Economics Legislation Committee
ANSWERS TO QUESTIONS ON NOTICE
Industry, Innovation, Science, Research and Tertiary Education Portfolio
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AGENCY/DEPARTMENT: COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION (CSIRO)

TOPIC: Shark Tagging

REFERENCE: Question on Notice (Hansard, 17 October 2012, page 12 & 13)

QUESTION No.: SI-6

Senator WHISH-WILSON: I have questions on great white sharks and European wasps. Starting with great white sharks, are CSIRO still conducting electronic tagging of great white sharks?
Dr Clark: We do still undertake tagging of sharks.
Senator WHISH-WILSON: Sharks in general. I understand a new shark tagging exercise for different benthic species in marine protected areas, but are you still tagging great white sharks?
Dr Clark: I will provide you with additional information on the range of the sharks that we tag, where we do that at our locations around Australia and how we report and record that. I am encouraging our team to develop an app that sends an SMS to your phone if you are within 500 metres of one of our tagged sharks, but we have not quite developed that app yet.
Senator WHISH-WILSON: Is that where you are heading with this?
Senator Chris Evans: That was not a specific request by the minister in WA!
Senator WHISH-WILSON: The reason I bring it up is that we hear stories about, for example, surf competitions or a surf lifesaving group being advised of a shark in the vicinity. I wonder if that is a consistent policy of working with, for example, the Western Australian authorities in this case?
Dr Clark: As I said, I have been encouraging our team and we have been looking into that—how do we use the wireless communication that we have on the tags to make sure that we can link that in with wireless phones? It is not ready yet, but I have been encouraging our staff to look at that. I would have to give you an update on that outside this committee or at our next meeting on how we are progressing. It is not trivial to do that in a push mechanism.

ANSWER

The CSIRO is still conducting electronic tagging of great white sharks (white sharks or white pointers).

There are various different types of electronic tags. The two most commonly used are (a) long-life acoustic tags that emit a unique code that can be detected and logged by underwater receivers, and (b) satellite tags that signal the location of a tagged shark if the shark comes to the surface (these surfacing periods are irregular) or that store data which is later transmitted after the tag releases from the shark on a pre-programmed date. Acoustic tags can remain active for up to seven years; satellite tags can remain active for up to approximately 18 months depending on the type, but because of fouling issues often provide useful information for only 4-6 months.

The CSIRO has engaged in a number of electronic tagging programs on sharks in recent years or has been a partner to such programs with other agencies. Species tagged include great white sharks

(white sharks), tropical whaler sharks, deepwater sharks (e.g. gulper sharks and dogfish), tiger sharks, blue sharks, mako sharks, thresher sharks and sawfish. Current tagging projects exist on white sharks (focussed on nursery areas in eastern Australia and opportunistic tagging of white sharks with partner agencies in South Australia) as well as tropical whaler species off northwest Western Australia, bull sharks in Southeast Queensland and freshwater sawfish in the Northern Territory. In addition to sharks tagged under current projects, long-life acoustic tags remain active on a range of sharks tagged under previous projects and continue to provide data on their movements. These include white sharks, whaler sharks, deepwater sharks, tiger sharks, sawfish, black tip reef sharks, white tip reef sharks, grey reef sharks and lemon sharks.

The CSIRO maintains a coordinated national white shark research portfolio that provides a national perspective on the species in collaboration with various State agencies including WA Department of Fisheries, NSW Department of Primary Industries, NSW Marine Parks, Hunter-Central Rivers Catchment Management Authority, South Australian Research and Development Institute, University of Technology Sydney, University of Queensland, Qld Department of Agriculture, Fisheries and Forestry (formally part of the Department of Employment Economic Development and Innovation), Fox Foundation and White Tag. The CSIRO also works with other agencies to communicate the results of shark research, for example Tag for Life and the Melbourne Aquarium.

White shark tagging

There are two main components to the CSIRO's electronic tagging program on white sharks. Tagging of juveniles (< 3 metres in length) in nursery areas and tagging of larger sharks (3-5+ metres) at known aggregation sites or those opportunistically targeted in various locations. Tagging white sharks is a complex and time-consuming process – it can take up to a day to locate, attract and tag an adult white shark. The objectives of the program are to determine: population structure in Australia; linkages between populations in Australia's region (e.g. Southwest Pacific and New Zealand); the habitats/locations used by white sharks and why; shark movement patterns; and aspects of behaviour and survival rates of sharks for input into population models to assess their status (are populations going up, down or are they stable).

In collaboration with various partners and funding agencies, the program has deployed approximately 250 electronic tags on 210 different white sharks since 2000 (some sharks are tagged with more than one type of electronic tag). Most white sharks have been tagged with long-life acoustic tags (198 individuals). Due to the defined battery life of electronic tags, there are no satellite tags currently active from previous tagging programs, however there are approximately 38 acoustic tags that remain active from these previous tagging programs.

White sharks have been tagged under the CSIRO program primarily in South Australia (Neptune Islands), and in NSW (Port Stephens nursery area, Central Coast) with smaller numbers tagged in Southeast Victoria (nursery area in the vicinity of Corner Inlet/90 Mile Beach) and previously in Southwest Western Australia (Albany – Esperance).

Tagged white sharks have been tracked over their known Australian ranges for the two genetically distinct populations: a) South Australia across the Great Australian Bight to southwest Western Australia, and north along the WA coast to the Exmouth region and return to South Australia; and b) central NSW to southern Queensland and Tasmania as well as across the Tasman Sea to New Zealand.

Current CSIRO tagging on white sharks is focussed at Port Stephens, NSW where two satellite and two acoustic tags were deployed on white sharks in October 2012. Up to 20 white sharks will be tagged with acoustic tags under this project in 2012-2013, up to six of which will also be tagged with satellite tags. Acoustic tag data are complemented by the 30 white sharks previously tagged in the area, under previous projects, that retain currently active acoustic tags which continue to contribute data on their movements.

Collaborators are currently tagging white sharks at the Neptune Islands in South Australia and the CSIRO will be trialling some prototype satellite tags in South Australia in November 2012. These and sharks with active acoustic tags from previous CSIRO tagging continue to provide data on movements in southern and Western Australia.

Data from acoustic and satellite tags are held in the CSIRO's purpose developed electronic tag database in Hobart. Data from any currently active satellite tags are uploaded into the database automatically from the ARGOS satellite system each night.

Satellite tracks of white sharks have previously been provided to relevant authorities (e.g. State Fisheries Departments and Surf Life Saving Australia) when available. Surf Life Saving NSW has previously used such tracks to plan asset deployments and schedule patrols in key areas such as the Port Stephens region.

Acoustic tag data from tags deployed by the CSIRO are uploaded into the CSIRO database when receiver data files become available. The CSIRO acoustic tag data is also mirrored into the Australian Animal Tracking and Monitoring System (AATAMS) database at the University of Tasmania which is part of the national Integrated Marine Observing System (IMOS) program. The AATAMS database receives acoustic data from all tagged species including sharks, finfish and other marine taxa.

Acoustic data are received via two station types; data logging receivers and active transmitting receivers. The most common receiver in Australian waters is the data logging receiver. Over 600 of these units are deployed in Australian coastal waters and maintained by various institutions including the CSIRO. Data logging receivers record and store detections of acoustic tags. These data are uploaded to databases when the units are retrieved which may be up to 12 months after the receiver's deployment. Receiver deployments are coordinated through the IMOS program. All receivers and tags are compatible and any sharks tagged by the CSIRO can be detected on any receiver in Australia, conversely any shark or fish species tagged by any institution can be detected by any receiver. Data logging receivers are also deployed by international agencies across the globe including Canada, the US, New Zealand and South Africa. The international analogue of IMOS's acoustic receiver program is the Ocean Tracking Network (OTN). OTN sponsored data logging receivers are also maintained in Australian waters off Perth and off eastern Tasmania under the IMOS program. White sharks and other species tagged internationally can also be detected if they travel into Australian waters.

There are 22 active transmitting units in operation in Australian waters. The CSIRO partnered with the Department of Fisheries Western Australia and the Canadian manufacturer (Vemco-Amirix Pty Ltd) in 2008 to develop and test them. These units differ from the more common data logging receivers in that they can transmit, in near real-time, detections of tagged sharks via the iridium satellite or GSM phone network directly. The CSIRO has maintained one active transmitting unit at the Neptune Islands in SA since April 2008. The Department of Fisheries Western Australia now

maintains 21 active transmitting receivers off Perth metropolitan waters, specifically to research the patterns of movement of white sharks and identify environmental predictors of increase risk of public encounter. Detections of tagged sharks are relayed via satellite or GSM and converted to an email format which provides the details of the detected tag within 2 minutes. Full data downloads of all detections by the receiver are automatically uploaded on a weekly basis without the need to retrieve the receiver. The WA system is now fully administered and maintained by the Department of Fisheries Western Australia (not the CSIRO), although tagging of white sharks is still done in a collaborative effort with the CSIRO. The Department of Fisheries Western Australia has further refined the active transmitting reporting system – tag detections now automatically generate an SMS message that is received by public safety authorities within two minutes of a tagged shark being detected including WA Police, local councils, Surf Life Saving WA. This information is currently used to temporarily close beaches due to the known presence of a tagged white shark if appropriate as well as focus monitoring of the area to determine the cues for shark presence in the area. Further details of the WA system can be obtained from the WA Department of Fisheries.

Shark app

The CSIRO is always looking for innovative ways to communicate our science, and Apps are one channel we are investigating for a number of research areas. We are investigating the feasibility of developing an App to provide information about the location of tagged white sharks in Australian waters.

There are many factors to consider regarding the viability of such an App, and these are currently being discussed and reviewed internally. A feasibility study of the data requirements and overall costs of this project will need to be undertaken prior to any decision to proceed with the development of an App.