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SW Dunlop [a], BQ Mann [a] & RP van der Elst [a]
[a] Oceanographic Research Institute, PO Box 10712, Marine Parade, 4056, South Africa
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A review of the Oceanographic Research Institute's Cooperative Fish Tagging Project: 27 years down the line

SW Dunlop*, BQ Mann and RP van der Elst

Oceanographic Research Institute, PO Box 10712, Marine Parade 4056, South Africa
** Corresponding author, e-mail: sdunlop@ori.org.za*

The Oceanographic Research Institute's (ORI) Cooperative Fish Tagging Project was initiated in 1984 and is one of the most enduring and successful environmental projects of its kind in South Africa. By the end of 2011, 5 130 anglers had joined the project, of whom 3 457 had tagged one or more fish. In the project's 27-year history (1984–2011), over 251 900 fish from 368 different species have been tagged and released, of which approximately 13 192 (5.2%) have been recaptured. The five most commonly tagged species to date are galjoen *Dichistius capensis*, dusky kob *Argyrosomus japonicus*, dusky shark *Carcharhinus obscurus*, garrick/leervis *Lichia amia* and spotted grunter *Pomadasys commersonnii*. Information from the Tagging Project has been extensively used in numerous research projects, scientific publications, popular articles and postgraduate theses. The results generated by this project have also contributed to policy development and decision-making on linefish management in South Africa. Furthermore, the project has had a positive impact on improving angler awareness and knowledge about linefish resources. The concept of tag and release has partly been responsible for changing the ethics of the recreational fishing community, many of whom now release their catch, thereby contributing to a more sustainable fishing future. This paper critically assesses the contribution that the ORI Tagging Project has made as a conservation achievement in general and to linefish management in particular, and reflects on future directions for the project.

Keywords: angling, cooperative tag and release, fish movement, growth rate, mortality rates, population dynamics, South Africa, tag recapture, tag release

Introduction

Fish tagging is a basic and practical tool that has been widely used for obtaining qualitative and quantitative information on fish stocks and aspects of resource management since the beginning of the 20th century (McFarlane et al. 1990). The Oceanographic Research Institute (ORI) Tagging Project, or the 'South African National Marine Linefish Tagging Project' as it has been more formally named, was initiated in 1984 and may be considered as one of the most successful cooperative marine environmental projects of its kind in South Africa. Although fish tagging projects were initiated as early as the 1930s on Cape snoek *Thyrsites atun* (De Jager 1955) and continued on other species (Davies and Joubert 1966, Newman 1970, Bass et al. 1973, Bass 1977, van der Elst 1990) in South Africa, these projects were generally limited and species-specific, and not all of them yielded relevant results (van der Elst 1990). Furthermore, much of the data from these projects remained unpublished and/or unavailable for dissemination (van der Elst 1990). In 1984, ORI recognised the potential for a well-managed cooperative tagging project to generate much-needed data on linefish and, spurred on by a growing number of anglers anxious to participate, the ORI Tagging Project was launched. The project was based on many similar cooperative tagging programmes that had been developed elsewhere around the world, particularly in the USA, Canada and Australia (Pepperell 1999, Loftus et al. 2000, Ortiz et al. 2003).

Most tagging projects in South Africa prior to 1984 involved experienced/trained personnel, such as scientists and conservation officers. In contrast, the ORI Tagging Project elicited the cooperation of voluntary, conservation-minded anglers to tag and release their fish and the marine angling public at large who report most of the recaptures. Despite the voluntary nature of this project, the primary aim, which was similar to that of many other tagging programmes around the world (Pepperell 1999), was to learn more about fish movement patterns, growth rates, mortality rates and population dynamics of important linefish species. The information generated by this project has been made available to students and scientists throughout southern Africa to augment their studies of linefish and to assist with decisions on management recommendations. Tagging provides an important tool to the fishery manager and is one of the most cost-effective, reliable and direct means to obtain data for studying fish populations (Kohler and Turner 2001, Ortiz et al. 2003). Successful fisheries management and conservation depends not only on sound data but also on good cooperation between users, managers and scientists. The ORI Tagging Project helps to achieve both these goals as it allows fishers to actively participate in the accumulation of data that can ultimately be used for conducting stock assessments.

In the past there has been much criticism of cooperative tagging projects because of factors such as poor fish-handling and inaccurate measuring conducted by members of the angling public, which can lead to increased mortality of released fish and poor data quality (Govender and Bullen 1999, Pepperell 1999, Loftus et al. 2000, Lucy and Davy 2000). Similarly, there are proponents of cooperative tagging programmes that claim that inclusion of the angling public in tagging fish enables large amounts of useful data to be collected, which would otherwise be difficult, if not impossible, to obtain (Pepperell 1999, Loftus et al. 2000). In addition, angler-based tagging programmes can be a vehicle used to promote resource stewardship and encourage conservation principles such as catch-and-release and better fish handling (Lucy and Davy 2000).

The aim of this paper was to critically assess the contribution that the ORI Tagging Project has made as a conservation achievement in general and to linefish management in particular, and reflect on future directions for the project.

Development of the ORI Tagging Project

The use of various markers (e.g. pigments, dyes, mutilation, etc.) to track the movements of fish in aquatic systems can be traced back to between 218 and 201 BC (McFarlane et al. 1990). Today, fish marking techniques are quite sophisticated and there are numerous tag types available for use on different species (Anon. 1953, Rounsefell and Everhart 1953, McFarlane et al. 1990, Bergman et al. 1992, Kohler and Turner 2001). The most commonly used tag types are external ones with some form of anchor that penetrates the skin or other tissue of the fish, and includes a component for recognition of individuals (McFarlane et al. 1990, Bergman et al. 1992, Kohler and Turner 2001). A number of different external tag types have been used; some derived from farm livestock markers and some from the clothing industry. Examples include Petersen disc tags, Rototags, opercle tags, bachelor button tags, Heinicke ring and stud tags, wire loop tags, T-bar tags, dart tags, etc. (Anon. 1953, Rounsefell and Everhart 1953, McFarlane et al. 1990, Bergman et al. 1992, Kohler and Turner 2001). Fortunately, prior to the implementation of the ORI Tagging Project, a number of international and local studies were conducted on various tag types to determine their affordability, practicality for application by anglers, and effectiveness (i.e. rates of tag loss/shedding and tag-induced mortality on captive fish). Locally, these included studies on shad/elf *Pomatomus saltatrix*, slinger *Chrysoblephus puniceus*, soldier/santer *Cheimerius nufar* and several species of sharks and rays (Davies and Joubert 1966, van der Elst 1990). From these results and a review of the international experience, a suite of suitable tag types were selected for the Tagging Project (Table 1). These tag types were issued to member anglers, depending on their preference (i.e. type of fish to be tagged) and capabilities. However, over the years, with experience and improved technology of tags, some of these tag types have been discontinued and new tag types have been incorporated into the project (Table 1). The position of insertion of these different tag types is shown in Figure 1.

Participation in the ORI Tagging Project is by membership only and not all anglers are simply accepted into the programme. Those anglers who can demonstrate an above-average technical capacity and commitment to contribute to the Tagging Project may formally request participation through a letter of motivation. Membership is only granted in the cases where an angler's credibility can be verified and a once-off nominal fee is charged for membership (currently R300 = US$35). Tagging kits are issued to individuals in specially designed pouches containing promotional matter, an instruction manual, tape measure, and one or more types of tags attached to postage-paid tag return cards, and associated tag applicators. More recently (2010), an instructional DVD has also been provided to members in order to improve fish handling and tagging techniques. In addition to normal individual membership, there are several charter groups that tag various gamefish species in Mozambique, and a large proportion of institutional scientific tagging takes place along the South African coast, particularly in marine protected areas (MPAs). Institutional scientific tagging accounts for approximately 30% of all fish tagged in the project, with one of the main aims of this research thrust being to determine the amount of spillover of fish from MPAs (*inter alia* Garratt 1993, Attwood and Bennett 1994, 1995, Attwood 2002, Cowley et al. 2002, Attwood and Cowley 2005, Maggs 2011, Mann 2012, Venter and Mann 2012, Maggs et al. 2013).

All tags that are issued to members of the Tagging Project are first recorded on the specifically designed tagging database and attached to postage-paid postcards for recording relevant tag-release information. The information required from each tagging event includes the unique tag number (already printed on the card), species, length (i.e. fork length, total length, disc width or precaudal length, depending on species), measurement units (millimetres or centimetres), date and locality. In addition, the individual tagger's name, unique reference (membership) number and address are required. A section primarily for remarks/comments is also included in order to enable anglers to provide additional biological/environmental information, such as sex of elasmobranchs, where possible. Each card should ideally be completed immediately after each tagging event and returned to ORI via post, fax or e-mail, depending on the angler's preference.

A large variety of species are eligible to be tagged as part of the project, although fish <30 cm (0.5 kg) should not be tagged. Since 1999, members of the Tagging Project have been requested to focus tagging efforts on certain priority fish species about which more information is required (Appendix). Furthermore, ORI has a standing agreement with the Mozambican authorities that only selected migratory gamefish species, including billfish (istiophorid spp.), giant kingfish *Caranx ignobilis*, king mackerel *Scomberomorus commerson*, largemouth/Talang queenfish *Scomeroides commersonnianus*, queen mackerel *Scomberomorus plurilineatus*, southern pompano *Trachinotus africanus*, yellowfin tuna *Thunnus albacares* and wahoo *Acanthocybium solandri*, may be tagged in their waters using ORI tags. Although ORI originally allowed members to tag fish in Namibian waters, this was discontinued in 1999 as Namibian authorities developed their own tagging project (H Holtzhauzen, Namibian Ministry of Fisheries, pers. comm.).

Table 1: The different types of fish tags used in the ORI Tagging Project over the past 27 years

Tag	Specifications	Use
Type A	Spaghetti-type, plastic-barb dart tag (114 mm × 1.6 mm)	Teleosts and elasmobranchs >60 cm in length
Type B	Steel-head, spaghetti-type dart tag (161 mm × 2.3 mm)	Billfish, tuna (>25 kg) and sharks. Restricted use as of 2011
Type C	Circular plastic disc tag (similar to a livestock ear tag)	Elasmobranchs (<25 kg). Discontinued in 1998
Type D	Spaghetti-type, plastic-barb dart tag (85 mm × 1.6 mm)	Restricted for smaller teleosts between 30 and 60 cm in length
Type M	Plastic head, spaghetti-type dart tag (181 mm × 2.3 mm)	Billfish and large tuna (>25 kg). Introduced in late 2011
Other	BT and DT tags. Identical to the Type B and D tags respectively	Used for oxytetracycline marking for validation of age

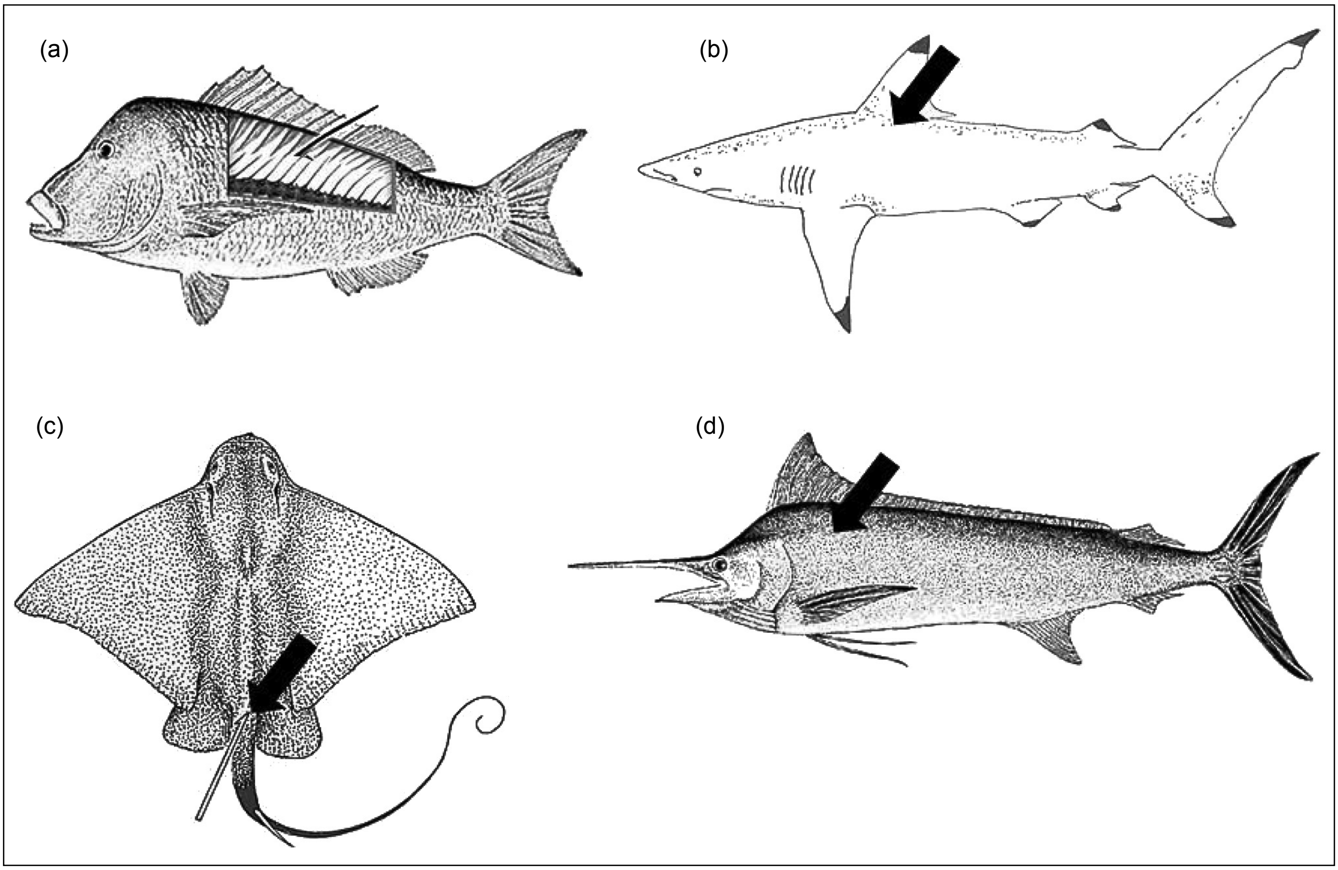

Figure 1: General tagging positions for (a) teleosts, (b) sharks, (c) skates and rays, and (d) billfish (courtesy N Kistnasamy and A Maggs, South African Association for Marine Biological Research [SAAMBR], Durban)

Achievements of the project

By the end of 2011, a total of 5 130 anglers had joined the ORI Tagging Project. Of these members, 3 457 had tagged one or more fish, although only 51% of those (1 753) had tagged 10 or more fish. Figure 2 describes the annual number of new and active members in the ORI Tagging Project's 27-year history. Between 1984 and 1996, the number of new anglers joining the project remained fairly constant with an average of 265 new members per year. However, between 1997 and 2005 there was a steady decline in annual membership with the lowest number of new members joining the project in 2002 (only 54). The reasons for this decline are unclear but may be related to marketing and management of the project itself. Although there was a similar decline in the number of fish tagged per year for the same period (Figures 3, 4), this was not related to a decline in overall fish abundance. Figure 3 shows that the number of tags bought and issued per year declined considerably between 1998 and 2007. Fortunately, from 2005 onwards the number of new members joining the project doubled and has remained at approximately 150 new members per year. Although there has been an overall decrease in the number of new members joining the project since its inception, this decline was related to a policy implemented whereby prospective anglers were more rigorously screened so as to improve the quality of tagging data received from anglers as opposed to simply increasing the quantity of fish tagged. Included with this decision was an ongoing attempt to improve members' ability to handle and tag fish correctly, measure fish accurately and to report recaptures correctly. Furthermore, over the past 10 years ORI found it difficult

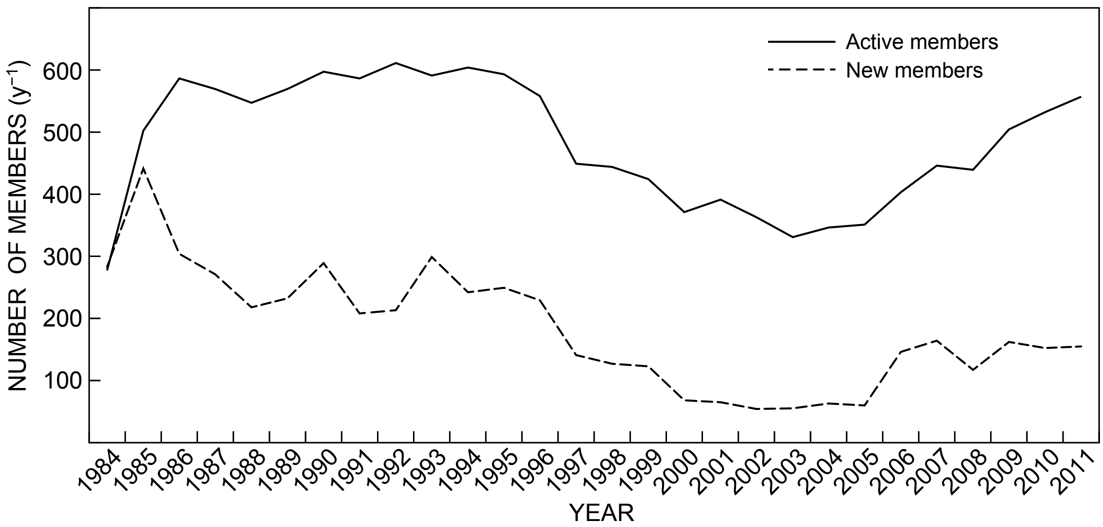

Figure 2: Annual number of new and active members in the ORI Tagging Project over a 27-year period

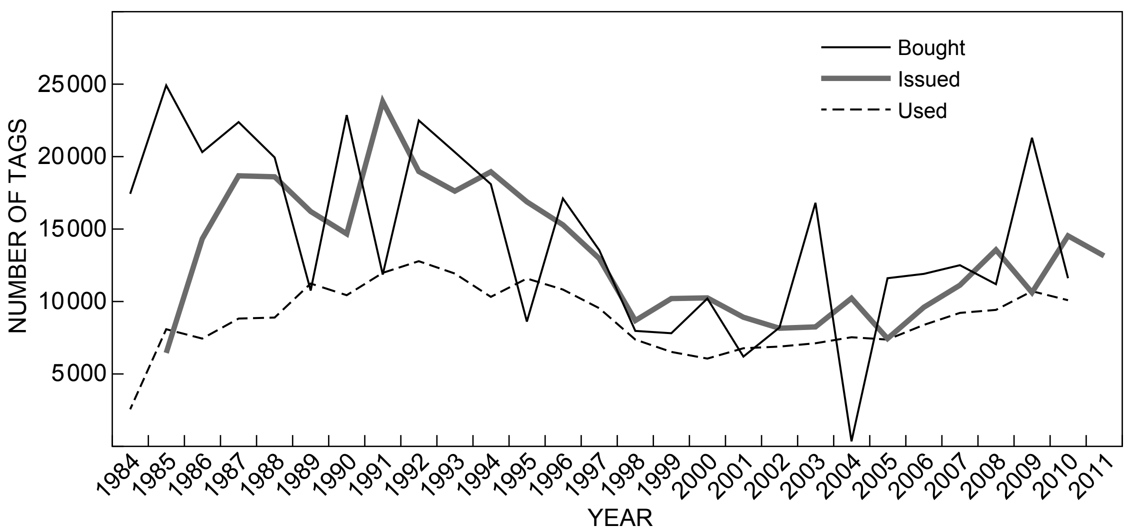

Figure 3: Annual number of tags bought, issued and used in the ORI Tagging Project, over a 27-year period. Note that data for the number of tags issued during 1984 are missing

to secure sufficient funding for the Tagging Project, which has subsequently resulted in stricter protocols in purchasing equipment and issuing out tagging kits and tags. Similar restrictive policies have also been introduced in the USA (E Orbersen, National Marine Fisheries Service, pers. comm.) and Australia (Sawynok 2011). Figure 3 further highlights the results of this policy decision as the number of tags issued per year dropped considerably over the years whereas the number of tags used per year remained fairly constant. The increased number of members joining the project from 2005 onwards can be related to improved communication (e.g. e-mail/Internet/cell phones) and the active promoting of tag and release in the media, such as on popular angling programmes that are aired regularly on national television, as well as in numerous articles in angling magazines.

Interestingly, despite the number of anglers that join the Tagging Project each year, the average number of members that are active each year (i.e. that tag one or more fish) remains fairly low (484 members y^{-1}). Furthermore, the number of active members also steadily decreased between 1997 and 2005, which parallels the trend in annual membership. Both these patterns indicate that although new members join the project each year, the novelty to be a regular tagger soon dissipates. This is partly explained by the fact that tag and release goes beyond simply catching and releasing a fish but requires extra effort by the angler to tag the fish and record and submit the data. Committed taggers that have remained active for long periods are therefore relatively scarce but their contributions to the project are among the most valuable (Govender and Bullen 1999).

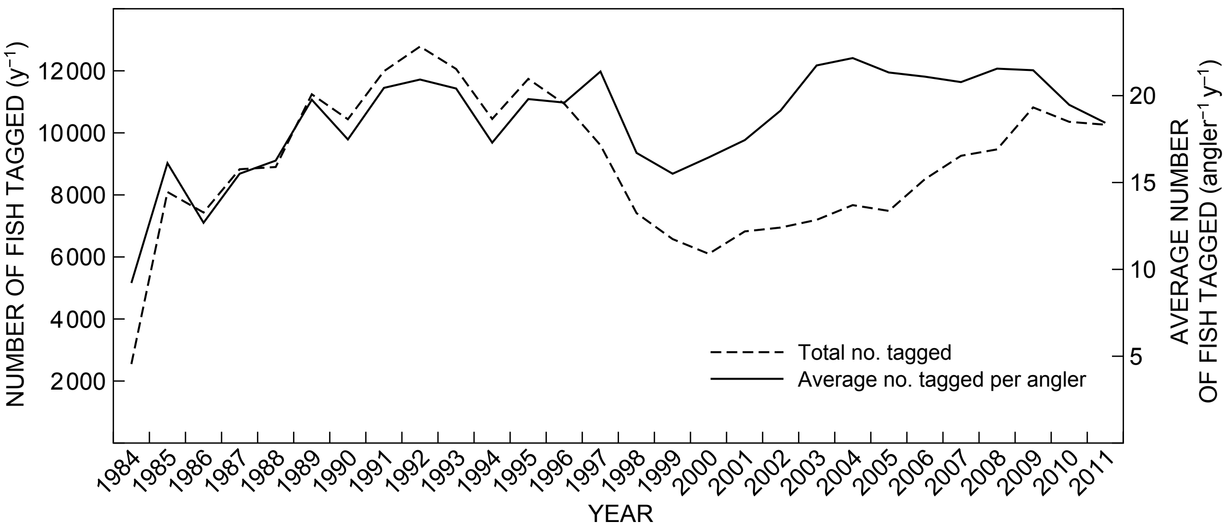

Figure 4: Total number of fish tagged per year (primary axis) and the average number tagged per angler per year (secondary axis) in the ORI Tagging Project over a 27-year period

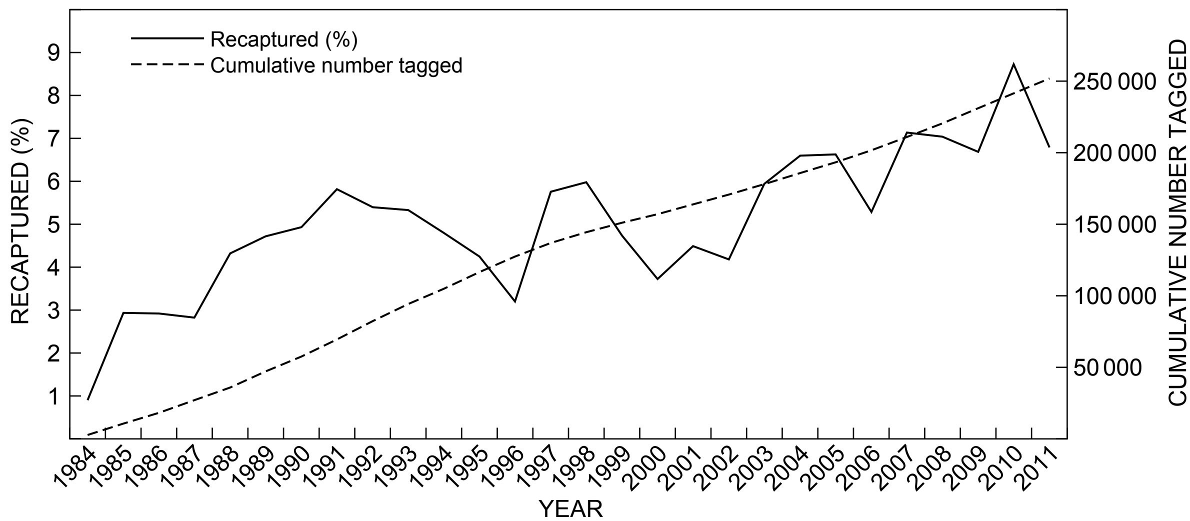

Figure 5: Percentage of fish recaptured per year (primary axis) and the cumulative number of fish tagged (secondary axis) in the ORI Tagging Project over a 27-year period

In the Tagging Project's 27-year history, a total of 251 969 fish (Figure 4) from 368 different species (166 species y^{-1}) has been tagged and released, of which 5.2% (489 fish y^{-1}) has been recaptured (Figure 5). The number of fish tagged per year has varied about an average of 9 332 fish y^{-1} (SD 2 264) since the project's inception, barring a decline between 1998 and 2002, which again can be accounted for by a change in management of the programme rather than a decrease in fish abundance. The fact that the number of members tagging fish decreased between 1997 and 2005, yet the number of fish tagged per angler per year remained high for the same period, emphasises this point. The drop recorded between 1998 and 2002 can be explained by the lower number of tags issued out over this period (Figure 3). Overall, this period marks a low point in the history of the ORI Tagging Project. Fortunately, since 2005 the project has experienced some of its best years yet with an increased number of new members joining and a large number of fish being tagged.

The percentage of recaptures reported has shown a consistent increase since the start of the project in 1984 (Figure 5). This may be attributed to several possibilities. First, it reflects the fact that there is an ever-increasing pool of tagged fish available for capture. It is also likely that ongoing attempts to educate the angling public through various media (e.g. talks to angling clubs, radio and television programmes, angling magazine and newspaper articles, awareness posters at tackle shops, etc.) have assisted with improving reporting rates (see Table 5). Another factor that has contributed to the increase in reported recaptures is the ongoing fish tagging projects being conducted in a number of South African MPAs where tagging and reporting of recaptures is mainly done by trained anglers and scientists. The recapture rates of certain reef fish species tagged in some of these projects are particularly high (e.g. speckled snapper *Lutjanus rivulatus* [44.5%] in the St Lucia Marine Reserve [Mann 2012] and yellowbelly rockcod *Epinephelus marginatus* [61%] in the Pondoland MPA [Maggs et al. 2013]) and has thus increased the overall recapture rate.

The distribution of tagging effort is skewed, with most of the tagging taking place in the Western Cape at 41% of the total fish tagged in southern Africa (Table 2). Despite the relative length of the coastlines of the Eastern Cape and KwaZulu-Natal, these provinces contributed only 27% and 24% of the total tagging effort respectively. Interestingly, in the past 27 years, only 159 fish have been tagged along the Northern Cape's 850 km coastline. Although the tagging of fish in Namibia with ORI tags was discontinued in 1999, Namibia still accounts for 6% of the total number of fish tagged. Mozambique accounts for 2%.

The five most commonly tagged fish species in the ORI Tagging Project are galjoen *Dichistius capensis* (21.3%), dusky kob *Argyrosomus japonicus* (5.5%), dusky shark *Carcharhinus obscurus* (4.5%), garrick/leervis *Lichia amia* (3.9%) and spotted grunter *Pomadasys commersonnii* (3.5%) (Table 3). The large number of galjoen tagged to date is partly due to the institutional scientific tagging that takes place in the De Hoop MPA and on the Cape Peninsula (Attwood 2002). Although there have been a large number of lesser sandsharks/guitarfish *Rhinobatos annulatus* (6 357) tagged (Table 3), the tagging of this species was discouraged from 1998 onwards due to the extremely low recapture rate and the low research priority attributed to this species at that time.

The longest period of time recorded for a fish at liberty (i.e. the length of time a fish was at sea between the initial tagging and first time recaptured) in the ORI Tagging Project is 8 256 d (22.6 years; Table 3), which indicates good tag retention for the tag type (B-tags) used in the project. This record is held by a ragged-tooth shark *Carcharias taurus* tagged at Leven Point near Cape Vidal in KwaZulu-Natal and recaptured 1 033 km away, just south of Mossel Bay in the Western Cape. Similarly, the record for the longest time at liberty for a teleost is held by a red steenbras *Petrus rupestris* that was tagged with an A-tag in the Tsitsikamma MPA in November 1989 and recaptured off Kei Mouth in December 2011. During its 8 080 d (22.1 years) at liberty, this fish travelled a minimum distance of 532 km and grew 370 mm. Both these remarkable recaptures have helped to provide proof of good tag retention time and the longevity of these species, as well as provide important information on their movement patterns. The record for the longest distance travelled by a tagged fish was 2 701 km, made by a yellowfin tuna *Thunnus albacares* tagged off Cape Point and recaptured off Inhambane in Mozambique, only 252 d later. This equates to a mean distance travelled of 10.72 km d^{-1}. The longest distance recorded for an elasmobranch was 2 699 km, again held by a ragged-tooth shark that travelled from Struisbaai in the Western Cape to Beira in northern Mozambique.

The concept of tag and release has been widely accepted in many countries and this is reflected by the development of numerous constituent-based marine tagging projects around the world (Prince et al. 2002, Ortiz et al. 2003). Although the main aims of each project may differ slightly, most of these projects have a common objective, which is to promote the concept of tag and release to fishers and to collect data on fish movements and growth. Table 4 shows a comparison of tagging effort for five well-known cooperative tagging projects from around the world. Considering the length of time that the ORI Tagging Project has been in operation (27 years), in terms of the total number of fish tagged, it stands as one of the more successful cooperative tagging projects worldwide (Table 4). However, it should be noted that within the USA and Australia there are numerous

Table 2: Percentage of fish tagged along the southern African coastline in the ORI Tagging Project over the 27-year period 1984–2011

Region	Percentage of tagged fish
Mozambique	2
KwaZulu-Natal	24
Eastern Cape	27
Western Cape	41
Northern Cape	<0.1
Namibia	6

Table 3: Tag-and-recapture data for the top 10 species tagged in the ORI Tagging Project over the 27-year period 1984–2011

Species	Total tagged	Total recaptured	Recaptured (%)	Average distance travelled (km)	Maximum distance travelled (km)	Average days at liberty	Maximum days at liberty
Dichistius capensis	53 565	3 674	6.9	45	1 892	400	5 118
Argyrosomus japonicus	13 750	825	6.0	30	1 625	330	4 370
Carcharhinus obscurus	11 345	732	6.5	75	1 374	93	2 772
Lichia amia	9 826	680	6.9	257	1 670	336	3 208
Pomadasys commersonnii	8 832	253	2.9	13	823	258	2 950
Carcharhinus brachyurus	8 585	266	3.1	161	1 790	429	3 981
Diplodus capensis	8 324	207	2.5	6	358	269	2 715
Triakis megalopterus	7 743	413	5.3	33	911	514	6 332
Pomatomus saltatrix	7 180	270	3.8	233	1 676	128	1 106
Rhinobatos annulatus	6 357	70	1.1	42	726	335	2 572
Other	116 462	5 725	4.9	63	2 966	325	8 256

other tagging projects that were not considered here. For example, in the USA, the National Marine Fisheries Service (NMFS) has several other tagging projects that fall under their auspices, such as the NMFS Cooperative Shark Tagging Program (Kohler and Turner 2001). The large Billfish Foundation Tagging Project is also run from the USA although it includes many international members. In Australia, most of the other states also have their own provincial tagging programmes (e.g. NEWTAG [New South Wales], VICTAG [Victoria], TASTAG [Tasmania], TOPTAG [Northern Territory]), although none of these are as large as the Australian National Sportfishing Association Tagging Project based in Queensland (i.e. SUNTAG) and some of them are not functional at present (Sawynok 2011). Considering the large number of smaller tagging projects within both the USA and Australia, the overall tagging effort is considerably greater than that undertaken in South Africa. In terms of recaptures, the ORI Tagging Project has one of the higher recapture rates (5.2%) (Table 4). This, however, is obviously related to the types of fish species tagged within each project. The New South Wales Gamefish Tagging Project (NSWGTP), New Zealand Gamefish Tagging Project (NZGTP) and the Cooperative Tagging Centre of the NMFS (NMFSTP) all focus primarily on highly migratory gamefish species, such as billfish and tunas. The recapture rates associated with such migratory species is far lower than with more-resident fish species. As previously mentioned, the ORI Tagging Project has a far broader species range and most elasmobranch and teleost fish species, including more-resident reef fish species, are tagged (Appendix). The SUNTAG and South Carolina Marine Game Fish Tagging Project (SCMGFTP) also tag resident reef fish and elasmobranch species and therefore have higher recapture rates compared to the other projects. Overall, in comparison to other long-term tagging projects, the ORI Tagging Project has produced a significant amount of tagging data and the recapture rate remains relatively high, which bodes well for the continuation of this important long-term project.

Critical review

The results from the ORI Tagging Project represent an important conservation achievement. Information from the Tagging Project has been incorporated into a minimum of 21 post graduate degrees (from Honours to PhD level), 80 scientific journal publications, 74 contributions to books, 93 presentations at scientific conferences and conference proceedings, 28 unpublished reports and 56 data reports that have been used for both academic and management purposes (Table 5). In addition to this, there have been more than 80 talks and tagging demonstrations given to angling clubs and associations, 194 popular articles and newspaper reports, 79 radio broadcasts and at least seven television documentaries, that have highlighted various aspects of the Tagging Project (Table 5). It must be noted that all these values are an absolute minimum and are based on what was found in the literature and those recorded by the Tagging Officer. This project has also played a major role in influencing policy and decision-making on linefish management in South Africa. For example, research into the biology and stock assessment of key linefish species, which has incorporated information from the Tagging Project, has been used to develop species-specific regulations to enable more sustainable use of our linefish resources. Some examples include management of roman *Chrysoblephus laticeps* (Buxton 1992), *L. amia* (van der Elst et al. 1993), *C. puniceus* (Garratt 1993), *D. capensis* (Attwood and Bennett 1994, 1995), *A. japonicus* (Griffiths 1997), *P. saltatrix* (Govender 1996a, 1996b), *P. rupestris* (Brouwer 2002), and many others. However, despite these contributions, the ORI Tagging Project database remains partly underutilised.

Table 5: Total number of publications and popular media communications (considered to be the minimum) that have used data from the ORI Tagging Project as of 2011

Contribution type	Number
Refereed scientific journal publications	80
Theses (Honours to PhD level)	21
Books and chapters/sections in books	74
Refereed reports and conference proceedings	32
Papers and posters given at conferences/workshops	61
Unpublished reports	28
Data reports	56
Public talks and tagging demonstrations to angling groups	>80
Popular magazine articles	141
Newspaper articles	53
Television documentaries/programmes	7
Radio broadcasts	79
Total	632

Table 4: Comparison of tagging effort by five major cooperative tagging projects (ORICFTP = Oceanographic Research Institute Cooperative Fish Tagging Project; NSWGTP = New South Wales Gamefish Tagging Project; NZGTP = New Zealand Gamefish Tagging Project; SCMGFTP = South Carolina Marine Game Fish Tagging Project; SUNTAG = Australian National Sportfishing Association Tagging Project; CTCNMFS = Cooperative Tagging Centre of the National Marine Fisheries Service)

Tagging programme	Initiated	Area of operation	Total members	Total tagged	Recaptured (%)
ORICFTP	1984	South-East Atlantic and South-West Indian oceans	5 130	251 969	5.2
NSWGTP	1973	Indian and South-West Pacific oceans	Unknown	384 243	1.8
NZGTP	1975	South-West Pacific Ocean	Unknown	61 685	3.1
SCMGFTP[2]	1974	North Atlantic Ocean	8 700	134 578	9.0
SUNTAG	1987	South-West Pacific Ocean	8 689	643 200	7.9
CTCNMFS[1]	1954	Atlantic and North Pacific oceans	133 477	314 868	4.4

[1] Known prior to 1995 as the Cooperative Game Fish Tagging Program (CGFTP)
[2] Results include up until end of 2009 only

There is a wealth of valuable data stored in the tagging database that is readily available and needs to be increasingly utilised by both scientists and managers. The database offers more than simple descriptions of fish distributions and movements. There is ample opportunity to include studies on resource use (e.g. distribution of life-history intervals, fish survival, presence or absence of species in catches, understanding sector interactions and allocations), space utilisation (e.g. effectiveness of MPAs, home range size) and population dynamics (e.g. growth rates, stock assessments, stock delineation, identifying straddling or transboundary stocks). Such collaboration is strongly encouraged and is a key aspect for good management of a fishery that is widely dispersed and utilised by a diverse range of users.

In general, the ORI Tagging Project needs to become stricter in terms of what species are prioritised for tagging. Common species, such as blacktail *Diplodus capensis*, lesser sandshark/guitarfish *Rhinobatos annulatus* and slinger *Chrysoblephus puniceus*, have been shown to be less suitable for tagging as there are very few recaptures, possibly as a result of high tag loss/shedding and high induced tagging mortality (Garratt 1993). Although there is a priority species list produced for the project (Appendix), this needs to be better communicated and more strictly implemented with project members. Such a step is achievable; the decreased tagging of *R. annulatus* since 1998 is a good example of this. Further, more focus needs to be directed at other important linefish species, such as king mackerel, queen mackerel, geelbek *Atractoscion aequiden*s, Englishman *Chrysoblephus anglicus*, Scotsman *Polysteganus praeorbitalis* and seventy-four *Polysteganus undulosus*, for which movement and distribution patterns are not yet clearly understood. Funding for the project is also an ongoing issue; therefore, the priority species list might have to be cut considerably in the future in order to focus limited resources. Other similar long-term cooperative tagging projects have been faced with related problems. For example, the CTCNMFS has gradually reduced or eliminated the tag and release of certain inshore pelagic and demersal fish species such as tarpon, grouper, snapper and mackerel (E Orbersen, National Marine Fisheries Service, pers. comm). Similarly, several tagging projects in Australia (NEWTAG, VICTAG, TASTAG and TOPTAG) have become non-functional, and the largest successful tagging project (SUNTAG) has recently taken a funding cut, which has reduced its overall tagging effort (Sawynok 2011).

One of the major problems faced by the ORI Tagging Project, and other similar cooperative tagging projects, is the reporting of recaptured fish by the general angling public. Attempts to quantify the non-reporting of recaptured fish have been made by conducting angler questionnaire surveys. Based on data from 1 200 interviewers of shore- and boat-anglers from KwaZulu-Natal in 2009–2010, Dunlop (2011) reported that 13% of the anglers interviewed had caught a tagged fish during their lifetime. This is a low proportion considering that over 251 000 fish have been tagged to date. Of these anglers interviewed, a surprising 42% had simply released the fish without recording the tag number or had simply not bothered to report it (Dunlop 2011). In other words, nearly half of the tagged fish recaptured were not reported to the Tagging Officer at ORI. Of the remaining 58% of anglers that had ‘reported’ catching a tagged fish, only 70% stated that they had received feedback from ORI about the fish. Therefore, some of this ‘reported’ recapture information may also have gone unrecorded. A similar low reporting rate was recorded by Dicken et al. (2006), who found that 38% of anglers interviewed in South Africa did not report capturing a tagged fish. In contrast to Dunlop (2011) and Dicken et al. (2006), van der Elst (1990) reported that on average only 3% of KwaZulu-Natal recreational anglers did not return tag recaptures. Whereas the latter value was based on a once-off survey soon after the start of the Tagging Project, it emphasises the ongoing need for greater angler awareness about the project and where to report the relevant information on tag recaptures.

Such low reporting rates are quite common in cooperative tagging projects worldwide. For instance, Kohler and Turner (2001) reported that out of 191 tagging studies reviewed, 55% of them had return rates of tagged fish of <5%. Similarly, the NSWGTP (1.8%), NZGTP (3.1%) and CTCNMFS (4.4%) also all have recapture rates of <5% (Table 4). Although most cooperative tagging projects rely on the general angling community (both recreational and commercial) to report the majority of tag recaptures, several other factors can also account for low recapture rates. Some of these include *inter alia* natural mortality of tagged fish, tagging-induced mortality, tag loss/shedding, emigration out of principal tagging areas, variation in fishing effort, experience level of tagging personnel, and incorrect recording of tag or recapture data (Kohler and Turner 2001). As a result of these biases, ORI has developed a number of initiatives to help increase the reporting rate. These include a dedicated e-mail address (oritag@ori.org.za) and cell phone number (+27 79 529 0711); the printing of the cell phone number and e-mail address directly onto the streamers of all new ORI tags, which previously only had a postal address printed on them; the production of an instructional tagging DVD given to both current and new tagging members; and the ongoing improvement of tag types. The poorest tag return rates are recorded from tagging projects that rely solely on mail services (Moring 1980). It is thus envisioned that ultimately the postal address printed on the streamers of the current tags will be removed and only the cell phone number and e-mail address will be printed between the unique tag numbers on each tag. This will allow the font size on each tag to be enlarged and made easier to read. Easily recognised tag legends have been shown to increase tag returns (Kohler and Turner 2001). The issue of biofouling also needs urgent attention (Dicken et al. 2006). Clearly, it is necessary to regularly evaluate the success of any long-term tagging project and, more specifically, the tag types used. For example, it would be advisable to quantify the success of the new ‘M-tag’, that has been recently introduced for tagging billfish in the ORI Tagging Project (see Table 1), in the next few years. Although other cooperative tag-and-release projects have dealt with low recapture rates by introducing a well-publicised reward and/or lottery system for tag returns, the results from such systems have not always been favourable (Davies and Joubert 1966, Green et al. 1983, Denson et al. 2002, Taylor et al. 2006). For example, Taylor et al. (2006) showed that tag recoveries varied from year to year for various monetary rewards (US$5–200) and that the reporting rate for unspecified reward tags decreased after the introduction of the reward system. A shark tagging project based in Durban at ORI in the 1960s also found several difficulties involved in the establishment of such a payment system; one of the biggest problems being the reporting of inaccurate information and fabricated multiple recaptures (Davies and Joubert 1966). Considering these biases and the fact that the ORI Tagging Project has limited funding, the introduction of a reward system is not considered feasible or viable.

One of the factors contributing to the ongoing success of the ORI Tagging Project has been the periodic incorporation of technological advancements, from the introduction of new tag types to the development and improvement of the tagging database. The project's database has been periodically upgraded and in 2009 it was linked to a new web-based system. This has enabled members to access their own tagging data (for viewing only) through the Internet and has greatly improved the accuracy of the data captured by the Tagging Officer. Additionally, recent improvements in the database include the import of tagging data specifically from scientists directly onto the database.

A controversial issue that has arisen in the past few years is that of tagging fish in fishing competitions. Although promoting tag and release in a competition environment seems ideal because fish are released rather than killed, there are numerous problems associated with this. Firstly, because anglers are fishing for points or prizes, they need to comply with certain competition rules, such as line-class strength, and as a consequence, the fight is often of extended duration, especially on lighter tackle. For this reason, many fish captured on light tackle have a decreased chance of survival once landed and tagged. For example, there have been a number of anecdotal reports of anglers tagging dead/dying billfish just to gain the extra points and satisfy the competition rules. Secondly, when a fish is tagged in a competition, the tagging data (i.e. tag number, locality, fish species, etc.) are often misplaced, as after the tagging event there is little priority given to returning the data once the points/prizes for the tagged fish have been awarded. In such competitive situations, we believe that it is better to adopt a 'catch and release' approach as this will ultimately maximise a fish's chance of survival and minimise the tagging of dead or weak fish. It is commonly accepted that tagging should not be encouraged just for the sake of tagging or as the right thing to do. For this reason, some states in the USA strongly discourage tagging or regulate it in some way (Loftus et al. 2000). For tag and release to work in competitions, it is advisable to have trained staff present who can tag fish and record the relevant data independently of the actual competition. Hosting of such organised tagging competitions can produce valuable data and can be used as an avenue to improve angler awareness.

Another weakness of the ORI Tagging Project is the lack of accurate geographical referencing with regards to where a fish is tagged and recaptured. Currently, tag localities are based on a system of locality codes reflecting the distance in kilometres that a locality is situated from the northern Mozambique border. These positions are not GIS-referenced and thus do not provide good information on fine-scale fish movements. Furthermore, if a fish is caught upstream in an estuary or offshore, this information is lost as only one locality code exists for the closest point along the coastline. It should also be noted that the recapture position described by a locality code represents one arbitrary point on the travel route of a fish and is the absolute minimum of the possible distance travelled. Despite this obvious weakness, the project does provide valuable large-scale, longshore movement information. This information has not yet been collected using other methods in South Africa, such as acoustic telemetry. Furthermore, in terms of fish movement, the project provides an excellent platform that supports the MPA tagging studies conducted along the coastline. With one of the primary aims of these studies being to evaluate the spillover of individuals from the MPA into surrounding areas, it would be impossible to evaluate such aims without the cooperative Tagging Project as it would require scientific angling along the entire coastline, which would be prohibitively expensive. The 'harnessing' of the general angling public to assist in reporting recaptures is undoubtedly one of the greatest strengths of this project. Another feature is the long-term nature of this project, which will almost never be matched by a strictly scientific tagging project as funding seldom extends longer than five years. Considering the lack of accurate geographical referencing, the introduction of a GIS-based system would considerably improve the accuracy of the project. This system could then also be linked up to Google Earth to provide a visualisation of fish movement, specifically for tagging members and the public. Such a system has already been achieved with much success in the SUNTAG project run out of Queensland, Australia. Attempts to achieve such a system are being investigated and will hopefully be introduced in the near future.

Although there are a number of limitations and biases associated with the ORI Tagging Project, there are also numerous strengths. For example, the use of conventional external tags by volunteers allows large numbers of fish to be tagged at a relatively low cost. This is in contrast to the use of internal acoustic or archival tags, which are expensive and in most cases difficult and time-consuming to insert (i.e. tags need to be inserted internally under anaesthetic and by trained staff) (Kohler and Turner 2001). Furthermore, internal tags are not highly visible to fishers and have a high initial cost both for the tags and associated detection equipment (Lucy and Davy 2000, Kohler and Turner 2001). The ORI Tagging Project has undoubtedly played an important role in improving angler conservation awareness and knowledge about our linefish resources and has made an important contribution towards changing the views of anglers towards catch and release. For example, the residency and longevity of many angling species determined through tag and recapture was one of the reasons that convinced the leadership of the South African Shore Angling Association (SASAA) to change the structure of their angling competitions to catch and release (B Wareham, SASAA, pers. comm.). Now, instead of killing fish and bringing them to the scale, fish are measured and released and weights (and thus points) are determined through published length/weight relationships (Pradervand et al. 2007). Similarly, other facets of organised angling in

South Africa, including the South African Light-tackle Boat Angling Association (SALTBAA) and the South African Deep Sea Angling Association (SADSAA), are increasingly encouraging catch and release in their angling competitions (BQM pers. obs.). The value of this cooperative tagging project therefore goes far beyond the scientific value of the data collected. Not only do anglers now have a reason to capture and release fish, by tagging they are contributing towards a better understanding of the biology and ultimately the improved conservation of their targeted fish species. The values of angler-based tagging programmes in promoting resource stewardship and conservation principles have been well documented worldwide (Lucy and Davy 2000, Kohler and Turner 2001).

In conclusion, we believe that the information that is available and that continues to be generated from the ORI Tagging Project adequately justifies its continuation. Furthermore, the relative value of such long-term projects is often only realised after many years of perseverance. The ORI Tagging Project has played an important role in improving the knowledge of many of the important linefish species in southern Africa and is considered to be one of the more successful collaborative marine environmental projects of its kind in Africa. To terminate such a successful project will not only be detrimental to marine science and fisheries management in South Africa, but to the greater angling community as well. Many past biases in the project have been overcome and those that still exist are being addressed. The future success of this project will undoubtedly be determined by its continued ability to adapt to new methods and technologies. The incorporation of data from acoustic, archival and satellite tags will strengthen the tagging project considerably and answer many of the movement and migration questions that traditional tags have not been able to. Such tags have already been used successfully in South Africa (Bonfil et al. 2005, Attwood et al. 2007, Cowley et al. 2008, McCord and Lamberth 2009 , Bennett et al. 2011, Childs et al. 2011, Smale et al. 2012). However, it is of vital importance that use of new tagging technologies complements the current conventional tagging methodology and voluntary participation used by the ORI Tagging Project. The opportunity also exists to consider broader use of tagging models (e.g. open population capture–recapture models) for estimating certain population parameters from tagging data (Pine et al. 2003). Incorporation of such models could lead to greater accuracy and precision of parameter estimates from tagging data, which would ultimately improve the overall understanding and management of fish populations (Pine et al. 2003). Future studies could also use the tagging dataset to find evidence for climate-driven changes in fish movement patterns along our coastline. Secure funding continues to challenge the future of this project and new funding opportunities should be pursued.

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References

Anon. 1953. A guide to fish marks: used by members of the International Council for the Exploration of the sea and by some nonparticipant countries (2nd edn). *ICES Journal of Marine Science* 19: 241–289.

Attwood CG. 2002. Spatial and temporal dynamics of an exploited reef-fish population. PhD thesis, University of Cape Town, South Africa.

Attwood CG, Bennett BA. 1994. Variation in dispersal of galjoen (*Coracinus capensis*) (Teleostei, Coracinidae) from a marine reserve. *Canadian Journal of Fisheries and Aquatic Sciences* 51: 1247–1257.

Attwood CG, Bennett BA. 1995. A procedure for setting daily bag limits on the recreational shore-fishery of the South-Western Cape, South Africa. *South African Journal of Marine Science* 15: 241–251.

Attwood CG, Cowley PD. 2005. Alternate explanations of the dispersal pattern of galjoen *Dichistius capensis*. *African Journal of Marine Science* 27: 141–156.

Attwood CG, Cowley PD, Kerwath SE, Naesje TF, Okland F, Thorstad EB. 2007. First tracking of white stumpnose *Rhabdosargus globiceps* (Sparidae) in a South African marine protected area. *African Journal of Marine Science* 29: 147–151.

Bass AJ. 1977. Long-term recoveries of tagged sharks. *Copeia* 1977: 574–575.

Bass AJ, D'Aubrey JD, Kistnasamy N. 1973. Sharks of the east coast of southern Africa. I. The genus *Carcharhinus* (Carcharhinidae). *Investigational Report* No. 33. Durban: Oceanographic Research Institute.

Bennett RH, Childs A-R, Cowley PD, Naesje TF, Thorstad EB, Okland F. 2011. First assessment of estuarine space use and home range of juvenile white steenbras, *Lithognathus lithognathus*. *African Zoology* 46: 32–38.

Bergman PK, Haw F, Blankenship HL, Buckley RM. 1992. Perspectives on design, use, and misuse of fish tags. *Fisheries* 17: 20–25.

Bonfil R, Meÿer M, Scholl MC, Johnson R, O'Brien S, Oosthuizen H, Swanson S, Kotze DJ, Paterson M. 2005. Transoceanic migration, spatial dynamics, and population linkages of white sharks. *Science* 310: 100–103.

Brouwer SL. 2002. Movement patterns of the red steenbras *Petrus rupestrus* tagged and released in the Tsitsikamma National Park, South Africa. *South African Journal of Marine Science* 24: 375–378.

Buxton CD. 1992. The application of yield-per-recruit models to two South African sparid reef species, with special consideration to sex change. *Fisheries Research* 15: 1–16.

Childs A-R, Naesje TF, Cowley PD. 2011. Long-term effects of different-sized surgically implanted acoustic transmitters on the sciaenid *Argyrosomus japonicus*: breaking the 2% tag-to-body mass rule. *Marine and Freshwater Research* 62: 432–438.

Cowley PD, Brouwer SL, Tilney RL. 2002. The role of the Tsitsikamma National Park in the management of four shore-angling fish along the South-Eastern Cape. *South African Journal of Marine Science* 24: 27–35.

Cowley PD, Kerwath SE, Childs A-R, Thorstad EB, Okland F, Naesje TF. 2008. Estuarine habitat use by juvenile dusky kob *Argyrosomus japonicus* (Sciaenidae), with implications for management. *African Journal of Marine Science* 30: 247–253.

Davies DH, Joubert LS. 1966. Tag evaluation and shark tagging in South African waters. *Investigational Report* No. 12. Durban: Oceanographic Research Institute.

De Jager BVD. 1955. The South African pilchard (*Sardinops ocellata*). The development of the snoek (*Thyrsites atun*) a fish predator of the pilchard. *Investigational Report, Division of Sea Fisheries, South Africa* 19.

Denson MR, Jenkins WE, Woodward AG, Smith TIJ. 2002. Tag-reporting levels for red drum (*Sciaenops ocellatus*) caught by anglers in South Carolina and Georgia estuaries. *Fishery Bulletin* 100: 35–41.

Dicken ML, Booth AJ, Smale MJ. 2006. Preliminary observations of tag shedding, tag reporting, tag wounds, and tag biofouling for raggedtooth sharks (*Carcharias taurus*) tagged off the east coast of South Africa. *ICES Journal of Marine Science* 63: 1640–1648.

Dunlop SW. 2011. An assessment of the shore-based and offshore boat-based linefisheries of KwaZulu-Natal, South Africa. MSc thesis, University of KwaZulu-Natal, Durban, South Africa.

Garratt PA. 1993. Slinger – the final analysis? In: Beckley LE, van der Elst RP (eds), *Proceedings of the second South African marine linefish symposium, Durban, October 1992*. *Special Publication* No. 2. Durban: Oceanographic Research Institute. pp 1–20.

Govender A. 1996a. An evaluation of size limits, closed seasons and daily bag limits for *Pomatomus saltatrix* in KwaZulu-Natal. Unpublished Report No. 127. Durban: Oceanographic Research Institute.

Govender A. 1996b. Mark-recapture models for the determination of mortality, migration and growth in *Pomatomus saltatrix* (Teleostei). PhD thesis, University of KwaZulu-Natal, South Africa.

Govender A, Bullen EM. 1999. Improving the data from an angling-supported tagging programme. In: Mann BQ (ed.), *Proceedings of the third Southern African marine linefish symposium, Arniston, 28 April–1 May 1999. Occasional Report* No. 5. South African Network for Coastal and Oceanic Research. pp 109–111.

Green AW, Matlock GC, Weaver JE. 1983. A method for directly estimating the tag-reporting rate of anglers. *Transactions of the American Fisheries Society* 112: 412–415.

Griffiths MH. 1997. Management of South African dusky kob *Argyrosomus japonicus* (Scianidae) based on per-recruit models. *South African Journal of Marine Science* 18: 213–228.

Kohler NE, Turner PA. 2001. Shark tagging: a review of conventional methods and studies. *Environmental Biology of Fishes* 60: 191–223.

Loftus AJ, Waldon J, Fay V, Davy K, Lucy J. 2000. Overview of angler-based tagging programs and management issues. *Fisheries* 25: 8–13.

Lucy J, Davy K. 2000. Benefits of angler-assisted tag and release programs. *Fisheries* 25: 18–23.

Maggs JQ. 2011. Evaluation of the Pondoland marine protected area in protecting key line-fish species and the potential benefit to adjacent fisheries. MSc thesis, University of KwaZulu-Natal, Durban, South Africa.

Maggs JQ, Mann BQ, Cowley PD. 2013. Reef fish display station-keeping and ranging behaviour in the Pondoland Marine Protected Area on the east coast of South Africa. *African Journal of Marine Science* 35: 183–193.

Mann BQ. 2012. St Lucia Marine Reserve surf-zone fish monitoring and tagging project. 2011 Year-end Report No. 18. Durban: Oceanographic Research Institute.

McCord ME, Lamberth SJ. 2009 Catching and tracking the world's largest Zambezi (bull) shark *Carcharhinus leucas* in the Breede Estuary, South Africa: the first 43 hours. *African Journal of Marine Science* 31: 107–111.

McFarlane GA, Wydoski RS, Prince ED. 1990. Historical review of the development of external tags and marks. *American Fisheries Society Symposium* 7: 9–29.

Moring JR. 1980. Nonreporting of recaptures of tagged rainbow trout from an Oregon stream. *The Progressive Fish-Culturist* 42: 113–115.

Newman GG. 1970. Migration of the pilchard *Sardinops ocellata* in southern Africa. *Investigational Report, Division of Sea Fisheries, South Africa* 86.

Ortiz M, Prince ED, Serafy JE, Holts DB, Davy KB, Pepperell JG, Lowry MB, Holdsworth JC. 2003. Global overview of the major constituent-based billfish tagging programs and their results since 1954. *Marine and Freshwater Research* 54: 489–507.

Pepperell JG. 1999. Is there a role for 'uncontrolled' tagging in 'real' fisheries science. In: Hancock DA, Smith DC, Koehn JD (eds), *Fish movement and migration. Australian Society for fish biology workshop proceedings, 28–29 September 1999*, *Bendigo, Victoria*. Sydney: Australian Society for Fish Biology. pp 38–43.

Pine WE, Pollock KH, Hightower JE, Kwak TJ, Rice JA. 2003. A review of tagging methods for estimating fish population size and components of mortality. *Fisheries* 28: 10–23.

Pradervand P, Mann BQ, Bellis M. 2007. Long-term trends in the competitive shore fishery along the KwaZulu-Natal coast, South Africa. *African Zoology* 42: 1–21.

Prince ED, Ortiz M, Venizelos A, Rosenthal DS. 2002. In-water conventional tagging techniques developed by the cooperative tagging center for large highly migratory species. *American Fisheries Society Symposium* 30: 155–171.

Rounsefell GA, Everhart WH (eds). 1953. *Fishery science – its methods and applications*. New York: John Wiley & Sons.

Sawynok B. 2011. SUNTAG research report 2010/2011. Report No. ST-2011-10. Frenchville: Australian National Sportfishing Association Qld Inc and Infofish Australia.

Smale MJ, Booth AJ, Farquhar M, Meÿer MR, Rochat L. 2012. Migration and habitat use of formerly captive and wild raggedtooth sharks (*Carcharias taurus*) on the southeast coast of South Africa. *Marine Biology Research* 8: 115–128.

Taylor RG, Whittington JA, Pine WE, Pollock KH. 2006. Effect of different reward levels on tag reporting rates and behavior of common snook anglers in Southeast Florida. *North American Journal of Fisheries Management* 26: 645–651.

van der Elst RP. 1990. Marine fish tagging in South Africa. *American Fisheries Society Symposium* 7: 854–862.

van der Elst RP, Govender A, Chater SC. 1993. The biology and status of the garrick (*Lichia amia*). In: Beckley LE, van der Elst RP (eds), *Fish, fishers, fisheries. Proceedings of the second South African marine linefish symposium, Durban, October 1992. Special Publication* No. 2. Durban: Oceanographic Research Institute. pp 28–31.

Venter JA, Mann BQ. 2012. Preliminary assessment of surf-zone and estuarine line-fish species of the Dwesa-Cwebe Marine Protected Area, Eastern Cape, South Africa. *Koedoe* 54: 1–10.

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Appendix: Current priority species list in the ORI Tagging Project

Family	Species	Common name
Alopiidae	*Alopias vulpinus*	Thintail thresher shark
Carangidae	*Carangoides ferdau*	Blue/ferdy kingfish
	Carangoides fulvoguttatus	Yellowspotted kingfish
	Carangoides gymnostethus	Bludger
	Caranx heberi	Blacktip kingfish
	Caranx ignobilis	Giant kingfish
	Caranx melampygus	Bluefin kingfish
	Caranx papuensis	Brassy kingfish
	Caranx sexfasciatus	Bigeye kingfish
	Lichia amia	Garrick
	Scomberoides commersonnianus	Talung queenfish
	Seriola dumerili	Greater yellowtail
	Seriola lalandi	Cape yellowtail
	Seriola rivoliana	Longfin yellowtail
	Trachinotus africanus	Southern pompano
	Trachinotus botla	Largespotted pompano
Carcharhinidae	*Carcharhinus amboinensis*	Java shark
	Carcharhinus brachyurus	Copper/bronze whaler shark
	Carcharhinus brevipinna	Longnose blackfin/spinner shark
	Carcharhinus leucas	Zambezi shark
	Carcharhinus limbatus	Blacktip shark
	Carcharhinus melanopterus	Blackfin reef shark
	Carcharhinus obscurus	Dusky shark
	Carcharhinus plumbeus	Sandbar shark
	Carcharhinus sealei	Blackspot shark
	Galeocerdo cuvier	Tiger shark
	Galeorhinus galeus	Soupfin shark
	Prionace glauca	Blue shark
Dichistiidae	*Dichistius capensis*	Galjoen
	Dichistius multifasciatus	Banded galjoen
Dinopercidae	*Dinoperca petersi*	Cavebass
Elopidae	*Elops machnata*	Springer/tenpounder
Haemulidae	*Diagramma pictum*	Sailfin rubberlip
	Plectorhinchus flavomaculatus	Lemonfish
	Plectorhinchus playfairi	Whitebarred rubberlip
	Pomadasys commersonnii	Spotted grunter
	Pomadasys kaakan	Javelin grunter
	Pomadasys multimaculatum	Cock grunter
Hexanchidae	*Notorynchus cepedianus*	Sevengill cow shark
Istiophoridae	*Istiompax indica*	Black marlin
	Istiophorus platypterus	Sailfish
	Makaira nigricans	Blue marlin
	Tetrapturus audax	Striped marlin
Lamnidae	*Isurus oxyrinchus*	Shortfin mako shark
Lethrinidae	*Lethrinus crocineus*	Yellowfin emperor
	Lethrinus nebulosus	Blue emperor
Lobotidae	*Lobotes surinamensis*	Tripletail/lebotes
Lutjanidae	*Aprion virescens*	Green jobfish
	Lutjanus argentimaculatus	River snapper
	Lutjanus rivulatus	Speckled snapper
Odontaspididae	*Carcharias taurus*	Spotted raggedtooth shark
Polyprionidae	*Polyprion americanus*	Wreckfish
Pomatomidae	*Pomatomus saltatrix*	Elf/shad
Rachycentridae	*Rachycentron canadum*	Prodigal son
Rhinobatidae	*Rhynchobatus djiddensis*	Giant guitarfish
Sciaenidae	*Argyrosomus inodorus*	Silver kob
	Argyrosomus japonicus	Dusky kob
	Argyrosomus thorpei	Squaretail kob
	Atractoscion aequidens	Geelbek
	Umbrina robinsoni	Tasselfish/baardman
Scombridae	*Neoscorpis lithophilus*	Stonebream
	Scomberomorus plurilineatus	Queen mackerel
	Thunnus alalunga	Longfin tuna
	Thunnus albacares	Yellowfin tuna

Appendix: (cont.)

Family	Species	Common name
Scyliorhinidae	*Poroderma africanum*	Striped catshark
Serranidae	*Epinephelus andersoni*	Catface rockcod
	Epinephelus chabaudi	Moustache rockcod
	Epinephelus lanceolatus	Brindlebass
	Epinephelus malabaricus	Malabar rockcod
	Epinephelus marginatus	Yellowbelly rockcod
	Epinephelus rivulatus	Halfmoon rockcod
	Epinephelus tukula	Potato bass
	Variola louti	Swallowtail rockcod
Sparidae	*Acanthopagrus berda*	Perch
	Cheimerius nufar	Santer
	Chrysoblephus anglicus	Englishman
	Chrysoblephus cristiceps	Dageraad
	Chrysoblephus gibbiceps	Red stumpnose
	Chrysoblephus laticeps	Roman
	Cymatoceps nasutus	Black musselcracker
	Diplodus hottentotus	Zebra
	Lithognathus lithognathus	White steenbras
	Pachymetopon aeneum	Blue hottentot
	Pachymetopon blochii	Hottentot
	Pachymetopon grande	Bronze bream
	Petrus rupestris	Red steenbras
	Polysteganus praeorbitalis	Scotsman
	Polysteganus undulosus	Seventy-four
	Rhabdosargus globiceps	White stumpnose
	Rhabdosargus sarba	Natal stumpnose
	Sparodon durbanensis	Brusher
Sphyraenidae	*Sphyraena barracuda*	Great barracuda
	Sphyraena jello	Pickhandle barracuda
Sphyrnidae	*Sphyrna lewini*	Scalloped hammerhead
	Sphyrna zygaena	Smooth hammerhead
Triakidae	*Mustelus mosis*	Hardnose smoothhound shark
	Mustelus mustelus	Blackspot smoothhound shark
	Mustelus palumbes	White spotted smoothhound shark
	Scylliogaleus quecketti	Flapnose houndshark
	Triakis megalopterus	Spotted gullyshark
Xiphiidae	*Xiphias gladius*	Broadbill swordfish