

## Taming the Seas: Empires of Fishing, Colonization and Ecological Collapse in the Western Pacific

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### **Abstract**

*In 2020 Chinese “dark fleets” replaced North Korean “ghost ships” in international discourse as symbolic of a certain form of global maritime threat and disturbance. This article takes a longer view of trouble on the high seas, looking back to the globalization of the oceanic commons at the behest of post 1945 geopolitics and new forms and methodologies of fisheries science. With Carmel Finley’s articulation of Pacific Empires of Fishing in mind the article explores fishing histories of East Asia and the Pacific, both during and after the era of colonization. The article considers the marginalization of already peripheral traditional Korean fishing communities by Japanese colonization, ecological collapse generated by the technological and statistical development underpinning scientific fishing, and the ghosts made of fish themselves as the powers and logics of accumulation and extraction transform the watery geographies of the Pacific.*

### **Introduction**

In 2020 many of the drivers of globalization appeared to go into reverse or halt uncomfortably, as that most global of forces, a worldwide pandemic, ravaged international travel and the connections through which intercontinental trade and travel have become so normalized in recent decades. As the airport lounges emptied and the stratospheric sinews that stretch across the planet became ever thinner and more tenuous, it was as if we had returned, apart from the ever present and very global virus, to the world of our grandparents and great-grandparents where nations such as Australia and South Korea, from Europe at least, were very, very distant, very much over there or down there, half known about and seldom visited. Just as these more familiar and practically useful products of globalization receded, so alongside the virus, and perhaps because of the disconnection brought by this extraordinary year, other seemingly uncontrolled globalizing energies began to disturb and dismay popular and political media. A particularly widely spread academic

article published in July 2020 raised the issue of Chinese “dark fleets” of fishing boats,<sup>1</sup> which had come to dominate many of the fishing grounds once important to North Korea (North Korean boats perhaps displaced or reduced due to Covid19-related epidemic restrictions which saw most of its fleet restricted to port). Later in the year the “dark fleets” were reported just outside the Exclusive Economic Zone of the Galapagos Islands (sovereign to Ecuador), and further reports suggested that they had created ecological pressure on waters off West Africa (displacing of course the very public fleets from European Union nations which had previously exploited these same waters). Such masses of fishing boats are of course dark in many ways in global discourse. Dark in the literal sense that they are generally invisible to the normal monitoring technologies important to contemporary global fishing (they switch their AIS transponders off or do not have them fitted in the first place). But Dark also in the conceptual sense that they are regarded as nefarious and evil in intent, another long arm of the autocratic People’s Republic of China (PRC) with which it shamelessly and brutally seeks to strip resources without limit from the global commons.



Image 1: Dark Fleets - Chinese Boats in North Korean Waters, 2019 - Image in supplementary materials for [Jaeyoon Park et al. 2020. “Illuminating Dark Fishing Fleets in North Korea.” [Science Advances 6.30, eabb1197](#). Twelve AIS messages are shown matched to detected pair trawlers (grey ovals) in a PlanetScope image captured on 2 June 2018 in North Korean waters. The solid white dots, with accompanying 9-digit MMSI numbers, indicate the AIS positions broadcast closest in time to image acquisition, while the hollow white dots are the estimated positions at acquisition time based on extrapolation of the vessels’ speed and course.

The Chinese global fishing fleets of 2020 and 2021 are highly obvious given their size, and perhaps provocative given their avoidance of the regularized monitoring systems prevalent across the globe, but they are not really unique in their ecological impact or in their presence in the Pacific. Industrial fishing since the 1950s has seen something of a developmental and technological arms race across the planet that has stripped the oceans of life and abundance, fishing down trophic levels and exploiting species such as krill that would never previously have been considered worth catching, and radically altering the topography of the deep sea, transforming sea floors across the planet into flat, featureless deserts marked by the drag lines of trawler gear.

The PRC is late to the enterprise, as fleets from the European Union, the United States, Japan, and the former Soviet Union and Warsaw Pact nations prior to 1992, ranged across

the globe. They are perhaps brazen in their efforts, which resemble a form of poaching on the high seas, but interestingly they have displaced the previous fleets of concern regionally, namely those North Korean “ghost ships” which began to appear after 2012 (Winstanley-Chesters 2020).<sup>2</sup> These forlorn, old fashioned and decrepit boats which washed up hundreds of times on the coasts of northern Japan and the Russian Federation, sometimes with cargoes of deceased North Koreans, were themselves the offspring of poaching fleets in the West Sea/Sea of Japan exploiting the rare rainbow squid populations on and around the Yamato Bank and competing uncomfortably with technologically advanced Japanese squid boats.

North Korean fleets were once almost as visible in the media as the Chinese from 2020, and aside from the impact of the occasional dead crew members on the Japanese and Russian coast, were almost as impactful when it comes to poaching and illicit extraction from the commons. There was huge concern about North Korea’s monetization of potential maritime resources and what that might have meant for the support given to its military capacity and capability, as well as the breaking of the sanctions regime led by the United States designed to restrict and constrain Pyongyang. There was also some concern that North Korean institutional pressure on non-fishing coastal communities, given the other pressures on its economy and government, was pushing people who weren’t actually fishermen to sea, endangering them and leading to those unfortunate situations which resulted in some boats becoming “ghost ships.” The Russian Federation in particular was most upset by the damage caused by North Korean fleets to the delicate conservational balance off the shores of Primorsky, particularly the Pacific Salmon which return to spawn in its far eastern rivers.

Here we take a longer view of East Asian and Korean maritime interactions. We also take a longer view of the impact of internationalization and globalization on fishing and marine matters. Whereas globalization is generally considered a product of the WTO and GATT agendas, post-Cold War deregulation, financialization and neo-liberalism, when it comes to the extraction of value from under the waves and the exchange of products from the sea, global interactions have long been the reality. Extending a nation’s fishing capabilities and capacities across the globe, essentially an invention of the first couple of decades of the twentieth century, was injected with a new sense of urgency after the end of Second World War. In the Pacific the late 1940s and 1950’s was an era of technological development and international competition in what was considered a global commons by the United States, Japan and other postwar allies on the one hand, and the Soviet Union and other Warsaw Pact nations on the other. After 1960 nations sought to claim sovereignty once again over waters closer to them, a trend which eventually led to the development of 200 mile EEZ’s (Exclusive Economic Zones), but this did not reverse the pressure and urgency on countries participating in global fishing efforts.

Korean interactions with the sea are, like most elements of the peninsula’s history, unnavigable and incomplete if its pre-modern and colonial histories are not examined. Korea’s watery history does of course not simply start in 1945, and neither does the history of Pacific fishing and maritime endeavor. The desire to extract and accumulate wealth and value from the seas, the coasts and the ocean floors of the Pacific as the reader will see, may have dramatically expanded in the second half of the twentieth century at the behest of capital, the United States and its former enemy Japan, but fishing has a longer history and the former Japanese Empire and territories such as the Korean peninsula were testbeds and nurseries for many of the techniques and technologies that would later be familiar in the practice of industrial fishing.

## Watery and Fishy Histories of the Korean Peninsula

Fishing and coastal development on the Korea peninsula is intricately linked to its complex religious and cultural histories. Buddhist practices integrated into Korean society during the Koguryŏ (高句麗) (37 BCE - 688 CE) and Koryŏ (高麗) (918 CE - 1392 CE) eras meant that, as was the case in Japan (as Jakobina Arch found with the transformation of wild boar into “mountain whales”<sup>3</sup>), eating animal flesh and animal products became highly problematic. Because of the stipulations of Seon Buddhist theology (in which Korea’s Jogye Order (曹溪宗) is rooted), fishing and the killing of fish and other marine life became entirely forbidden, seen as an act of blasphemy against the Buddha. When Koryŏ was replaced by Chosŏn and the Yi dynasty in 1392, Buddhism declined in institutional influence, replaced by what came to be a very distinct approach to Confucianism and later Neo-Confucianism. Neo-Confucianism was very tightly focused on social ordering and complex organization of state ritual which included a restrictive class based system.<sup>4</sup> Fishing as a tradition that involved the killing and preparation of fish never rank high under Buddhism, but became more or less problematic at various moments during the history of Chosŏn. At times fishermen or gatherers of products from the sea were counted in the Sangmin, (百姓) (common people) and sometimes within the Ch’ŏnmin (賤民) (vulgar common people) class. Those that actually killed and prepared fish products or took shellfish and prepared them however found themselves in the Paekchŏng (白丁) (untouchables or unclean) class. Thus contact or relationships with fishing people for people in other, higher classes, or the development of trade or enterprise with them, was further complicated by social strictures.<sup>5</sup> This meant that fishing communities were often at some distance or remove from other villages and towns in historical Korea and they were extremely low down the list of institutional priorities for the institutions of Chosŏn.

There is one further element of spiritual practice which impacted on Korean fishing communities. While both Buddhism and Confucianism established rigorous frameworks for religious and cultural practice on the peninsula, they did not entirely replace earlier animist and geomantic traditions.<sup>6</sup> Given Korea’s topography a real sense of geomancy developed, perhaps influenced by similar development in what would become China. Such geomancy remains influential in Korean culture, known through notions such as Paektutaegan/Baekdudaegan (北極山), in which spiritual energy is seen as flowing through the Korean peninsula using the mountain ranges as networks and conduits,<sup>7</sup> and mountain spirits, Sanshin/Sansin (山神), who embody the spirit and the physicality of mountains.<sup>8</sup> Geomancy does not revolve entirely around mountains, and it would be surprising if similar traditions had not developed at the coast or beyond it. For traditional or early Korean spiritual traditions, as with Chinese, the sea, its coasts and waters were the domain of one of the Sea Dragon Kings. While in China these latter served as both water and weather gods, connecting to the points of the compass in a variety of traditions, in Korean coastal traditions they become unified as a single King.<sup>9</sup> This spiritual vision of watery geomancy has the waters not as a place of control, but of dangerous chaos. Thus Korean coastal communities and by extension the peninsula’s wider culture were wary of the sea, which needed placating.<sup>10</sup> Before the modern and colonial periods, this placating was done by a highly complex, but little researched, network of ritual and practice which is very rarely

glimpsed in the contemporary era. Just as in the mountains, communities would visit and intercede with Sanshin at Sanshingak, coastal and fishing communities would have Sea Dragon King temples and visit auspicious places along the coast where spiritual energy resided.<sup>11</sup> This often meant that particular coastal rocks or islets were extremely significant, that there were areas of sea or coast which could not be visited or only visited at certain times. It also meant that Korean traditional fishing boats were organized in particular formats and decorated with shamanic signs and charms and that their sails were as much for coordinating spiritual messages as they were for catching the wind.<sup>12</sup> Beyond the complexity of the nexus of purely spiritual or cultural matters and development, observers/scholars must also contend with the extreme reluctance of the Chosŏn government to develop what might be called conventional mercantilism in Korea. This difficulty with economic development and the connection between people engaged in practical development or extraction, (such as fishermen) is also demonstrated by the restrictive and exploitative system developed of commission tradesmen and bond holders, who financially complicated the daily and yearly life of fishing communities, the *Kaekchu*.



Image 3: Sea Dragon King painting in harbor shrine at Gageodo Island, South Korea - Image taken by author, 22nd June, 2017.

### **Fishing and colonization in the Pacific**

The Korean fishing communities and Korean maritime culture in the 19th century was impacted by the new forces of capitalism and colonialism. Japan and Korea are something of a special case in Asian fishing, given that Japan colonized Korea and neither country was colonized by a European or American power. The impositions of extra-territoriality during the treaty port era heavily impacted on China's extensive maritime cultures, western powers setting up new institutions and enterprises all along its coast. While the Dutch had long been engaged in connection with South Asian territories and developmental communities, for the most part these had involved spices and materials from the land.<sup>13</sup> Fish and products of the sea had been difficult to ship and trade across great distances but by the 19th century steam ships and refrigeration promised real changes to potential maritime economies. Such changes came first to Japan whose economy and political structures had been forced open by the powers of colonialism and upended in the turmoil of the Meiji restoration (明治維新). The Sakoku 鎖国 (closed country) restrictions (instigated after 1639), were quickly lifted and in 1867 stipulations on the size of Japanese ships, and whether they could go beyond the coast into the deep sea were abandoned.

It would take another two decades before extensive change occurred as Japan's population was still too small due to Tokugawa policies and cultural traditions surrounding abortion and infanticide which allowed poor families to deliberately keep their families small, To support an extensive fishing industry and the local class system in which fishing people had low status (though not as low as in Korea), meant that when the class system was finally abolished in 1870 many fishing people partially abandoned the sea to work in agricultural settings.<sup>14</sup> However improved technology and the reduction in restrictions on boat size and distance meant that in-shore fishing began to place an impractical burden on fish stocks and catches actually began to decline.<sup>15</sup> Accordingly, in 1887, the government of Japan's first modern Prime Minister, Ito Hirobumi, instituted legislation which sought to encourage deep sea fishing by bestowing subsidies on sailing ships of more than thirty tons.<sup>16</sup> Later this legislation was extended to cover steamships of over fifty tons. Steam fishing ships were soon added to the fleet, the first two being imported into Japan in 1897 and by 1899 Sahrhage and Lundbeck report that there were some "3000 locally built vessels and 37 sailing and two steam driven ships of European type."<sup>17</sup> This new offshore fishing industry aimed for all manner of fish including herrings, sardines, anchovy, mackerel and squid focusing heavily on the northern seas around Hokkaido. The yield of the Japanese industry exploded with the development of new technology such as gill nets, cotton made nets, and the purse seine nets which were first imported from America in 1882.



Image 4: Russo-Japanese War Ukiyo-e painting, Kobayashi Kiyochika 小林清秋, 1904, '*Russo-Japanese Naval Battle at the Entrance of Inchon: The Great Victory of the Japanese Navy-BANZAI!*' (public domain).

Hokkaido became an extremely important jumping off ground for Japanese forestry interests led by the Hokkaido Development Agency (Kaitakushi 開拓使), following Japan's final colonization of the island and subjugation of the Ainu in the 1870s.<sup>18</sup> Early attempts to clear land for agriculture had given way to industrial timber extraction in the interior such as Tokkachi and the Daisetsuzan range<sup>19</sup> to feed the Oji Paper Company's paper mill at Tomakomai.<sup>20</sup> Hokkaido on both sea and land therefore was very important in the nexus of Imperial economic and political interests. Developing pressure on fish stocks to the south meant that Japanese fishermen had already explored north to Sakhalin and the Kuriles, even into the Sea of Okhotsk by the middle of the 18th century (this all being home territory in the Japanese mind). While Imperial Russia had claimed the east coast of Siberia and Primorsky Krai from a weakened Qing dynasty China in the 19th century, there were still few Russians in the area to compete. The Russo-Japanese war of 1904-1905 and the Treaty of Portsmouth which followed it gave Japan complete dominance in the seas and the Kuriles and southern Sakhalin (which was named Karufuto (羸虜島) by the Japanese). Japan even gained fishing concessions in Kamchatka and the northern end of Sakhalin and a 1907 agreement between the two nations allowed Japanese companies to establish processing plants on the Russian coast, especially in Kamchatka, reserving much of the offshore for their boats while granting river mouths and bays to the Russians.<sup>21</sup> By 1910 thousands of Japanese fishing boats and ships were focused on various types of salmon off the coast of Siberia and northern Sakhalin and as Sahrhage and Lundbeck report over "Japanese canneries on Russian territory produced between 60 and 90% of all tinned salmon, which was mostly exported and sold on the world market from this region."<sup>22</sup>

Japan had become a nation with imperial ambitions following the Russo-Japanese war and its annexation of Korea between 1907 and 1910.<sup>23</sup> Prior to this, Japan had extended its interests beyond the home islands of the archipelago co-opting the Ryukyu Kingdom and Okinawa and then aiming its acquisitive gaze to the south incorporating the Bonin and Volcano Islands, part of the same chain which includes the Mariana Islands. Fishing had always been important to Japan, and a sense of that importance can be gained from other writing including the fantastic work of Jakobina Arch.<sup>24</sup> However, fishing endeavors had primarily

been around the home islands and focused on fish and whales passing by Japan. The Bonin Islands had presented Japan (once British possessions but claimed by the Meiji government in 1875), with an opportunity to engage in deep sea fishing and trawling for the first time, and its acquisition of what are now the Marshall Islands, Palau and Micronesia (seized by Tokyo in 1914 and awarded to Japan as the South Seas Mandate by the Treaty of Versailles in 1919), presented Tokyo with enormous further opportunities. Aside from the efforts of the South Seas Development Company (Nan'yō Kōhatsu K.K. (南洋興業株式会社), often referred to as the Mantetsu of the south (referencing the South Manchurian Railway (南滿洲鐵道) responsible for colonization efforts far to the north), to extract phosphate from the islands, plant and manage sugar cane plantations, Japanese fishing enterprises built an extensive fishing infrastructure on islands such as Saipan.<sup>25</sup> Harbors were reconfigured and extended and a number of fish processing plants built. Japan would keep its southern mandate until the end of the 1941-1945 Pacific war.

Salmon were not the only quarry for the Japanese, and in 1905 Japanese business and fishing boats began to focus on King Crabs, following the development of canning technology and safe curing of crab meat.<sup>26</sup> However by this point the Trans-Siberian Railway and reconfiguration of Russian priorities meant that more Russians and more Russian boats were fishing and crabbing in the area and disputes began to break out between fishing people of the two nations.<sup>27</sup> This encouraged the Japanese to engage in further infrastructural and technological development, and by 1920 factory ships for fish processing had been developed which meant that Japan no longer needed as many shore stations.<sup>28</sup> In 1930 some 19 factory ships, each accompanied by 2 or 3 ships for laying nets and another 12 smaller boats to haul the catch worked the waters off Kamchatka, canning some 600,000 cases of King Crab, which represented some 30 million crabs.<sup>29</sup> This hugely impacted on crab stocks. In 1927 the mothership and factory ship method was deployed on the stocks of salmon and within four years some 13 factory ships and 100 smaller ships were deployed off Kamchatka.<sup>30</sup> Such activity again began to create tension between the now organized and effective government of the Soviet Union which had established a fisheries interest in Vladivostok and was concerned to not only compete with the Japanese but to reclaim its own seas from them.<sup>31</sup>

Japanese fishing interests had also begun to develop trawl and drag net fishing, following the first imported steam trawler in 1908 (imported from a ship builder in Swansea, Wales).<sup>32</sup> More than 130 further trawling boats were in place over the next four years. Soon, the inshore waters of Japan were restricted to them.<sup>33</sup> The trawlers then worked in the East China Sea and Yellow Sea, both fairly shallow with flat beds, perfect for trawling with a focus on fish like Croaker and Sea Bream. In 1920 Japanese companies introduced bull trawling, new technology with long trawl wings and greater capabilities in the extraction of species preferred by the home market.<sup>34</sup> Tokyo's developing Imperial project meant that bases and processing plants could be constructed for the processing of fish caught by these trawlers in Liaodong and in Formosa (Taiwan), as well as on the Korean peninsula. However Korea's inshore waters were restricted so far as the trawling companies were concerned, as local stocks were too fragile.<sup>35</sup> Soon the seas of China began to be depleted and the Japanese trawlers focused north to Kamchatka and the Bering Sea in the early 1930s before going completely global and travelling to the waters around Australia, the Gulf of Thailand, the

Arabian Sea and even off the coast of South America after 1937.<sup>36</sup>

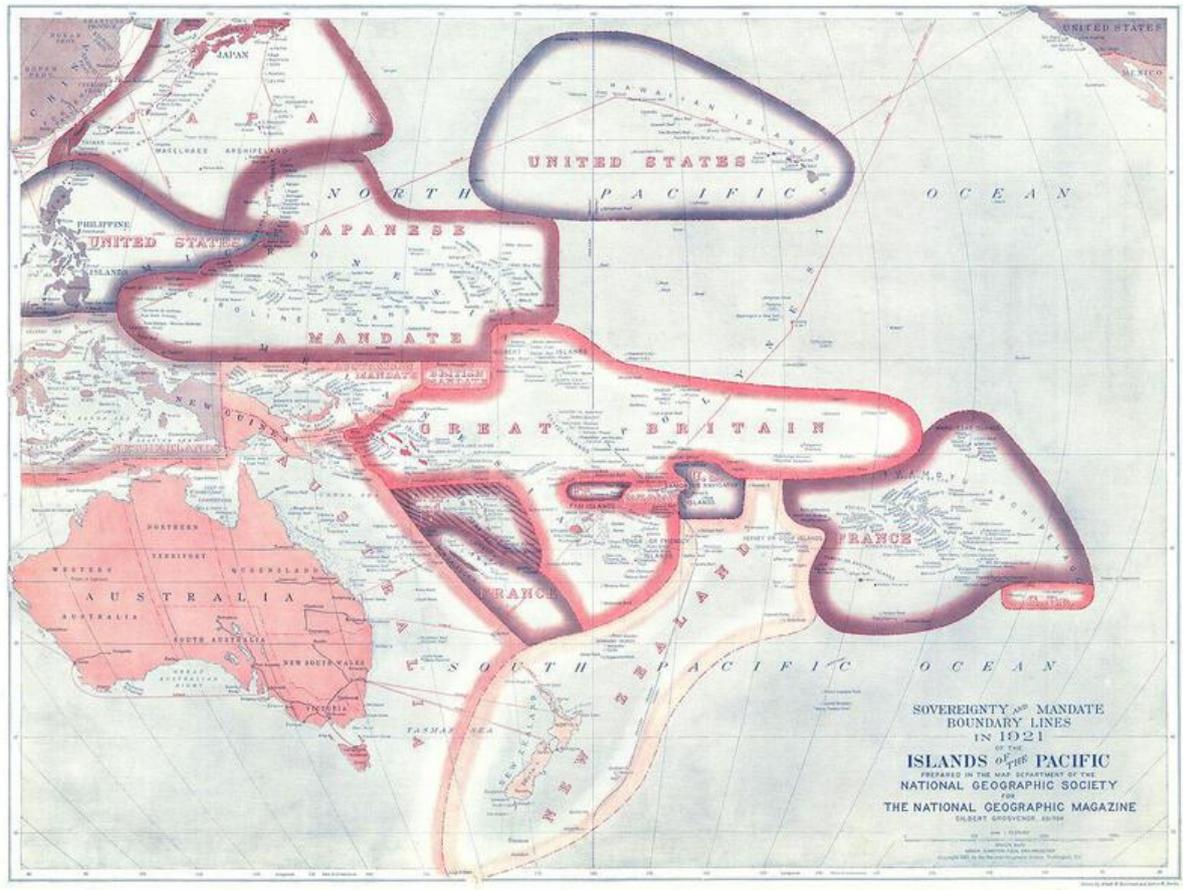


Image 5: 'Sovereignty and Mandate Boundary Lines in 1921 in the Islands of the Pacific,' National Geographic Magazine, 1921 (public domain).

Finally, Japanese development came to Tuna fishing. Bonito in particular are historically significant to Japanese cooking, providing for many centuries one of the primary elements of the fundamentally important broth underlying many of the nation's most popular dishes.<sup>37</sup> For much of Japanese history Tuna fishing was a coastal enterprise, using pole and line techniques from open boats taking advantage of those populations of Tuna that passed the home islands using the currents. However in 1913 new technologies and boat construction practices came to the Tuna industry and they were given motors and their range increased.<sup>38</sup> Japan's gain of Germany's South Pacific territories meant that these new boats could be used in an area of prime Tuna fishing, and new technologies and practices were deployed in these south Pacific fisheries. By the 1920s boats were capable of carrying 200 tons and, equipped with refrigeration, could sail great distances across the Pacific and the world and fish across all seasons.<sup>39</sup> New developments in long lining in which lines could be miles long allowed practical fishing of the Albacore Tuna, a fish of the deep sea and the mid oceans. Yellowfin Tuna exploitation was begun in the early 1930s with motherships and supporting boat fleets which did not need to be anywhere near land and were truly part of an industry of the deep oceans.<sup>40</sup>

The reality of China's experience in this narrative of technological and capacity development following the interventions of modernity and colonialism, in both late Qing and pre-1949 Republic of China iterations was that its fishermen were hemmed in by the power

of the Japanese Empire, western colonial and capitalist powers and the weakness of Chinese government institutions of the time.<sup>41</sup> While shipping and logistics companies and institutions certainly developed around coastal ports in China, almost exclusively at places like Macau, Hong Kong, Lüshūn, Tianjin, Dalian and many others, they did not serve Chinese interests.<sup>42</sup> Instead they were concerned with the trade in materials of real interest to European businesses and institutions, which did not include during the period its fish and sea products. Trawling was introduced to China by Japanese trawlermen in 1912 after they had been restricted from accessing the home waters of Japan and set up business in Shanghai, attempting to exploit what remained of the stock in Chinese home waters.<sup>43</sup> Inspired perhaps by these pioneers and the pressure placed on fishing resources by Japanese interests from Japan, traditional fishing boat technologies such as the Junk and Sampan had motors installed in the 1920s and then by 1933, fishers in Shanghai had managed to import nine steam trawlers.<sup>44</sup> This meant that Shanghai would become the main site of fishing infrastructure and development prior to 1949.<sup>45</sup> Both Japanese imperialism and the struggles of the Chinese civil war meant that much of even this small level of development was lost or destroyed so that by the end of the war “only 600 small wooden trawlers were available, left by the Japanese.”<sup>46</sup>

### **Fishing infrastructures of Chosen: Korean colonial fishing development**

Japan’s fishing development was really a product of its imperial and colonial periods, when capitalist logics and rapidly developing technology powered its fishing and other interests across the globe. Much developmental reorganization was undertaken when Japanese authorities began to implant themselves on the Korean Peninsula following the 1907 Protectorate Treaty, seeking to reconfigure Korean institutions and practices not only to accept the power and authority of Tokyo but also the logics of capitalism and state enterprise. So far as fishing and fishing infrastructure were concerned the second report of His Imperial Japanese Majesty’s Resident General from 1909 found matters extremely wanting: “The three sides of the Korean Peninsula are washed by the sea, and its coast line extends to about 6000 nautical miles, so that the marine products of the country should be abundant. While the maritime products annually obtained in Japan, which has about 8000 nautical miles of coast, amount to 100 million yen, the annual products in Korea reach only 6 or 7 million yen. The inadequacy of these products in Korea is undoubtedly due to the backwardness of fishing industries and lack of effective administration.”<sup>47</sup> The Resident General, and, after 1910 the Government General, were extremely concerned about the lack of regulation of Korea’s waters, in particular the presence of poachers of all nationalities and potential overexploitation of whales and other valuable creatures of the sea. In 1908/1909, before Korea was annexed and became Chosen, the Resident General saw to it that the legislative framework around fishing rights was completely rewritten and the government departments reorganized with Japanese bureaucrats imposed and Korean staff placed within a better structured hierarchy.<sup>48</sup>

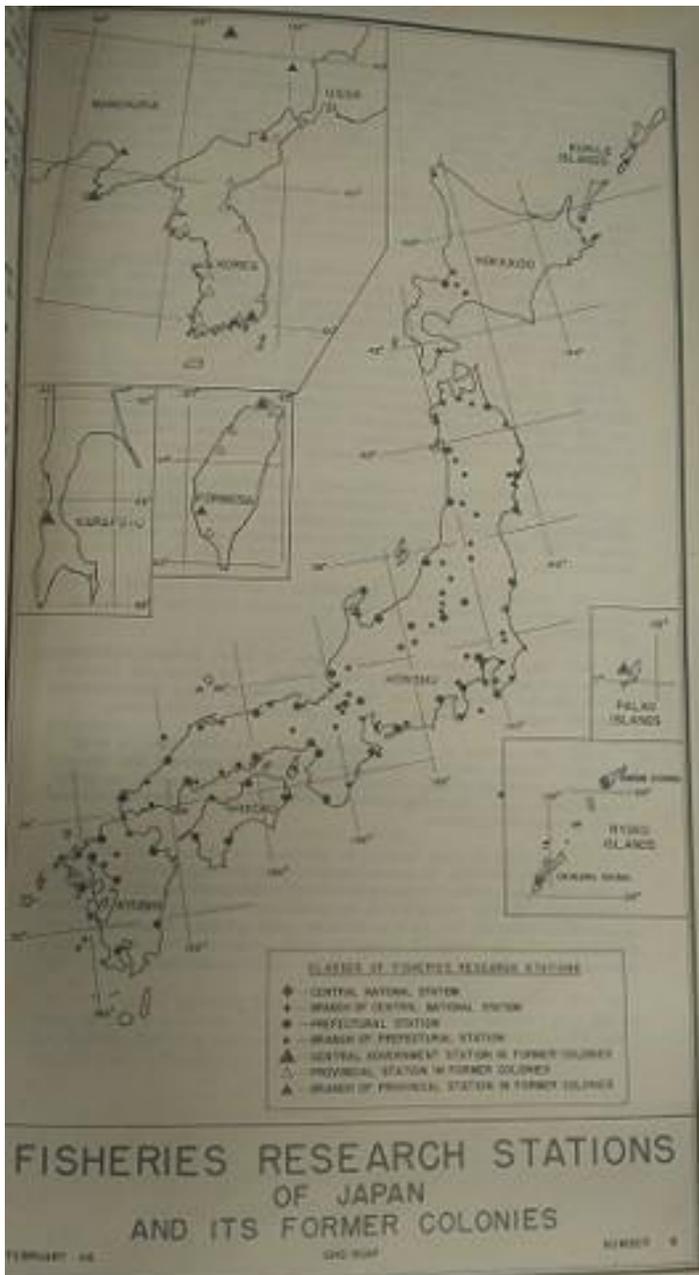


Image 6: 'Fisheries Research Stations of Japan and its Former Colonies,' Supreme Commander for the Allied Powers, 1946. *Summation of Non-Military Activities in Japan and Korea*, No 4, January, 1946, Tokyo: Supreme Commander for the Allied Powers Japan.

In 1909/1910 the Resident General established a new nationwide fisheries association which integrated all the local fisheries associations that existed at the time. The national association was also able to give local associations subsidies of some 5000 yen each to purchase new Japanese nets and fishing equipment in order to make some progress on improving both the catch and the quality of life and income of fishermen. The Japanese in particular appeared appalled by the tiny incomes generated by Korean fishermen, given the potential resources at their disposal. These subsidies to local and national associations were placed on an annual basis after the annexation of Korea, in 1910. From this year Japanese fisheries authorities were able not just to improve the capabilities and practices of Koreans themselves but to import Japanese fisher families to the peninsula. The Government General of Korea (Chosen) in 1910/1911 reported that to make this possible, Japanese provinces and other authorities had been buying land on the Korean coasts for resettlement. This had meant that by the end of 1910 some 45 villages for Japanese fishermen had been

established, containing 1600 families with a population of some 6200.<sup>49</sup>

By 1921 there were over 12000 Japanese citizens living in Korea whose job was solely focused on fishing or the preparation or production of fish products.<sup>50</sup> The Government General had also sought to import Japanese methods of salmon farming on the Korean peninsula, introducing fry to rivers and training Koreans to look after young salmon.<sup>51</sup> The Government General had also sought to diversify the products generated by its colony's fishing industry, investing in infrastructure and technology to produce glue derived from fish bones and to export washed seaweed and other products of the sea to Japan. By the early 1920s research and academic organizations from the colonial mainland had begun to implant fishery experts into the various fishery associations established since annexation. In 1920 the Government General established the first experimental fishery research station connected to the wider network on the home islands of Japan. This station served as the base for a steam powered research ship to undertake a geologic survey of the Korean coastline and coastal shelf.<sup>53</sup> This development of the Korean fisheries sector and the research surrounding it was focused not only on implanting colonial imperatives into this developmental field, but also really improving the viability of Korean fishing, so that it would pull its financial weight in the empire. After the sense of disbelief at the moment of annexation that a nation with such an extensive coastline could only derive 8 million yen value from the sea, the Governor General reports observed with satisfaction that by 1921 this had been increased to over 45 million yen.

By the late 1930's, as noted in Supreme Commander of Allied Powers (SCAP) reports dating from after the collapse of the Japanese empire in 1945 and 1946, Korea had seven core fisheries research stations on the peninsula, which were part of a network of such stations extending beyond the core of the Japanese home islands to Korea, Formosa (Taiwan), the Liaodong peninsula and the South Pacific Mandate.<sup>53</sup> Government General documents from 1934 and 1937 show that the fishing catch from Korean waters, expanded enormously from 1910 and reached a peak in 1931, becoming then slightly erratic, before fishing effort increased to maintain the upwards curve.<sup>54</sup> It was also necessary in 1936 for the Government General of Chosen to obtain a quasi-military cutter to protect the waters of Chosen from infiltration from fishing poachers from China and to control fishing boats from the Japanese mainland. The 1934 Government General report suggests that by that point there were some 116,000 people engaged in fishing, primarily Koreans themselves (though presumably the Japanese immigrants would have taken the bulk of the share from the sea and profits as Koreans wages tended to be around 40% of those for a Japanese worker). The result was a huge expansion in the peninsula's once moribund industry. Whether those fishermen really made a living from the sea in a way which had not been the case before is not clear, and whether the traditional cultural practices which accrued to fishing on the peninsula had been done away with or dissipated is also not clear, these issues not mentioned in the reports and other documentation. Japanese colonial authorities certainly made great efforts to reconfigure the fishing industry of the peninsula. They concluded: "These and other efforts towards improvement of the fishing industry have already been productive of good results. Nothing however has contributed more to the recent progress of Korean fisheries than the increased immigration of skilled Japanese fishermen..."<sup>55</sup>

Fishing from the Korean peninsula was sacrificed like so many other elements of colonial developmental policy in the late 1930s and early 1940s to the military priorities of the

Japanese Empire. A reading of the colony's history between 1933 and 1945 sees much of the effort in the colony being directed at producing military materiel and imperial subjects for Tokyo. Boats were commandeered for the war effort and towards the end of the war in 1943, 1944 and the first half of 1945 it became virtually impossible to go to sea for fishing because of the risk of bombing. Accordingly both Japanese and Korean fishing catch and the value of any products produced by the industry collapsed.<sup>56</sup> While Korea was not bombed like the Japanese mainland, much of the research infrastructure dissipated in this period, and following the capitulation of the Empire to the Americans in August 1945 and the liberation of the Korean peninsula, Japanese fishing companies and crews saw to it that a huge percentage of the Korean fishing fleet was transferred to the Japanese mainland.<sup>57</sup> It would take the combined powers of the Supreme Commander of Allied Powers and later the US Army Military Government in Korea several years to return some of the fleet and enable Korea to begin fishing again at anything like the extent to which it had before the war.<sup>58</sup> This interestingly is in stark contrast with the fishing industry of the Japanese mainland, which SCAP was very concerned to return to strength, and within 18 months had reclaimed much of its former waters in the South Pacific and former whaling grounds in the Antarctic.<sup>59</sup>

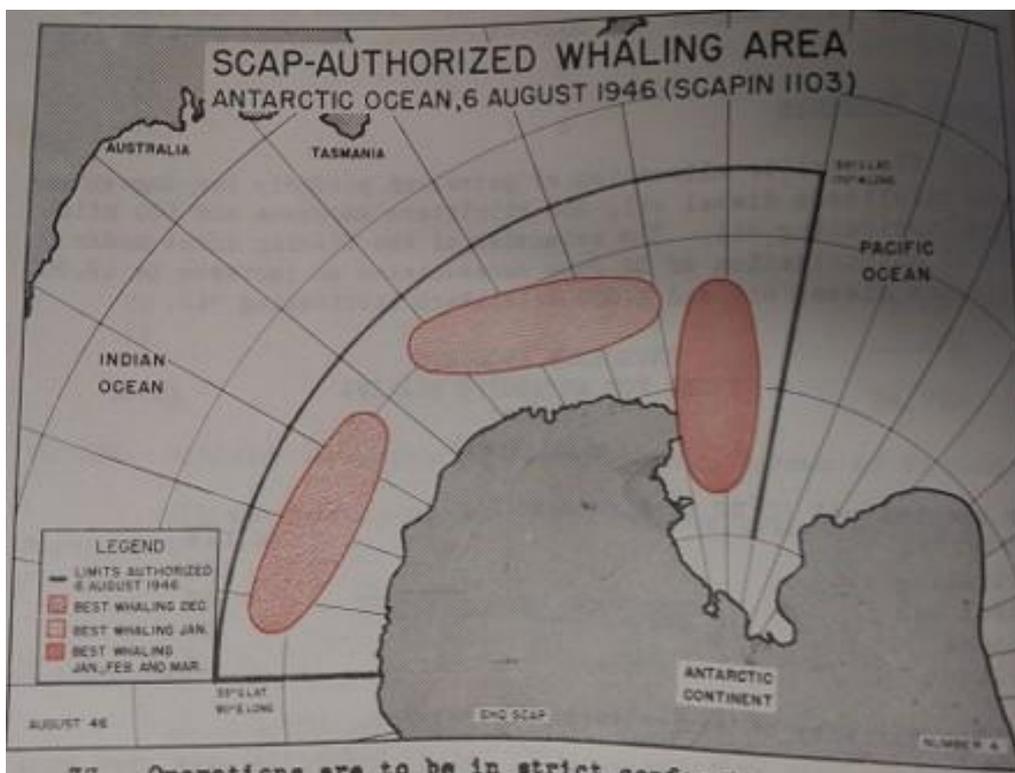


Image 7: 'SCAP Authorized Whaling Area, Antarctic Ocean, August 1946,' Supreme Commander for the Allied Powers, 1946. Summation of Non-Military Activities in Japan and Korea, No 12, September, 1946, Tokyo: Supreme Commander for the Allied Powers Japan.

### Maximum Yield and the Empires of Fishing in Asia and the Pacific

August 15th 1945, would bring the Japanese Imperial period to an end, and its pre-war empire of fishing would be, for a short period at least, brought to an end. The Korean peninsula gained a momentary independence before being occupied by both the United States and the Soviet Union.<sup>76</sup> In 1948 the two Koreas came into being. Both were for some years singularly unsuccessful when it came to deep sea fishing. Japan, the United States,

Canada (and eventually the Soviet Union) would in the 1960s and 1970s come to dominate not just the seas they had once controlled but to develop a global stranglehold over fishing resources. These countries would do so through new technologies and statistical theories which have only in the last decade or so been considered in a historical framework for the Pacific Ocean, part of, as Carmel Finley has suggested, “a new empire of fishing.”<sup>60</sup> Fish and fish products in this new empire become even more abstracted, but remain no less vibrant, important lively matters. While individual fish and other animals are rather lost in the planetary scale metrics of such development, they are no less energetic.

On the Korean peninsula following 1945 it appears that fishing activity diminished, perhaps to the level prior to 1910. Fishing communities of the East Asian or Korean near present have been subjected to much of the geo-political reconfiguration and technological change seen in this chapter. The vibrant matters of fishing are a product of a number of the processes of modernity, colonization and commodification seen so far. Japanese fishing communities as they are now developed during the late 19th century and early 20th century when Japan itself was under great pressure to modernize its bureaucracy, politics and industry having been opened to colonial forces in the 1860s. Japan then projected its own colonial influence onto the South Pacific having been granted some of the former German territories in the Pacific by the League of Nations in 1919, known as the South Pacific Mandate. Japanese industrial tuna and other fishing boats would exploit the waters of Palau, the Marshall Islands and others, developing new technologies, science and statistical sensibilities in the period before the outbreak of the Pacific War in 1941. For the most part these practices and projections sound like the development of industries at a national scale, far from the coastal communities of the past that Arch wrote about and whose lives are so intriguingly intertwined with the journeys and bodies of the sea creatures they seek.<sup>61</sup>

They were not simply entwined however with the material bodies of maritime species, nor with the communities that sought them, but with those developments in statistics and analytical and other technologies which gave power to and projected the power of new forms of state and corporate control in the Pacific. Such control would primarily be exerted on large fish which were radically different in lifestyle from the smaller fish of the coasts and North Atlantic, tuna being primarily a fish of the deep and warm seas, salmon what is known as anadromous in nature, migrating from their birthplaces up continental rivers to the deep sea and then back again as adults to the same spawning grounds from which they were born. Both tuna and salmon have complicated lives, long journeys to make and relatively low levels of population growth. These aspects of their lives make them complicated to know, and historically unmeasurable in their numbers as they crossed the oceans.

In the early twentieth century however there had been an extraordinary moment in British Columbia, Canada which demonstrated just how impactful human development could be on seemingly unconnected salmon populations. Just as the United States had sought to do in settling its western reaches, Canada aimed to build railway lines that would span its continent. Crossing the Rocky Mountains in British Columbia to reach Canada’s foremost Pacific port, Vancouver was essential and both the Canadian National Railway and Canadian Pacific Railway sought to use the valley created by the Fraser River to cut through the deep mountains. By 1911 both railways had reached the narrowest part of the river’s canyon, building a double track all the way through.<sup>62</sup> Blasting the rock out to allow a functional embankment and then ballasting the tracks meant that there was a huge amount of stone and soil in a tight space and much of that went directly into the river. Neither the railway

nor the engineers tasked with building the railway considered that the waterway below their enterprise was perhaps the most important route to spawn for Pacific Sockeye Salmon, and between 1911 and 1914 the river became almost entirely blocked, a rock slide in particular in 1914 completely altering the form and flow of the water.<sup>63</sup> Local residents and even company workers noticed quickly that the salmon found it virtually impossible to make their way through the raging waters and tight spaces. A huge collapse in the spawning and breeding numbers of Sockeye Salmon that year and in following years, meant that across the Pacific Sockeye numbers were dramatically down for seventeen years after that.<sup>64</sup> The normal pattern of large and small years for spawning amongst the salmon was disrupted and in many ways the population never recovered, despite an effort by the railway companies in 1915 to clear the blockage and the invention of “fishways” and “fishgates” to allow safe passage for migrating salmon in future years.<sup>65</sup>

After the Hells Gate disaster (as it was known), it became very clear that the fish sought by fishermen in the Pacific and in the waters and rivers of continental United States and Canada could be heavily impacted by human actions. This created a sense of possessive paternalism amongst the nations whose fishermen sought these fish, even while in the case of tuna they would develop new technologies which would allow them to harvest them much more thoroughly from the sea. The United States, Canada, Japan and Russia came to see the salmon in the Pacific as their fish, a feeling much amplified around Bristol Bay in Alaska, which was a favourite ground of Sockeye Salmon and once under the control of Russia.<sup>66</sup> Since it had become clear from incidents like Hells Gate that particular groups of migratory fish in the Pacific relied on physical terrains in specific countries to maintain their populations, those nations sought to essentially claim those populations of fish.<sup>67</sup>

It was easy in a sense to know a Canadian salmon when it was fighting its way back up the Fraser River, much harder when perhaps fish who would one day aim for that same river, might be found out towards the Aleutian Islands or even further across the ocean. Might it be possible to know where these different populations were when not heading home? Did they mix with other national populations, would it even be possible to restrict other nations from accidentally or purposefully catching one’s fish, even when they were a long way from “home?” The United States and Canada in fact sought to set out to do just that with the foundation in 1937 of the International Pacific Salmon Fisheries Commission, later the Pacific Salmon Commission and after the war were joined by Japan and Russia as part of the North Pacific Anadromous Fish Commission.<sup>68</sup> These nations set out on a huge research exercise to map the spread and travel of salmon from either side of the Pacific, and eventually through not just statistics, but developments in the knowledge of fish biology and their parasites it became possible to determine that particular groups of salmon were indeed Canadian, Japanese, Russian or American (particular rivers had specific types of parasites and mineral markers in the fish’s digestive systems).<sup>69</sup> This embedded a certain form of national politics into perhaps ephemeral or diffuse matters, namely the journeys of fish, matters which became a great deal less diffuse following Japan’s entry into conflict with the United States in 1941.

These Pacific facing nations now had, following the extensive research, a real geographical sense about the location of communities of large and migrating fish. Even though it was now quite possible to know where fish originated, resided and moved, as well as a good sense of their numbers, politics and geo-politics impacted the fish and other marine life of the Pacific,

again hugely.

Political trends which had emerged early in the twentieth century in which nations surrounding the ocean exerted their sovereignty over the less tangible and concrete spaces of the water, influenced by colonial imperatives and concepts of statehood post Westphalian settlement, would carve out dominions in the more unlikely and previously inaccessible places. It could be possible to read these trends back to 1838-1842 and the United States Exploration Expedition encouraged by President Jackson or the pressuring, harassment and eventual overthrow of the Kingdom of Hawaii in 1898 by the United States.<sup>70</sup> Americans were of course not the only nation involved in the Pacific. The United Kingdom had long enabled the colonization and settlement of Australia and New Zealand. France and Germany were also deeply engaged in the Pacific islands. Imperial Germany of course fell foul of world politics following the 1914-1918 war and its extensive territories known as German New Guinea were divided among the victors Australia and Japan by the new League of Nations.<sup>71</sup>

The sudden attack on Pearl Harbour on December 7th, 1941 not only brought the United States directly into conflict with the Japanese Empire, but also brought the extent of Tokyo's territory across the Pacific very much to the forefront of the American institutional mind. While the Guano Islands Act of 1856, the 1899 Tripartite Convention (which gave half of Samoa to the United States), and later efforts to lay telegraph and telephone cables across the Pacific and the needs of international airlines to have places for their flying boats and other aircraft to stop on flights across the ocean, meant that the United States extended its interests and sovereignty in the ocean, the war fixed in its government mind that it was not simply its northern Pacific boundary between Alaska and Russia which might be problematic.<sup>72</sup> It would be necessary to prevent the disaster of 1941 and any other threat across the Pacific to the United States from ever happening again. Japanese territories such as those of the South Sea Mandate, but also others including Midway, Guam, Henderson and Wake would be brought firmly under the sovereignty of the United States. The South Pacific Mandate was removed from Japan, becoming a United Nations Trust Territory with the United States as the mandate holder, (until 1994 when Palau finally gained its independence).<sup>73</sup> Many of the islands integral to Japanese notions of sovereignty such as the Bonin Islands, Okinawa and Iwo Jima were not returned to Japan on the final settlement with the Treaty of San Francisco in 1952, but held by the United States as militarily useful for a number of decades afterwards (Okinawa was not returned to Japanese administrative control until 1972 and, like Japan generally, still hosts, very uncomfortably, extensive American military infrastructures).<sup>74</sup>



Image 8: William Herrington, United States and Japan delegates signing the North Pacific Fisheries Treaty in Tokyo, December 1951. Image in Carmel Finley. 2011. *All the Fish in the Sea: Maximum Sustainable Yield and the Failure of Fisheries Management*. Chicago: IL: Chicago University Press, image copyright held by University of California, Berkeley, School of Law

President Harry Truman, responsible after the death of Roosevelt for unleashing the atomic bombing of Hiroshima and Nagasaki in an effort to force Japan's surrender, and for setting the course for the future of United States interests in the Pacific, is renowned for decisions made across the field of conflict. In 1945, the United States Army Government in Korea decided to utilise much of the Japanese imperial government personnel and infrastructure on the peninsula, rather than build up local Korean capabilities, essentially because of concerns about the influence of communist agitators.<sup>75</sup> Similarly, while policy towards the Japanese government and its priorities after 1945 was initially harsh in tone, within two years American policy became more malleable and supportive of Tokyo, perhaps again influenced by the fear of communist success in Asia and the requirement for a functional and useful ally in the area to serve as a bulwark and a base for American force projection against both Chinese Communist forces and the Soviet Union.<sup>76</sup> Truman, it seems, was profoundly concerned with extending the maritime sovereignty of the United States across the Pacific, not simply to support its military and diplomatic capacities, but also to create opportunities for American business and enterprise.<sup>77</sup> Quite contrary to this, Truman and the Supreme Commander of Allied Powers (SCAP), were also concerned that Japan should not be too costly to occupy and that it should be capable of assuring its own food supply and other material needs.<sup>78</sup> Thus, while American restrictions on Japanese fishing boats were quite severe in the initial months following surrender, by the end of 1945 SCAP gave Japanese boats opportunities to fish further offshore.<sup>79</sup> Within 18 months SCAP was infuriating former war allies in Australia and New Zealand by allowing the Japanese whaling fleet to travel to access its former whaling grounds in Antarctica.<sup>80</sup>

Carmel Finley describes the extraordinary policy shifts relating to tuna fishing and control in the Pacific, which had long been hugely important to the Californian fishing industry.<sup>81</sup> Former Japanese colonies such as those next to American Samoa and Guam became vitally important to the supply chain for maritime products in the Pacific, but rather than exclusively as sites of enterprise for American companies, they were declared duty free areas, and open to Japanese companies.<sup>82</sup> Thus Japanese-owned tuna fishers were allowed to land catches in American Samoa and ship their product to the American mainland free of tax or import charges. This put mainland American tuna canneries and other businesses at a distinct disadvantage and this aspect of the United States fishing industry followed its predecessor the sardine canning industry into decline and eventual extinction.<sup>83</sup> However the policy served greater American aims by reducing the cost of fish products in the American food industry, securing maritime sovereignty and control over the Pacific for the United States, underpinning the economic functionality and future of American colonial territories such as Samoa, and finally, integrating Japanese business and enterprise alongside wider Japanese diplomatic interests into the post 1945 status quo.

These extraordinary themes of new colonial ambitions, America maritime dominance beyond America's western shores, and the integration of new modes and practices of capitalism and free enterprise following 1945, produced a malleable and flexible developmental landscape which as well as being underpinned and funded by this new geo-political reality found itself energised and enabled by developing scientific and statistical models derived in part from the work of statisticians such as Johan Hjört and Michael Graham on the other side of the world.<sup>84</sup> Graham's theory of "optimum catch" had developed following what Hjört and others referred to as the "second great fishing experiment," namely the European war of 1939-1945. While Hjört would not live long after the end of the war, Graham, now a vital figure in the infrastructure of fishing and maritime research, and other scientists such as H.R. Hulme continued working on a statistically minded and empirical approach which might counter the practices of over-fishing, damaging to both fishers and fish populations alike.<sup>85</sup> Graham's young protégés, Raymond Beverton and Sidney Holt, developed theories of fish population dynamics<sup>86</sup> These theories, first published in the journal *Nature* as "Population Studies in Fisheries Biology" in 1947 (later reworked into 1957's book *On the Dynamics of Exploited Fish Populations*), took into account both fluctuations in population, fishing effort projected onto or at them, and the carrying capacity of the environment itself to articulate what has been described as the "steady state yield." This calculation was a twin of the analysis which produced notions of "optimal yield."<sup>87</sup>



Image 9: Raymond Beverton and Sidney Holt, working in the Ministry of Agriculture, Fisheries and Food laboratory in Lowestoft, UK, 1946, Image in Carmel Finley. 2011. *All the Fish in the Sea: Maximum Sustainable Yield and the Failure of Fisheries Management*. Chicago: IL: Chicago University Press, image copyright held by Centre for Environment, Fisheries and Aquaculture Science, UK.

While President Truman's declarations of September 28th, 1945 extending United States claims over the sea bed and rights to fisheries in waters contiguous to it, far beyond what had historically been considered a state's territorial waters,<sup>88</sup> made a dramatic impact on the geopolitics of the Pacific, they also provided the opportunity for this geopolitics to become further enmeshed in science and to begin reconfiguring statistical methodologies for political goals. Just as Hjört and Graham drove forward development of the scientific basis behind fisheries research and were heavily involved in the creation and foundation of new institutions and places of empiricism, the United States was home to an academic who would become central to the research and management framework befitting the new needs of the expansionist nation.<sup>89</sup> Wilbert M. Chapman a scientist from Washington State who had extensive experience of working within the state and federal fishing agencies, was tasked after 1945 with building the practical institutions on the ground in the United States' new Pacific mandates and new semi-colonies. Briefly Director of Fisheries at his alma-mater (and that of William Thompson who had done much of the research on Sockeye Salmon populations in the Pacific, directing the Pacific Salmon Commission and essentially a foil to the European scientists), the University of Washington in 1948, he was appointed to the State Department in Washington DC as an undersecretary for fisheries policy.<sup>90</sup> Within the State Department, Chapman appears as an energetic organizer of the realities of US focus on the ocean, and very much at the behest of the close nexus between state power and business interests, as Carmel Finley recounts "Chapman and the Pacific Fisheries Congress

had tirelessly lobbied to create the undersecretary position at the State Department...The fishing industry's support had placed him within the State Department; now the industry had to get behind his policies".<sup>91</sup> Chapman is known for his energy directed at two principle elements of United States ocean policy, firstly the creation of multinational agencies to manage fishery and maritime resources, and secondly the adoption of a quasi-scientific rationale that lay behind the activity which the United States would apply in, on and under the high seas.<sup>92</sup>

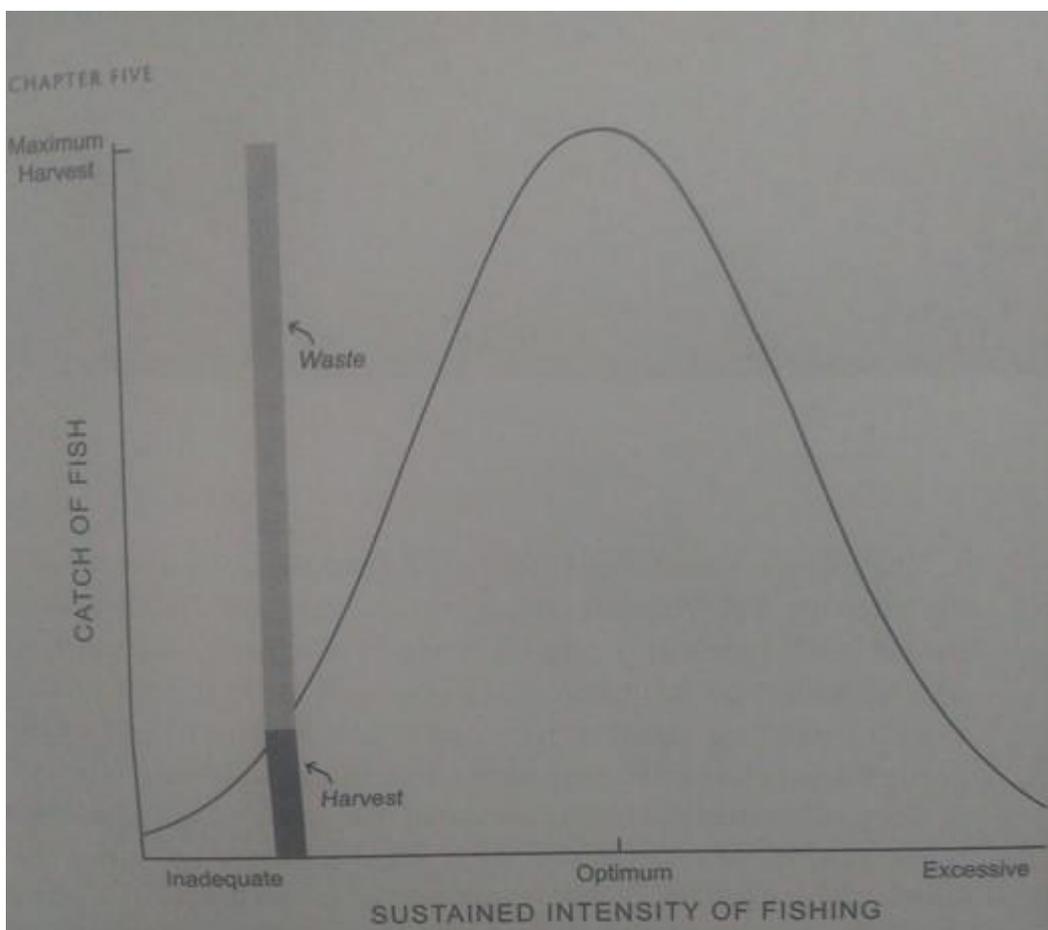


Image 10: Maximum Sustainable Yield Curve, Image in Carmel Finley. 2011. *All the Fish in the Sea: Maximum Sustainable Yield and the Failure of Fisheries Management*. Chicago: IL: Chicago University Press.

On the 16th of January, 1949, via a State Department Bulletin, Chapman articulated how fishing was to be undertaken in this new geo-political and business world, including a graphic curve known as the Maximum Sustainable Yield<sup>93</sup> curve While the curve looked, and still looks classically scientific, there were absolutely no statistics given and no references listed in the bulletin.<sup>94</sup> In fact the mathematical formulae which underpinned the curve were not made accessible for another five years, while the curve was essentially treated as scientific fact by the United States from the moment it was released. Contrary to the science and approach that the Europeans had been seeking, Chapman was articulating an extremely utilitarian view of fisheries and the seas in which methodologies derived from industrial management were applied to the sea. Fish and the other living things in the sea are, as crops in a field, products to be harvested. Just as one would not leave wheat grown in a field to fail and rot, so to leave any more fish than were strictly necessary in the sea

was to waste them.<sup>95</sup> Chapman even configured this message into a humanitarian framework: “So long as the resource is underfished there is room for more fishermen to fish and it would be morally as well as legally unjustifiable for a resource of the high seas to be fenced off and not fished to the full extent that is needed to produce the maximum sustained harvest from the resource.”<sup>96</sup> Chapman’s concept included an assumption that fish populations would, as Graham, Holt, Beverton and others had ascertained, fluctuate and fall, but they insisted that at some point they would recover and return to a useful or functional level.<sup>97</sup> Maximum Sustainable Yield held to the strange tautology that young fish are helped by the capture of old and large fish and the reduction in a population’s food requirements, because that leaves more food and resources for the young fish.<sup>98</sup> This is strictly counter to earlier analysis done of Sockeye populations which suggested that removing the large and old fish from a population or impacting on their ability to create more generations of young fish means that there will in future simply be less fish of any size.<sup>99</sup> One of the fundamental problems of modern fishing has been that fish are simply not allowed or left to get old or large, so notions of what is a large fish or what is an old fish begin to change and fishermen themselves begin to misread and misremember species’ potential for growth and length.<sup>100</sup>

Maximum Sustainable Yield held that it was the impact of fishing and human effort according to Chapman’s model that would stabilize populations; not going to sea or vigorously harvesting them would even result in less efficient, smaller, less useful stocks.<sup>101</sup> While the United States demarcated its own maritime territories, the policy of the State Department with Chapman at the helm was to internationalize everything else, to the extent that local governments could only exert control over coastal waters – international waters were free game for the practices and policies of Maximum Sustainable Yield, no matter where they were in the world.<sup>102</sup> The United States even pushed the idea in the face of considerable pressures from Latin American countries reacting against increased American tuna fishing and whaling in the oceanic commons. By 1955 the United Nations, concerned about these ructions across the globe, called the International Technical Conference on the Conservation of the Living Resources of the Sea.<sup>103</sup> At this conference Chapman and his scientific colleague Milner Schaefer, who had attempted to better theorize Maximum Sustainable Yield essentially defeated the arguments of the Europeans such as Graham and Holt, by appealing to the industrial and economic interests of their own countries.<sup>104</sup> Disregarding aspects of the theory which might make over fishing worse or reduce catches, the Americans succeeded (supported throughout the conference by the Soviet Union, which was looking out for its own deep sea interests across the globe), in maintaining the deep sea as a commons, though allowing for offshore economic zones, and in placing the concept of Maximum Sustainable Yield at the heart of the conference’s conclusions, which were to form the bases for international law of the sea.<sup>105</sup>

## **Conclusion**

Maximum Sustainable Yield created the fishing industries of our modern world, underpinned by the economics which generated investment capital that transformed the technology involved in global fishing processes. Ships became larger, refrigeration was put to use so that problems of spoilage and decay were no longer a concern and so larger ships could put to sea for longer journeys and travel further. Motherships were developed as floating

factories so that fish caught by a fleet of smaller ships could be processed and packed without ever having to touch land and could then be landed at the most convenient market. These preparation technologies even revolutionized the form that fish were actually eaten in, from fillets and cuts of whole fish, to processed fish sticks and fish fingers, a key part of a developing convenience economy and society. Where once fishing was a matter of chance and luck, technologies such as sonar and radar allowed fishing boats to see fishing populations from above optimize the catch. In more recent times, these technologies have been superseded by GPS and Remote Sensing from satellites, so that fish movements and stocks can be tracked from space, a developmental technology with aspirations to omniscience rooted in the observation-security complex. From this is birthed the panoptical tendencies which uncover Chinese “dark fleets” in 2020 and create fear of the unknowable North Korea “ghost ships” of earlier years.

These fishing empires of the Pacific, in cahoots with extractive and accumulative capital and American and Japanese power, have themselves created so many ghosts, just as the energies of Japanese Imperialism ghosted away Korean fishing materiel in 1945<sup>106</sup> and extraordinary rendition and extra-territorial assassination by drone make specters of unwanted humans in the present. Industrial fishing rooted in the statistical framework and presumptions of the American century and the Cold War Empires of Fishing has essentially asset stripped the past, present and future of our oceans. In reality there is little left to catch that has not already been extracted from the waters, coasts and seafloor of the Pacific. The fishing methods and practices of the 20th century guided by the satellite gaze and remote observational techniques have not simply reduced the populations of fish and other species to a fraction of what they have historically been, they have transformed the geographies of the sea and the seabed. Deep sea trawling has flattened and reduced the ecosystem of the ocean floor, from a complex and complicated topography of coral and other deposits, built not only by geologic and sedimentary time, but by the combined efforts of polyps, worms and mollusks, to often flat deserts devoid of life, but perfect for the interminable scraping of trawling gear.

Fish and maritime ecologies in the Pacific, from which Korean, Japanese and Chinese fishers draw resources, are not simply challenged by the technologies of industrial fishing and the energies of these fishing empires. North Korean, South Korean and Japanese fishing people and gatherers of coastal shellfish and mollusks are challenged by their own nation’s extensive deployment of coastal and tidal reclamation projects, which have impacted heavily on what were peripheral, marginal, liminal and muddy spaces, but which were very productive for those communities. The author of this article has written extensively on coastal development in North Korea which focused first on tidal and flood control around the River Taedong’s course and estuary (particularly at Nampo with the famous West Sea Barrage), but later generated large scale coastal reclamation projects such as at Taegyedo.<sup>107</sup> North Korea has continued to plan for the transformation of its coasts, such as projects at Ansok in South Phyongan province and Ryongmaedo in South Hwanghae visited quite recently respectively by Pak Pong Ju<sup>108</sup> and Kim Tok Tun<sup>109</sup> at the time of writing the former and present North Korean Premiers. There is also much written on South Korea’s reclamation of the Saemangeum Tidal Flats, the largest of many transformational projects on the nation’s foreshores, including the enormous impacts on the flora and fauna of the landscapes of the flats.<sup>110</sup> Across the East Sea/Sea of Japan, there is also extensive research on the impact of coastal reclamation at Isahaya Bay, which, echoing research addressing changes in the deep sea, suggests that the development has disrupted the sea water

exchange process in the bay. This means that the ecologies on which coastal fishing people would rely, are no longer supplied with oxygen, nor are pollutants or agricultural run-off diluted or washed away, creating both the potential for hypoxic and eutrophic conditions.<sup>111</sup>

Moving from the coast to deeper waters, future Pacific underwater ecologies will be (and indeed already are), hugely impacted by both global climate change and by technological and other imperialisms. Acidification of global waters generated by increased and sustained dangerous levels of carbon dioxide in the atmosphere is but the latest challenge to befall the creatures of the Pacific.<sup>112</sup> While acidification so far appears to have a disproportionate long-term impact on species requiring calcified shells and exoskeletons, such as corals, rising water temperatures and rapidly shifting gyres and currents bringing temporary hot spikes could wipe out many fish and sea animals.<sup>113</sup> Changes in the routes and topographies used by sea creatures are of course not new. Jakobina Arch has deftly recounted historical shifts in the migration routes around the Japanese mainland of whales in response to technological strategic developments in whaling practices during Japan's Tokugawa period (1603-1868).<sup>114</sup> However, there is already evidence that rising sea temperatures have begun to shift fish populations and their migration routes across the globe so that fish species appear in parts of the ocean where they have never been seen before.<sup>115</sup> Spider crabs and other predatory crustaceans have also, due to changing temperatures, begun to colonize new territories across the world, depleting and devastating maritime species who have not through evolution developed a defense or response to them.<sup>116</sup> Global audiences have similarly been horrified and transfixed by programs such as the BBC's Blue Planet II, which not only recounted some of this but also considered the sheer catastrophe of plastic and other non-biodegradable pollutants in our oceans.<sup>117</sup> Awareness of seascapes subject to extreme degradation such as the shifting spaces known as the Great Pacific Garbage Patch, where tens of thousands of tons of plastic and other material in suspension in the water column have accumulated in the middle of the Pacific Ocean through the actions of the North Pacific Gyre, have been impacting on both fish populations and fishery communities.<sup>118</sup>

Very much more local to Korean and Chinese fishing people, the Bohai Sea at the north end of the Yellow/West Sea, has sustained heavy ecological damage due to extensive run off from Chinese agriculture and pollution due to its proximity to ports and industrial centers such as Dalian and Tianjin. It is particularly vulnerable as a relatively shallow body of water that is impacted quickly by changes in water temperature. Once an important fishing ground for shellfish, research has shown that temperature rise, changes in salinity and pollutants have had dramatic impacts on species variety, distribution and overall numbers in the Bohai Sea.<sup>119</sup> On the other side of the Korean peninsula in the East Sea/Sea of Japan, the international monitoring program CREAMS (Circulation Research of East Asian Marginal Seas), has detected a substantial reduction in dissolved oxygen in the deeper waters of the sea, indicating a climate change driven break down in current circulations which would normally reoxygenate it.<sup>120</sup> Further research has suggested that this break down or reduction in circulation patterns in the East Sea/Sea of Japan, the upwelling of nutrients to the surface and significantly diminish the food supplies relied upon by fish and other creatures further up the water column in the deep sea.<sup>121</sup> North Korean (alongside South Korean, Chinese and Japanese), fishing people would be subject to the degradation of the

seas and their coasts as a result of all of these factors, many of which their own institutions are in part responsible for, or at least aspire to be control. The oceanic commons which provides North Korea with what it sees as a free resource in spite of its position as a geopolitically, developmentally and institutionally challenged nation, will inevitably be much reduced and diminished.

In the context of the Korean Peninsula and its very particular political and geopolitical difficulties, it is perhaps worth also mentioning, beyond the ecological, another factor whose impact is traceable backwards to other Imperial nations across the Pacific. In 1953 the end of the Korean War saw the two sides of the conflict sign an armistice agreement (not a peace treaty for a final settlement), which drew the conflagration to a close on land, but no agreement could be reached on a mileage limit to settle matters at sea. The peculiar situation of the armistice, which means of course that South Korea as the Republic of Korea, was not a signatory to it, created a situation in which the Syngman Rhee government in Seoul could avoid permanently settling the sea boundaries in the West Sea, but instead unilaterally drew what has become known as the Northern Limit Line (NLL), which hemmed in North Korean maritime sovereignty, created real problems for its shipping into the important port of Haeju, left islands such as Yongpyeong and Baengnyeong in South Korean hands, though a reasonable reckoning of lines of sovereignty might have deemed them to be North Korean territory and therefore fishermen from North Korea's coastal South Hwanghae would not be excluded from their traditional fishing grounds. Terence Roehrig has written detailed analysis of the history of the NLL and its implications,<sup>122</sup> and Gavan McCormack has also written on the extraordinary political dynamics that flowed from attempts to resolve the NLL issue,<sup>123</sup> but the Line itself is just one element in a regional architecture of security and sovereignty on the coast and in the near sea, which impacts heavily on the options available to fishing people, not just North Koreans. The security needs of both nations has meant that their coastal waters are a securitized zone in which fishing people are monitored and restricted, as this author saw during field work on Gageodo Island, South Korea's most south western territory, which has an intelligence and observation post of the ROK Marines built at the highest point of the island in order to surveil the waters and restrict the fishing efforts of non-compliant Chinese boats.<sup>124</sup> North Korean fishing people in the far northwest of the country, who would traditionally go to sea in Korea Bay and the Bohai Sea have themselves been restricted by rules imposed by the People's Republic, so that they do not further impact on the fragile ecology of that sea, as well as create a logistical and security issue for busy shipping lanes in an around Dalian.<sup>125</sup>



Image 11: ROK Marine Observation Post, Doksilsan, Gageodo Island, South Korea - Image taken by author, 18th June, 2017.

While the security complex produced by the Korean Peninsula's "Division System,"<sup>126</sup> the continued echoes of the post 1953 status quo, and more contemporary energies unleashed by geopolitics in East Asia have certainly made an impact in the past, global warming and environmental crisis will surely bring challenges for the future for fish and fishing people alike. There will be new transformations, new ghosts and new disruptions created in the decades to come by forces which have been unleashed by the industrial revolution of the age of fossil fuels and internal combustion engines, that research is only now getting a sense of. However the impact of the Fishing Empires of the Pacific is already mostly clear, and its transformations are knowable. Industrial fishing in the Pacific and elsewhere has simply transformed the spaces, journeys and spatial possibilities for marine creatures.

Maximum Sustainable Yield, scientific fishing and the technologies enabling us to see migrating populations from afar, have transformed both the fish themselves and human perception of and relationship to fish and the seas. Fish, which are attractive and valuable to the global fishing industry, are no longer allowed to live to anywhere near their normal life spans, so do not in general reach anywhere near their historic potential size. So the fish of our present, really are not the same fish as those of our pasts and human perception of them has radically altered. In the future we have created, but which is only now coming into becoming clear, climate change, temperature rise and transformations of currents and flow across the oceans, and transformation of international law shaping fishing and the seas, such alterations will continue. For now, while humans loom larger than life in our anthropocentric times, fish are very much smaller, their geographies and topographies taking up a great deal less space. Whether it be on the Korean peninsula, in the Japanese Empire or on the waves of the Pacific Ocean, we have made ghosts of them.

\*

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## Notes

<sup>1</sup>Jaeyoon Park et al. 2020. "Illuminating Dark Fishing Fleets in North Korea." *Science Advances* 6.30, eabb1197, <https://advances.sciencemag.org/content/6/30/eabb1197>

<sup>2</sup>Robert Winstanley-Chesters. 2020. *Fish, Fishing and Community in North Korea and Neighbours: Vibrant Matters*. Singapore: Springer.

<sup>3</sup>Paul Williams. 2008. *Mahayana Buddhism: The Doctrinal Foundations*. London: Routledge.

<sup>4</sup>James Palais. 1981. "Chosŏn Ch'ogi Yangban Yŏn'gu, and Kwagŏ." *Journal of Korean Studies* 3. 1: 191-212.

<sup>5</sup>Shin-ock Chang, Arkadiusz Kołodziej, and Agnieszka Kołodziej-Durnaś. 2015. "The Social Position of Fishers: South Korea and Poland Compared." *Roczniki Socjologii Morskiej*.

<sup>6</sup>James Grayson. 2013. *Korea: A Religious History*. London: Routledge.

<sup>7</sup>Yi Chung-hwan 2018. *A Place to Live: A New Translation of Yi Chung-hwan's T'aengniji, the Korean Classic for Choosing Settlements*, translated by Inshil Choe Yoon, Honolulu, HI: University of Hawaii Press.

<sup>8</sup>David Mason. 1999. *Spirit of the Mountains: Korea's San-shin and Traditions of Mountain-worship*. Weatherhill Inc.

<sup>9</sup>Robert Buswell. 2009. "Korean Buddhist Journeys to Lands Worldly and Otherworldly." *The Journal of Asian Studies* 68.4: 1055-1075.

<sup>10</sup>Horace Underwood. 1934 *Korean Boats and Ships*. Seoul: Royal Asiatic Society Korea Branch (reprint by Yonsei University Press).

<sup>11</sup>Ibid, pg. 34.

<sup>12</sup>Ibid, pg. 32.

<sup>13</sup>Mohd Nawawi. 1971. "Punitive Colonialism: The Dutch and the Indonesian National Integration." *Journal of Southeast Asian Studies* 2. 2: 159-168.

<sup>14</sup> Dietrich Sarhage and Johannes Lundbeck.1992. *A History of Fishing*. Berlin: Springer Verlag, pg, 172.

<sup>15</sup> Ibid, pg. 175.

<sup>16</sup> Ibid, pg. 176.

<sup>17</sup> Ibid. pg, 179.

<sup>18</sup> Sidney Lu. 2016. "Colonizing Hokkaido and the Origin of Japanese Trans-Pacific Expansion, 1869-1894." *Japanese Studies* 36.2: 251-274.

<sup>19</sup> See David Fedman's 2009 article for the Asia-Pacific Journal: Japan Focus, "[Mounting Modernization: Itakura Katsunobu, the Hokkaido University Alpine Club and Mountaineering in Pre-War Hokkaido](#)" (*Asia-Pacific Journal: Japan Focus*, 7.42.1) for the processes and journeys involved in making the mountain ranges, forests and wildernesses of central Hokkaido modern and knowable.

<sup>20</sup> David Fedman touches on the Oji Paper Company and its efforts in Hokkaido in his 2020 monograph, *Seeds of Control: Japan's Empire of Forestry in Colonial Korea* (Seattle: University of Washington), at page 41, but Fedman's work on the Oji Paper Company is in development and from personal communication with the author, there is no doubt that the company's work in Hokkaido will be covered within his future work on this important enterprise in the wider Japanese Imperial project.

<sup>21</sup> Dietrich Sarhage and Johanne Lundbeck.1992. *A History of Fishing*. Berlin: Springer Verlag

<sup>22</sup> Ibid, pg. 183.

<sup>23</sup> Gi-Wook Shin and Michael Robinson. 2001. *Colonial modernity in Korea*. Cambridge, MA: Harvard University Asia Center.

<sup>24</sup> Jakobina Arch. 2018. *Bringing Whales Ashore: Oceans and the Environment of Early Modern Japan*. Seattle, WA: University of Washington Press.

<sup>25</sup> Harold Brookfield. 1971. *Colonialism Development and Independence: The Case of the Melanesian islands in the South Pacific*. Cambridge: Cambridge University Press.

<sup>26</sup> Dietrich Sarhage and Johanne Lundbeck.1992. *A History of Fishing*. Berlin: Springer Verlag, pg. 183.

<sup>27</sup> Ibid, pg 182.

<sup>28</sup> Ibid, pg. 184.

<sup>29</sup> Ibid, pg 185.

<sup>30</sup> Ibid.

<sup>31</sup> Ibid.

<sup>32</sup> Ibid, pg. 186.

<sup>33</sup> Ibid.

<sup>34</sup> Ibid.

<sup>35</sup> Ibid.

<sup>36</sup> Ibid, pg. 187.

<sup>37</sup> Kumiko Ninomiya. 2015. "Science of Umami taste: Adaptation to Gastronomic Culture." *Flavour* 4.1: 13.

<sup>38</sup> Dietrich Sarhage and Johannes Lundbeck.1992. *A History of Fishing*. Berlin: Springer Verlag, pg. 189.

<sup>39</sup> Dietrich Sarhage and Johannes Lundbeck.1992. *A History of Fishing*. Berlin: Springer Verlag, pg. 189.

<sup>40</sup> Ibid, pg. 191.

<sup>41</sup> Julia Strauss. 1998. *Strong Institutions in Weak Polities: State Building in Republican China, 1927-1940*. Oxford: Oxford University Press.

<sup>42</sup> Jeremy Taylor. 2002. "The Bund: Littoral Space of Empire in the Treaty Ports of East Asia." *Social History* 27. 2: 125-142.

<sup>43</sup> Dietrich Sarhage and Johannes Lundbeck.1992. *A History of Fishing*. Berlin: Springer Verlag, pg. 217.

<sup>44</sup> Ibid, 218.

<sup>45</sup> Ibid.

<sup>46</sup> Ibid, 219.

<sup>47</sup> His Imperial Japanese Majesty Resident General. 1909. *Annual Report on Reforms and Progress in Korea, 1909*, pg. 155.

<sup>48</sup> Ibid.

<sup>49</sup> Government General of Chosen. 1911. *Annual Report on Reforms and Progress in Chosen (Korea) 1910-1911*. pg 2018

<sup>50</sup> Government General of Chosen, 1921. *Annual Report on Reforms and Progress in Chosen (Korea) 1920-1921*.

<sup>51</sup> Ibid.

<sup>52</sup> Ibid.

<sup>53</sup> Supreme Commander for the Allied Powers, 1946. *Summation of Non-Military Activities in Japan and Korea*, No 4, January, 1946, Tokyo: Supreme Commander for the Allied Powers Japan, pg. 37

<sup>54</sup> Government General of Chosen. 1934. *Annual Report on Reforms and Progress in Chosen (Korea) 1933-1934*.

<sup>55</sup> Ibid, pg. 116.

<sup>56</sup> Supreme Commander for the Allied Powers, 1946. *Summation of Non-Military Activities in Japan and Korea*, No 4, January, 1946, Tokyo: Supreme Commander for the Allied Powers Japan.

<sup>57</sup> United States Army Forces Pacific, 1946. *United States Army Military Government Activities in Korea*, *Summation* No. 6, March, 1946. United States Army Forces Pacific, pg. 30.

<sup>58</sup> Ibid.

<sup>59</sup> Supreme Commander for the Allied Powers, 1946. *Summation of Non-Military Activities in Japan and Korea*, No 12, September, 1946, Tokyo: Supreme Commander for the Allied Powers Japan, pg. 68.

<sup>60</sup> Carmel Finley. 2011. *All the Fish in the Sea: Maximum Sustainable Yield and the Failure of Fisheries Management*. Chicago: IL: Chicago University Press

<sup>61</sup> Jakobina Arch. 2018. *Bringing Whales Ashore: Oceans and the Environment of Early Modern Japan*. Seattle, WA: University of Washington Press.

<sup>62</sup> Ibid, pg. 30.

<sup>63</sup> Ibid, pg. 31.

<sup>64</sup> Ibid, pg, 32.

<sup>65</sup> Ibid, pg. 31.

<sup>66</sup> Carmel Finley. 2011. *All the Fish in the Sea: Maximum Sustainable Yield and the Failure of Fisheries Management*. Chicago: IL: Chicago University Press, pg. 27.

<sup>67</sup> Ibid, pg. 39.

<sup>68</sup> North Pacific Anadromous Fisheries Commission. 2018. International North Pacific Fisheries Commission (1952–1992). <https://npafc.org/inpfc/>. Accessed 27<sup>th</sup>, April, 2019.

<sup>69</sup> Carl Sindermann. 1983. "Parasites as Natural Tags for Marine Fish: a Review." *NAFO Sci. Counc. Stud* 6: 63-71.

<sup>70</sup> Devine, Michael J. 1977. "John W. Foster and the Struggle for the Annexation of Hawaii." *Pacific Historical Review* 46.1: 29-50.

<sup>71</sup> Thomas Burkman. 2008. *Japan and the League of Nations: Empire and World Order, 1914-1938*. Honolulu, HI: University of Hawaii Press.

<sup>72</sup> Akira Iriye. 1984. "Contemporary History as History: American Expansion into the Pacific Since 1941." *Pacific Historical Review* 53.2: 191-212.

<sup>73</sup> Stewart Firth. 1989. "Sovereignty and Independence in the Contemporary Pacific." *The Contemporary Pacific*: 75-96.

<sup>74</sup> Gavan McCormack and Satoko Oka Norimatsu. 2018. *Resistant Islands: Okinawa Confronts Japan and the United States*. Lanham, MD: Rowman & Littlefield.

<sup>75</sup> Michael Seth. 2016. *A Concise History of Modern Korea: From the Late Nineteenth Century to the Present*. Lanham, MD: Rowman & Littlefield, pg. 93.

<sup>76</sup> Victor Cha. 2000. "Abandonment, Entrapment, and Neoclassical Realism in Asia: The United States, Japan, and Korea." *International Studies Quarterly* 44.2: 261-291.

<sup>77</sup> Peter Cowhey. 1993. "Domestic Institutions and the Credibility of International Commitment: Japan and the United States." *International Organization* 47. 2: 299-326.

<sup>78</sup> Chalmers Johnson. 2000. *Blowback: The Costs and Consequences of American Empire*. London: Macmillan.

<sup>79</sup> Supreme Commander for the Allied Powers, 1946. *Summation of Non-Military Activities in Japan and Korea*, No 9, June, 1946, Tokyo: Supreme Commander for the Allied Powers Japan, pg. 88.

<sup>80</sup> Supreme Commander for the Allied Powers, 1946. *Summation of Non-Military Activities in Japan and Korea*, No 12, September, 1946, Tokyo: Supreme Commander for the Allied Powers Japan, pg. 68. New Zealand and Australia certainly protested and questioned the United States authority on the dispensation offered to occupied Japan so far as its whaling fleet was concerned at the 1947 meeting of the Far Eastern Commission (see "Proposal by Australia and New Zealand to raise question of authority by U.S.A. for Japanese Whaling Expedition 47/48 at meeting of Far Eastern Commission," 1947, HM Government, National Archives PREM 8/482). Gavan McCormack also recalls the famous British scholar of Japan, Professor Richard Storry of SOAS, ANU, Oxford and many other institutions, mentioning in a paper at an early meeting of the British Association for Japanese Studies in the mid-1970s, that while working in the British embassy in Tokyo during the occupation of Japan, he had sought the advice of the British government as to what position to take in relation to Japan's desire to resume fishing. His instructions duly came back that His Majesty's government had no objection to such resumption but hoped that Japan could be confined for the time being to sail-powered ships (Personal communication, 2021).

<sup>81</sup> Carmel Finley. 2017. *All the Boats in the Ocean: How Government Subsidies led to Global Overfishing*. Chicago, IL: Chicago University Press

<sup>82</sup> Ibid, pg, 69.

<sup>83</sup> Ibid, pg. 74.

<sup>84</sup> Carmel Finley. 2011. *All the Fish in the Sea: Maximum Sustainable Yield and the Failure of Fisheries Management*. Chicago: IL: Chicago University Press.

<sup>85</sup> Tim Smith. 1994. *Scaling Fisheries: The Science of Measuring the Effects of Fishing, 1855-1955*. Cambridge: Cambridge University Press, pg. 296.

<sup>86</sup> Ibid, pg. 310.

<sup>87</sup> Ibid, pg. 312.

<sup>88</sup> Traditionally territorial sovereignty extended some 3 Nautical Miles from the low tide mark of its coasts (the range of a cannon shot), and fishing rights within those waters were solely held by that nation (for historical work on the origin of the 3 Nautical Miles tradition which is sceptical when it comes to the "cannon shot" notion see: Heinz Kent. 1954. "The Historical Origins of the Three Mile Limit." *The American Journal of International Law* 48. 4: 537-553), Although there were some differences across the globe (such as Iceland's shorter 2 Nautical Miles, and Spain's more extensive 6 Nautical Miles), the [Truman Declaration](#) extended elements of national sovereignty far beyond the traditional limit. This has led to the contemporary status quo of 200 Nautical Mile Exclusive Economic Zone's (EEZ's), encompassing the waters around the land territories of most states, an extension to some 12 Nautical Miles from a state's coasts of what are considered sovereign territorial waters, and the development of sovereign rights over sub-sea or continental shelf topographies connected to a state's territorial waters or EEZ (such as the Russian Federation's claim to the Lomontsov Ridge, see Vsevolod Gunitskiy. 2008. "On Thin Ice: Water Rights and Resource Disputes in the Arctic Ocean." *Journal of International Affairs* 61.2: 261-271). Analysis of the implications of the Truman Declaration is provided by: Donald Cameron. 1979. "First Steps in the Enclosure of the Oceans: The Origins of Truman's Proclamation on the Resources of the Continental Shelf, 28 September 1945." *Marine Policy* 3. 3: 211-224.

<sup>89</sup> Carmel Finley. 2011. *All the Fish in the Sea: Maximum Sustainable Yield and the Failure of Fisheries Management*. Chicago: IL: Chicago University Press, pg. 55.

<sup>90</sup> Ibid, pg, 87.

<sup>91</sup> Ibid, pg. 88.

<sup>92</sup> Ibid.

<sup>93</sup> Ibid, pg. 94.

<sup>94</sup> Ibid.

<sup>95</sup> Ibid.

<sup>96</sup> Ibid, pg. 96.

<sup>97</sup> Ibid, pg. 95.

<sup>98</sup> Ibid, pg. 96.

<sup>99</sup> Ibid.

<sup>100</sup> Erik Stokstad. 2007. "The Incredible Shrinking Cod," *Science*, January 31<sup>st</sup>, 2008. Accessed 27<sup>th</sup> April, 2019.

<sup>101</sup> Carmel Finley. 2011. *All the Fish in the Sea: Maximum Sustainable Yield and the Failure of Fisheries Management*. Chicago: IL: Chicago University Press, pg. 95.

<sup>102</sup> Ibid, pg. 96.

<sup>103</sup> Ibid, pg. 134.

<sup>104</sup> Ibid, pg. 146

<sup>105</sup> Ibid, pg. 148

<sup>106</sup> See again for a report on the removal to the Japanese mainland in the chaos following the Japanese surrender and liberation of Korea, the majority of the fishing fleet and other fishing technology from the waters of the peninsula: United States Army Forces Pacific, 1946. *United States Army Military Government Activities in Korea, Summation* No. 6, March, 1946. United States Army Forces Pacific, pg. 30.

<sup>107</sup> Robert Winstanley-Chesters. 2014. Chapter 4 "Building a Landscape of "Lived" Utopia II: Tideland Reclamation" of *Environment, Politics and Ideology in North Korea: Landscape as a Political Project*. Lanham, MD: Lexington Press.

<sup>108</sup> Rodong Sinmun. 2020. "[Pak Pong Ju Inspects Newly Completed Ansok Tideland.](#)" *Rodong Sinmun*, September 16<sup>th</sup>, 2020.

<sup>109</sup> Rodong Sinmun. 2021. "[Kim Tok Hun Inspects Third and Fourth Districts of Ryongmaedo Tideland.](#)" *Rodong Sinmun*, April 30<sup>th</sup>, 2021,

<sup>110</sup> Jongseong Ryu et al. 2014. "The Saemangeum Tidal Flat: Long-term Environmental and Ecological Changes in Marine Benthic Flora and Fauna in Relation to the Embankment." *Ocean & Coastal Management* 102: 559-571.

<sup>111</sup> Yoshikuni, Hodoki and Tetsuo Murakami. 2006. "Effects of Tidal Flat Reclamation on Sediment Quality and Hypoxia in Isahaya Bay." *Aquatic Conservation: Marine and Freshwater Ecosystems* 16 (6): 555-567.

<sup>112</sup> James Orr et al. 2005. "Anthropogenic Ocean Acidification over the Twenty-First Century and its Impact on Calcifying Organisms." *Nature* 437, no. 7059: 681.

- <sup>113</sup> Gian-Reto Walther et al. 2002. "Ecological Responses to Recent Climate Change." *Nature* 416 (6879): 389.
- <sup>114</sup> Jakobina Arch. 2018. *Bringing Whales Ashore: Oceans and the Environment of Early Modern Japan*. Seattle, WA: University of Washington Press.
- <sup>115</sup> Ove Hoegh-Guldberg et al. 2007. Coral reefs Under Rapid Climate Change and Ocean Acidification. *Science* 318, no. 5857: 1737-1742.
- <sup>116</sup> Thatje Tatje et al. 2005. "Challenging the Cold: Crabs Reconquer the Antarctic. *Ecology* 86 (3): 619-625.
- <sup>117</sup> Imogen Calderwood. 2018. "[88% of People Who Saw 'Blue Planet 2' Have now Changed Their Lifestyle.](#)" *Global Citizen*, November 1st, 2018, . Accessed 27 Apr 2019.
- <sup>118</sup> Evan Howell et al. 2012. "On North Pacific Circulation and Associated Marine Debris Concentration." *Marine Pollution Bulletin* 65(1-3): 16-22.
- <sup>119</sup> Hong Zhou et al. 2007. "Changes in the Shelf Macrobenthic Community over Large Temporal and Spatial Scales in the Bohai Sea, China." *Journal of Marine Systems* 67 (3-4): 312-321.
- <sup>120</sup> Toshitaka Gamo. 2011. "Dissolved Oxygen in the Bottom Water of the Sea of Japan as a Sensitive Alarm for Global Climate Change." *TrAC Trends in Analytical Chemistry* 30 (8): 1308-1319.
- <sup>121</sup> William Jenkins. 2008. "The Biogeochemical Consequences of Changing Ventilation in the Japan/East Sea." *Marine Chemistry* 108 (3-4): 137-147.
- <sup>122</sup> Terence Roehrig. 2009. "North Korea and the Northern Limit Line." *North Korean Review* 5 (1): 8-22.
- <sup>123</sup> Gavan McCormack. 2011. "Contested Waters – Contested Texts: Storm over Korea's West Sea," *Asia-Pacific Journal: Japan Focus*, 9.8.5.
- <sup>124</sup> Robert Winstanley-Chesters. 2020. *Fish, Fishing and Community in North Korea and Neighbours: Vibrant Matters*. Singapore: Springer, pg. 140-141.
- <sup>125</sup> Ibid, pg, 174-175.
- <sup>126</sup> Nak-chung Paik 2011. *Division System in Crisis: Essays on Contemporary Korea*. Berkeley: University of California Press.

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