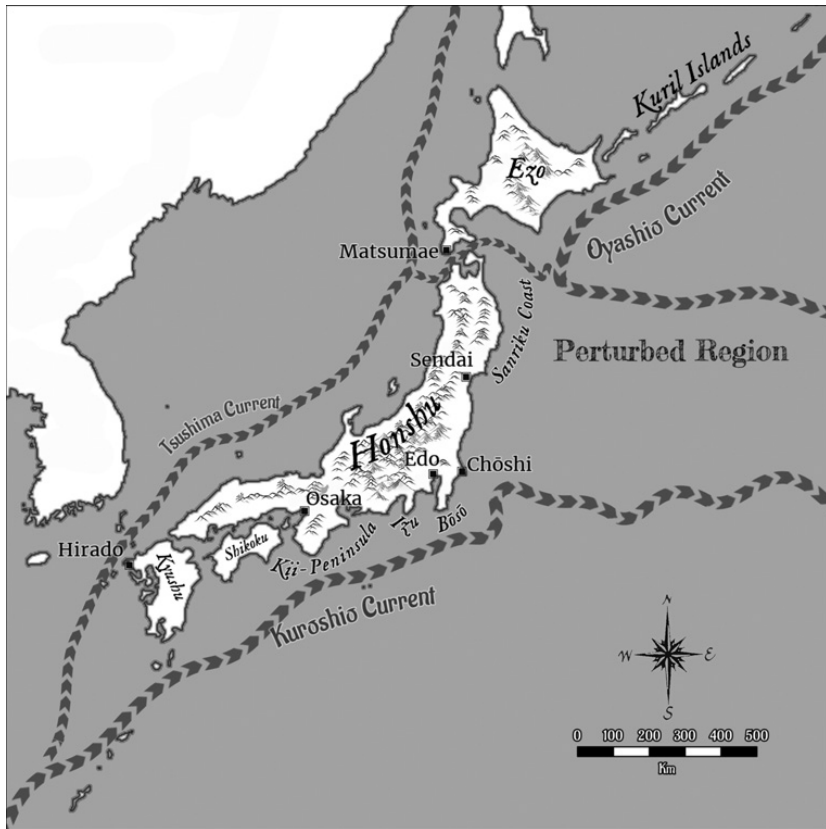


Figure 1.2 Map of Early Modern Japan with ocean currents and the ‘perturbed region’

The exact frontline of the perturbed region moves from winter to summer from Chōshi until Hachinohe and back along the Sanriku Coast.<sup>12</sup>

The perturbed region was the main reason for the good fish catches of the Sanriku fishing communities. However, the ocean currents also posed a considerable threat to the small Japanese fishing vessels, who easily got taken away by the currents and sometimes ended up as far away as Hawai‘i or the Bering Strait.<sup>13</sup> Coupled with the shogunate’s ban of building ocean-going vessels, for most of the Edo period (1600–1867)

<sup>12</sup> Longhurst, *Ecological Geography of the Sea*, 262–3; Qiu, ‘Kuroshio and Oyashio Currents’, 1417–22.

<sup>13</sup> Rüegg, ‘The Kuroshio Frontier’.

fishing remained close to the shore and the fishermen had to wait for their prey to come to them. Poor fish catches, either caused by bad weather or changes in the fishes' migration patterns, were a constant threat. In other parts of Tokugawa Japan, fishing communities mitigated these risks by also engaging in part-time farming in the off-season. However, due to its mountainous terrain and unreliable weather, farming opportunities were limited at the Sanriku Coast. Fishing villages had to use most of their revenue to import staple food from nearby farming villages or via officially sanctioned merchants, who as monopolists could dictate the prices. To put this into context, in the coastal community of Ryōri, an average of 83 per cent of their earnings from fishing had to be used to purchase agricultural products.<sup>14</sup> In this way, abundant fish catches and times of relative wealth could suddenly alternate with times of poor harvest and famine.

### The Cetosphere around the Japanese Archipelago

While early modern fishermen were quite successful at harvesting marine life near the shore, the more we move towards the open ocean, the less influential anthropogenic top-down pressure became. Here, the fishermen entered the realm of the whales, the 'cetosphere'. As Jakobina Arch has rightly pointed out, our knowledge base of whale ecology and behaviour is very limited even today.<sup>15</sup> This becomes even more of a problem when one attempts to reconstruct how the cetosphere worked before it was severely disrupted by humans in the twentieth century. It is clear, however, that the Japanese Coast was heavily influenced by the cetosphere. To understand how whales interacted with their environment during their migration along the Japanese coastline, I will refer to recent scientific debates in marine biology and ecology. As population sizes have drastically changed in the past two hundred years, and it remains unclear to what degree this has altered the behaviour and culture of particular whale species, referring to present-day observation needs to be taken with caution.

We are currently recognising ninety different species of whales, dolphins, and porpoises, which all belong in the order of Cetacea.<sup>16</sup> Cetaceans are divided into two sub-orders: baleen whales (*mysticetes*) and toothed whales (*odontocetes*). The former includes most larger cetaceans and are characterised through their baleen plates (also called

<sup>14</sup> Wilhelm, 'Ressourcenmanagement in der japanischen Küstenfischerei', 155.

<sup>15</sup> Arch, *Bringing Whales Ashore*, 2018, 23–4.

<sup>16</sup> Carwardine, *Handbook of Whales, Dolphins and Porpoises*.

‘whalebone’), instead of teeth. These comb-like structures are used to filter large numbers of small prey, typically zooplankton such as krill and copepods but sometimes also small fish. They are hunting in shallower depths than their toothed counterparts and are known for their long migration routes from warm-water winter breeding grounds to cold-water summer feeding grounds. This group includes right whales, the most important species hunted in western Japan, as well as the faster rorquals such as the massive blue, fin, and sei whales. Another important species in our context is the smaller minke whale.

Toothed whales include dolphins and porpoises, as well as all whales possessing teeth. With the exception of the massive sperm whales, they tend to be smaller than most baleen whales. With their sharp teeth, odontocetes hunt fish of all sizes, octopods, and in some cases even other marine mammals. Killer whales (also called orcas) are one of the few species that also attack other cetaceans. Some toothed whales are living in larger groups with a complex social organisation, leading some biologists to speculate on a non-human ‘whale culture’.<sup>17</sup> Another characteristic is their ability to produce sounds for communication and echolocation.

While toothed whales are often apex predators, baleen whales are in a peculiar spot in the food chain. On the one hand, they are the largest animals that have ever lived on this planet and are therefore not typically prey for other predators (with the exceptions of humans and sometimes killer whales), but at the same time, they are consuming massive amounts of smaller marine life, such as zooplankton and small fish. It has been estimated that great whales (all baleen whales and sperm whales) consumed between 53 per cent and 86 per cent of the North Pacific Ocean’s net primary production before industrial whaling.<sup>18</sup> Thus, cetaceans directly intervene at different stages of the trophic structure, with toothed whales curbing the larger marine fauna, while baleen whales put pressure on smaller marine fauna.

Today, we know of thirty-seven different species of cetaceans that are regularly visiting the Japanese waters. The behaviour between the species is extremely diverse, fulfilling different ecological roles. Typically, baleen whales such as right whales and fin whales have long migration routes along the Japanese coast. During the winter months, these whales stay in the warmer tropical water around the Philippines for calving. However, as these waters are poor in nutrients, the baleen whales live off their blubber reserve. In late winter and early spring, they would then follow the

<sup>17</sup> Whitehead and Rendell, *The Cultural Lives of Whales and Dolphins*.

<sup>18</sup> Estes et al., ‘Megafaunal Impacts on Structure and Function of Ocean Ecosystems’, 99.



Kuroshio northwards until they reach the Japanese Coast. Here some whales follow further the branching Tsushima Current into the Sea of Japan while others continue the Kuroshio close to the Pacific Coast. Around June, the baleen whales reach the perturbed region off the Sanriku Coast, where they would for the first time in months feed on zooplankton on fish. In summer, these baleen whales would traverse the perturbed region and along the Oyashio into the Sea of Okhotsk, where they feed on the plankton bloom. In winter, the whales swim through the open ocean back to the tropics for mating and calving.<sup>19</sup>

This route is, however, not followed by all baleen whales. Sei whales, for example, stay mostly offshore and are only rarely seen in the waters around western Japan. In summer and autumn, they appear near the Sanriku Coast and eastern Ezo following the Oyashio Current. In winter, some sei whales could be found around the Ogasawara Islands (Bonin Islands), south of the Japanese Archipelago, but whale biologists are unsure whether these sei whales belong to the same population.<sup>20</sup> The situation is similar for the largest toothed whales: the sperm whales. These are also more frequently found offshore or near the northern Pacific coasts of Honshu and Ezo and only occasionally in western Japan.<sup>21</sup> Smaller-toothed whales and dolphins have far less pronounced migration patterns and they live in a variety of habitats, from estuaries to the deep ocean. While they could be found along the whole Pacific coast, the Kuroshio and Oyashio warm- and cold-water fronts act as natural barriers that smaller-toothed whales would not – or could not – cross.<sup>22</sup>

The long-distance whale migrations fulfil crucial functions in the marine ecosystem. Migrating megafauna are essentially biomass transporters of carbon, nitrogen, and phosphorus. Through feeding, they bind biomass to their body while regulating the abundance of zooplankton and small fish in the water through predation pressure. Also, as whales move in a three-dimensional space, they transport nutrients vertically through the water columns. During their dives, whales physically whirl up the water and thus bring the free-floating nutrients back to the surface. This so-called whale pump can bring more nutrients to the surface than all river systems combined. Even more significantly, whales release nitrogen-rich faecal plumes and urine near the water surface. In this respect, they

<sup>19</sup> Longhurst, *Ecological Geography of the Sea*, 1417–22; Jones, ‘Running into Whales’. It is believed that the reason why most baleen whales do not stay in the Arctic waters through the whole year is to evade killer whales, see Whitehead and Rendell, *The Cultural Lives of Whales and Dolphins*, 1445.

<sup>20</sup> Kasahara, *Nihon kinkai no hogeigyō to sono shigen*, 1950, Fuzu:26; Omura, ‘Whales in the Adjacent Waters of Japan’, 59, 88.

<sup>21</sup> Kasahara, *Nihon kinkai no hogeigyō to sono shigen*, 1950, Fuzu:27–33.

<sup>22</sup> Kasuya and Miyashita, ‘Distribution of Sperm Whale Stocks in the North Pacific’, 68.

'fertilise' the upper water masses during their migration route along the Japanese Coast with their faeces.<sup>23</sup> Baleen whales are regulators of marine meta-ecosystems and distribute and exchange nutrients between partly closed systems. With their presence and feeding behaviour, they also stabilise the trophic structure of local ecosystems. Removing them from the coastal ecosystem reduces the resilience of these systems and increases the risk of an irreversible regime shift.<sup>24</sup>

Early modern coastal ecosystems were not all influenced in the same way by the presence of whales. Some cetaceans visited only certain places, while not appearing at others. Even among a specific whale species, their behaviour could change depending on geographical and seasonal circumstances. Both factors – spatiality and season – massively influenced how human communities would interact with whales that appeared near their fishing grounds. During Gentaku's lifetime, for example, proto-industrial whaling operations were conducted nearly exclusively in western Japan, while there were nearly no whaling activities in the northern region of the archipelago, despite whales being more common in the north. In the following chapters, we will investigate this peculiar circumstance in more detail.

### Whale People on the Japanese Archipelago

Around 35,000 years ago, during the last Ice Age, humans arrived over a land bridge in the region that would later become the Japanese Archipelago. As the shallow East China Sea and Sea of Japan did not yet exist, the migration routes of cetaceans were quite different. The early palaeolithic communities focused most likely on the hunt for terrestrial megafauna such as mammoths, and there is no evidence of them possessing boats or conducting whaling.<sup>25</sup> With the end of the Ice Age, Japan was separated from the continent and the coastal sea became part of the cetosphere.

Humans living close to the coast have likely profited from the presence of migrating cetaceans early on. Archaeological findings from the Jōmon period (14,000–300 BCE) have uncovered whale and dolphin

<sup>23</sup> Roman et al., 'Whales as Marine Ecosystem Engineers'; Roman and McCarthy, 'The Whale Pump'; Holmlund and Hammer, 'Ecosystem Services Generated by Fish Populations'.

<sup>24</sup> A regime shift describes an (often irreversible) sudden change in the internal dynamics and feedbacks of an ecosystem. Human activities, like overfishing, often unwillingly cause a regime shift of an ecosystem to a less desired socio-ecological system, see Biggs, Carpenter, and Brock, 'Turning Back from the Brink'; Walker and Salt, *Resilience Thinking*, 36–7.

<sup>25</sup> Nakazono and Yasunaga, *Kujiratori emonogatari*, 8.

bones in shell mounds. For the human communities, the carcass of stranded whales provided a wealth of protein and raw materials, as cetaceans were disassembled, eaten, and their bones used as tools. Unclear remains, however, in what capacity these coastal settlers were engaged in active whaling. Evidence suggests that Jōmon hunters have most likely hunted dolphins. The small size of their boats and the insufficient equipment make it unlikely, however, that larger cetaceans were hunted outside of a few opportunistic kills, for example, when a whale was already injured and disorientated. Most whale bones that have been found near their settlements are, therefore, likely gathered from beached cetaceans.<sup>26</sup>

On the other hand, cetaceans could also cause distress to a coastal community. Some whale species competed for the same fish species as humans and toothed whales, like some dolphin species and killer whales have been known to disperse fish swarms.<sup>27</sup> Even more, killer whales and sperm whales might have posed a serious threat to these coastal hunters, especially when provoked. Injured or dead whales often lost large amounts of blood and grease near the coast. While these additional nutrients could prove beneficial to the coastal ecosystem as a form of marine fertiliser, as we will see later in the book, sometimes the amount of blood at one specific spot was just too large to absorb and thus killed off coastal sea grass, shells and scared off fish. In these instances, the out-flowing bodily fluids of whales were perceived by the coastal communities as ‘pollution’, not unlike an oil spill. Eating spoiled whale meat also posed a serious health risk, leading to the belief of a ‘whale curse’ that would befall communities that ate whale meat without the consent of the gods of the sea. In this way, the same biomass that contributed to the fertilisation of coastal ecosystems and provided large amounts of protein to humans could also turn into a biological time bomb.

These positive and negative effects of the cetosphere on the early coastal communities have most likely influenced their religious and cultural representation of cetaceans. Unfortunately, we do not know much about these prior to the early modern period. One of the oldest cultural depictions of a whale is a 6.3-centimetre-long figurine found near Hakodate in southern Hokkaido that is dated from 4,500 years ago. It is believed to show a killer whale and might be a predecessor of the Ebisu belief.<sup>28</sup> Other artefacts, such as cave paintings depicting fishermen killing whales, or spoons made out of whale bones were found nearby. In northern Kyushu, burial mounds from the Kōfun period (300–538 CE)

<sup>26</sup> Yamamura, ‘Kōkogaku kara mita Nihon rettō ni okeru hōgei’, 137–42.

<sup>27</sup> Nakamura, *Iruka to Nihonjin*, 207–9. <sup>28</sup> Ōsumi, *Kujira to Nihonjin*, 76.

also contain depictions of whale hunts.<sup>29</sup> At least since the Heian period (794–1185 CE), stranded whales were not only eaten by the local population but the carcasses were also turned into whale oil for illumination. Dolphins and other smaller cetaceans were sometimes trapped into coves by communities across the Archipelago. A document from 1404 alludes to a possible whaling operation on Tsushima, an island between Japan and Korea, but it could also have been a dolphin hunt. From the same Muromachi period (1336–1573), references to whale meat have survived in cookbooks and the meat was a high-priced commodity consumed by the elite in the capital, indicating that it must have been a relatively rare dish.<sup>30</sup>

While many details remain unclear, it seems that whales played an important part in the lives of coastal societies and were early on harvested on the Japanese Archipelago, even though the use of stranded whales was most likely much more important than active hunting. In this regard, early coastal communities 'lived with' whales in a similar way as described by Nancy Shoemaker.<sup>31</sup>

### Following the Pilgrimage of the Whales

The seasonal arrival of whales in local waters was a highly anticipated event for many communities as a single accidental whale stranding could bring enough wealth as a whole fishing season. Eventually, some villages were no longer content with leaving this possibility to chance, or – to the grace of the whales – but began actively looking for whales to drive them into coves. It is believed that whaling as an occupation emerged around 1570 in the Ise Bay of central Japan. Whalers on seven to eight boats drove whales into coves, where they could be killed with simple harpoons. The preferred target were right whales that followed the Kuroshio Current northwards during the winter months and came close towards the coast. Once a whale was struck with a harpoon, it was hauled to the ships and brought to the beach, where the skin was removed with long blades from the underlying blubber, meat, tissue and bones in a process we call 'flensing'.<sup>32</sup> Eventually, the new whaling techniques were taken up by fishing communities on the Kii Peninsula, where the first whaling group (*kujira-gumi*) was established in Taiji in 1606. At the beginning, whaling was just one of many coastal activities conducted by the Kii fishing communities, supplementing sardines (*iwashi*), sea bream (*tai*) and

<sup>29</sup> Yamaura, 'Kōkogaku kara mita Nihon rettō ni okeru hoge'i', 144–8.

<sup>30</sup> Nakazono and Yasunaga, *Kujiratori emonogatari*, 18–19.

<sup>31</sup> Shoemaker, *Living with Whales*. See also the Introduction.

<sup>32</sup> Nakazono and Yasunaga, *Kujiratori emonogatari*, 23–5.

bonito (*katsuo*) catches for the markets of the nearby merchant city Osaka in the Kansai plain.<sup>33</sup>

Coinciding with the emergence of active whaling operations was the unification of the Japanese main islands (except for Ezo) under the warlord Tokugawa Ieyasu (1543–1616) in 1600. Under the new Tokugawa Shogunate, new innovations in agriculture, such as more resilient rice types or new irrigation projects, led to a steep increase in the overall population.<sup>34</sup> Especially in the Kansai plain, farmers used newly attained fields not only to increase production of food crops, however, but also to produce new cash crops, like cotton, indigo, and tobacco, which further put ecological pressure on the agricultural land, which began to lose its productivity.<sup>35</sup> To compensate farmers in the agricultural core regions began to use commercial fertiliser. Among these were ‘night soil’ and soybean cakes, but the most common commercial fertilisers were fish and to a lesser degree whale fertiliser.<sup>36</sup> Thus, marine fertilisers made out of dried or pressed sardines from the Kii Peninsula were in high demand to replenish the exhausted fields of the Kansai plain. Additional to sardines, demand for not only other marine products, such as bonito, which were used as the basic ingredient in the Japanese cuisine, but also of whales increased drastically.

<sup>33</sup> Translating Japanese fish species into English is often not precise. For example, Edo period fishermen used the term *iwashi* not only for different subspecies of sardines but also for other similar-sized fish, like anchovy and round herring, see Kalland, *Fishing Villages in Tokugawa Japan*, 99. In this case, the distinction is especially relevant as sardines and anchovy are mutually exclusive of each other because of preferences in food and water temperature. Good sardine catches typically mean poor anchovy catches and vice versa, but as both species were called *iwashi* indiscriminately in Tokugawa Japan, this problem is not visible in the primary sources. See also, Longhurst, *Ecological Geography of the Sea*, 265.

<sup>34</sup> It is estimated that the Japanese population almost doubled from 16 to 30 million between 1600 and 1721. However, the exact number of people living on the Japanese islands is still contested. For 1600, Hayami estimated a conservative 12 million, while Farris calculated around 15–17 million. Both agree that at the beginning of the eighteenth century, roughly 30 million people were living on the Japanese archipelago, see Hayami, *The Historical Demography of Pre-modern Japan*, 43–6; Farris, *Japan to 1600*, 171, 195. Carmen Gruber notes that the Japanese population grew by 1.4 to 2.6 times between 1600 and 1721 compared to a much slower population growth in England during the same period of only about 1.3 times to 5.3 million people, see Gruber, ‘Escaping Malthus’. Regarding the introduction of a new rice types, see Verschuer and Cobcroft, *Rice, Agriculture, and the Food Supply in Premodern Japan*, 82.

<sup>35</sup> Francks, *Japan and the Great Divergence*, 59–63; Totman, *Early Modern Japan*, 100.

<sup>36</sup> For more on soybean fertiliser, see Higuchi, ‘Japan as an Organic Empire’. ‘Night soil’ were human feces that were the East Asian alternative to European livestock manure. Specialised guilds in large cities organised this lucrative trade and carried the feces to nearby fields, see Ferguson, ‘Nightsoil and the “Great Divergence”’; Howell, ‘Fecal Matters’; Walthall, ‘Village Networks’.

With the rising demands for food and cash crops, humans began to interfere more regularly in the cetosphere. Soon, the marine animals coming close to the Kii Peninsula during the yearly migrations no longer withstand this increased anthropogenic pressure and either diminished or avoided the region. The Kii fishing groups were thus confronted with the choice of either reducing their fishing and whaling activities or to find whales and fish elsewhere. The Kii communities opted for the latter option and built a fleet of ships following the migration route of the whales along the coast to discover new fishing and whaling grounds. Since the Sengoku period (1477–1600), the Kii region had been famous for its shipbuilding techniques, which continued under the Tokugawa rule despite its regulation that forbade the construction of ocean-going vessels.<sup>37</sup> Thus, every year dozens of Kii fleets pushed west and east following along the whale pilgrimage route.

The whales first guided the Kii fishermen westward towards the Seto Inland Sea. When they found on their journey a promising fishing or whaling place, they visited the local village headman and paid for the rights to harvest the marine resources that were then often sent back to Osaka. However, since the Kii fishermen were much more efficient and reckless in harvesting marine resources, they quickly exhausted the new grounds. Sometimes, the Kii fishermen were invited by local communities to teach them new techniques, while at other places, the locals observed the newcomers and eventually adapted their advanced fishing and whaling techniques on their own. Sooner or later, however, the locals had learned the new techniques and began to regard the Kii groups as unwanted competition and ousted them.<sup>38</sup>

As early as 1626, we have reports of Kii fishermen hunting whales in Kyushu, some 600 kilometres west from their home waters. Around the same time, a number of coastal communities in western Japan began to hire Kii fishermen as experts for whaling or formed their own whaling groups.<sup>39</sup> Harpoon whaling became especially successful in regions where whales migrated closely along the coast and where agricultural opportunities were limited. For example, in the 1660s, the Tosa domain in southern Shikoku was in desperate need of tax income and invited Kii fishermen to develop the local fisheries by introducing new net types

<sup>37</sup> Roberts, 'Shipwrecks and Flotsam'; Howell, 'Foreign Encounters and Informal Diplomacy in Early Modern Japan'. This policy was part of what has been later called *sakoku* (closed country). Newer literature has suggested that this policy was not as absolute as previously thought, see, for example, Hellyer, *Defining Engagement*.

<sup>38</sup> Sugiura, *Tōgoku gyogyō no yoake to kishū kaimin no katsuyaku*, 29–39; Wakayama kenshi hensan iinkai, *Wakayama kenshi: Kinsei*, 4:446–8.

<sup>39</sup> Wakayama kenshi hensan iinkai, *Wakayama kenshi: Kinsei*, 4:454. See also, Kijima, *Nihon gyogyōshi ronkō*.

and stimulating bonito rod fishing as well as harpoon whaling.<sup>40</sup> In this way, the Kii fleets progressed at a steady pace along the whale migration route on the Kuroshio and Tsushima currents, introducing whaling and fishing techniques to new communities, only to advance further after a short time, leaving behind an exhausted coastal ecosystem. Due to the limitations of the harpoon whaling techniques, which allowed only a limited range of whale species to target and proved often unsuccessful in the end, the impact of these Kii fleets was probably more devastating for fish stocks than for cetaceans, who could easily avoid the dangers close at the coast.

The relationship between whales and humans changed fundamentally, with the development of the net whaling technique (*amitori-hō*) by Wada Kakuemon Yoriharu from Taiji in 1675. While the less advanced harpoon whaling method could be conducted with a few dozen helpers, net whaling required at least two hundred whalers, meaning there was a high level of organisational sophistication and access to capital needed to pay hired fishermen. This new method had a much higher success rate and could target a broader range of whale species but was also a financial risk as operating a whaling group could cost up to 5,000 *ryō* per season, as it required paid workers, infrastructure, boats and equipment.<sup>41</sup> A lookout was placed on a nearby hill looking for migrating single whales coming close along the shore. When spotted, a smoke signal was given, and up to three hundred whalers in small boats blocked the targeted whales access to the open sea. Using drums and spanned nets between the boats, the whale was driven towards the coast or into the nets and once its movement was taken away, dozens of hand harpoons were shot at the whale from all sides. Eventually, the leader of the group would jump on the back of the whale, killing the animal with a sword stab near the blowhole. After the kill, the whale was brought to a land station where another hundred to two hundred helpers were disassembling the whale into various commodities.

Most whaling villages in western Japan soon adopted this method, with northwestern Kyushu becoming the most successful whaling area. In the second half of the Edo period, almost 80 per cent of all whaling groups were based here and apart from the main island of Kyushu, coastal villages established whaling groups on the Gotō Islands, Ikitsukishima, Iki, and Tsushima.<sup>42</sup> These groups focused on whales who migrated on the Tsushima Current and became disorientated in the maze of small islands.

<sup>40</sup> Kesenuma shishi hensan iinkai, *Kesenuma shishi. Sangyōhen*, 5–2:108.

<sup>41</sup> Koga, 'Saikai hogeigyō ni okeru geiniku ryūtsū'. One *ryō* was supposedly enough money to feed one adult for a year with rice, see Rekishi Misuteri-Kurabu, *Zukai! Edo jidai*, 72.

<sup>42</sup> For a detailed description of the net whaling method, see Nakazono and Yasunaga, *Kujiratori emonogatari*. Taiji whalers in Kii domain targeted mainly right, gray, sperm,

### Whale Bodies on Fields

When a whale died near the shore, the sudden release of the nutrients fixed in its body biomass could fertilise a coastal ecosystem for months. By bringing whales ashore humans altered in fundamental ways the energy balance of marine and terrestrial ecosystems alike. As a single coastal community could not possibly make use of all the energy stored in a whale, after flensing a whale, its parts were transformed into a variety of commodities to be traded over the whole Japanese Archipelago. As Jakobina Arch observed, it is no accident that all the thriving whaling communities, while scattered over the land route, were connected via the main shipping routes from where whale goods could be transported quickly to the markets.<sup>43</sup> For example, larger whaling groups like Masutomi from Ikitsukishima in Kyushu had their primary interest in processing and selling whale oil and fertiliser to the markets in Hakata and other bigger cities. Unlike harpoon whaling, which was often an ad-hoc opportunistic enterprise and used to feed the local population, net whaling transformed whale bodies into proto-industrial products aimed for interregional markets.<sup>44</sup>

Nevertheless, especially smaller whaling communities focused on the production of whale meat. Koga Yasushi estimated that in northern Kyushu, the profit made from whale meat surpassed whale oil and fertiliser sales. As fresh whale meat could not be transported over longer distances, however, it was not suited as a proto-industrial product and was mainly sold at local markets and eaten by the local population. Outside of western Japanese coastal communities, whale meat was not well known in the Edo period.<sup>45</sup> Communities with access to whale meat,

humpback, and Bryde's whales. Other whale species, like fin and blue whales were often too fast and therefore dangerous to approach, see Wada, 'Whaling, Culture and Traditions in Taiji', 84.

<sup>43</sup> For a comprehensive account on the western Japanese whaling enterprises in general, see Arch, *Bringing Whales Ashore*, 2018.

<sup>44</sup> 'Proto-industrialisation' was originally conceived to describe a European phenomenon in the early modern period, but in recent years, a number of studies have adopted the concept to describe the rural non-agricultural economy in late Tokugawa Japan. The manufacturing of commodities for non-local markets took place in many rural villages. In landlocked villages, the production of textiles, sake breweries, papermaking, salt, indigo, and timber products was commonplace, while fishing villages often engaged in the production of fish fertiliser. Rural men and women either worked from home or were contracted as seasonal workers for these industries and specialised merchants brought the products to the interregional markets. Typically, proto-industrialisation led to the monetisation of the affected economies and a social hierarchy among the commoner class, with the merchants usually coming out on top, see Ogilvie and Cerman, 'The Theories of Proto-Industrialization'; Pratt, *Japan's Protoindustrial Elite*; Wigen, *The Making of a Japanese Periphery, 1750–1920*; Howell, *Capitalism from Within*.

<sup>45</sup> Koga, 'Saikai hogeigyō ni okeru geiniku ryūtsū', 47–9.



had, however, some advantages, especially during the frequent famines of the time. The whaling season was in the winter and the early spring months when the fields would not produce crops and the dreaded ‘spring famines’ were most violent. In such cases, a single whale could save ‘seven villages’ as a popular saying goes. It seems reasonable to assume that in northern Kyushu, a stable source of whale protein during the most critical months of the year saved many lives.<sup>46</sup>

While the availability of whale meat could feed starving mouths, some proto-industrial products, such as whale fertiliser and whale oil had a much larger ecological impact on the terrestrial ecosystem. For example, whale oil had initially been used for illumination, but this usage fell out of fashion because of the strong odour and the availability of alternative plant-based oil.<sup>47</sup> After 1670, several farmers and scholars discovered independently from each other another application of whale oil: as it turned out, whale oil was an effective repellent against planthopper (*unka*). Whale oil proved its potency during the Tenmei famine (1782–1788) by helping peasants in western Japan repel a locust invasion and preserve part of their harvest. Several domains in western Japan stored whale oil for emergencies and the Tokugawa government helped disseminate the knowledge of this use of whale oil in 1787 and 1796.<sup>48</sup> According to one source, peasants who used whale oil during the Tenmei famine were able to save 30 to 40 per cent of their harvest, while their neighbours lost everything.<sup>49</sup>

Compared to whale meat and whale oil, whale fertiliser played a less significant role in western Japan. According to the log of a ship that brought whale products from a whaling place to the regional city of Hakata in the 1850s, 60 per cent of the whale products were meat, followed by 30 per cent oil and about 5 per cent fertiliser.<sup>50</sup> Although the volume of whale fertiliser on the market compared to fish fertiliser was low, whale fertiliser was a noteworthy supplement to the fish fertiliser trade network as it had a different chemical composition and could therefore be used for different crops. The *Nōgyō zensho* (The Farmer’s Compendium) written in 1697 mentions whale scarp as an alternative to dried sardines, plant oil and night soil.<sup>51</sup> A 1709 manual, meanwhile,

<sup>46</sup> The scholar Ōtsuki Heisen, for example, believed that whale meat kept whalers from getting sick during the winter months, see Ōtsuki, *Geishikō*, 1976, 518–19.

<sup>47</sup> Nakazono and Yasunaga, *Kujiratori emonogatari*, 146.

<sup>48</sup> Arch, ‘Whale Oil Pesticide’; Torisu, *Nishikai hogeigyōshi no kenkyū*. The use of whale oil as pesticide was also known among Yankee whalers, see Demuth, *Floating Coast*, 26.

<sup>49</sup> Ōkura, ‘Jokōroku [1826]’, 55–6.

<sup>50</sup> The exact amount varied on each shipment. The numbers are taken from Koga, ‘Saikai hogeigyō ni okeru geiniku ryūtsū’, 55.

<sup>51</sup> Miyazaki, ‘Nōgyō yensho [1697]’, 98.

stressed that sardine fertiliser was of inferior quality to herring fertiliser and that farmers only used it because it was cheap and available. It also stated that whale fertiliser was even worse and should not be sprinkled on barley or rice fields as it would spread sickness.<sup>52</sup> It is not clear what exactly was meant here by ‘sickness’, but it is possible that early versions of whale fertiliser failed and that it took some trial and error to figure out the right combination. Also, in 1709, herring fertiliser from Ezo was still new to the market and was therefore probably praised. Indeed, agricultural manuals published in the early nineteenth century were more enthusiastic regarding sardine and whale fertiliser. The *Baiyō hiroku* (Secret Notes on Cultivation) from 1840 concluded that whale oil cake was only surpassed by high-quality sardine oil cake and was more effective than herring fertiliser. High-quality whale fertiliser was, however, expensive and was advised not to be used on low-profit products like grains or vegetables. An added advantage of whale fertiliser was that it would not freeze in winter and could be used for winter crops.<sup>53</sup>

The *Baiyō hiroku* also claimed that whale bone fertiliser (or other bone fertilisers) was necessary for sugar plants to grow and for the plants to develop their characteristic sweetness. Also, for the growth of other cash crops, like indigo plants, tobacco, hemp, and ramie this bone powder was indispensable.<sup>54</sup> The *Geishikō* (Manuscript on Whale History) from 1808, written by Gentaku’s cousin Ōtsuki Heisen, explained that a single treatment of whale bone powder on a rice field would yield high-quality crops for three years.<sup>55</sup> Furthermore, a manual from Iwashiro Province (today Fukushima Prefecture) written in 1837 proposed mixing fish oil, ash, and whale waste fertiliser for the best results when growing daikon seed.<sup>56</sup> The last example is especially interesting as it shows that whale fertiliser was transported from western Japan as far as Iwashiro Province.<sup>57</sup> Sardine or herring fertiliser from Sanriku or Ezo, respectively, was transported in large quantities, which reduced the transportation costs. Whale fertiliser, on the other hand, was only available in small quantities (as the ship records from Hakata demonstrate), indicating that it was traded as a high-priced commodity.

All agricultural manuals make a clear distinction between whale waste and whale bone fertiliser, which were used for different purposes. As we know today, the effectiveness of fertilisers is based around two specific

<sup>52</sup> Kano, ‘Nōji isho [1709]’, 45. <sup>53</sup> Satō, ‘Baiyō hiroku [1840]’, 301–3, 308.

<sup>54</sup> Satō, ‘Baiyō hiroku [1840]’, 314–17. <sup>55</sup> Ōtsuki, *Geishikō*, 1976, 518–20.

<sup>56</sup> Kashiwagi, ‘Denshichi kannōki [1837]’, 202.

<sup>57</sup> A whale scroll from Iwaki shows that organised whaling was conducted in the early eighteenth century in today’s Fukushima Prefecture. This whaling group most likely no longer existed in the nineteenth century, however, see Ono, ‘Iwaki no koshiki hoge’.

elements: nitrogen and phosphorus. Even though sardines were the most often used commercial fertiliser of the time, compared to their body mass, these elements were low in quantity.<sup>58</sup> When we compare the different kinds of fertilisers, we can see that sardine oil cake contained 7.97% nitrogen and 7.11% phosphate, while whale waste contained 11.59% nitrogen but only 3.01% phosphate and whale bone-meal contained 3.01% nitrogen and 26.03% phosphate.<sup>59</sup> From this, we can conclude that whale oil cake was the superior nitrogen fertiliser, while whale bones far outmatched anything else regarding phosphate accumulation.

Even though they did not have this chemical knowledge, the Japanese farmers recognised that whales provided two different types of fertilisers. Without a substantial livestock population, Japanese peasants had to replace the missing nitrogen with night soil and fish fertiliser and needed a different source for phosphate as animal bones were not widely available. A single whale could bring both nutrients at once and at a higher concentration than any other fertiliser. Whale fertiliser was therefore a secret trump card in the fertiliser trade network, even though it was not available in the same amounts as other fertiliser types. While fish fertiliser was brought to the agricultural core regions from the northern periphery (Sanriku and Ezo), whale oil and whale fertiliser were brought from the peripheral whaling villages in Kyushu, southern Shikoku, and the Kii Peninsula.

### Conclusion

The yearly migration of thousands of cetaceans on the ocean currents along the Japanese coast, shaped and influenced the coastal and marine ecosystems in countless ways. In the cetosphere, whales were responsible for binding and transporting nutrients in their bodies, mixing and fertilising water masses and regulating fish and zooplankton abundance. However, in western Japan, these positive effects for the ecosystem remained largely unnoticed, instead the whale bodies themselves were seen as the biggest prize. Japanese fishermen understood the significance of fish and whales as the holders of valuable nutrients that could replenish the impoverished soil and this system had the advantage that more crops could be harvested in the short term and more humans could be fed. By following migrating fish and whale stocks, Kii fishermen disseminated proto-industrial fishing and whaling technologies from the Kansai region

<sup>58</sup> The Norwegian Ambassador in Japan made this remark in his report to his home government in 1908, see Utenriksdepartementet, '32/08 Japan 1908'.

<sup>59</sup> Lindemuth, 'Composition of Certain Fish Fertilizers from the Pacific Coast and the Fertilizer Value of Degreased Fish Scrap', 616.

to more peripheral coastal communities. The process of connecting coastal Japan with the agricultural hinterland was an integral part of the emerging interregional coastal trade network in which not only fish fertiliser but also rice and other products were transported from one side of the archipelago to the other.<sup>60</sup>

While whale meat was mainly of regional importance, we can understand early modern Japanese whaling better if we frame it as part of agricultural history. The Kansai and Kantō core regions could outsource many of the ecological repercussions of the fertiliser production to the less populated peripheral region. Compared to European livestock like cows and horses, fish and whale fertiliser had the advantage that it did not compete for valuable land resources and received all its nutrients from marine ecosystems. Farmers did not have to worry about removing valuable nutrients from other terrestrial ecosystems and received these nutrients without immediate negative consequences for them.

However, the mass extraction of marine resources did disturb the marine ecosystem. Overfishing, especially in places where fish spawned, would eventually lead to an overall decrease in marine fauna. Moreover, whales also began to appear less often near the coast of Japan, while they reached the coast of Japan later each year on their migration routes. In the long term, the marine fertiliser trade externalised the ecological cost from the land to the ocean and weakened the ecological functioning of the cetosphere.

<sup>60</sup> Dusinberre, *Hard Times in the Hometown*, 17–36.