



Update on the Global Spatial dynamics Archival Tagging project - 2008

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Abstract

As part of the CCSBT SRP, Australia initiated a Global Spatial Dynamics project involving the archival tagging of juvenile (2–4 year old) SBT throughout their range (i.e. from South Africa to New Zealand) with the objective of estimating movement and mixing rates, and periods of residency in different parts of this range. The project has been implemented as a collaborative project between New Zealand (NZ), Taiwan and Australia. Attempt to expand the collaboration to other CCSBT members have been unsuccessful to date, but would be welcomed. The results of to date of this program are described. Archival tags have been released in NZ, Australian, central Indian Ocean and South African waters. Eighty eight tags were released in 2004, 104 in 2005, 129 in 2006, 150 in 2007 and 88 so far in 2008¹. Out of the 88 released in 2004, 25% have been recaptured so far including the first recoveries ever from archival tags released in the central Indian Ocean and New Zealand and the overall return rate for the first three years of releases is 16%. The movement patterns of the archival tags returned to date differs from those seen from the archival tagged fish released during the 1990s in the extent of their eastward and westward movements. In particular, only one of the recaptured fish from tags released in South Australia has moved into the Tasman Sea, and movement into the Indian Ocean has been restricted to the more central and eastern areas.

Introduction

As part of the CCSBT SRP, Australia initiated a Global Spatial Dynamics project involving the archival tagging of juvenile (3–4 year old) SBT throughout their range (i.e. from South Africa to New Zealand). The primary objective of the project is the estimation of movement and mixing rates, and periods of residency in different parts of this range. The project has been implemented as a collaborative project between New Zealand (NZ), Taiwan and Australia. This paper presents a summary on activities undertaken in the archival tagging project and planned activities in 2008-2009.

Global Spatial Dynamics Project - Overview

CCSBT-ESC/0309/Info04 provided an overview of the global spatial dynamics project for juvenile SBT. The project is a multi-year, large-scale project that CSIRO initiated to improve our understanding of the global spatial dynamics of juvenile southern bluefin tuna (SBT). The project aims to archival-tag 150 to 200 juvenile SBT per year for 3 years throughout the range of habitats in which they are exploited. The project aims to provide improved knowledge of, the basis for and an understanding of the implications of incorporating spatial dynamics and habitat utilization information directly into the analyses of conventional tag return data, CPUE standardizations using habitat-based approaches, the SBT stock assessments, and the management advice. The data collected in this spatial dynamics project will be useful in estimating mixing-rates and should help to provide a robust basis for interpreting the conventional tagging results. The project is intended to be complementary to the current conventional tagging program under the CCSBT Scientific Research Program, and to take advantage of this program through recovery programs and deployment opportunities. This project also builds upon previous and concurrently running archival and conventional tagging projects.

¹ These years refers to the fishing season December to November.

The project seeks to collaborate with other CCSBT members in all aspects of the work, including tag deployment, recovery and analysis of results. In the first year of the project, collaborative arrangements were developed with New Zealand and Taiwan for tag deployments and future analytical collaboration when data becomes available from returned tags. These arrangements continued and were expanded during the second, third and fourth years of the project. We have attempted to extend this collaboration to other CCSBT members and a detailed proposal for this has been provided previously to the CCSBT Scientific Committee (Polacheck et al. 2004). This has not occurred to date. Collaboration with other members would still be welcomed. However, the current year is the last year that this project has resources for releasing tags so that opportunities for collaboration with those not already involved in the project will be limited, unless they are able to assist in the future with resources and logistics for releasing additional tags.

Archival tag releases

So far during this project, archival tags have been released in 5 locations in collaboration with this project:

1. in high seas in the central Indian Ocean
2. off the south west of West Australia (WA)
3. in the Great Australian Bight (SA)
4. off New Zealand
5. off South Africa

A summary of archival tag releases including those for previous years is shown in Table 1, together with recaptures to date.

Table 1. Numbers of archival-tagged SBT by area and year, together with recapture numbers by area of release. The number of releases and recaptures is through June 2008. Note year refers to fishing year (December through November).

Year	Data	Indian Ocean	WA	SA	Tasman Sea	South Africa	Total
2004	No. released	37	22*	23	6		88
	No. recaptured	6	6	9	1		22
2005	No. released	48	15	40			103
	No. recaptured	5	3	7			15
2006	No. released	25	39	35	30		129
	No. recaptured	1	2	10	2		15
2007	No. released	50	50	24	19	7	150
	No. recaptured		0	1			1
2008	No. released		49		20	19	88
	No. recaptured		0				0
Total	No. released	160	175	122	75	26	558
	No. recaptured	12	11	27	3	0	53

* Deployed in conjunction with CSIRO/NRIFSF Recruitment Monitoring Program (RMP).

A scarcity of suitable fish in New Zealand severely restricted the tagging of juvenile SBT from this area in the first two years of this project. Greater success has been achieved during the last three seasons with a total of 75 tagged fish now released from waters around New Zealand (although some of the recent success was achieved by tagging fish larger than the target range for this project). Tagging activities are on-going in New Zealand waters, and New Zealand will be providing additional information on the tagging activities in NZ waters in 2008.

As noted previously, the project was unsuccessful in its prior attempts to have tagged fish released off South Africa (Polacheck et al, 2007). However, since then, the program has been successful in having 25 SBT archival tagged fish released by observers on Taiwan vessels during the latter part of 2007 and the early part of 2008. We are hoping to augment this number during late 2008 or early 2009 (although the funding for these tags is separate from the original source of funding for this project). In the central Indian Ocean, a total of 160 SBT have been tagged with archival tags between 2004 and 2007.

At the time of last year's report (CCSBT-ESC/0709/20), the total SRP/RMA mortalities in 2005/2006 attributable to the release activities associated with this project were 7 fish or 477kg. No additional SRP/RMA mortalities were attributable to the project since then and no additional ones are anticipated.

Recaptures

As shown in Table 1, a total of 58 tags have been recaptured and returned to date (as of the end of June 2008). We anticipate that additional archival tags have been recaptured and are in the farms in South Australia and look forward to these being returned during the harvesting operations. As expected, the largest percentage of returns is from the releases in 2004 followed by the 2005 releases. It is too early to have had significant number of returns from the 2007 and 2008 releases (fish in the farms from the 2007/08 fishing season in South Australia are still being harvested). From the 88 releases in 2004, 22 or ~25% have been recovered to date. These include 6 from releases in the central Indian Ocean, 6 from releases in Western Australia, 9 from releases in South Australia and 1 from releases in the Tasman Sea (New Zealand). The recoveries from the releases in the Indian Ocean and New Zealand are the first recoveries ever of archival tags from releases in these two areas. For the 2006 releases, 12% have been recovered to date. The recovery rate is approximately 60% of those for the 2004 releases at this time last year. Similarly, for the 2005 releases, only 15% have been recovered and there have been no additional recoveries in the last year from either the 2004 or 2005 releases. In this regard we note that most of the recoveries to date have been from the Australian surface fishery and there has been a paucity of returns from the Japanese² (0) and Korean longline fleets³ (0). These recovery rates suggest that reporting rates may have declined and that reporting rates may be low in some of the longline fisheries.

² Since archival tagging commenced in Australia in 1993 the Japanese fishery has returned 33 archival tags, the most recent being returned was captured in October 2006. However, it was from a release made prior to this current project. Since 2002 the Japanese fishery has not reported a recapture of a fish at liberty for less than 6 years.

³ The Korean fishery has only ever reported one archival tag recapture, in September 2003 for a fish released in 1999.

Altogether 12 recaptures have been made from the 160 fish tagged by Taiwanese observers in the central Indian Ocean in July–August of 2004, 2005 and 2006 (6 of 37 from the 2004 releases, 5 of 48 from the 2005 releases and 1 of 25 from the 2007 releases). Two of these recaptures were made by the Taiwanese fleet. These results combined with the recapture of 1 out of 6 releases by observers in New Zealand in 2004 demonstrate the feasibility and viability of conducting archival tagging from longline vessels and using trained observers to do the tagging.

The movement patterns of the archival tags returned to date continue to differ from those seen from the archival tagged fish released during the 1990s in the extent of their eastward movements (Polacheck et al, 2006). Only one (4%) of the recaptured fish from tags released since 2000 in South Australia has moved into the Tasman Sea (Table 2). This compares with 33% of the tags recaptured from prior releases. Based on a chi-square test, this difference is highly significant ($p < 0.001$). Also, only one (4%) of the recaptures for releases since 2000 in South Australia has moved into the more western part of the Indian Ocean (i.e. $< 65^\circ\text{E}$). This compares with 17% previously (Table 3). This difference is also significant at the 0.01 level.

Table 2: The number of recovered archival tags by calendar year which had a maximum longitude less than or exceeding 145°E . Only fish released in the GAB are included. Results are based on recaptures through March 2008.

Year	Maximum Longitude	
	≤ 145	> 145
1993	2	0
1994	6	2
1995	11	5
1998	9	7
1999	6	2
2000	5	3
2002	2	0
2004	8	0
2005	13	1
2006	1	0
2007	1	0
Total	64	20

Table 3: The number of recovered archival tags by calendar year which had a minimum longitude less than 65°E. Only fish released in the GAB are included. Results are based on recaptures through March 2008.

Year	Minimum Longitude	
	<65	>65
1993	0	2
1994	3	5
1995	1	15
1998	1	15
1999	3	5
2000	2	6
2002	0	2
2004	1	7
2005	0	14
2006	0	1
2007	0	1
Total	11	73

Plans for 2008–2009

As noted last year, the plan was to complete the releases of all archival tags currently available for this project by the end of the Austral summer (March 2008). The releases have been completed with the exception of a few tags still planned for release in New Zealand waters. A small number (~10) of additional tags made available to CSIRO outside of the initial funds for this project are intended to be released off South Africa in the latter part of 2008 or the early part of 2009. Beyond these, there are no plans for further releases and only if additional tags were made available would additional releases be possible. The focus of the work in 2008 and 2009 will be on the analyses of data from the tags that have been recaptured to date.

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