

Chapter 12

Shifting Baselines or Shifting Currents? An Environmental History of Fish and Fishing in the South-West Capes Region of Western Australia

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Abstract The South-west Capes region of Western Australia is one of high marine biodiversity but relatively low productivity. Still the region's waters have long provided food for the local Noongar people and sustained commercial and recreational fishing since the nineteenth century, when activities were loosely regulated, if at all. But from the mid- to late-twentieth century, as catch rates apparently declined while the popularity and reach of recreational fishing increased, policies governing fishing in the region became increasingly restrictive and fiercely contested. This chapter therefore endeavours to disentangle the strands of policy, perception, and fish populations in the Capes region, evaluating evidence of change in the region's fish populations over the long run, and accounting for it with reference to social contexts, fishing intensity and practices, and change in the regional environment. It ultimately suggests that the movements and abundance of fish have varied considerably over time due to biophysical and ecological influences, and claims of depletion have sometimes reflected cultural anxieties rather than environmental change. However, there is also a long history of human interventions in the region's marine ecosystems. Such interventions, shaped by complex cultural and economic factors, have left short- and longer-term imprints on the region's ecosystems.

Keywords Marine environmental history · Ngari Capes Marine Park · South-west capes region · Fishing history Western Australia · Leeuwin current

Environmental issues featured prominently in the lead up to the Western Australian state election held in February 2001, with then opposition leader Geoff Gallop making a range of election promises relating to old growth forest, ecotourism and conservation, coastal development and dryland salinity. Among the promises was a proposal to create a marine park in the state's south-west, which would encompass Geographe Bay, the coast between Capes Leeuwin and Naturaliste, and Hardy Inlet (Fig. 12.1). The proposed park included several sanctuary zones in which

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Fig. 12.1 Map of the South-west Capes region and surrounds

fishing would be prohibited. Gallop won the election and the planning process for the park was commenced but later stalled after the period of public consultation, as the increasingly beleaguered Labor government pursued other priorities. The Ngari Capes Marine Park was finally declared in 2012, including 15 sanctuary zones in which fishing will be prohibited. At this time the region was also subject to a marine bioregional planning process being undertaken by the Commonwealth Government (DEWHA 2009). The planning and proclamation of marine parks in the region has generated considerable public debate, with both proponents and opponents increasingly turning to historical records to support claims of degradation and depletion over time on the one hand, or sustained and effective fisheries management for ecosystem health on the other. In this context, there is an obvious need to better understand the history of fish and fishing in the region.

Although the region's fisheries have been the subject of considerable scientific research over the past four decades, there is still much to learn about the biology and ecology of the region's marine life. Less still is known of the way in which the region's marine resources have been exploited in the past. Some archaeological and anthropological studies have shed a little scholarly light on the long history of Aboriginal fishing (Meagher 1974–1975; Dortch 1997); a few researchers have considered aspects of commercial and recreational fishing in the region as part of broader studies (see for example Lenanton 1984; Tull 1992; Christensen 2009); and research reports have employed fisheries data stretching back to the 1970s in

order to evaluate the condition of fish stocks (see for example Wise et al. 2007; Hall and Wise 2011). However, to date no historical study has focused on fishing in the region from Aboriginal times to the 1970s and placed recent trends in the context of this longer history.

This chapter therefore aims to evaluate evidence of change in the region's fish populations over the long run, and account for it with reference to social contexts, fishing intensity and practices, and change in the regional environment. That is, it endeavours to explore, as far as the evidence will allow, the relationship between fish, fishing and environmental variation in the region. It ultimately suggests that the movements and abundance of fish have varied considerably over time due to biophysical and ecological influences, and claims of depletion have sometimes reflected cultural anxieties rather than environmental change. However, there is also a long history of human interventions in the region's marine ecosystems. Such interventions, shaped by complex cultural and economic factors, have left short- and longer-term imprints on the region's ecosystems.

The Capes Region

The marine life of the Capes region is characterised by high biodiversity. This is partly due to the region's diverse habitats, which range from the protected seagrass meadows of Geographe Bay to the high energy coastline and limestone reefs between the Capes and the estuarine environment of Hardy Inlet. It is also due to the pervasive influence of the Leeuwin Current, which transports warm water of low salinity southward from the tropics. This enables tropical species to survive—temporarily or permanently—further south than they would otherwise, placing the Capes region within the overlap between the range of northern tropical and southern temperate species (Thomson-Dans et al. 2002–2003). However, the marine productivity of the Capes region, especially of finfish, overall is low. As Western Australian Superintendent of Fisheries A. J. Fraser remarked in 1953:

I do not for a moment suggest that Western Australia's fishery resources are unlimited... in contradistinction to other parts of the world, Nature was somewhat niggardly when she endowed our fisheries. We certainly have many species of fish, but we have a smallish number of individuals of each species and they could possibly, without proper management, in the long run become depleted. It is essential therefore that we take very good care of what we have. (Fraser 1953)

Fish stocks are limited by a range of factors, one being the relatively narrow continental shelves (Tull 1992). Another is that the Leeuwin Current waters are low in nutrients, so do not support the abundance of pelagic planktivorous fish found in other eastern boundary current systems such as the Benguela and Humboldt (Lenanton et al. 1991). The main sources of nutrients in the region are surface water runoff, groundwater, and inshore biological processes, so finfish are mainly found shoreward of the current. There is a winter nutrient peak in the region's inshore waters, presumably from the runoff of surface water which occurs mainly in the winter

months. However, primary production during this period is limited by light, reduced during winter by the shorter day length and turbid water (Hanson et al. 2005).

In addition to the Leeuwin Current, the region is influenced by the Capes Current, a summer inshore countercurrent flowing equatorward past Cape Naturaliste (Pearce and Pattiaratchi 1999). This current, which originates between Capes Leeuwin and Naturaliste, augmented by waters from the south east of Cape Leeuwin (Gersbach et al. 1999), is probably a significant influence on economic finfish species, facilitating or impeding the movement and feeding of pelagic species such as Western Australian salmon (*Arripis truttaceus*), pilchard (*Sardinops sagax*), and Australian herring (*Arripis georgianus*), all of which spawn off the south-west coast (Pattiaratchi 2007).

The Capes marine environment is subject to considerable variation, both natural and anthropogenic. The Leeuwin Current varies from month to month, flowing more strongly in winter than summer, and from year to year, with variations associated with the El Niño Southern Oscillation (ENSO). The Capes Current depends on wind velocities which vary seasonally and annually, as well as interaction with the Leeuwin Current. Within the area affected by the Capes Current, the most intense upwelling occurs mid-way between Capes Leeuwin and Naturaliste under summer conditions of strong southerly winds (Pattiaratchi 2007). Although this water is still nutrient-poor in world terms, it supports primary production which is relatively high for this region, and which forms the basis of extended food chains involving aggregations of small pelagic fish and predators including larger fish, sharks, dolphins and seabirds (Pattiaratchi 2007). Climate change may be affecting the key marine ecological processes around the Capes, as the Leeuwin Current is predicted to weaken under conditions of global warming (Pattiaratchi and Buchan 1991; Feng et al. 2009). There is also less runoff of nutrient-rich surface water due to declining winter rainfall since the mid-1970s, which has reduced streamflows in the region by up to 50% (Pearcey and Terry 2005), while more and more of the region's surface water is impounded for agricultural use.

The historical sources relating to fish and fishing in the region are patchy at best, reflecting its distance from the administrative centre, under-resourcing of management agencies, and low priority given to preserving 'mundane' records (such as district monthly reports), particularly prior to the 1960s. The main primary sources relied upon here are the reports of district inspectors (1901 on); departmental and ABS statistics (1941 on); archived correspondence, forms and reports; newspaper reports; and a series of oral histories with local fishers conducted in 2005–2006. Of the early inspectors' reports, relatively few survive; the statistical data prior to 1975 is also frustratingly incomplete. Furthermore, the surviving numerical data is often confounded by the nature of Capes fisheries: multi-species, multi-method, and, particularly from the 1970s, with a significant but largely unquantified recreational component. Still, taken together, the available sources illuminate something of the fisheries' past, suggesting a long-term picture of decline in some species, against a background of considerable natural variability.

Capes Fisheries Past

Prior to establishment of the first British permanent settlements in the 1830s, there were clearly sufficient fish for the local Noongar people to catch significant quantities by constructing fish traps in the mouths of estuaries, spearing the fish or catching them by hand. The Capes region has been occupied by Aboriginal people for at least 48,000 years (Turney et al. 2001), and it is likely that they engaged in fishing activities of various kinds for much or all of that time. Having no means of water transport, Noongar fishing was confined to shallow waters, but by the nineteenth century fishing had nevertheless become a key subsistence activity and prime fishing sites had high economic, social and ceremonial values (Dortch 1997). One of the mineralogists of the Baudin expedition, arriving in Geographe Bay in May of 1801, reported that he had found a small lagoon with its mouth 'barred across with rough wooden stakes that the natives plant there to catch fish brought in by the rising tide' (Baudin 1974). Large quantities of fish might be caught by men and women gathered to drive them into such traps set in rivers or estuaries, with excess fish left to die, buried for later use, or cooked and wrapped in soft bark. There are no accounts of Aboriginal people using nets, lines, or narcotic or poisonous plants, although some used bait such as ground shellfish to attract fish for spearing (Meagher 1974–1975; Gaynor et al. 2008). Captain Baudin himself reported an encounter with 'a native' who was 'up to his waist in water, busy spearing fish' (Baudin 1974; also reported by Peron 1975). It is highly unlikely that this latter method of fishing would yield much of a meal today; this in itself suggests a change in abundance or behaviour of fish, or both.

On the issue of fish abundance, the extant records of exploration and settlement are equivocal. For example, in May 1801 Nicholas Baudin wrote that 'fish are very rare' in Geographe Bay (Baudin 1974). By contrast, in March 1827 James Stirling described the fishing prospects in much the same glowing terms as his evaluation of the land, which proved incorrect. He did, however, claim that in the broad lower west coast region 'a Boat with one or two Men in her might be filled [with fish] in a few hours' (Stirling 2005), though whether this was conjecture or observation is unclear. Such conflicting reports support an image of historically variable fish abundance, spatially and temporally. Indigenous people had learnt how to successfully exploit this variable abundance, but visitors to the region had no such experience, so their encounters with fish were largely a matter of chance.

The first British settlement established in the region was at Augusta, where a small number of families landed in May 1830. In 1834 members of one of these families, the Bussells, left Augusta and established themselves on the Vasse River at the site of what would become Busselton; Bunbury was established in 1838. From the 1840s, Busselton became the centre of an emerging dairy industry, and by the mid-nineteenth century it had become a port for the export of timber, though in 1850 the non-Indigenous population of the Sussex district, encompassing the whole of the Capes area, was only 209 people (Jennings 1983). As the region's population grew, there was doubtless a movement from subsistence fishing to a division of labour in which some families began to catch and sell fish. However, the detail

of such a transition is now lost to us, as the earliest surviving detailed accounts of commercial fishing in the region were created in the late nineteenth century by a fledgling fisheries bureaucracy.

Fisheries in the region were effectively unregulated before the advent of the *Fishery Act 1889*, 'An Act for the Protection of Fish', which established a framework for legal fishing. This involved a schedule of minimum weights for various commercial species and empowered the Governor to appoint Inspectors, as well as specify permitted net mesh dimensions, closed seasons and closed waters, and prohibited methods. In 1893, a Fisheries sub-Department was created within the Department of the Commissioner for Crown Lands and its officers were given the responsibility of enforcing fisheries regulations (Anon 1984). With meagre resources, however, effective oversight of fisheries was impossible: in the south-west one Inspector, based first in Busselton and then in Bunbury, was expected to supervise coastal fishing from Bunbury to beyond Augusta, as well as two major estuaries, more minor inlets, and inland waters, equipped with only a bicycle and rowboat.

Under such circumstances, one might expect extensive abuse of the resource. However, populations in the region were small, and the only effective way to transport a catch to the metropolitan centre of Perth, 175 km to the north, was via rail, a line between Perth and Bunbury having been completed in 1893. Perth at that time was also a relatively small market, with a non-Indigenous population of only 9,617 in 1891 (Fraser 1895). Furthermore, ice was scarce and freight expensive, so sending fish to Perth could be a risky financial proposition. By 1897, the Perth Ice and Refrigeration Company had begun to run a railway car with ice to Busselton daily, buying fish from the local fishermen to send to Perth, but in October the Manager declared that:

we very much regret that through the many times it has had to leave Busselton empty and the many other times when it contained only three or four schnapper, we have been compelled to request the Railway Department to discontinue running the car on our account... we have lost heavily in waiting for the fishermen to get... wonderful catches, but up to the present we have not received them and if we wait until the Busselton fishermen endeavour to supply them, I am afraid that we shall have to wait a very long time. (Hancock 1897)

Why this scarcity of fish? If local prices were often better than those offered by the Company, fishers may well have been content with selling small catches to the small local market. Perhaps it was also the case, as Malcolm Tull suggests, that 'the lack of effort by many fishermen suggests that for them fishing is a way of life rather than an occupation' (Tull 1992). In any event, it appears likely at this time that market factors played a part in limiting the fishing effort.

By 1901, in his first annual report from the district, the Busselton Inspector of Fisheries reported that there were 20 fishermen and 10 boats, and that the fishing was good; a diverse range of species was caught, including mullet, pilchard, whiting, herring, snapper, dhufish, salmon, tailor, salmon trout and silver bream. By this time, most of the fish was sent by rail to Perth and regional towns, while around 180 kg was sold locally per week. Other than inclement weather, the only problems reported at this time were with fish-eating cormorants, which attracted a bounty of 6d per head; the inspector wanted that extended to pelicans, of which

there were 'a great number' in the region. Also the entrance to the Wonnerup estuary was 'choked with sand and seaweed' leading to fish kills (Chief Inspector of Fisheries 1901). This was likely a result of agricultural development in the catchment, which was quite extensive by that time. With regard to effort, in 1912 the Inspector remarked that Bunbury and Busselton fishermen would only fish in the shallows or haul from the beach; they didn't like fishing in deeper water (Department of Aborigines and Fisheries 1912). Early reports indicate that in any event weather prevented much offshore fishing, especially in the winter months. Gear was rudimentary: basic nets were set or hauled; snapper and dhufish were caught with manual hand lines. In 1910 there was only one 'big boat' (Department of Aborigines and Fisheries 1910). Even in 1952, of the 68 boats licensed in the Bunbury district, 30 were propelled by oars or sail; 26 of the motorised boats were 25 ft or under; and only 2 motorised boats were over 35 ft. The total value of boats and gear was £ 43,020 (Fisheries Department 1960).

In the 1940s, as the war disrupted food imports, and some locally-produced food was diverted to feed servicemen and women in Australasia, the price of fish increased, and as Chief Inspector A. J. Fraser put it in 1953, 'Whereas formerly he [the Western Australian fisherman] was on the bread-line... and regarded by many as a nuisance who was spoiling their angling, the fisherman all at once found himself earning good money, suddenly needed' (Fraser 1953). This provided the impetus for a gradual transformation of the industry from one characterised by low investment and low returns, to greater investment for larger returns. From the 1950s, we therefore see the Capes region's fishing fleet being upgraded. By 1968, of the 65 licensed boats only 16 were not motorised, and 19 were over 25 ft. The value of boats and gear had risen to \$ 310,226 (Fisheries Department 1960).¹ The introduction of motors, and larger boats, helped to overcome the obstacle of weather and extend the fishing season. From 1955, black and white sounders were available, but it is unclear how widely they were adopted in the south-west (Wise et al. 2007). More technological innovations with the potential to considerably increase efficiency followed: hydraulic reels, useful for handline fishers targeting dhufish, were (gradually) adopted from the mid-1970s; colour sounders were becoming more prevalent in the mid-1980s; and the technology responsible for the greatest increase in fishing efficiency, GPS, was available from the mid-1980s and widely adopted in the early 1990s (Wise et al. 2007).

Participation in any of the state's fisheries was unrestricted until 1963 when, amid concerns about declining productivity, entry to the Western Rock lobster fishery was limited in order to constrain growth in commercial fishing effort and enable more sustainable exploitation of the resource (Rogers 2000; Morgan 2001). The Shark Bay and Exmouth Gulf Prawn fisheries were declared limited entry soon after. Access to some south-west fisheries was limited from 1969, when there was a deliberate reduction in the number of licenses for estuarine fishing in the region (Lenanton 1984; Fisheries Department 1999). The South-west Coast Salmon Limited Entry Fishery was created in 1976. However, access to the remainder of the

¹ When the Australian dollar was introduced in February 1966, the exchange rate was £ 1 = \$ 2.

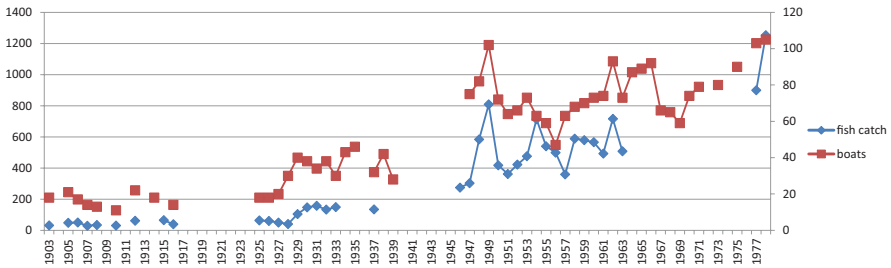


Fig. 12.2 Catch of finfish (tons) and licensed boats, Bunbury district, 1903–1978

state's fisheries remained unrestricted and the fishing fleet continued to expand until 1983, when in light of concerns over excess fishing capacity, a moratorium was placed on the issue of new fishing boat licenses. Subsequently, more Managed Fisheries were created,² and legislation was introduced enabling the creation of voluntary fishing license buy-back schemes. Together these measures saw the state's fishing fleet shrink from its peak of 1,615 units in 1985, to 1,361 units in 1998 (Rogers 2000). However, access to one of the region's major fisheries was only limited in January 2008, in anticipation of the creation of the West Coast Demersal Scalefish Interim Managed Fishery in January of the following year (IFAAC 2010).

Turning, then, to the available catch and effort data for the region, the only extended run of data comprises the number of fishing boats registered and reported catch for the Bunbury district, which encompassed all fisheries from around Myalup on the west coast to Broke Inlet on the south coast, including the inshore and off-shore fisheries around the Capes, and the Leschenault and Hardy Inlets (Fig. 12.2). The data is highly confounded, as it includes multiple fisheries, and does not include the catch or effort of boats from the Fremantle-based fleet, which often visited the region. Nor does it account for changing technology or the changing nature of the fisheries, for example in terms of expansion within the region; shifts in methods and species targeted (and in particular the expansion of deep-sea shark fishing from the 1940s); the increasing recreational catch and effort; or changes in technology, over time. It also relies heavily on fishers' reports of their catch, without independent verification.

Nevertheless, it does point usefully, if vaguely, to some changes in the regional fisheries over time. Most generally, it shows a trend toward increasing catch per unit effort (CPUE) over the period, reflecting increasing efficiency and the absence of any sustained general collapse in fish stocks over the region as a whole (Fig. 12.3). Looking at the data in more detail, it indicates a fairly stable number of boats, total catch, and CPUE from 1903 to 1927 then, after a dip in the late 1920s, an increase in boats, catch and CPUE from 1930. As the measure of CPUE here, namely licensed boats, does not account for how often the boats were used, it is quite likely that the

² Managed Fisheries were the successor to Limited Entry Fisheries. By 1998 there were 31 Managed Fisheries and one Interim Managed Fishery (Crowe et al. 1999).

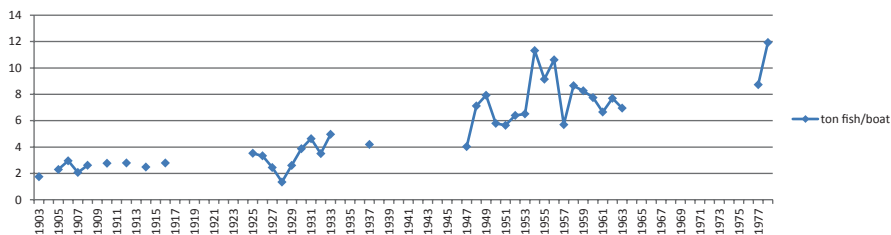


Fig. 12.3 Catch per unit effort indicator: finfish catch (tons) per licensed boat, Bunbury district, 1903–1978

increase in CPUE at this time is the result of an increase in the number of days spent fishing, as fishers struggled to make a living during the Great Depression. After the Second World War (WWII), there appears to have been a rapid increase in boats, catch and CPUE, perhaps associated with the expansion of shark fishing in the region (McAuley and Simpfordorfer 2003). The number of locally-registered boats then fell from 1949 to 1956, before increasing again. However, the fish stocks appear to have come under pressure from 1955 to 1963, a period of declining CPUE.

Given the problems associated with using such aggregated data, it is necessary to look in more detail at individual fisheries in order to arrive at a better understanding of the relationship between fish, fishing and natural variation in the region. To this end, two species of fish of commercial and recreational significance, both relatively well-represented in the historical sources but of diverse biology, were chosen for further investigation. One, snapper, is a demersal fish; the other, Australian herring, is pelagic.

Snapper

Snapper (*Pagrus auratus*) is a long-lived, slow-growing carnivorous demersal scalefish usually known locally as ‘pink snapper’, and historically as ‘schnapper’. Distributed throughout temperate coastal Australasian waters, the adult fish form spawning aggregations in particular sheltered marine embayments, which are also important nursery areas. On the lower west coast of Western Australia, the maturing fish move further offshore after 2–4 years (Wakefield et al. 2011). Adult fish then return to inshore waters to spawn, and irregularly at other times of year to feed.

Snapper have long been a prized table fish, commanding good market prices. They were therefore extensively targeted by line fishers in the early twentieth century, though relatively few were operating at the Capes, and with unsophisticated boats and technology. In spite of that, Inspectors’ reports suggest localised depletion at a very early stage of the fishery’s development. For example, in 1902, Inspector Locke reported from Busselton that snapper were among the fish caught, and ‘the supply of most species has been plentiful, with the exception of whiting’ (Locke 1902). Likewise, in his 1903 annual report, F. W. Taylor, Bunbury Inspector of

Fisheries, noted that the snapper ‘was fairly plentiful at times’ (Taylor 1903). By 1905, however, he observed that ‘Schnapper Fishing has been very erratic, and owing to the long distances to the Fishing grounds now, it does not return large profits’ (Taylor 1905). Similarly, in his 1906 annual report, ‘The schnapper fishing has been erratic, at times very scarce, and other times good catches have been taken. There has been a lot of prospecting for schnapper in the South-West during the summer months, boats going as far as the South coast in quest of fresh schnapper grounds’ (Taylor 1906). These reports reflect the natural variability of the region and movement of the fish, but the references to the need for fishing boats to move further afield to find snapper may also be taken to suggest an early and rapid localised depletion of ‘virgin’ abundance, which the Inspectors evidently accepted as a normal, inevitable event. This is perhaps similar to the experience of northern New Zealand where, although the initial abundance was likely greater than at the Capes, localised depletion of snapper was first observed in the early twentieth century, but the species did not subsequently become rare (Parsons et al. 2009).

Other reports also suggest some early concern about the snapper stocks in the state’s waters. In 1931, the Chief Inspector of Fisheries wrote that ‘The question of increasing the minimum length at which these fish may be taken is one continually in my mind, but the present moment, is, I fear, inopportune’ (probably because of the circumstances of the Great Depression, in which restricting access to a wild food item would have been politically difficult) (Chief Inspector of Fisheries 1931).³ Evidently much offshore snapper fishing before WWII was undertaken by Italian migrants (Chief Inspector of Fisheries 1942). When many of these people were interned as ‘enemy aliens’ during the war, the species had some respite, and at least one report from 1947 suggested some increase in numbers along the lower west coast (Bramley 1947).⁴ The sparse available monthly and annual returns of snapper catches (line only) shows variable but declining returns (Fig. 12.4). The downward trend is particularly evident in the 1970s and 1980s, especially considering the improvements in technology referred to above: bigger and better boats, hydraulic winches, and sounders.

The available catch records are interesting not least because they point to a shift in effort in the region from snapper to dhufish: in 1916, only 43 kg of dhufish were landed in the year, compared with 1,145 kg of snapper (Fisheries Department 1917). By 1941 the tables had turned, as 8,352 kg of dhufish were landed compared with 1,677 kg of snapper (Fisheries Department 1945). This shift is worth investigating in more detail. West Australian dhufish (*Glaucosoma hebriacum*) is a reef-associated demersal scalefish that grows to over 1 m in length. Although dhufish is endemic to the waters off Western Australia, both it and the more cosmopolitan snapper were recognised early on as highly desirable table fish and appeared, for example, on late nineteenth-century restaurant menus (*West Australian* 20 April

³ The minimum size was at that time 11 inches (279 mm); by 2010 it had been increased to 500 mm, or 410 mm north of 31°S.

⁴ For 2 weeks in late April 1947, anglers caught up to 5 snapper a night, weighing between 19 and 24 lb (8.6–10.9 kg) at the Bar, Mandurah, for the first time in living memory.

Month	catch kg	men	Boats	days	hooks	catch/boat	catch/man	catch/hookday
Sep 1911	356*	2	1			356*	178*	
Oct 1911	375*	4	3			125*	94*	
Jan 1964	2	1	1	15	4	2	2	0.4
Jan 1965	91	1	1	4	2	91	91	11
July 1965	345	1	1	9	20	345	345	2
Feb 1966	617	2	1	7	10	617	308	8.6
Year	catch kg	men	Boats	days	hooks	catch/boat	catch/man	catch/hookday
1916	1145							
1941	1677							
1943	1223							
1975-6	813	26	10	119	37	81	31	1.58
1976-7	628	8	6	76	17	105	78	2.84
1977-8	603	22	11	120	35	46	22.9	1.42
1978-9	1438	20	10	178	36	72	144	2.95
1979-80	388	12	6	61	17	65	32	2.23
1980-81	374	15	7	72	30	53	25	1.15
1981-82	213	9	5	41	24	43	24	1.3
1982-83	366	26	10	63	55	37	14	1.15

* Catch includes snapper, dhufish and whiting; however, quantities of the latter two species are likely to have been negligible.

Fig. 12.4 Commercial handline snapper catches 1911–1983

1895, p. 5. See ‘Classified Advertising’, Menu for the Duke of York Restaurant). It seems likely that snapper was initially valued more highly than dhufish, given its treatment on menus and in discussion of fisheries (*Western Mail* 13 February 1892, p. 26; *West Australian* 20 April 1895, p. 5). In 1900 snapper (of average weight 12 lb/5.4 kg) fetched 4s each at the Perth wholesale market, whereas dhufish (of unknown weight, though likely larger) sold for 6s each (*West Australian* 3 November 1900, p. 3). By 1911 the two species attracted the same price per pound (*West Australian* 26 January 1911, p. 5) and by the 1930s, dhufish routinely fetched around 3 pence per pound than snapper (*West Australian* 28 September 1937, p. 14; 13 August 1938, p. 14). In March 1941, the price of dhufish reached a record £ 2/0/1/2 per pound (*West Australian* 8 March 1941, p. 4). This change in the market doubtless played a role in the shift to targeting dhufish in the region, though given that snapper continued to command good prices, it is perhaps still surprising that they were not more often caught if they were abundant.

In 1941, the Chief Inspector of Fisheries reported that although Cockburn Sound (approximately 150 km to the north of Geographe Bay) was one of the most important spawning grounds for snapper in the state, “‘school’ snapper, i.e. snapper which have schooled for the purpose of spawning, have been marketed from various localities’, including the Bunbury district (Chief Inspector of Fisheries 1941). In the context of declining abundance, these ‘distributed’ schooling events might have become less common, at least in shallower waters, making snapper harder to target in the region than the dhufish that routinely school in the vicinity of Cape Naturaliste to spawn (John Nelson, personal communication with the author, 31 October 2010). By the 1940s, most of the state’s snapper was supplied from the abundant

resources of the mid-west coast and Shark Bay, hundreds of kilometers to the north. In the Capes region snapper became by-catch, although still a valuable one, that was usually retained and sold. Snapper were also highly sought-after by the increasing number of recreational fishers in the region, many of whom had access to boats.

In the late 1970s, a study of the marine resources of the waters of Bunbury and Geographe Bay caught more dhufish than snapper on set lines, though neither species was prolific (Walker 1979).⁵ When changes to recreational bag limits were being canvassed in 1984, the Busselton fisheries inspector considered both snapper and dhufish to have declined, and noted that there was considerable community concern over the demersal scalefish. Oral histories recorded in 2005/2006 yielded multiple observations of declining abundance of snapper and dhufish (Gaynor et al. 2008). By 2007, snapper and dhufish were classified as 'being overfished' over their range on the basis of age-length modelling; fishing effort was accordingly to be reduced by at least 50% (Wise et al. 2007). This led to a prohibition on the commercial take of demersal scalefish in the Metropolitan Zone in November 2007; creation of the West Coast Demersal Scalefish Interim Managed Fishery in January 2009; closure of the recreational fishery for snapper and dhufish (along with other key demersal species) for 2 months per year; a decrease in recreational bag limits (2 snapper, 1 dhufish per fisher), and an increase in the minimum size.

In 2011, a scientific study of commercial fishery data collected between 1976 and 2005 found that in the West Coast Bioregion (which includes the Capes region), there was, overall, no evidence to suggest the occurrence of 'fishing down the food web' (that is, depleting higher-order predators then moving on to exploit species occupying progressively lower trophic levels). Rather, mean trophic levels (MTLs) and mean maximum length of fish caught increased then stabilised over the 30 year period (Hall and Wise 2011). However, it would be unwise to draw too much comfort from this conclusion in relation to the status of specific species in the Capes region, for several reasons. Firstly, as the authors acknowledge, the data was aggregated over large regions, and so cannot detect whether the indices were maintained by expanding the fishery into previously less exploited areas (or, for that matter, by other changes in fishing practice, such as technologically-driven increases in gear efficiency or economically-driven shifts in species targeted). Similarly, it assumes that within each region each species represents a single breeding stock, when the existence of sub-populations and separate breeding stocks are increasingly being recognised. The authors also acknowledge that quantitative data on fish diet is lacking even for key species (including snapper), which somewhat reduces the certainty of the modelling, as does uncertainty around the exact trophic levels of different species. Finally, the consensus that change in MTL is the best measure of fishery sustainability in all contexts has recently been challenged by a research finding that catch and ecosystem MTLs often diverge, and fisheries can collapse even when MTL is increasing, depending on patterns of development (Branch et al. 2010). It would therefore be unwise on the basis of this report to ignore other sources of

⁵ For 6,300 hooks set, 12 dhufish and 9 snapper were caught.

historical information that suggest declining abundance of particular species, or ecosystems in trouble.

Overall, therefore, the picture for snapper is one of historical variability: the area was probably never brimming with the species as Shark Bay and the north of New Zealand were, but there was possibly a quite rapid initial localised decline in abundance, followed by a further uneven but sustained decline, associated with commercial and recreational fishing effort.

Australian Herring

The Australian herring or tommy ruff (*Arripis georgianus*) is a small pelagic fish found in southern Australian waters. Most juveniles of the adult population found in Western Australian waters mature in South Australia and on the south coast of Western Australia, then migrate west to spawn in a run that commences in summer and usually reaches the west coast in autumn, with spawning reaching a restricted peak in May. This spawning run heralds the beginning of the main fishing season for herring, and most of the commercial catch is comprised of fish migrating to spawn, although anglers target the species on the lower west and south coasts all year round. An area north of Cape Leeuwin is the main spawning ground for the species, although spawning probably also occurs across its range in Western Australia (White 1980). Once spawning is complete, the adult fish tend to remain in the south west region. Some larvae hatching inshore also remain in the area, forming part of a resident population, but most are carried eastward by the Leeuwin Current to South Australian or even Victorian waters, from where they will begin their westward journey at around 2 years of age (Ayvazian et al. 2000). Following a study of recruitment indices in the years 1996–1998, and a longer-term South Australian study, it has been proposed that recruitment to the Western Australian fishery is influenced by the Leeuwin Current, with more adults recruiting to the west coast following weak flows, and the south coast following strong flows, although factors such as the strength and direction of prevailing winds are also implicated (Ayvazian et al. 2000). Certainly this relationship is reflected in historical years of high abundance in the South-west, with 1953, 1960, 1974, 1981, 1982 and 1983 each following 2 years of relatively weak flows.

Herring have long been valued as a ‘bread and butter’ fish, and remain popular among anglers looking for both some sport and a meal. In Western Australia most of the commercial catch has historically been taken from the south coast, with a small percentage coming from Geographe Bay and Bunbury (Walker 1987). The commercial herring catch has historically varied according to a range of factors, including the size of the catch from the preceding run of Australian salmon (*Arripis trutta*), with more effort in years of a poor salmon catch, and less in good salmon years (Walker 1987). Demand has also played an important role. Between 1970/1971 and 1976/1977 a market for herring as rock lobster bait was established, and as demand for the fish rose, prices increased from around \$ 60 per tonne in 1970, to \$ 300 per

tonne in 1979 (White 1980). This market was opened up to Geographe Bay fishers with the arrival of West Ocean Canning at Busselton in 1975/1976. Within 2 years, they were buying most of the herring caught within the region and processing it for bait (White 1980). This appears to have led to an increase in effort in the region, and in the 1980s record catches were taken (ABS 1966/1967 to 1989/1990). With a few minor exceptions until the 1983 season the Western Australian herring fishery was unregulated. However, as the value of herring increased so did conflict among fishing teams, and regulations relating to entry to the fishery and use of herring traps followed soon after (Walker 1987).

Rock lobster fishers had been catching their own herring to use as bait, mainly around Rottnest Island (approx. 175 km to the north of the Capes region) since the 1950s, but by 1964 conflict with recreational fishers had led to a seasonal restriction on netting activities in that area. When conflict continued, a ban on netting in the area was implemented in 1973 (Walker 1987). The earliest preserved written claim of a decline in herring comes from 1960, when one G. Reid complained that the abundance of herring at metropolitan beaches was much less than in the 1920s and 1930s (Reid 1960). It is difficult to know how to interpret this complaint, as commercial catches were rising in this period, and the late 1950s saw a weak Leeuwin Current which should have enabled more herring to recruit to the west coast. Furthermore, contemporary newspaper reports suggest that 1960 was in fact a bumper year for migratory herring, with large hauls reported. Once the main run of fish arrived, one party of anglers caught 15 dozen herring in two trips, and another caught 38 dozen herring and garfish in 7 h off northern beaches (Davidson 1960a, b). In the Capes region, oral histories recorded in 2005–2006 also suggest that herring were abundant in the late 1950s and early 1960s (Gaynor et al. 2008). Made in the context of rising concern over the effects of the netting around Rottnest, it is likely that the claim that herring had declined was driven by a deeply-held belief that commercial netting was causing long-term damage to the fishery and depriving anglers of their fair share of the resource,⁶ though it may also have been the case that the size of the commercial and recreational catch combined reduced the resident herring population in popular fishing areas.

The next claim that herring were declining appeared in the mid-1970s. This was after the ban on netting at Rottnest had been declared, although the author seemed unaware of this development, as the complaint was mainly directed at the Rottnest netting (Mumme 1976). Writing in December 1976, the complainant (for a trade union) described a decline over ‘the last two seasons’, but in 1977 the Fisheries and Wildlife Department’s chief scalefish research officer reported that ‘Herring were abnormally abundant in the metro area during 1974/1975 season & anglers made exceptionally good catches up until about March 1976’ (correspondence in Fisheries Department 1947). However, the 1975–1976 herring season was a poor one for both amateurs and professionals, as the main run of fish did not make it as far north

⁶ This is particularly so because the complaint contains some obvious falsehoods: for example, given the scale of herring catches by anglers in 1960, it simply could not be true that ‘In 1960, after 10 years of systematic netting, the total herring catch by all the anglers during the whole season would not represent one good day’s catch even to the inexperienced angler of 1920’ (Reid 1960).

as usual. This was likely due to strong Leeuwin Current flows in 1974 and 1975. Interestingly, the commercial catch of herring reached 1,200 t in 1972–1973, the highest to that point, and remained significant at 800 t in 1974–1975. Given the reports of herring abundance in that year, it appears that the commercial catch (mostly on the south coast) was having little, if any, effect on the apparent abundance of fish reaching the west coast.

A subsequent controversy over herring decline, in November 1979, did not follow strong Leeuwin Current flows, and commercial catches in the preceding years had been only average, ranging between 500 and 800 t. As anglers' claims of dramatic depletion at this time are not borne out by the available evidence, it seems highly likely that their perceptions arose out of their moral indignation over the use of a sought-after angling species as lobster bait, rather than any significant decline in herring numbers. Indeed, in a newspaper article published at the height of the controversy, Australian Anglers Association publicity officer Laurie Birchall stated that:

We don't mind amateur anglers catching 50 or 100 to take home for family and friends...
And we don't mind them being caught by the tonne if it's for food. However we do object to unrestricted slaughter for fertiliser, petfood and craybait when alternatives are available
(*Sunday Times* 15 April 1979, p. 70).⁷

It therefore seems that past perceptions of herring abundance may reflect the effect of the Leeuwin Current on the abundance of the fish in the region, but even more so the immediate political context of resource conflict between professional and recreational fishers.

A 2008 study of angling club herring catch records for the years 1977–2008 raised the possibility of declining abundance in more recent years, showing a dramatic reduction in the mean number of herring caught per angler per trip (from 22.9 in 1984 to 1.7 in 2008), and a considerable reduction in the percentage of trips resulting in a bag limit of the species, from 26.6% in 1984 (bag limit of 50), to 12.1% in 2008 (bag limit of 8) (Pember 2008). However, caution must be used in interpreting angling club data over the long run, as it is very likely to reflect changes in a range of factors other than abundance of fish.

The club in question has run beach and rock field day competitions since 1974, including autumn and winter field days in the Capes region. The data available for analysis included the number and weight of each species caught by each angler on each field day between 1976 and 2008, bar 13 field days for which the records were either not created or not kept. In that time the club, either on its own initiative or in line with state legislation, implemented bag limits for herring, starting with 50 fish per angler in mid-1980. This was then reduced to 40 in 1992, 20 in 2000 and 8 in mid-2007. The autumn field trip records reveal that for the 3 years prior to imposition of a bag limit in 1981, the average catches for the top 5 anglers fluctuated around 40–50 herring; for the top 10 around 30; and for all anglers around 20. On imposition of the bag limit of 50, the top 5 and top 10 anglers caught the bag limit, or very close to it, in each year bar one (Pember 2008). This strongly suggests a cultural phenomenon at work, in which the bag limit becomes a target. From 1994,

⁷ Quoted in Sergeant Baker (pseud.). Later in the same article, it was acknowledged that herring provided most of the catch at an angling club field day the previous weekend.

however, the bag limit was not reached with such regularity. The winter field trip data yields similar findings, although as this is not peak season for herring, the bag limits were never reached with quite such regularity.

How can we explain the reduction in the percentage of anglers catching a bag limit of herring on field days? Were there fewer fish to be caught, or was it more the result of changes in angling practices? The commercial take of herring in WA reached an all-time high of 1,537 t in 1991; as the fourth year with a catch over 1,200 t, this may, in conjunction with the recreational take, have reduced the breeding stock to an unsustainably low level, and led to a reduction in the abundance of herring available for anglers to catch in subsequent years. However, from 1995 the price of Australian herring fell, most likely due to higher imports of cheaper North Sea herring for lobster bait. By 1999 demand for Australian herring was very low, with reports of frozen fish remaining unsold for over a year, and herring being discarded from trap nets (Ayvazian et al. 2000). The commercial catch therefore fell rapidly, to around 800 t by 1993. By 2008, it had fallen to only 217 t. Although the commercial take in the early 1990s may have reduced the availability of fish for anglers in the short term, given its reduction over subsequent years it is unlikely to have been responsible for a sustained decline.

Cultural factors doubtless also played a role in the failure of even the best anglers to routinely catch the bag limit even after it was reduced to 20. By the late 1980s, the club had changed the scoring system such that instead of receiving one point per fish and three points per kg of fish weighed in on a field trip, the fish caught were differentiated by species, and more points awarded for 'premium' fish. This would presumably have enticed anglers to spend more time targeting higher-scoring fish than herring. Any such response would have been reinforced by a broader shift in angling culture in this period. Rather than 'bread and butter' species such as herring, more anglers sought larger fish, which were seen as presenting a greater personal challenge than the shrinking legal bags of small fish (Brenton Pember, personal communication with the author, 20 January 2011). This shift is reflected in newspaper fishing columns, which even in the 1970s included stories of large herring catches, but by the 2000s typically discussed the conquest of larger table species, and sports fishing feats. The rise of sports fishing, centred around the skill of catching the fish rather than filling the freezer, was accompanied by the growing prevalence of 'catch and release' over this period. This was briefly accommodated by the club's rules via an honour system, but only from 2005–2007; outside of this period club anglers releasing fish would not have had them counted. Finally, there was also a broader shift within the culture of the angling club in question: a past president, Brenton Pember, recalled that in the 1980s the club was very competitive and anglers would fish all night during field trips, but over time it became much more a social club, with less emphasis on the competition (Pember, personal communication). This, too, may well have influenced the catch rates from the mid-1990s.

The mid-1990s were years of average to low Leeuwin Current flow, so any variation at that time was unlikely to have been a result of the Current's influence on recruitment. However, it may be that larger-scale environmental change in the region has begun to affect the herring's fortunes. Although much uncertainty remains, the

Leeuwin Current is predicted to weaken due to climate change (Feng et al. 2009). As we have seen, this has the potential to increase recruitment of herring to the western fishery, although that potential could be undermined by other factors. One such factor is the changing climate of the region, which has seen a step decline of around 15% in the rainfall over south-west WA since the 1970s, largely due to fewer winter storms in the region (Hope and Foster 2005; Rupercht et al. 2005). It has been hypothesised that the reduction in both Leeuwin Current flow and winter storms will reduce nutrient inputs into the upper ocean, reducing productivity in the region (Feng et al. 2009); perhaps we are seeing these effects already. In 2008, the Department of Fisheries reported that although the usual index of herring abundance, the commercial catch rate, had become increasingly unreliable due to the reduction in fishing effort, other data sources including voluntary logbooks for anglers and fishery-independent sampling suggested a decline in abundance from the late 1990s (Smith and Brown 2009). The lack of reliable data, however, has seen the stock status deemed 'uncertain'.

Conclusion

In the relatively low-productivity fisheries of the Capes region, where fishing effort has varied considerably over time, it is impossible to precisely trace changes in the abundance of fish. However, it is clear that apparent shifts in the abundance of fish have taken place against the backdrop of environmental variation, which is quite pronounced as a result of the variability of the Capes and Leeuwin Currents, as well as changes in the regional climate. In this context, some claims of declining abundance appear to have been misconceptions or tendentious; some reflected likely short-term variation; others suggest longer-term localised depletion. The three cannot be definitively disentangled without supporting information, which is patchy at best in this region for the period prior to 1976. However, an historical perspective, even if incomplete, provides a potentially useful resource for current management, encouraging a cautious approach in the light of (necessarily) incomplete scientific understanding. It also provides a useful context for future Ngari Capes Marine Park monitoring, especially as the interim management plan claims that 'most finfish populations are considered to be in a largely undisturbed state' (DEC 2006). Furthermore the proposed conservation objectives for any reserves established in the area under the Commonwealth marine planning process include preserving transects of land and water 'in its natural and/or unmodified conditions' from the coast, to inshore waters and into the deep ocean (DEWHA 2009). As this research suggests, commercially-significant marine species in the region are far from 'undisturbed', and nature itself can be a source of considerable 'modification'.

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