Swordfish – An IMAS study to improve responsible fishing practices

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Recreational fishing is a legal activity in Australia, with many social and economic benefits. Anglers can either retain their catch for consumption (within catch limits) or voluntarily release the catch.

Catch and release is a common practice in recreational fishing. One advantage is that it can reduce the impact on a resource by minimising the proportion of fish removed from a population that could contribute to spawning.

Bag, possession and size limits are used globally as the principal means to manage recreational fisheries. These tools are used widely within Australia's recreational fisheries (regulatory release). Bag and possession limits control the number of fish retained by an angler.

The effectiveness of both voluntary and regulatory catch and release is contingent on the assumption that a high proportion of released fish survive.

This is an important opportunity for science to engage with the recreational sector at the inception of a potential new fishery.

Studies have indicated that post-release survival rates are highly variable among fish species. This is important and highlights the need to investigate post-release survival on a species-by-species basis.

Recently recreational fishers have discovered that it is possible to fish for Swordfish on the east coast of Tasmania. This is the first time that recreational fishers in Australia have caught the species regularly, albeit it in low numbers. It is possible the fishery will develop further as interest grows. The development of this new fishery raises some important questions. The answers to which may help ensure that current management strategies are effective as well as potentially improve responsible fishing practices.

Scientists and support staff at the University of Tasmania's Institute for Marine and Antarctic Studies are applying experience gained from a similar study conducted recently on Southern Bluefin Tuna to a pilot study to assess post-release survival of recreationally caught Swordfish.

Satellite tagging

The development of pop-up archival transmitting (PAT) tags has provided a useful tool to understand the response of large pelagic species after release by recording aspects of their movement and behaviour for up to 12 months after release. Twelve tags will be used in this pilot study. Data returned from the tags can also be used to further our understanding of the biology of these iconic fish by investigating aspects such as migration patterns, temperature preferences and dive behavior of Swordfish.

What we know about Swordfish

Swordfish inhabit temperate, subtropical and tropical regions in the Pacific Ocean where they are caught mainly by commercial longline vessels. Seasonal variations in catches reflect movements associated with the extension and retraction of warmer waters.

Juvenile swordfish are generally restricted to tropical and subtropical regions, while adults can migrate to cooler temperate waters at higher latitudes. Female Swordfish grow larger than males and also tend to migrate further into cooler waters than males.

Data obtained from more than 70 electronic tags deployed by CSIRO on Swordfish caught by the commercial fishery have recorded varying movements in adult fish in Australian waters. Some individuals were resident in the Coral Sea region all year round and others moved south into waters east of Tasmania during winter and spring.

CSIRO has also examined the stomach contents of more than 600 Swordfish caught by the commercial fishery off eastern Australia. In the warm waters of the East Australian Current, fish are most common in the diet of smaller Swordfish while larger males eat fish and squid, and large females feeding almost exclusively on squid.

In Australian waters, commercial catch and tagging data link Swordfish distributions with topographic features such as seamounts, probably due to higher prey densities around these features. CSIRO tagging data show Swordfish routinely occupy 600–800m depths during the day, ascend at dusk to 0–100m where they commonly remain during the night, before descending to depths again at dawn, probably following the daily vertical migrations of their prey.

Swordfish grow to nearly 1 m in length (15 kg) in their first year and may live to 15–18 years. Most Swordfish longer than 2 m in length are females, and fish greater than 3 m in length are not uncommon.

Broadbill Swordfish (*Xiphias gladius*)
Illustration by Peter Gouldthorpe, copyright DPIPWE

Spawning occurs in the Coral Sea and the East Australian Current where surface temperatures exceed 24˚C. Most spawning activity occurs in summer.

Commercial fishery and stock status

Swordfish are distributed and harvested globally. In Australian waters Swordfish are caught commercially as part of the Eastern Tuna and Billfish Fishery and the Western Tuna and Billfish Fishery, both are managed by the Australian Fisheries Management Authority. The Australian east coast fishery currently has a total allowable catch (TAC) of 1,378 tonnes. This Australian fishery is part of the broader Western Central Pacific Ocean fishery managed by an international Regional Fisheries Management Organisation (the Western Central Pacific Fisheries Commission), where the international TAC is much larger.

Swordfish are currently assessed as a sustainable fishery in Australia (http://www.afma.gov.au/portfolio-item/broadbill-swordfish). The International Union for the Conservation of Nature (IUCN) Red List, which provides an independent global assessment of the conservation status of animals, currently lists Swordfish in the category 'of least concern'.

A new fishery = new questions

In any new fishery such as the recreational capture of Swordfish, there are many unknowns, such as:

- What proportion of the fish survive after release?
- Are there fishing methods that can be used to improve the survival of the fish if necessary?
- What is the size range of fish that are caught?
- How many fish are recreational fishers catching? And,
- What bycatch species might be caught?

Project objectives

This pilot study will investigate the potential to assess post-release survival of Swordfish from recreational fishing using satellite tags, there are four core objectives

1. Preliminary quantification of survival rates for Swordfish caught by recreational fishers, both pre- and post-release
2. An assessment of the size frequency composition, angling duration, hooking location and damage associated with Swordfish caught using standard recreational fishing methods
3. Determine migratory behaviour of Swordfish that survive post-release based on data from satellite tags
4. Collect tissue samples for use in future molecular stock structure and heavy metal accumulation analyses.

Study outcomes

The results of this pilot-study will provide important information on the fate of **S**wordfish caught by recreational anglers.

The fish will be caught using standard recreational fishing practices from both research and recreational vessels. The vessel type and the methods used will be very similar, and therefore the research fishing will be representative of standard recreational fishing methods. Factors such as angling duration, hook location and physical damage will be recorded, these factors are currently unknown for the fishery.

Information gained from the study will be communicated to recreational fishers to assist them make informed choices when catching, handling and releasing **S**wordfish.

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The results of this pilot-study will provide indicative results on the fate of Swordfish caught by recreational anglers.

The information will also be provided to fisheries managers to allow an assessment of the effectiveness of current recreational fishing management as it relates to Swordfish, in particular the effectiveness of bag limits which are currently used to manage recreational catch of this species.

The resulting mortality rates will also be made available for stock assessments to contribute information on currently unaccounted mortality from the population.

The team will be using a particularly novel technique to assess the direct response of the fish to the capture process. The technique utilises an accelerometer/depth logger attached to the fishing line close to the hook end. The use of such technology in this way is a world first for recreational fishing research. The logger will record 30-times a second and record with a high degree of accuracy the behaviour of the animal during the angling event. This will provide an insight into the depth-profile the animal undertakes as well as the vigour of the animal during the process (measured primarily as headshakes and tail beats which are typical of fish caught on a hook and line). They will be able to assess trends in the vigour through the duration of the capture process, providing an insight for the first time into the direct response of a large pelagic fish hooked by a recreational angler.

Information gained from the study will be communicated to recreational fishers to assist them make informed choices on responsible fishing practices when catching, handling and releasing Swordfish.

Summary

The University of Tasmania animal ethics committee has approved this pilot study.

The results will provide crucial information to begin to fill in some of the knowledge gaps for this new fishery. The information can be used by recreational fisheries managers to ensure current management strategies are appropriate as well as provide recreational fishers with fact based strategies to improve responsible fishing practices.

The $113,000 study has been funded by the Australian government through the Fisheries Research and Development Corporation (FRDC), with cash contributions from the Tasmanian Government, the Game Fishing Association of Australia and TARFish, the Tasmanian Association for Recreational Fishing.

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