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7.3 RECREATIONAL FISHING

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INTRODUCTION

Recreational fishing involves the catching or harvesting of marine resources for a variety of reasons: leisure sport and as a supplementary source of high-protein food. This activity is known to have psychological and societal benefits in terms of relaxation and de-stressing (Arlinghaus *et al*. 2015). It is also an important economic activity through the associated activities such as bait, tackle, boats and accommodation (Saayman *et al*. 2017). While coastal communities draw benefit from harvesting, it is the recreational fisheries that appeal to visiting tourists. Management of recreational fisheries dictates that catches are for personal use only and may thus not be sold. There are also an increasing number of recreational anglers who practice catch-and-release angling and do not keep the fish they catch (Cooke and Suski 2005). In KZN, there are a wide range of different facets of recreational fishing including linefishing (i.e., shore angling, kayak fishing, skiboat angling, charter-boat angling), spearfishing, shellfish/ invertebrate collecting, etc. Marine recreational fisheries are managed in terms of the Marine Living Resources Act (18 of 1998) implemented nationally by the DFFE. Anglers must purchase a permit through a South African Post Office for each type of fishing and/or resource-type being harvested. Specific output management controls limit the catches, such as size limits, daily bag limits, closed seasons and areas closed to fishing (e.g., no-take marine protected areas (MPAs)). Historically, enforcement and monitoring of marine recreational resource use in KZN was delegated to the provincial nature conservation authority, Ezemvelo; however this was inexplicably terminated by DFFE in August 2016. DFFE appointed Fisheries Control Officers (FCOs) to undertake this oversight role (Kramer *et al*. 2017); however, there are insufficient officers to effectively enforce fisheries regulations along the entire KZN coast. As a result, monitoring of catch and effort has decreased substantially.

DRIVERS

There are several drivers that can cause change in a recreational fishery. The main biological driver is the impact of over-fishing/harvesting on the biomass of the targeted fish stocks or populations. Basically, too many people are catching too many fish. This affects both the number of fish available to be caught and future stock recruitment. The biomass of a target species theoretically determines the allowable catch (or amount of fishing effort) that can be taken/used to ensure that the maximum sustainable yield (MSY) is not exceeded. This should be regularly assessed and carefully managed using appropriate fishing regulations. Fishing can also result in changes in fish communities and trophic cascades because of

removal of top predators (Pauly *et al*. 1998). In addition to fishing, other drivers such as pollution, sedimentation, habitat destruction and climate change can affect the availability of target fish species.

In recreational fisheries the demand or desire to go fishing can be affected by both the availability and quality of fish, as well as other environmental and socioeconomic factors. For example, a healthy outdoor environment, perceived safety and level of human well-being can all be considered as potential drivers of the desire to go fishing. Economic factors such as the cost of transport, accommodation, bait, tackle, etc. can also affect the demand for recreational fishing.

PRESSURES

Recreational fishing has high socioeconomic importance to the province of KZN. However, unlike commercial fishing, recreational fishing is not dependent on the economic yield from catches and can therefore effectively fish species down to levels well below their optimum. This, and the large number of participants in recreational fisheries, makes it difficult to manage (Arlinghaus *et al*. 2010).

Recreational fishing can selectively target and remove larger individuals (e.g., trophy fish) and/or species, which can cause changes to a species' population structure, and can also affect ecology via altered predator-prey relationships and changes in community composition (Pauly *et al*. 1998, Maggs *et al*. 2013). Some species are particularly vulnerable to fishing because they may have one or more of the following life-history characteristics: highly resident, aggregate to spawn, long-lived, slow-growing, late-maturing, low fecundity and/or change sex. Long-term monitoring of recreational catches can provide an indicator of the status of targeted fish stocks. It can also provide an indication of ecosystem health over time, as catch composition provides an index of the degree of change in marine communities impacted by fishing. Such changes can be compared using a benchmark such as unfished communities in no-take MPAs.

STATE

Historic perspective

Everett (2014) and references therein provide a detailed overview of marine recreational fisheries in KZN. Recreational fishing in KZN commenced in the 1800's and has gradually increased in terms of the number of participants and has diversified into different facets of fishing with increasingly diverse fishing gear (van der Elst 1989). With the increase in effort, so too has the quality of fishing gear and associated technology improved (effort creep), thus making fishing far more effective than it was historically (e.g., better hooks, line, rods, reels, boats, motors, echo-sounders, GPS, etc.). In addition to recreational fisheries, commercial and small-scale fisheries have also increased in number and diversity and often target the same resources. As a result of increasing fishing pressure being placed on the province's fish and invertebrate/shellfish resources (in addition to other anthropogenic impacts such as pollution, increased sedimentation, habitat destruction, climate change, etc.), several changes and environmental responses have taken place. For example, large predatory reef fish species such as seventy-four, red steenbras, black musselcracker, etc. that dominated catches in the early 20th century have been fished down to critically low levels and have been replaced by other smaller, less desirable species in lower trophic levels such as slinger, santer and Natal emperor (Sauer *et al*. 1997, Penney *et al*. 1999, Dunlop and Mann 2013). Similarly, once abundant shore angling species

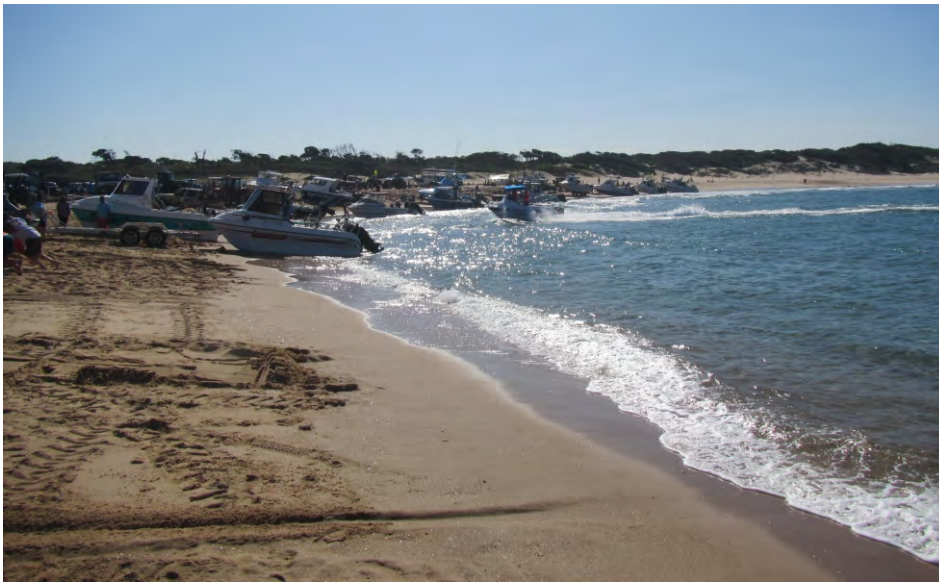
Table 7.2: The stock status of some of the recreationally important fish and invertebrate species caught along the KZN coast. Stock status is based on the levels suggested by Griffiths *et al*. (1999).

Species	Stock status	Assessment method	Year	References
Shad/elf	Over-exploited	Per-recruit	2015	Winker *et al*., 2015
Karanteen/strepie	Optimally exploited	Per-recruit	1996	van der Walt and Govender 1996
Blacktail	unknown	-		
Yellowfin tuna	Over-exploited	Surplus production	2019	IOTC
Slinger	Optimally exploited	Surplus production	2017	Parker and Winker 2016
Dorado	Unknown	-		
Englishman	Collapsed	Per-recruit	2005	Mann *et al*., 2005
King mackerel/cuda	Optimally exploited	Per-recruit	2013	Lee 2013
Garrick/leervis	Collapsed	Per-recruit	2008	Smith 2008
Queen mackerel	Optimally exploited	Per-recruit	1999	Chale-Matsau *et al*., 1999
Brown mussels	Over-exploited	CPUE	2019	Steyn 2019
Burrowing prawns	Over-exploited	CPUE	2019	Steyn 2019
ECRL	Optimally exploited	Per-recruit	2011	Steyn and Schleyer 2011

such as garrick and dusky kob have also been depleted to critically low levels and largely replaced by smaller species such as shad, karanteen and blacktail (Brouwer *et al*. 1997, Griffiths 1997, Dunlop and Mann 2012, Maggs *et al*. 2016). Shellfish resources have shared a similar fate and many of the province's popular intertidal resources such as brown mussels have been greatly reduced (Tomalin and Kyle 1998). Fortunately, primarily through careful past management, East Coast rock lobster (ECRL) stocks are currently still considered to be optimally harvested (Steyn and Schleyer 2011).

Current state

Most recent estimates suggest that there are at least 1.3 million recreational anglers in South Africa (i.e., anglers that fish by means of rod and line but excluding shellfish collectors), and of these about 730 000 are marine anglers (Saayman *et al*. 2017). In KZN, there are approximately 70 000 shore anglers (Dunlop and Mann 2012), 20 000 boat anglers (Dunlop and Mann 2013), 4 000 spearfishermen (Mann *et al*. 1997) and about 18 000 shellfish collectors (Steyn 2019). Estimates of the annual total catch of these facets of recreational angling suggest that shore anglers catch approximately 270 t (700 000 fish), skiboat anglers catch approximately 460 t (260 000 fish), charter-boat anglers catch about 245 t (160 000 fish) (Dunlop and Mann 2012, Dunlop and Mann 2013) and spearfishermen shoot about 150 t (35 000 fish) (Mann *et al*. 1997). Interestingly, the combined catch of the recreational linefishing sector is greater than that taken by the commercial



Recreational skiboats beaching during a fishing competition at Sodwana Bay
Photo: Bruce Mann

linefishery in the province (i.e., approximately 800 t per year (Dunlop and Mann 2013)). The overall annual catch taken by shellfish collectors is approximately 49 t of mussels, 37 t of ECRL, 8 t of redbait, 6 t of octopus and 5 t of burrowing prawns (Steyn 2019). In terms of catch composition, shore anglers' catches by mass are dominated by species such as shad (20%), karanteen (14%) and blacktail (11%) (Dunlop and Mann 2012). Recreational skiboat angler's catches comprise species such as yellowfin tuna (22%), slinger (14%) and dorado (10%), while charter-boat anglers catch mainly yellowfin tuna (43%), slinger (11%) and englishman (8%) (Dunlop and Mann 2013). Spearfishermen mainly shoot species such as king mackerel, garrick and queen mackerel (Mann *et al*. 1997).

Without regular monitoring, the status of these fish resources is difficult to assess. While fish species caught in well-monitored fisheries with accurate catch and effort data can be assessed using standardised catch per unit effort (CPUE) and surplus production models (Winker *et al.* 2014), species in data poor fisheries need to be assessed using other simpler techniques (often with more assumptions) such as per-recruit models. While some species of fish are resident, others are migratory and only visit KZN waters for part of the year. Stock assessments of migratory species therefore need to take the full distribution of the stock into consideration. Estimates of stock status of some of the most important species harvested by recreational fisheries in KZN are shown in Table 7.2. Where a fish species is also harvested in commercial fisheries (e.g., yellowfin tuna and slinger), their stocks may have been assessed using data provided by those fisheries. It is also important to note that many of these stock assessments are old and need to be updated.

IMPACT

The impact of overfishing is the decline of fish stocks and the resultant impact on both the biological systems and the recreational fishing industry. For example, several important fish species such as seventy-four, red steenbras, dusky kob, garrick, etc. have been overfished to the point of population collapse. This has in turn affected the trophic dynamics and composition of fish communities and has greatly decreased the "potential reward" to recreational anglers. Selective removal of larger fish (from a variety of different species) has resulted in reduced reproductive success and, in the case of sex changing species such as slinger and englishman, greatly distorted the natural sex ratios (Garratt 1993). The socioeconomic implications of overfishing will include reduced demand to go fishing. This impacts on all the industries that support recreational fishing such as accommodation, tackle, bait, boats, fuel, etc. (Saayman *et al*. 2017). Other factors such as political changes in the country have also impacted on recreational fishing in KZN. For example, the increased levels of crime and lack of security along the KZN coast has resulted in a 23% decline in the number of shore anglers between the mid-1990s and 2018 (Mann and Mann-Lang 2020). The recent roll-out of the small-scale fishery and the issuing of long-term (15 years) fishing rights also has the potential for increased user conflict by placing greater demand by one sector on limited resources.

RESPONSE

Multi-species, multi-user fisheries such as the KZN marine recreational fishery are extremely difficult and complex to manage. However, due to their high socioeconomic value to the province, it is essential that they are well managed. In this regard, primary goals of management should include:

1. Maintain fish populations at target levels of biomass through implementation of appropriate fisheries regulations (e.g., reduce or limit fishing mortality to a level where biomass of targeted fish populations is not reduced below 40% of their theoretical pristine level).
2. Ensure the health of fish and invertebrate populations by protecting at least 30% of key habitats (including spawning aggregation sites, nursery areas, foraging areas, etc.) in no-take MPAs.
3. Optimise levels of carrying capacity (e.g. number of angler access points, boat launch sites, etc.) and ensure a safe, clean environment.
4. Improve angler awareness and compliance. To achieve these goals, a well-trained, well-organised team of FCOs with sufficient manpower is required to effectively enforce fisheries regulations along the KZN coast. Secondly, an independent observer programme is required to conduct roving creel surveys (shore), access point surveys (boat launch sites) and remote questionnaire surveys (online) to enable random collection at least 10% of the catch and effort and size frequency data for each facet of recreational fishing and shellfish collecting. This would provide the information necessary to monitor the fishery and to ascertain whether it is achieving the goal of sustainable use. Existing monitoring programmes such as invertebrate catch monitoring, boat launch site monitoring and periodic snapshot surveys to assess total effort should be continued. Stock assessments of targeted fish species need to be undertaken or updated at a recommended frequency of the half-life of the fish species concerned (e.g., every 10 years for a species that lives for 20 years). Collection of species-specific biological data (e.g., size-at-maturity, age-length key, spawning season, population size structure, etc.) may be required to undertake such stock assessments and provide sound management recommendations. MPAs established in KZN (including iSimangaliso, uThukela, Aliwal Shoal and Protea) need to have effective management plans implemented and monitoring of fish populations within these MPAs should be carried out using suitable methods. Lastly, a well-designed angler awareness programme is required to ensure that anglers understand the rationale behind the fishing regulations and to ensure improved compliance by self-policing.

Data Requirements
In the long-term, a well-managed observer programme is needed to collect suitable fisheries data for improved management of the recreational fishery. In the short to medium-term, stock assessments on the main target species are required to assess sustainability of the fishery.