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# Selling the 'Untold Wealth' in the Seas: A Social and Cultural History of the South-east Australian Shelf Trawling Industry, 1915–1961

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## ABSTRACT

Between 1915 and 1961 a state-run trawling industry operated on the South-east Australian shelf targeting tiger flathead (*Neoplatycephalus richardsoni*) as its principal species. When the last steam-trawlers left in 1961, stocks in flathead had effectively collapsed. The familiar experience of overfishing, however, was due as much to social and cultural pressures as it was to increasing numbers of fishers targeting a delicate species with ever improving technologies. Flathead stocks declined as a direct result of a government initiative, designed to induce New South Wales residents to consume the Shelf's neglected wealth. In the intersection between the consuming masses, trawling nets, and government-directed marketing campaigns, tiger flathead became a new 'cheap food' and it could not withstand those forces. This article analyses the emergence of the Shelf fishery in 1915 and its evolution through the twentieth century. The history it details reveals the impact of the culture of consumerism on fishing ecosystems and the process through which a species declined from abundant to exhausted.

## KEYWORDS

New South Wales fisheries, trawling, Tiger flathead, marine ecosystems, David Stead

In 1915, the New South Wales government developed a state-run trawling industry to target fish stocks on Australia's south-east shelf. In doing so, they bore witness to a widely held dream that Australia's marine ecosystems could support a fishing industry to rival those on the Grand Banks or the North Sea. David Stead, naturalist to the Board of Fisheries of New South Wales, best expressed this vision. He coveted the riches of the South-east Australian shelf, terming them 'vast storehouses filled with untold wealth lying at our doors, with their portals wide open, bidding us to enter and carry off the spoil'.<sup>1</sup> Stead's words are ironic in view of the consequent decline of those once great storehouses. Overfishing, stock exhaustion, and ecological decline have followed his prognostication.<sup>2</sup> In the 1930s, stocks in the fisheries' target species, tiger flathead (*Neoplatycephalus richardsoni*), began to decline and by 1961, stocks had effectively collapsed. The decline in flathead redirected the fishers' efforts to other species such as jackass morwong (*Cheilodactylus macropterus*) and redfish (*Centroberyx affinis*), which were then in turn taken close to exhaustion point. While the fishing industry survived into the early twenty-first century, the dreams of its original architects – of hundreds of trawlers crisscrossing the oceans and hauling in ever-increasing catches – remained unfulfilled. This article analyses the history of the shelf fishery and its evolution through the twentieth century and examines the nexus of forces which drove the exploitation of the marine ecosystem. In so doing, it offers a cautionary tale about the speed with which fish stocks can go from healthy to exhausted and the central role that patterns of consumption play in inducing such changes.

To understand the history of the fishery, one needs to disaggregate the social, political, cultural, and economic forces that affected the ecosystem. While the ecological dreams of David Stead and their technological consequences remain central – propelling his desire for a proper national industry in ocean fishing only to see the nets and rigs overwhelm a resource that could never sustain that vision – there is a powerful role played by consumption patterns that also transformed the South-east Australian shelf. While the decline in flathead was a consequence of overfishing, the forces that produced this were as much cultural as they were technological.<sup>3</sup> Examining the web of overfishing in relation to the State Trawling Industry (STI) requires particular attention to the way in which the profit motive intersected with a 'culture of consumption'.<sup>4</sup> William Cronon and other historians have traced the flow of commodities from ecosystems to mass markets, showing the power of the consumer to be at the centre of profound environmental change.<sup>5</sup> John Soluri, for example, investigated the development of the banana market in the United States in the twentieth century in this manner and wrote of the need to 'lend agency to the consuming masses', in studies of environmental decline.<sup>6</sup> In his study, he argued that the transformation of environments in Latin America and the Caribbean to the exclusive production of the Gros Michel banana variety owed as much to the socially contingent definition of what a banana looked like and how it tasted, as it did

to the voracious need of the United Fruit Company to pursue monocultures to maximise product.<sup>7</sup> Similarly, in a discussion of Californian fisheries in the late nineteenth century, Jerry C. Towle argued that fish consumers in the state made 'the bland assumption that Atlantic-coast species were superior to those of the west'.<sup>8</sup> This assumption, in part, fuelled the introduction of new species such as Striped Bass and Atlantic salmon to Californian rivers with varying degrees of success.<sup>9</sup> These pressures were also at play in the Australian example as the government induced consumers to embrace a new foodstuff in the shape of trawled fish. Patterns of consumption were central to the loss of flathead species and subsequent varieties that were caught to fill the niche of the consumer demand for trawled fish after flathead stocks declined. After cultivating demand, and even after the STI was privatised, the trawling industry switched from flathead to morwong (*Cheilodactylus macropterus*), and then to nannygai (*Centroberyx affinis*) as successive species of choice. In doing so, the marketers engaged with the culture of fish as food that had been induced by the government industry. As they did, subtle shifts in the names of species and their marketing to the public, allowed what had once been 'by-catch' to find a market as a desired fish. This perspective is critical to understanding the historical impact of the fishery on the marine ecosystem of the South-east Australian shelf. That history also has a wider resonance. The Australian example is small compared with the spectacular collapses in the Atlantic cod fishery, or that of salmon and sardine species on America's Pacific coast. Yet, its history is as relevant to the wider study of humanity's impact on marine ecosystems as those more prominent examples, given the continued loss of known fish and the shift to under-exploited species to fill niches in the worldwide fish market.<sup>10</sup>

By contrast with the ocean fisheries of the northern hemisphere, the Australian trawling industry faced a marine environment capricious in its supply of fish. In productive waters there are abundant levels of phytoplankton that reproduce rapidly in the nutrient-rich waters brought to the surface of the ocean by the upwelling of currents sweeping nitrates and phosphates from the cold depths.<sup>11</sup> In turn, zooplankton feed on the phytoplankton and form the basis of the rich fishing industries such as those in the Grand Banks for cod or off the Californian coast for sardines and anchovies. Australian waters, however, lack these large areas of upwelling and while the South-east Shelf does contain the East Australian Current (EAC), and Western Australian coastal waters have the Leeuwin Current (LC), which flow along it from north and north-west respectively, they circulate warm waters instead of the so-called 'dirty' plankton-rich waters sought by fishers.<sup>12</sup> These forces combine to prevent the concentration of one species of fish on the shelf that could be easily harvested. This does not mean that Australian waters are without fish. On the contrary, they house great varieties of species but what they lack (from a fishing perspective) is a large concentration of any one species sufficient to support a vibrant industry.

A detailed understanding of the complexities of the South-east Shelf environment, however, was not available to men such as David Stead whose extensive work classifying Australian species for ichthyology developed coterminously with his calls for a fishing industry.<sup>13</sup> 'The exploration of our waters has just begun', Stead claimed in 1906 and then argued that the coastal waters along Australia's eastern coast would soon play 'an exceedingly important part in contributing to the material wealth of our country'.<sup>14</sup> Stead was keen to mimic northern hemisphere fishing successes in southern hemisphere waters and he was not alone in holding that vision. In 1893, the New South Wales colonial government had sent commissioners to the Columbian Exposition in Chicago to market the potential benefits of a fishing industry.<sup>15</sup> It was *potential* that they advertised, for, to that point, the fishing industry was concentrated on estuarine species and only experimental trawls had been conducted on the shelf – notably in 1881 when the NSW Fisheries Commission purchased fishing nets, a beam trawl, and an otter trawl to test the fishing potential of the ocean fishery only to see them destroyed by fire in 1882.<sup>16</sup> Yet, the NSW government representatives at the Chicago Exposition used the promise of significant industry to highlight the colony's economic future. The *Sydney Morning Herald* wrote of the fisheries as a 'noble gift of the creator', and their economic use by the New South Wales government would underscore their acceptance of that providential bounty.<sup>17</sup> Those convictions were only underscored by the vision of environmental riches projected at the Columbian Exposition. The Fisheries Building, where the NSW representatives exhibited, included a 750-gallon freshwater and a 1500-gallon sea water aquarium tank that contained all known specimen of fish from American waters as well as the Gulf of Mexico and the Atlantic and Pacific oceans.<sup>18</sup> Given that the Columbian Exposition was a great American symbol of their apparent mastery of the natural world, the New South Wales government would appear negligent of their providential bounties if they did not develop a comparable fishing industry. The *Herald* made this point clear.<sup>19</sup> As it stood in 1893, the fisheries were being 'flouted and disdained' by a negligent government and if it did not follow through with plans to develop it properly, 'a couple of smart Americans will take this industry in hand, and from behind their profits laugh at the apathy of this community'.<sup>20</sup>

The comment that 'smart Americans' would steal the shelf's wealth was a statement not about the seas as commons, which American vessels would simply exploit, but rather a more pointed observation about the failure of Australian governments to develop their resources to the same extent as their American cousins. As noted by historian Thomas Dunlap, America and Australia shared 'Anglo' ties that propelled their settlement of these new worlds and induced significant changes on the land. What is less noted, however, is that bringing the resources of the South-east Australian shelf into the nexus of Anglo settlement in Australia was as much a demonstration of progress and success as more traditional impacts such a farming and the presence of European animals.<sup>21</sup>

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Settling Australia in that Anglo model included a desire to exploit its ocean for fish resources that could be brought within the purview of the nation and demonstrate its mastery over all environments. Three years after the Chicago Exposition in 1896, a makeshift trawler, the *Thetis*, spent two months fishing the seas to further test the viability of an industry with this vision in mind.<sup>22</sup> Another experimental trawl was conducted in 1909 with the vessel *Endeavour* and the Superintendent of the Fisheries, Harald Dannevig, added his voice to the push for an industry, arguing that one hundred vessels would be needed to exploit the seas.<sup>23</sup> The loudest voices for the industry came from within the fisheries department. To Frank Farnell, chairman of the New South Wales Board of Fisheries in 1910, the Shelf was a source of 'neglected wealth'.<sup>24</sup> The same logic lay at the centre of David Stead's vision for a fishing industry. He used his presidential address at the New South Wales Naturalists' Club in 1909 to emphasise the worth of what he termed, 'our economic fishes'. In other parts of the world, species such as pilchards, anchovies, kingfish, and mackerel formed the basis of vibrant canning and salting fishing industries but, he lamented, 'we simply do not bother about [using those] inexhaustible supplies', that lay off the coast.<sup>25</sup> In the development of a trawling industry, not only would such supplies be brought into the economy of the state but also would also secure a 'new province' for New South Wales.<sup>26</sup> In the same manner in which European settlement had pushed west from Sydney and brought 'virgin' land under agricultural settlement, Stead sought to extend the colonies' reach into the oceans. There were 'hundreds of tons of fish', he assured his fellow enthusiasts and they would remain at the bottom of the sea unless the government acted.<sup>27</sup> The future, he felt sure, would demonstrate that they would be 'numbered among the State's greatest national assets'.<sup>28</sup>

Extending Stead's prophecies into a significant fishery along the New South Wales coast, however, required vessels, and it was the wealth of the state that was needed to secure them. As with other projects that mixed environmental transformation with a social agenda, the architects of the New South Wales industry were motivated by a desire to use government to secure Australia's wealth for Australians. Resource development was tied to national security, economic health, and social stability by first colonial and then state and national governments after Federation in 1901.<sup>29</sup> The large-scale irrigation projects developed in the 1890s around Renmark and Mildura in the respective colonies of South Australia and Victoria were prominent examples of a government initiative designed simultaneously to transform and secure the environment. Those settlements were designed with respect to an idealised 'garden landscape', wherein irrigators sought to induce people to settle on the land and develop the crops that could sustain them.<sup>30</sup> Fishery architects similarly sought to induce people to consume apparently abundant crops that lay waiting in the seas. To do so they relied on the state to cover the risk. And, in the left-leaning Labour government of William Holman, which took office in New South Wales in 1913, men like

Stead found common ground with the government's willingness to design a state-controlled industrial landscape. A state-run trawling industry would accord well with the state brickworks, clothing factories, joinery works, pipe work and sawmills that were all developed in this period as a way to not only expand the wealth of the state but also provide new sources of employment.<sup>31</sup>

The notion that it was the responsibility of government to develop the fishery, rather than the private sector, was underscored by a Royal Commission in 1912. The Commission was launched in response to accusations of profiteering within the marketing of estuarine fishing resources but also extended into commentaries on the lack of exploitation of the oceans fishery. It was imperative, argued the Commission, that the government act to 'put an end to the neglect of this almost illimitable field for the supply of so useful an article of food'.<sup>32</sup> In this climate, Stead was placed at the head of the newly-created State Trawling Industry (STI) in 1915, where he purchased three British vessels for £7000. Renamed the *Brolga*, *Koraaga*, and *Gunundaal*, weighing 217 tons and 115 feet in length,



FIGURE 1. The State Trawling Industry worked the fishing grounds on the continental shelf off the coast of New South Wales. Initially, the 'home grounds' were those off the coast of Botany Bay and the 'southern grounds' were worked from Eden. When the industry was privatised in 1922, the increasing numbers of vessels added territories south of Gabo Island to the trawling grounds.

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they housed crews of 11 to work the fishing grounds off Botany Bay. Initially, these three vessels had success. Individual catches reached 30,750 lbs (13,947 kilograms) for the *Brolga*, 51,000 lbs (23,133 kilograms) for the *Koraaga* and 35,000 lbs (15,875 kilograms) for the *Gunundaal* on separate days in 1915. This equated to approximately 1000 60-pound baskets for each trawler each month and the industry appeared to be fulfilling Stead's vision.

It was evident quickly, however, that three obstacles stood in the way of the development of the trawling industry. The first related to the catch itself. There was tremendous variability in the supply of fish—one catch for the *Koraaga* in 1916 reached only 16,440 lbs (7,457 kilograms) and only 18,600 lbs (8,436 kilograms) for the *Gunundaal* and 18,450 lbs (8,368 kilograms) for the *Brolga*. These figures – roughly half that achieved the year previously – reflected the inconstancy of the shelf as a source of fish as the trawling crews sought out the cold currents and nutrient-rich 'dirty' waters where flathead schooled, which were infrequent. In addition, the vessels were limited in their ability to extend their fishing into all areas of the shelf. From August to the end of September, they worked the so-called 'Home Grounds' off Botany Bay; from January to July, they worked the 'Southern Grounds' off Eden.<sup>33</sup> Such a limited geographic reach was due to their reliance on a centralised coal bunkering facility. Based at Woolloomooloo Bay in Sydney Harbour, the vessels could only extend so far before they would exhaust fuel. Stead augmented his confidence in both the 'inexhaustible fish supply on the ocean floor' and that the trawlers would achieve greater results when their knowledge of the grounds improved with a demand for additional trawlers.<sup>34</sup> This was the second obstacle that he faced because World War One intervened to disrupt the industry. The construction of new vessels was hampered by the allocation of resources to the war effort and the first of them, the *Goonabee*, did not make its first trawl until June 1919, while productivity issues remained for the older vessels. During World War One, as many as two vessels at a time were on requisition to the Commonwealth government for use as minesweepers – hampering any chance for a regular supply to the market.<sup>35</sup> After the war, new vessels were again added to the fleet – the *Goorangai*, *Dureenbee* and *Dibbiu*. Significantly, the *Dureenbee* and *Dibbiu* were fitted with refrigeration plants enabling them to carry out more distant cruising than ice-carrying boats and this did work to increase supply.

A third obstacle remained for Stead to confront, however: consumer preference. In developing the industry, he had followed the logic of monocultural production practiced in agriculture – the commodification of a crop. Yet, in conceiving of flathead as a crop, he had to cultivate a demand for his product. This cultural shift was proving to be as difficult to negotiate as the funding for new trawlers. Throughout his promotion of the industry, Stead insisted that there was a latent demand in New South Wales for fish in general. 'A large proportion of our people really desire a constant and regular fish supply most ardently', he had originally asserted in 1909.<sup>36</sup> He produced no evidence in support of his beliefs,



however, and at that time the Australian diet was focused overwhelmingly on red meat, primarily mutton. At the end of the nineteenth century, Australians ate more meat per person, per year, than the residents of the United States and Great Britain combined.<sup>37</sup> Fish was only an occasional respite from a diet of steak, chops and sausages, and fishing – at least for Sydneysiders – meant the targeting of estuarine stocks and inshore varieties. These were primarily mullet (*Mugil dobula*) and snapper (*Chrysophrys guttulatus*). The former were drawn mostly from the Clarence River, in the state's north, Port Hacking, and Bateman's Bay in the south, and from Port Jackson.<sup>38</sup> Snapper was drawn in limited numbers by crews working the breeding grounds they found along Botany Bay and up and down the length of the New South Wales coast. These ocean efforts were minor but they did reach the floor of the fish market run by Sydney Municipal Council at Woolloomooloo and they were hawked around the emerging suburban streets of Sydney by barrowmen selling both fresh and smoked fish. But could such a small demand for fish expand in line with the new catches from the shelf? To make that catch sell, Stead would not only have to furnish the product but also he would have to place the government at the centre of its marketing so that demand for trawled fish could be cultivated. To that end, the state became fishmonger as well as fisherman with the creation of State Fish Depots. The first opened at 98 Oxford Street on 17 August 1915 where, in a grand ceremony, the Lord Mayor ordered £10 worth of fish for the city hospitals before the general public was offered the new fish supplies.<sup>39</sup> By 1916, Sydney boasted five State Fish Depots – stores at Pitt Street and Castlereagh Streets in the city proper, and two additional stores in inner city Newtown and Glebe. Each month, 71,000 sales were recorded for each depot. The state depots were an ideal place to introduce Sydney consumers to a new product that they could buy either raw or cooked. In addition to fresh fish, these depots also sold fish sausages and pre-smoked fish, which reduced the need to discard damaged fish.<sup>40</sup> The trawled fish products represented 'cheap and wholesome food', argued Stead and he felt confident that the state's actions would take pressure off the larders of Sydney residents and reduce the cost of living over all.<sup>41</sup>

The state's hands on the supply of fish allowed the trawled product to withstand the price shocks of World War One, as food prices inflated; by 1918, retail food prices rose 34 per cent above 1914 levels. By 1920, they were 96 per cent higher than in 1914.<sup>42</sup> The state's control over the cost of fish, however, allowed the government to keep trawled fish at affordable prices for Sydney residents. There were 20 retail depots for the State Trawling Industry by 1922 (14 in Sydney and the remaining six in the growing regional centres of Newcastle, Maitland, Lithgow, Orange, Katoomba and Goulburn) and the government's messianic position in relation to consumption also concentrated attention on the species that the consumers liked. Stead's industry was not economically motivated, but rather focused on promoting trawled fish as a community service. Trawled flathead prices were artificially set lower than estuarine mullet so that flathead

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would be an affordable choice. Between October 1921 and August 1922, trawler skippers were ordered to land no more than 20 boxes of fish other than flathead when flathead were plentiful.<sup>43</sup> Even after a second Royal Commission into the industry in 1920, Stead maintained that fish could not exceed six to seven pence a pound or it would be priced out of the cheap food bracket pushing consumers towards meat instead.<sup>44</sup> Between 1915 and 1923, the State Trawling Industry perpetually ran at a loss – to the sum of £330,000 – but it did so to capture the consumer.<sup>45</sup>

The lack of profitability in the State trawling industry eventually cost Stead his job after the 1920 Royal Commission concluded that he had mismanaged the industry. While this removed Stead from controlling the direction of the industry his legacy was clear in relation to the cultivation of trawled fish as a new foodstuff. By 1927, Sydney's 1.2 million residents had steadily developed a 'taste' for 'deep sea flathead', as observed by A. M. Wood, the new officer in charge of State Fisheries. This reality was due not only to the State-run Fish Depots but also due to wider shifts in the public's fish consumption patterns. As Sydney's suburbs expanded through the 1910s and 1920s, the development of fish and chip shops in suburban shopping strips meant the gradual displacement of inner-city hawkers. By 1924, there were 65 fish and chip shops in the city of Sydney (compared with 30 in 1912). In popular memory, this was a time of Friday fish and chips that relied upon catches from the State Trawling Industry. One memoir characterised the period in the following manner: Every suburb 'had at least two excellent fish shops' and people waited in line for an hour for two 'four-penny pieces of cooked fish and three pennies' worth of 'chips that was enough for two people's Friday night tea'.<sup>46</sup> Between 1921 and 1927 the average consumption of fish rose from 6.2 kilograms a head to 7.3 kilograms and by 1929, the trawled ocean catch was 55 per cent of the total market catch – exceeding the sale of estuarine fish for the first time.<sup>47</sup> H. H. Marshall, delivering his commentary on the industry to an Australian Fisheries conference in 1929 reported that one shop alone was selling five tons of fish per week.<sup>48</sup>

The industry privatised as sales of trawled fish expanded. In 1922, the incoming Fuller conservative coalition government in New South Wales rejected many of Labor's ideas of state-owned industry. It privatised the trawling industry and the fish depots along with the state-owned timber yard, bakery and sawmill. Three private firms came to control the trawling industry – Cam and Sons, Red Funnel Fisheries and A.A. Murrell. In the hands of private industry, the trawling industry expanded the catch of ocean fish through the use of new technology, transforming the supply of fish to the Sydney market, and producing significant changes in overall impact on the environment.

By 1930, the seven trawlers that had operated within the State Trawling Industry in 1920 had expanded to 17. An average of 13 men worked a fishing week that lasted 132 hours on board these trawlers. A journey of 16 hours took them to the fishing grounds where the vessel would trawl for three to four days

before returning. These vessels discovered and worked new grounds, particularly in southern waters, where trawlers extended to Gabo Island. The catch of flathead was raised significantly within this privatised market and, in part, this reflected a new philosophy. The demand of the privatised market was for a ready supply of a known fish without the requirement that less saleable fish be kept in storage to fill troughs in later supplies. The State scheme had developed large cold storage facilities to hold over such less saleable fish but the trawling companies installed refrigeration and freezing facilities on board their vessels to allow them to deliver to the market a supply of the desired flathead. This was an important switch from the supply of fish at the lowest possible price to an operating principle based on the sale of fish in bulk for the best possible price.<sup>49</sup>

The privatisation of the industry brought financial rewards to a select few. A.A. Murrell controlled two steam trawlers, two retail shops, and a wholesale distribution agency for a turnover of £70,000 to £80,000 and Cam and Sons alone operated eight trawlers by 1930.<sup>50</sup> Financial rewards were precarious and during the Great Depression, all the trawling companies felt the effects of the economic downturn. In 1931, five trawlers were pulled from the trawling grounds because of declining prices and demand.<sup>51</sup> Yet, the efficiency of the catch improved through the application of technological advancements. As a modification to the net itself, the Vigneron-Dahl method introduced in 1926 extended a rope from the otter board to the mouth of the net, which created turbulence through which the boards swept more fish into the net. This increased the efficiency of the trawl by 30 to 40 per cent.<sup>52</sup>

Fish were swept into more nets too, through the introduction of new vessels into the industry (see Table 1). The 19 steam trawlers owned by private companies were joined in 1933 by smaller Danish seiners. Danish seiners contrasted to the large steam trawlers in a number of ways. Half their length, Danish seiners were constructed of wood and powered by diesel. The smaller size meant that a crew of only three men could work the vessel and the shift from coal to diesel freed the seiners from the Steam trawlers' dependence on centralised coal bunkering facilities. As a place of work, the trawling grounds now introduced small businesses crewing one or two boats. They also witnessed a new catching method that expanded the impact of fishing vessels on the South-east Fishery even further. Smaller in size, the seiners could work in smaller areas than trawlers and in areas of less depth. They also used a new net designed for its efficiency – diamond shaped, it used a bridle to herd fish inward and enclosed them in the net as it was winched into the vessel. New vessels also found new areas to work. In March 1933, the first seiner, the *Unique*, operated in Jervis Bay and the South Coast towns of Ulladulla and Eden emerged in the 1930s as central stations for the small seiner industries.

These technological changes built on changes within the social geography of Sydney. Government support for public expenditure on roads and transport links continued to expand the Sydney metropolitan area and brought the coastal

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Table 1. Estimated total commercial landed catch for the South-east Trawl Fishery, 1915-61.\*

Year	Total catch (t)	Year	Total catch (t)	Year	Total Catch (t)
1915-16	740	1930	6450	1945-46	5802
1916-17	743	1931	5187	1946-47	7360
1917-18	861	1932	5325	1947-48	6885
1918-19	1372	1933	4410	1948-49	6419
1919-20	2533	1934	4493	1949-50	5857
1920-21	2507	1935	4896	1950-51	5094
1921-22	2452	1936	6275	1951-52	4767
1922-23	1478	1937-38	6222	1952-53	5571
1923	1301	1938-39	6391	1955	4620
1924	2405	1939-40	5619	1956	3924
1925	3490	1940-41	3648	1957	4560
1926	3838	1941-42	3113	1958	3456
1927	4841	1942-43	1016	1959	3228
1928	5800	1943-44	1032	1960	3720
1929	6839	1944-45	4568	1961	1296

\* Neil Klaer, 'Steam Trawl Catches', 400.

centres to the north and south within easy reach of Sydney markets. The development of a Danish seine industry on the New South Wales South Coast was only possible because of a regular road transport industry that trucked ice southward from Sydney and returned loaded with fish. Similarly, the technological innovations that expanded the catch of flathead were married to the expansion of Sydney's population. Whereas in 1921, 43 per cent of the state's population lived in Sydney, by 1931 that percentage had increased to 47 per cent.<sup>53</sup> And this population's taste for flathead was discussed as concerns grew about the longevity of the fishing industry. At the close of the 1920s, T.C. Roughley, zoologist at the Technological Museum and later the Superintendent of New South Wales Fisheries between 1939 and 1952, warned of the depletion of old fishing grounds and noted that this pushed trawlers into more distant waters, which meant that profits for fishermen were being squeezed.<sup>54</sup> By the 1930s, the depletion of flathead stocks had become apparent. The annual catch rate for tiger flathead per hour of trawling dropped from an average of 231.6 kilograms in 1921 to 150.9 kilograms in 1930 and the catch rate per hour in 1937 was less than a half of that achieved at the beginning of the 1920s.<sup>55</sup> Although more vessels were added to the industry, they were forced to travel further, work harder, and fish to deeper levels in search of flathead.<sup>56</sup> World War Two delayed the seemingly inevitable depletion of flathead stocks by the NSW Trawling Industry

as trawlers were requisitioned by the Royal Australian Navy to act primarily as minesweepers. At its lowest point, the trawling industry counted only one boat as actively engaged in fishing in 1943 and 1944 and between 1940 and 1945, as a whole, there were never more than four. While seiners did continue to work the grounds during the war, even these vessels were occasionally requisitioned for defence purposes.<sup>57</sup> By 1947, the number of trawlers was back to 13 and the resulting catch spiked sharply upward. In 1943-44, the catch was 998 tons. By 1946-1947, this figure reached 7,350 tons.<sup>58</sup>

The decline in the total numbers of trawlers working the grounds increased profits for those fishermen that remained. While World War Two had produced a change in food patterns for New South Wales' residents – most notably in the rationing of meat – fish were spared rationing and the removal of vessels from the industry actually inflated prices. To avoid suggestions that a black market was inflating prices, the Commonwealth Prices Commissioner fixed the wholesale price of all fish in 1943. For flathead, this price was set at 9 ¼ d. per lb.<sup>59</sup> Nearly three-quarters of all fish sold in New South Wales were flathead or mullet, as this bureaucratic framework regulated marketing during World War Two.<sup>60</sup> The dominance of flathead meant that its stocks bore the brunt of the resumption of fishing after the close of the war. The 1943-4 catch was 998 tons (554 tons flathead); the next year, 4,038 tons (2,586 tons flathead), but that year marked the beginning of a shift. When the catch increased to 7,350 tons in 1946-7, flathead declined to 2,269 tons, and two years later declined to 953 tons in a total catch of 6,443 tons, representing only 15 per cent.<sup>61</sup>

The decline in flathead drove a series of consequences for the sustainability of the industry. The first demonstrated the logic of what Garret Hardin termed the 'tragedy of the commons'. In Hardin's analysis, the profit motive drives the fishers to push a known species to the point of exhaustion, even though they rely on it for their livelihood.<sup>62</sup> Over the course of the industry from 1915 to 1939, this process was evident as the trawlers caught progressively greater numbers of flathead. Based on available catch analyses, Neil Klaer concluded that the catch of flathead increased from 578 tons in 1918 to 1953 tons in 1939. After the brief increases seen at the close of World War Two, however, the catch of flathead was never greater than 299 tons throughout the 1950s. Although trawlers used new technologies to reach under-exploited schools of flathead, their increasing number of nets simply did not pull in increasing numbers of flathead. These declining catches of flathead were offset by the increasing catch of what was once considered second-grade species: to maximise gain, fishers shifted target rather than abandoning the 'commons'. During the year ending 30 June 1948, for example, tiger flathead (1500 tons) ranked third among fish sold through the Sydney Market behind nannygai (2,000 tons) and morwong (1950 tons).<sup>63</sup> Analysts of the South-east Shelf industry noted this shift to new species but failed to consider the reason for it.<sup>64</sup> Such transference of market-share has been a feature of many fisheries and industries that faced a fishing-out of spe-

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TABLE 2. Commercial Catch records for the South-east Australia Trawl Fishery, 1918–41, 1952–57. The estimated catch for the three target species (flathead, morwong, and redfish) are listed below. The category of 'other' contained primarily Leatherjacket, Latchet, and Shark. Figures for World War Two are published separately in Table 3.\*

Year	Total catch (t)	Flathead	Morwong	Nannygai (Redfish)	Other
1918	1012	578	14	1	419
1919	1863	992	0	2	869
1920	1138	486	1	4	647
1921	2326	1483	3	2	838
1922	3154	2113	0	2	1039
1923	443	311	0	0	132
1937	1953	1132	210	44	567
1938	3058	1943	322	40	753
1939	3070	1953	249	76	792
1940	732	410	36	22	264
1941	675	348	83	118	330
1952	1261	1260	399	181	382
1953	1427	1427	498	348	344
1954	1091	1091	482	208	211
1955	1118	1118	562	179	227
1956	1000	1000	490	115	241
1957	846	846	433	105	125

\* Neil Klaer, 'Steam Trawl Catches', 403.

TABLE 3. Fish Authority statistics for the South-east Australia trawling fishery between 1942 and 1948. The statistics below include the catches for trawlers and for seiners. They demonstrate the sharp uptake in the amount of fish caught when vessels requisitioned to the war effort returned to the grounds, beginning in 1944. They also show the declining rates of flathead and the rising catch of both morwong and redfish as fishers increasingly shifted to those species as new targets.†

Year	Total catch (t)	Flathead	Morwong	Nannygai (Redfish)
1942–3	590	226	n/a	45
1943–4	998	544	n/a	45
1944–5	4038	2586	227	45
1945–6	5127	2359	907	363
1946–7	7350	2269	1770	907
1947–8	6851	1724	1770	1588
1948–9	6443	953	1361	2495

† *Fisheries Newsletter* 9 (February 1950), 3. The total catch figures differ slightly from Klaer's as his statistical analysis drew on a variety of previous estimates. See Klaer, 'Steam Trawl Catches', for a discussion of his statistical modelling.

cies. In California, for example, fishers confronted rich sources of albacore in the 1910s that they struggled to sell to a public oriented to salmon. Eventually it was the entrepreneur A.P. Halfhill who, in 1911, aggressively marketed this unfamiliar fish to the American public as 'chicken of the sea'.<sup>65</sup> California's canned tuna industry blossomed on this targeting of the public's cultural frame of reference as much as it did the technological innovations that facilitated both the catching and the canning of the albacore. Cultural shifts in the nature of food, therefore, were as central to the continued exhaustion of the commons as the economic motive.

In New South Wales, the process of connecting the catch to the culture of its consumers was central to the marketing of the so-called secondary catch. In the same manner that flathead needed to become fish before it could become food, nannygai and morwong had to undergo a similar cultural transformation and a central aspect of this re-orientation was the control that government maintained over the retailing of fish. While the state no longer owned the fish shops, they did control the names under which fish was sold. This was most often enforced when fish species were incorrectly marketed so as to attract a higher price – such as the deliberate sale of sea bream for 'black bream', which was popularly considered a more edible fish and more expensive or the sale of leatherjackets as 'butterfish'.<sup>66</sup> Although these actions by retailers were illegal, they were sanctioned by the Department of Public Health in 1930 to facilitate the popular acceptance of these species.<sup>67</sup>

The process of renaming was central to the consumption of nannygai and morwong that, in both cases, occurred after their catch had increased (see Table 3). In 1944, the catch of nannygai was the equivalent of 45 tons yet, by 1948-49 it had reached 2495 tons. The disposal of this catch was only possible through the lobbying efforts of the Fish Merchants Association. Nannygai, argued the editors of the *Fisheries Newsletter*, was an 'unhappy name' that was 'mentally associated with nanny goats'.<sup>68</sup> To sell the increasing numbers of those fish, consumers needed to be attracted by a new name – redfish. Consequently, after additional lobbying by the Chief Superintendent of Fisheries, the name change was officially sanctioned by the Minister in charge of the Fisheries Act, John Baddeley, in November 1947.<sup>69</sup> Morwong endured a similar route to the dinner table. From a catch of only 500,000 lbs (226,796 kilograms) in 1944-45, only four years later it reached over 3,000,000 lbs (1,360,572 kilograms) in 1948-9.<sup>70</sup> It was the New South Wales Fisheries department that condoned the use of 'sea bream' to make the catch – quite literally – more palatable.<sup>71</sup>

After World War Two, the fishery was influenced by the increasing awareness and promotion of the health benefits of fish in the diet. Easing consumer concerns about the names of fish species coincided with the increasing awareness of the fish consumer on behalf of organisations such as the Fish Merchants Association. The Fish Merchants Association of NSW recognised the importance of making trawled fish palatable and, in doing so, sought not only to change

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the public name of species but also sought to increase the public's awareness of the nutritional value of fish in general. The systematic investigation of fish by nutritionists had begun in earnest in 1918 with the work of J.G. Drummond but continued with greater emphasis in the 1940s and 1950s. This reflected the development of the science of nutrition and scientific advances in the study of disease. Those treatments pointed favourably toward fish in general. Connections had been drawn between the treatment of Haemophilia and vitamin consumption, such as K1 and K2 (both found in sardines and pilchards). Additionally, a regular ration of fish alleviated the debilitating disease Rickets. To NSW Fish merchants, the message was clear. 'We must have a better and more regular supply of marine foods', argued G.T. Russell, 'from our sun-kissed waters'. In doing so, there would be 'better health for our people'.<sup>72</sup>

Yet, this push towards health cannot be divorced from the international standards that the Australian people were held to with respect to their fish consumption. To enthusiasts for a fishing industry, Australia was a fish-poor nation. After the initial successes of the NSW Industry, the national government proposed a national industry. Its chair, minerals industrialist H.W. Gepp, who is better known for his work in national forestry initiatives, characterised the need for nationalisation in 1929: 'we have been remiss in our national neglect of the fisheries. We are a fish starved people. At present we eat about 14 lb of fish a year, whereas in Britain the per capita consumption is about 40 lb'.<sup>73</sup> While such a national industry did not eventuate, the comparative dimension to Australia's use of its marine environment was perpetuated after the 1940s. At the close of the decade, the Australian Fish Merchants Association still bemoaned the fact that Australia, with a population 'nearly exclusively of European origin' could not match European consumption patterns. Instead, a United Nations report listed Australia alongside countries like Luxembourg, Chile and Ceylon as an 'intermediate consumption' country.<sup>74</sup>

In the 1950s, increasing fishing on the South-east Shelf to boost consumption resulted in further declining returns. The catch of flathead, once as much as 1,953 tons before the war, amounted to only 239 tons in 1953 and only 79 tons in 1957 (see Table 2). Redfish suffered an even more dramatic decline, moving from 76 tons in 1939 to 181 tons in 1952 and peaking at 348 tons in 1953, but by 1957 it had declined to 105 tons.<sup>75</sup> Trawled catches of flathead were also progressively declining in relation to seiners. In 1946-7, seiners contributed 62 per cent of the tiger flathead catch and by 1957-1958, this reached 85 per cent. Smaller vessels with access to fish stocks that trawlers could not reach began to push steam trawlers out of the industry. Consequently, trawlers relied on redfish, morwong and leatherjackets for their profits, but trawlers began to leave the waters as the progressive depletion of the fishery set in.<sup>76</sup> Cam and Sons left the trawl industry in 1954, leaving only six Red Funnel Fisheries vessels until 1959 when they too were retired. By 1961, the steam trawling industry officially ended.



When the last trawler left the grounds, stocks of *Neoplatycephalus richardsoni* had been heavily depleted. In the 1970s and 1980s, otter trawlers replaced steam trawlers and found a new species to target: orange roughy (*Hoplostethus atlanticus*). In 1990, orange roughy constituted 75 per cent of the total catch. This new fishery operated under new management structures after 1985 that introduced gear restrictions and imposed individual target quotas (ITQs) and Total Allowable Catch (TAC) policies.<sup>77</sup> After 1994, the state-run Fish Marketing Authority was privatised, removing the state entirely from the catching and selling of the Shelf's products. To an extent, these changes worked to sustain the industry and only the stocks of gemfish (*Rexea solandri*), targeted after the close of the trawling industry, are classified as overfished.<sup>78</sup> Yet, in the evolution of targets from flathead to morwong to nannygai to orange roughy, the same process has been evident – the switch from one desired food to another. The reduction in the numbers of all of those stocks was the consequence of a combination of economic, social and cultural forces among which the process wherein flathead became fish and hence food cannot be underestimated.

The collapse of the South-east Australia Shelf fishery is not a big economic story in world terms. The trawling fleet based in Hull, which dominated the English trawling industry, landed approximately 100 times the weight of demersal fish of the industry based in Sydney through the early twentieth century.<sup>79</sup> The maximum catch from the South-east Shelf was 7,360 tons in 1946–7, whereas the catch from British trawlers peaked in 1937 at an equivalent level of 803,438 tons.<sup>80</sup> Even W.J. Dakin, who outlined much of the ecological changes to the Australian Shelf as a consequence of the trawlers conceded that the South-east grounds were 'nothing more than a huge lake', when compared to the scale of the fishing grounds in the Irish sea alone.<sup>81</sup> The industry along California's coast similarly dwarfed the industry across the Pacific in New South Wales. California's sardine catch halved from 325,000 tons to 165,000 tons between 1929 and 1932.<sup>82</sup> Even a depleting sardine fishery was a bonanza when compared to the trawled catches in New South Wales – the largest catch in the same period being 6,839 tons in 1929.<sup>83</sup> Even in contemporary terms, the total value of Australia fisheries is small compared with OECD nations. On figures for 1994, Australia's catch was nineteenth in a list of twenty-three nation's fisheries – larger than only Belgium, Greece, and Finland.<sup>84</sup> As a social crisis too, the failure of the trawling industry in New South Wales never reached the comparative dislocation felt in villages along England's coastline or indeed, along both the Pacific and Atlantic coastlines of North America. What is significant about the STI is that when compared with the initial available fishing species, the ecological impact of the trawling industry in New South Wales was as great as that which befell species in the North Sea or the eastern Pacific. When the industry found its market target, the decline in its stocks was swift. Within just 45 years, tiger flathead stocks were exhausted.

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As a consequence, the historical lesson of the trawling industry relates both to patterns of Australian consumption and to the wider understanding of the impact of humanity on maritime resources. First, the cultural process wherein flathead became fish merely added another pre-packaged food product for New South Wales consumers. The history of food consumption for European settlers in Australia has been, to quote author Michael Symons, 'one continuous picnic'. The absence of settled regional centres (rural and coastal) produced a superficial food culture where food was transported around Australia rather than grown and consumed in one place. The latter would have allowed a food culture to develop through the 'creative interplay between society and the soil'.<sup>85</sup> The absence of such an interplay meant that one fish could be replaced by another on the tables of New South Wales residents with little thought of the process through which it had arrived there or the ecological base from which it derived. The fact that consumers responded to the more suitable names for fish stocks emphasises that point.

Second, fishing is an increasingly globalised trade and the proximity between the fishing public and the fish it consumes grows ever wider in nations other than just Australia. The Food and Agriculture Organisation of the United Nations stated that in 2000, imports by developed countries reached \$49.9 billion.<sup>86</sup> Increasingly, exotic species from developing countries find their way onto the tables of consumers in the developed world, helping the first with a cash crop and the latter with a new dining experience.<sup>87</sup> Similarly, trade between developed nations brings fish from Australia's shelf to restaurants in New York and Atlantic species to restaurants in Sydney.<sup>88</sup> Yet, as this trade increases it also pressures species that otherwise had escaped consumer preference. The notable example is that of Alaskan pollack, which has emerged as one of the United States' most valuable fisheries as a consequence of the invention of the surimi process in Japan. Through the surimi process, fish flesh is separated from the bones and skin, water-washed to remove fat and water-soluble components, and then ground with salt and other ingredients to form a generic fish product. Through this once ancient process – made more intensive through modern technology – pollack can be made to mimic crabmeat at a fraction of the cost of actual crabmeat.<sup>89</sup> Over the last 20 years, the surimi process has produced a billion dollar market in Alaskan pollack out of a previously minor fishery.<sup>90</sup>

The need to target and market previously unused fish remains a central part of future planning for fisheries. Growth in fisheries is predicted to occur in the more prudent use of by-catches and the use of species previously overlooked. 'Most of the forecasted growth', concluded a recent study, 'is likely to occur from aquaculture activities, greater use of unconventional species, and use of species now considered to have little or no commercial value'.<sup>91</sup> And Michael Berrill's otherwise elegiac discussion of declining worldwide fisheries, *The Plundered Seas*, observes that to reduce the problem of wastefulness, 'fish species that are considered unmarketable... might be sold elsewhere on the global market where

consumer tastes differ, or it may be possible to disguise these species and sell them as fish sticks'.<sup>92</sup>

The example of the South-east Australian trawling industry offers a cautionary tale about the consequences of seeking new species as a basis of an ocean food supply. The architects of the South-east Australian trawling industry approached the fish stocks backwards, as it were. Rather than seeking to exploit an available resource as a base for a population's food source they sought to induce the population into consumption of a resource that was otherwise separate from their need. The NSW state government willed an industry into place where none previously existed and relied on establishing a 'culture of consumption' to fulfil the exploitation of demersal fish on Australia's South-east Shelf.<sup>93</sup> Tiger flathead recovered from its targeting but this, in part, was due to the shifting focus of the public to the newly palatable redfish and then to Orange Roughy. The fact that any *P. richardsoni* remain on the South-east Australian Shelf is the direct result of the shifts of those economic and cultural forces to other species. Other species may well survive their targeting but, if so, it may well take the shifting of the public to other stocks and the driving of that species to near extinction for it to survive. In any case, it may need to withstand not only its fishers but also those future dreamers seeking untold wealth from a harvest of new fish from the seas.

## NOTES

<sup>1</sup> David G. Stead, *Fishes of Australia: A Popular and Systematic Guide to the Wealth within Our Waters* (Sydney: William Brooks and Co. Limited, 1906), 241.

<sup>2</sup> David Stead was a leading figure in the development of fisheries in Australia in the late nineteenth and early twentieth-centuries, publishing a series of studies into Australia's ichthyologic potential. After developing the NSW trawling industry (and being fired as its general manager in 1920) he later became a popular scientific educator in Australia, pioneering radio broadcasts on wildlife topics and editing nature periodicals. See G.P. Walsh, 'Stead, David George', *Australian Dictionary of Biography* 12: 1891–1939, (Melbourne: Melbourne University Press, 1990), 57–8.

<sup>3</sup> Arthur F. McEvoy, *The Fisherman's Problem: Ecology and Law in the California Fisheries, 1850–1980* (New York: Cambridge University Press, 1986) provided a template for subsequent investigations of economic pressures that provoked collapses in marine ecosystems. In those that have followed, Joseph E. Taylor, "'Burning the Candle at Both Ends": Historicizing Overfishing in Oregon's Nineteenth Century Salmon Fisheries', *Environmental History* 4, (January 1999), doi: 10.2307/3985328, argued for a wider investigation on the stresses experienced by fish stocks. In his investigation of the fishing activities in the Pacific Northwest of the United States, for example, Taylor stressed that 'overfishing occurred not simply because fishers took too many fish – a tautology – but because salmon were undergoing stress from too many directions at once' [70]. While the economic motivations of catchers were a factor, Taylor nevertheless argued that the

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loss of salmon was due to a process 'far messier and more interesting than historians have so far suggested' [56].

<sup>4</sup> Richard Wrightman Fox and T.J. Jackson Lears, *The Culture of Consumption: Critical Essays in American History, 1880–1980* (New York: Pantheon Books, 1983), x–xi.

<sup>5</sup> W. Cronon, 'Modes of Prophecy and Production: Placing Nature in History', *Journal of American History* 76, (March 1990), 1124.

<sup>6</sup> John Soluri, 'Accounting for Taste: Export Bananas, Mass Markets, and Panama Disease', *Environmental History* 7 (2002), 388.

<sup>7</sup> Soluri, 'Accounting for Taste', 388.

<sup>8</sup> Jerry C. Towle, 'Authored Ecosystems: Livingston Stone and the Transformation of California fisheries', *Environmental History* 5 (2000), 56.

<sup>9</sup> Towle, 'Authored Ecosystems', 57. The decline in salmon stocks in rivers in the Pacific Northwest of the United States also pushes historians into an evaluation of consumption patterns. The first white settlers in California pressured the runs of chinook and sockeye because they preferred its deep red meat. As Joseph E. Taylor observed in his study, industrial fishers compressed the fishing season to the Spring when those salmon varieties were plentiful. By contrast, the native populations had harvested runs from March to November of various salmon species and this had alleviated their impact on the runs of all the salmon stocks. The fact that the Euro Americans were oriented towards a particular definition of salmon exacerbated the impact of their catch as much as the economic pressures of the fishers with their nets. See Taylor, 'Burning the Candle at Both Ends', 67.

<sup>10</sup> M. Kurlansky, *Cod: A Biography of the Fish that Changed the World* (New York: Walker and Co., 1997); Arthur F. McEvoy, *The Fisherman's Problem: Ecology and Law in the California Fisheries, 1850–1980* (New York: Cambridge University Press, 1986); and Joseph E. Taylor, *Making Salmon: An Environmental History of the Northwest Fisheries Crisis* (Seattle, Washington: University of Washington Press, 2002) are three prominent historical studies of these ecological crises. Research into the South-east Australian shelf fishery has received a recent boost through the HMAP (History of Marine Animal Populations) study, which included the shelf as one of its seven case studies of ecological decline. The research in this paper was possible because of funding provided by HMAP.

<sup>11</sup> A.J. Underwood, and M.G. Chapman, eds., *Coastal Marine Ecology of Temperate Australia* (Sydney: UNSW Press, 1995), 32, 277.

<sup>12</sup> Jeremy D. Prince and David A. Griffin, 'Ecosystem of the South East Fishery (Australia), and Fisher Lore', *Marine and Freshwater Research* 52 (2001), 434, doi: 10.1071/MF00042.

<sup>13</sup> The first scientific investigations into the demersal fish stocks on the South East Australian shelf were conducted in 1913 by the then Federal Director of Fisheries, Harald Dannevig. In 1914, his trawler, *Endeavour*, was lost with all hands on board and it took until the 1930s for detailed scientific studies of flathead to develop. See R.D.J. Tilzey and K.R. Rowling, 'History of Australia's South East Fishery: A Scientist's Perspective'. *Marine and Freshwater Research* 52, (2001), 361–75, doi: 10.1071/MF99185, p. 364.

<sup>14</sup> Stead, *Fishes of Australia*, iii.

<sup>15</sup> New South Wales was a colonial government until the Federation of Australia in 1901 changed its status to that of a state within the Commonwealth of Australia.

<sup>16</sup> David G. Stead, *The Edible Fishes of New South Wales: Their Present Importance and their Potentialities* (Sydney: Government of the State of New South Wales, 1908), 19–20.

<sup>17</sup> Viator, 'A morning at the Fish Markets'. Article from the *Sydney Morning Herald* quoted in Lindsay G. Thompson, 'History of the Fisheries of New South Wales; with a Sketch of the Laws by which they have been Regulated'. *Pamphlets issued by the NSW Commissioners for the World's Columbian Exposition, Chicago 1893* (Sydney: Charles Potter, Government Printer, 1893), 50.

<sup>18</sup> J. W. Buel, *The Magic City: a massive portfolio of original photographic views of the great World's Fair and its treasures of art, including a vivid representation of the famous Midway Plaisance* (St. Louis, Missouri: Historical Publishing Company, 1894); H.G. Cutler, *The World's Fair* (Chicago, Illinois: Star Publishing Company, 1892), 360.

<sup>19</sup> Reid Badger, *The Great American Fair* (Chicago, Illinois: N. Hall, 1979), xiii

<sup>20</sup> Viator in Thompson, 'History of the Fisheries', 50.

<sup>21</sup> The connections between Australia and America that could provoke such fears illustrates the wider point about the 'Anglo' transformation of new worlds described in Thomas Dunlap, *Nature and the English Diaspora: Environment and History in the United States, Canada, Australia, and New Zealand* (Cambridge: Cambridge University Press, 1999). While Dunlap traces the intersection between an Anglo vision and these environments, fisheries are not as well represented in his analysis.

<sup>22</sup> Stead, *The Edible Fishes of New South Wales*, 19.

<sup>23</sup> L. Amato, "'The Dialectics of Fish": Fishing, Fish Marketing and Government Intervention in the Fishing Industry of New South Wales 1880–1964' (MA diss., University of Newcastle, 1989).

<sup>24</sup> Frank Farnell, quoted in J.W. Watson, *Newspaper Cuttings: Australian Shipping. Volume 2, no. 78* [Mitchell Library].

<sup>25</sup> Stead, *The Edible Fishes of New South Wales*, 1–7.

<sup>26</sup> David G. Stead, *A Few Facts about the New South Wales Trawling Industry. Cheap Food for the People* (NSW State Trawling Industry Pamphlet, 1916) [Mitchell Library].

<sup>27</sup> Stead, *A Few Facts*.

<sup>28</sup> Stead, *The Edible Fishes of New South Wales*, 1.

<sup>29</sup> William J. Lines, *Taming the Great South Land: A History of the Conquest of Nature in Australia* (Athens, Georgia: University of Georgia Press, 1999), 160–7; Kevin Frawley, 'Evolving Visions: Environmental Management and Nature Conservation in Australia', in *Australian Environmental History: Essays and Cases*, ed. S. Dovers (Melbourne: Oxford University Press, 1999), 55–70.

<sup>30</sup> I. Tyrrell, *True Gardens of the Gods: Californian-Australian Environmental Reform, 1860–1930* (Berkeley, California: University of California Press, 1999).

<sup>31</sup> C. Grieve and G. Richardson, 'Recent History of Australia's South East Fishery: A Manager's Perspective', *Marine and Freshwater Research* 52 (2001), 377, doi: 10.1071/MF00070. The interest of the government in the establishment of a state-run trawling industry was also motivated by food safety issues. An outbreak of the plague in Sydney in 1900 had prodded successive state governments to more closely monitor health and food standards through legislation such as the 1908 Health and Pure Food Act. In addi-

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tion to the trawling industry, other state-run industries were also developed – such as a Bread Trust – but they were unsuccessful.

<sup>32</sup> Amato, 'The Dialectics of Fish', 74.

<sup>33</sup> C.E. Taylor, 'State Fishing in Australia', *Mid-Pacific Magazine* 26 (August 1923), 132.

<sup>34</sup> Stead, *A Few Facts*.

<sup>35</sup> Amato, 'The Dialectics of Fish'.

<sup>36</sup> David G. Stead, *A Brief Review of the Fisheries of New South Wales: Present and Potential* (Sydney: Published by the Authority of the Government of New South Wales, 1910), 5.

<sup>37</sup> Richard Beckett, *Convicted Tastes: Food in Australia* (Sydney: George Allen & Unwin, 1984), 78.

<sup>38</sup> Stead, *Brief Review of the Fisheries of New South Wales*, 8–9.

<sup>39</sup> *Sydney Morning Herald*, 18 August 1915.

<sup>40</sup> Damage to fish occurred as a result of being twisted in the net. Amato, 'The Dialectics of Fish', 123.

<sup>41</sup> Stead, *A Few Facts*.

<sup>42</sup> Michael Hogan and David Clune, eds., *The People's Choice: Electoral Politics in 20th Century New South Wales, Volume 1: 1901–1927* (Sydney: Parliament of New South Wales, 2001), 181.

<sup>43</sup> Amato, 'The Dialectics of Fish', 122.

<sup>44</sup> Amato, 'The Dialectics of Fish', 111. Historic terms: one farthing ( $\frac{1}{4}$  d.); one halfpenny ( $\frac{1}{2}$  d.), where 1 penny (d.) = 1 cent, 1 shilling = 10 cents, one pound = \$2. Australian currency changed from pounds, shillings and pence to dollars and cents in 1966.

<sup>45</sup> T.C. Roughley, *Fish and Fisheries of Australia* (Sydney: Angus and Robertson, 1955 [revised edition]), 173–4.

<sup>46</sup> Lydia Gill, *My Town: Sydney in the 1930s* (Sydney: State Library of New South Wales Press, 1993), 27.

<sup>47</sup> Amato, 'The Dialectics of Fish', 133–5.

<sup>48</sup> H.H. Marshall, 'Report into the Transport, Marketing and Distribution of Fish in Australia', *Australian Fisheries Conference*, 60–1. It must also be noted that fish and chip shops also relied on technological advances – not the least of which was the fish and chip fryer itself.

<sup>49</sup> Amato, 'The Dialectics of Fish', 132.

<sup>50</sup> 'Trawling Fleet', *Sydney Morning Herald*, 1 Feb. 1929.

<sup>51</sup> 'Five Trawlers Out of Commission: Industrial Depression' *Sydney Morning Herald*, 11 Feb. 1931.

<sup>52</sup> Roughley, *Fish and Fisheries of Australia*, 195.

<sup>53</sup> NSWSR and Commonwealth Censuses quoted in Spearritt, *Sydney's Century*, 3.

<sup>54</sup> 'Fishing Industry: Exhausting the Trawling Grounds', *Sydney Morning Herald*, 14 June 1929.

<sup>55</sup> Mathieson, 'A Contribution to an Understanding of the Commercial Fisheries of South-Eastern Australia', 268; Neil Klaer, 'Steam Trawl Catches from Southeastern

Australia from 1918 to 1957: Trends in Catch Rates and Species Composition', *Marine and Freshwater Research* 52 (2001), 399–410, doi: 10.1071/MF00101.

<sup>56</sup> Klaer, 'Steam Trawl Catches', 400–405.

<sup>57</sup> *Fisheries Newsletter* 3 (November 1944), 3.

<sup>58</sup> Klaer, 'Steam Trawl Catches', Table 1. One ton = 1.02 tonnes

<sup>59</sup> 'Ninepence farthing per pound' means approximately nine cents for 0.454 kg.

<sup>60</sup> Amato, 'The Dialectics of Fish', 164.

<sup>61</sup> Steven S. Montgomery, 'Aspects of the Biology of the Tiger Flathead *P. richardsoni* and the Associated Fishery' (MA diss., University of New South Wales, 1985), Appendix 6.1.

<sup>62</sup> G. Hardin, 'The Tragedy of the Commons', *Science* 162 (1968): 1243–8.

<sup>63</sup> *Fisheries Newsletter* 8, (February 1949), 3.

<sup>64</sup> *Fish Marketing Authority* states just that 'after the war ... catches of flathead declined severely to about 500 tons per annum, and the previously secondary species, jackass morwong, *Cheilodactylus macropterus*, and redfish, *Centroberyx affinis*, comprised the bulk of the marketed catch' [21].

<sup>65</sup> McEvoy, *Fisherman's Problem*, 130.

<sup>66</sup> Roughley, *Fish and Fisheries of Australia*, 98.

<sup>67</sup> *Master Fish Merchants' Association of NSW*. Annual Report 1939–40, 9–10.

<sup>68</sup> *Fisheries Newsletter* 6, (December 1947), 20.

<sup>69</sup> *Fisheries Newsletter* 6, (December 1947), 20.

<sup>70</sup> Roughley, *Fish and Fisheries of Australia*, 98.

<sup>71</sup> There was a similar argument in the United Kingdom in the 1920s when the Food Council suggested that stocks of gurnard, megrims and witches, which consumers avoided in favour of less prevalent cod, haddock and plaice species, be renamed to help with their marketing. Chris Reid, 'From Trawler to Table: The Fish Trades since the Late Nineteenth Century', in *England's Sea Fisheries: The Commercial Sea Fisheries of England and Wales since 1300*, ed. David J. Starkey, Chris Reid and Neil Ashcroft (London: Chatham Publishing, 2000), 163.

<sup>72</sup> G.T. Russell, 'Fish as a Necessary Diet', *MFMA NSW Annual Report* (1939–40), 29.

<sup>73</sup> 'Fisheries: Untouched Resources', *Sydney Morning Herald*, 27 July 1929.

<sup>74</sup> 'Australia in Second Lowest Fish Consuming Group', *Fisheries Newsletter* 8, (June 1949), 15.

<sup>75</sup> Klaer, 'Steam Trawl Catches', Table 3.

<sup>76</sup> Mathieson, 'Contribution to an Understanding', 379.

<sup>77</sup> *Towards Sustainable Fisheries: Economic Aspects of the Management of Living Marine Resources* (Paris: Organization for Economic Co-operation and Development, 1997), 181.

<sup>78</sup> Klaer, 'Steam Trawl Catches', 399.

<sup>79</sup> Robb Robinson, *Trawling: The Rise and Fall of the British Trawl Industry* (Exeter: University of Exeter Press, 1996), 250.

<sup>80</sup> Robinson, *Trawling*, 250. The figures for British trawlers are listed in cwt (hundred-weights). For 1937, the catch across England, Scotland and Wales was 15,815,078 cwt,

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which is equivalent to 803,438 tons. The catch in Scotland alone (2,481,731 cwt or 126,077 tons) was eighteen times the size of the trawled catch on the South-east Shelf.

<sup>81</sup> W.J. Dakin, quoted in Roughley, *Fish and Fisheries of Australia*, 145.

<sup>82</sup> McEvoy, *The Fisherman's Problem*, 144.

<sup>83</sup> Klaer, 'Steam Trawl Catches', 400.

<sup>84</sup> *Towards Sustainable Fisheries*, 59.

<sup>85</sup> Michael Symons, *One Continuous Picnic: A History of Eating in Australia* (Adelaide: Duck Press, 1982), 10.

<sup>86</sup> 'State of Food and Agriculture, 2002', [http://www.fao.org/DOCREP/004/Y6000E/y6000e05.htm#P121\\_21299](http://www.fao.org/DOCREP/004/Y6000E/y6000e05.htm#P121_21299) [Accessed 01/14/04].

<sup>87</sup> Paul Hohn, 'An International Perspective on Britain's Fisheries in the New Millennium', in Starkey, Reid and Ashcroft, *England's Sea Fisheries*, 239.

<sup>88</sup> 'Flying Fish', *Sydney Morning Herald*, 11 March 2003. 'Adventure at Sea', *Sydney Morning Herald*, 28 Jan. 2003.

<sup>89</sup> Tyre C. Lanier and Chong M. Lee, eds., *Surimi Technology* (New York: M. Dekker, 1992), 4–5.

<sup>90</sup> John A. Knauss, 'The State of the World's Marine Resources', *The State of the World's Fisheries Resources. Proceedings of the World's Fisheries Congress, Plenary Sessions*, ed. Clyde W. Vaigtlander (Lebanon, New Hampshire: International Science Publisher, 1994), 21.

<sup>91</sup> Dayton L. Alverson, 'Fisheries Resources and Management in the Twenty-First Century', in *Ocean Agenda 21: Passages to the Pacific Century*, ed. Courtland L. Smith (Corvallis, Oregon: Oregon State University, 1989), 39.

<sup>92</sup> Michael Berrill, *The Plundered Seas: Can the World's Fish be Saved?* (San Francisco, California: Sierra Club Books, 1997), 192.

<sup>93</sup> Fox and Jackson Lears, *The Culture of Consumption*, x–xi.



