

USE OF THE BIGHT BY SOUTHERN BLUEFIN TUNA AND POTENTIAL IMPACTS OF NOISE ASSOCIATED WITH OIL AND GAS EXPLORATION

At a glance

Project title

Southern bluefin tuna: spatial dynamics and potential impacts of noise associated with oil and gas exploration

Project summary

To better understand the feeding, diving and migratory behaviour and habitats of juvenile southern bluefin tuna in the Great Australian Bight, in the context of oil and gas exploration and extraction.

Project investigators

CSIRO

Program partners

CSIRO, BP, SARDI, the University of Adelaide and Flinders University are working on a \$20 million research program to better understand the environmental, economic and social value of the Great Australian Bight.

Project contacts

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Overview

Southern Bluefin Tuna are an important apex predator in the Great Australian Bight ecosystem.

The Bight provides a summer home for young southern bluefin tuna (one to four years), with large numbers migrating into the warm, shelf waters each year to feed on abundant prey (predominantly sardines).

While in the Bight, southern bluefin tuna are targeted by the Australian purse seine fishery which captures young fish to fatten for the export market. The fishery was valued at \$153.5 million in 2012–13.

As the young southern bluefin tuna move into the Indian Ocean and Tasman Sea at the end of summer, they are targeted by recreational fisheries in South Australia, Victoria, Tasmania, New South Wales and Western Australia, and international longline fleets in the Pacific, Indian and Southern Oceans.

Southern bluefin tuna belong to one population that spawns only in the north-east Indian Ocean in the vicinity of the Java Sea. Commercial fisheries are managed internationally under the Convention for the Conservation of Southern Bluefin Tuna, which is administered by the Commission for the Conservation of Southern Bluefin Tuna (CCSBT).

The CCSBT oversees regular assessments of southern bluefin tuna and sets national catch allocations according to a management procedure designed to rebuild the stock from previously over-fished levels. Fishery-dependent data (commercial catches) and fishery-independent data (estimates of abundance

derived from aerial surveys of young southern bluefin tuna in the Bight) contribute to the assessments.

The Challenge

Little is known about the response of southern bluefin tuna, or fish in general, to noise generated by human activities. This means that the potential impact on southern bluefin tuna, occupying those shelf and shelf slope areas of the Bight earmarked as the focus of oil and gas exploration, are unclear.

If southern bluefin tuna are impacted by noise from activities associated with oil and gas operation, this could affect the annual aerial surveys that contribute abundance estimates to support southern bluefin tuna management and in turn impact on fishing operations in the Bight.

This project will investigate potential changes in the movement and behaviour of southern bluefin tuna in the Bight that may be associated with increased noise.

It will analyse data held by CSIRO on the movement, migration and behaviour of southern bluefin tuna collected across the period 1994–2009 (before exploration activities), and data from archival tags deployed during the period of exploration (2013–2016).

If changes in the movement and behaviour of southern bluefin tuna are detected, they will be examined for potential flow-on impacts on fishery monitoring, assessment and management. The quantification of any behavioural changes will guide the development of potential measures required for mitigating such impacts.

The Research

CSIRO will develop novel statistical methods for estimating positions, behaviours and changes to feeding patterns in individual southern bluefin tuna from electronic tag data.

Models of juvenile southern bluefin tuna dynamics in the Bight will be used to highlight patterns of change across three decades, including the period before and during current oil and gas exploration.

The research will involve:

- deploying electronic tags to collect data on juvenile southern bluefin tuna over the short (less than one year) and long (one to four years) term;
- improving statistical methods for estimating the movements of fish from tag data (geolocation);
- developing new methods for investigating variability in diving behaviour and environmental influences on this behaviour;
- analysing feeding behaviour in relation to prey availability and environmental conditions;
- developing habitat models based on both tag and aerial survey data to show where southern bluefin tuna and human activities such as development and exploration are likely to overlap; and
- reviewing historical exploratory activity and other noise generating activities (such as commercial shipping) to provide a historical noise profile for the region.

The Impact

This project will provide a basis to distinguish any potential impacts of oil and gas exploration, and other human activities in the region, by better

understanding the variability in the feeding, diving and migratory behaviour and habitats of juvenile southern bluefin tuna in the Great Australian Bight. It will examine the environmental drivers associated with these behaviours using data collected across a period of three decades. This will provide important information for the identification and development of mitigation measures that may need to be implemented to reduce impacts, resulting in long-term benefits for the fishing and aquaculture industry, the Bight ecosystem, and the broader Australian community.

The People

Dr Campbell Davies of CSIRO has a background in applied marine science, in particular the spatial ecology of fish and fisheries, marine conservation planning, and the development and evaluation of adaptive management systems.

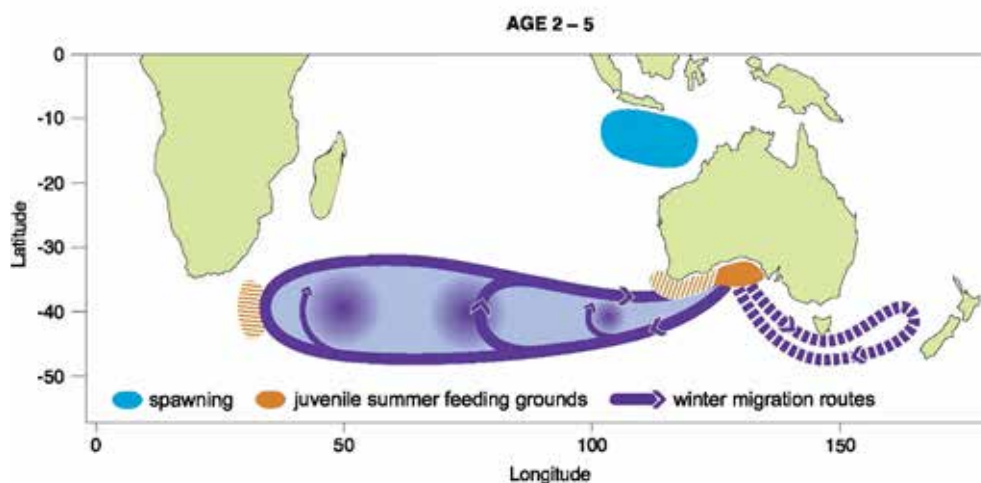
Dr Karen Evans of CSIRO develops and deploys tags, and analyses their data to see how top order predators move,



Above: A Juvenile southern bluefin tuna tagged with a small yellow conventional tag ready to be released back into the water.

feed and behave. She has tagged tunas, billfish, sharks, seabirds, seals and whales from the tropics to Antarctica.

Dr Toby Patterson of CSIRO examines the use of animal movement and behaviour data for conservation and fisheries management. He specialises in statistical analysis of electronic tag data and has studied tracking and behaviour data from tuna, sharks, whales, seabirds, turtles, seals and reindeer.



Above: Schematic of 2-5 year old southern bluefin tuna migrations, showing the distance and patterns of movements. Movements between the Great Australian Bight and the Pacific Ocean (dashed purple) are less well known than those between the Great Australian Bight and the Indian Ocean. It is also not clear if some southern bluefin tuna spend their summers in an area south-east of South Africa and an area south of Western Australia (hashed orange).

For more information

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