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Striped marlin: biology and fisheries

Final Report to the Australian Fisheries Management
Authority Research Fund and the Fisheries Resources
Research Fund

**Don Bromhead¹, Julian Pepperell², Brent Wise¹ and
James Findlay¹**

¹Bureau of Rural Sciences; ²Pepperell Research



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Bureau of Rural Sciences
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Executive Summary

Striped marlin are caught by recreational and commercial fishers off the east and west coasts of Australia

Striped marlin, *Tetrapturus audax*, are a migratory pelagic billfish species that are distributed throughout the Pacific and Indian Oceans. They are caught by both recreational and commercial (predominantly longline) fisheries throughout these regions, including off the east and west coasts of Australia. The enforcement of a ban on commercial landing of marlin in Western Australia since 1999 means there is little commercial catch recorded in the Southern and Western Tuna and Billfish Fishery.

Recent increases in catches and fishing effort have led to increased inter-sector conflict

Off the east coast, between 1995 and 2001, domestic longline catches of striped marlin increased more than three-fold to around 750 mt (unprocessed), making it one of the top five species catches taken annually in the Eastern Tuna and Billfish Fishery. Over the same period, recreational tag releases of striped marlin increased to a similar degree. Concern was raised by recreational fishers over the potential impact of increased commercial catches on recreational catch rates, and intersector conflict was heightened.

A review of striped marlin biology and fisheries was undertaken to assist managers to resolve this issue

Fisheries managers found they had little information upon which to base a sound management strategy to resolve this conflict. Subsequently the current study was funded to provide fishery managers and policy makers with a comprehensive information base pertaining to key issues surrounding this species. These include a review of the biology and ecology of striped marlin, global fisheries exploitation and current stock status, management strategies, past and current research, domestic longline and recreational fisheries catch and effort trends, and an analysis of the nature and extent of interactions between the longline and recreational sectors catching this species off the southeast coast of Australia.

Still relatively little is known about key biological parameters of striped marlin

Striped marlin grow quickly and can achieve large sizes (Record: 250 kg). Age at maturity and lifespan are uncertain, but believed to be around 2-3 years and 10+ years respectively. They are highly productive, with mature females able to spawn between 11-29 million eggs per spawning season. They are migratory, occurring throughout the Indian Ocean north of 40°S, and throughout the Pacific Ocean (40°S to 40°N), excepting a low abundance region in the equatorial western and central Pacific waters. Stock structure is uncertain in both oceans, but a separate southwest Pacific stock is suggested on the basis of tag-recapture data and genetic research. They mainly inhabit the surface layer to depths of around 150m, making them

particularly susceptible to shallow set longline gear.

The majority of global commercial catch has been taken by Japanese longline fisheries

The majority of the reported global catch of striped marlin over the past 50 years has been taken by the Japanese longline fleet. In the Indian Ocean, however, Taiwanese flagged catches essentially replaced Japan's from the early 1970s onwards. In the Pacific Ocean, Japan's annual catch also declined, in part due to EEZs exclusions and targeting shifts. This decline has been offset somewhat by increasing numbers of striped marlin caught by developing longline fleets of numerous other Pacific and Indian Ocean nations (e.g. Australia, Fiji, Sri Lanka, Indonesia). The annual catch of "Unidentified" billfish (i.e. billfish catches not identified at the individual species level, but rather lumped together) reported has risen to over 16000 mt in both oceans, with striped marlin making up an unknown, but possibly significant component of this.

The status of striped marlin in the wider Indian and Pacific Oceans is uncertain

These catch trends have occurred during a period in which catch rates for striped marlin, as reported by both Japanese and Taiwanese fleets in both the Indian and Pacific Oceans, have substantially declined. Shifts in fishing methods, species targeting and in spatial distribution of fishing effort may explain some of the decline in catch rates. However, standardised catch rate indices for the Indian Ocean suggest abundance may have also declined. Early assessments for the Southern Pacific Ocean suggested exploitation levels nearing or beyond MSY, but these assessments were relatively simple and all assessments to date have been hindered by a critical shortage of information regarding key biological parameters including age, growth and reproduction.

Abundance in eastern AFZ waters appeared to increase in the mid-late 1990s

A preliminary standardisation of domestic longline catch rates in the ETBF was undertaken using a generalised additive model (GAM) to gain an indication of recent abundance trends for striped marlin off eastern Australia. This preliminary analysis indicated that overall abundance off the east coast may have increased slightly over the past 12 years. However, analyses of subregions within the fishery gave mixed results. While the proportion of fishing operations catching striped marlin increased over this period, in inshore waters the catch rates of striped marlin for these operations/vessels may have declined. These analyses are very preliminary and require further development before firm conclusions can be made. Future analyses should aim to improve this model by including Japanese data and considering interactions between main effects (particularly time-area factors), and looking at possible localised depletion effects.

Striped marlin has become an increasingly important catch in the eastern domestic longline fishery

Two longline fisheries have operated in Australian waters, these being the domestic longline and Japanese longline fisheries. Japanese longliners took substantial catches of striped marlin from EAFZ waters prior to their withdrawal in November 1997. Australian longline catches and catch rates increased dramatically between 1996 and 2000, with the distribution of catch shifting seasonally (coastal 30°S-40°S between Jan-May; coastal and offshore 20°S-32°S between June-Dec). Total catch and catch rates dropped in 2002. Striped marlin are rarely discarded in the eastern fishery and there is evidence for opportunistic targeting, probably due to the presence of strong domestic and foreign (sashimi) markets for this species.

Striped marlin is also an important and highly prized gamefishing target species

A recreational fishery for striped marlin has existed off the coast of Australia since the 1930s. The number of striped marlin caught by recreational fishermen has varied between decades. In the mid-late 1990s there was a rapid increase in the number of striped marlin tagged and released off south-eastern Australia, although this has declined somewhat in the last two seasons. These trends are also reflected in charter boat catch rates. It has become a very important species in tournament fishing, charter fisheries, and for gamefishers in general. Recreational tag-release practice supplies valuable information to scientists regarding the biology and stock structure of the species.

There is clear evidence for an interaction between the longline and recreational sectors catching striped marlin

An analysis of commercial catch and effort data, recreational tag-release and recapture data, and charter boat catch and effort data, was undertaken to determine if an interaction (two fleets fishing the same stock) was occurring between the two sectors, and if so, what the nature and extent of that interaction was. Tag recapture data indicates that both sectors are catching marlin from the same stock, with 54% of recaptured marlin taken by longline gear. Size data from both sectors indicates that they are fishing the same size classes of marlin. Spatial and temporal mapping of catch and tag-release data indicates the most intense interaction region to be in southeast coastal waters between Port Stephens and Merimbula. Within this region, waters off Bermagui have the highest interaction level, with large numbers of marlin being taken or tagged by both these sectors in the 1st and 2nd quarters of each year.

There is only limited evidence for charter catch rates being negatively impacted by longline activity

Detailed catch and effort data was collected for 11 charter boats operating off the southeast coast of Australia in the region deemed to have high interactions between sectors catching striped marlin. An analysis using simple regressions between commercial and charter boat catch and effort data produced two main conclusions. Firstly, catch rates in both fisheries appear most likely to vary predominantly with variations in the underlying abundance or availability of marlin. Although an instance of lower than expected charter catch rates, coinciding with a period of intensive targeting of striped marlin by domestic longliners was noted, the constraints surrounding the data analysed (and type of analysis) meant the cause of this event could not be determined. Continued collection and analyses of charter data may help resolve this issue further.

There are no international management arrangements for marlin in the Indian or Western and Central Pacific Oceans

Until the mid-1990s no international management arrangements had been established for marlins. Since that time, catch and size limits have been introduced within the Atlantic and purse seine operators in the Eastern Pacific Ocean are required to immediately release all billfish. At present, there is a lack of verified data on which to base assessments of the effectiveness of these measures. No management arrangements have been established for billfish, including striped marlin, in either the Indian Ocean or Western and Central Pacific Ocean.

Domestic management of marlin in Pacific countries has been driven predominantly by sectoral conflict

To date, domestic management of marlins in Australia and other countries (e.g. New Zealand, United States, Mexico) has been driven principally by sectoral conflict. However, assessment of the effectiveness of various management actions in reducing interaction and conflict between fleets is heavily constrained by a lack of data. Voluntary arrangements to reduce conflict have generally not worked. This failure is probably due to the persistence of commercial financial incentives for the capture and retention of marlins and/or perception of harm by commercial fishers amongst recreational fishers in the absence of regulations. In most cases voluntary arrangements by commercial fishers to not target marlins or retain marlin, that are alive at the time of retrieval, have been replaced by formal regulatory actions such as bans on landing. Such bans do eliminate the incentive for targeting and/or retention of live fish but do not stop the mortality of marlins during commercial fishing and hence may not best pursue management objectives including stock sustainability.

Intersector conflicts over marlin have commonly been dealt with using time-area restrictions.

Global experiences with a range of management tools used to deal specifically with marlin were examined within this report including non-retention policies, bans on sale, limited entry, non-targeting policies, time-area closures and gear restrictions. If a central management objective is to reduce inter-sectoral interactions (and hence conflict), then time-area closures areas seem to have had the most marked impact on interaction rates and sectoral conflict. Relatively small time-area strata are often the source of relatively large proportions of commercial and recreational marlin catch. Hence, time area closures could be carefully considered as a means to deliver cost-effective management outcomes with respect to marlins including both reducing inter-sectoral conflict and addressing potential concerns about overfishing.

Multiple issues require consideration in managing striped marlin

This report highlights a number of key issues that fishery managers need be aware of in order to facilitate sustainable management of this species. Striped marlin are vulnerable to longline gear from a relatively young age, and may not be as migratory as once thought, suggesting increased potential for localised depletions. Stock structure is uncertain but some evidence suggests a southwest Pacific stock. The status of this species requires immediate investigation, given its importance to domestic longline and gamefishing sectors. Analyses demonstrate it is caught throughout the distribution of the eastern fishery (south of 15°S), with catch rates higher on shallower sets, during the day, using live baits, in waters between 22-26°C. This species has been opportunistically targeted by longliners, and based on catch levels and economic value warrants increased management attention. Both sectors are catching similar sized marlin from the same stock, often in similar locations and at similar times of year, but no conclusive evidence that charter catch rates are negatively impacted by longline catches was identified. However, analyses were limited by data quality, and the main interaction regions should continue to be monitored closely and further analyses of interactions undertaken as more data becomes available from the charter boat sector.

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