

## CFRAMP'S LARGE PELAGIC FISH TAGGING PROGRAM

Susan Singh-Renton<sup>1\*</sup> and John Renton<sup>2</sup>

<sup>1</sup>CRFM Secretariat, Core's Building, Halifax Street, St. Vincent & The Grenadines

\*Corresponding author. E-mail [ssinghrenton@vincysurf.com](mailto:ssinghrenton@vincysurf.com).

<sup>2</sup>Science Department, Girls' High School, St. Vincent & The Grenadines.

**ABSTRACT** CFRAMP's Large Pelagic Fish Tagging Program was established to examine the distribution and movement patterns of *Thunnus atlanticus* (blackfin tuna), *Acanthocybium solandri* (wahoo), *Coryphaena hippurus* (dolphinfish), and *Scomberomorus cavalla* (king mackerel), large pelagic fish species of commercial importance to several Caribbean countries. The Program explored several means to facilitate fish tag and release activities, involving collaborative partnerships with national fisheries administrations, the recreational fishing sector, and individual commercial fishers. A total of 1,143 fish were tagged and released in the coastal waters of several islands within the Eastern Caribbean: 787 blackfin tuna, 250 wahoo, 89 dolphinfish, and 17 king mackerel. To date, only 13 recaptures have been reported. Eleven (11) blackfin tuna, released in the coastal waters of St. Vincent and the Grenadines were recaptured near to, or at original release sites after times at liberty ranging from 5 d to 1,230 d. Similarly, 2 king mackerel, released off the west coast of Trinidad, were recaptured very near original release sites after 74 and 129 d at liberty.

El Programa de Marcado de CFRAMP, para peces pelágicos grandes fue establecido para examinar los patrones de movimiento y distribución de *Thunnus atlanticus* (atún aleta negra), *Acanthocybium solandri* (peto), *Coryphaena hippurus* (dorado común), y *Scomberomorus cavalla* (carite lucio), especies de importancia comercial para varios países del Caribe. El Programa exploró varios medios de facilitar actividades de marcaje y liberación, consistiendo en colaboración conjunta con administraciones de pesquerías nacionales, el sector recreativo, y pescadores comerciales individuales. Un total de 1,143 peces fueron marcados y liberados en las aguas costeras de varias islas localizadas dentro del Caribe del Este: 787 atunes aleta negra, 250 petos, 89 dorado comunes, y 17 carite lucios. Hasta ahora, solo 13 peces han sido recuperados. Once (11) atunes aleta negra, liberados en las aguas costeras de San Vicente y las Granadinas fue recuperado cerca de, o en los puntos de liberación después de varios días en la libertad, entre 5 d hasta 1,230 d. Del mismo modo, 2 peces de carite lucio, liberados en la costa de oeste de Trinidad, fueron recuperados muy cerca de sus puntos originales de liberación después de 74 y 129 d en la libertad.

### INTRODUCTION

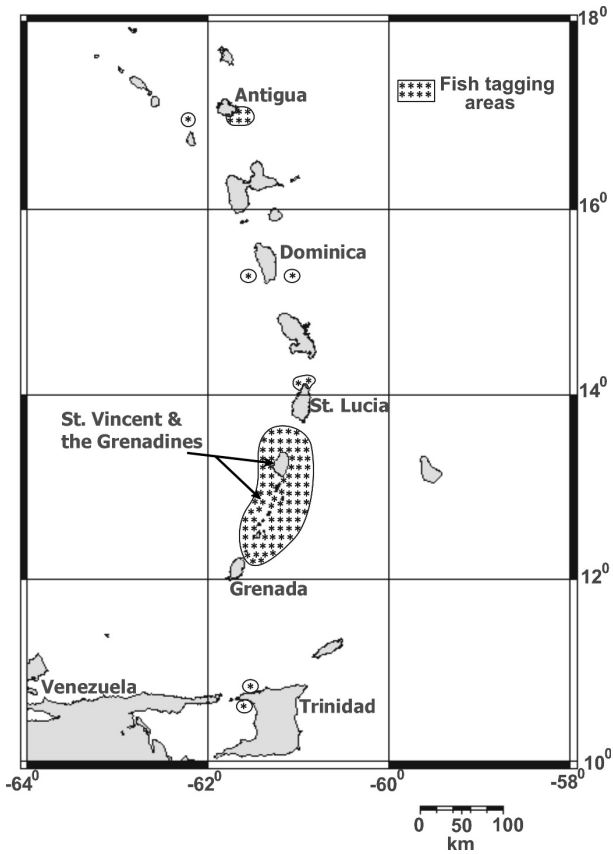
Various studies have considered the issue of stock identification and distribution of small tuna-like species in the Caribbean (e.g., Constantine 2002, Fable 1990, Oxenford and Hunte 1986a, 1986b). In the Eastern Caribbean, there is evidence that stocks of small tuna-like species and other large pelagic fish species such as dolphinfish are shared based on synchrony in annual abundance trends, and similarity of fishing seasons among neighboring islands (Hunte 1987). The extent of resource sharing among countries of the region has not been quantified. Analyses of size frequency data suggest that the fisheries in this area harvest only a section of the overall fish stocks concerned (George et al. 2001, Parker et al. 2001). Improved understanding of the distributions of these stocks, their movement patterns, and the extent of sharing among fisheries in the region is essential for achieving successful management at the appropriate sub-regional and regional levels.

Fish movement patterns are usually investigated with tagging experiments (e.g., Ortiz 2001). Population parameters such as growth, fishing and natural mortality, and population size can also be derived from tagging data (e.g., Porch 1999, Ortiz et al. 2003). The CARICOM (Caribbean Community)

Fisheries Resource Assessment and Management Program (CFRAMP), which was a co-operative program of 12 Caribbean countries during 1991-1999, established a Large Pelagic Fish Tagging Program to obtain information on the movement patterns and distributions of the stocks of *Thunnus atlanticus* (blackfin tuna), *Acanthocybium solandri* (wahoo), *Coryphaena hippurus* (dolphinfish), and *Scomberomorus cavalla* (king mackerel), large pelagic fish species of regional commercial importance.

### MATERIALS AND METHODS

Fish were caught with either rod and reel gear or trolling gear, using artificial bait deployed at depths of  $\leq 50$  m. For tagging purposes, each fish was usually brought into the boat and placed on its side on a wet mat or sponge. When necessary, the head of the fish was covered with a damp cloth to keep the fish calm. Badly hooked or damaged fish were not used for tagging purposes. Fish were measured for straight fork length (FL), usually to the nearest 0.1 cm, using a commercial tape measure, and weight was estimated using length-weight relationships developed by Battaglia (1993). Each fish was tagged with a single-barb, yellow dart tag used to tag similar pelagic fish

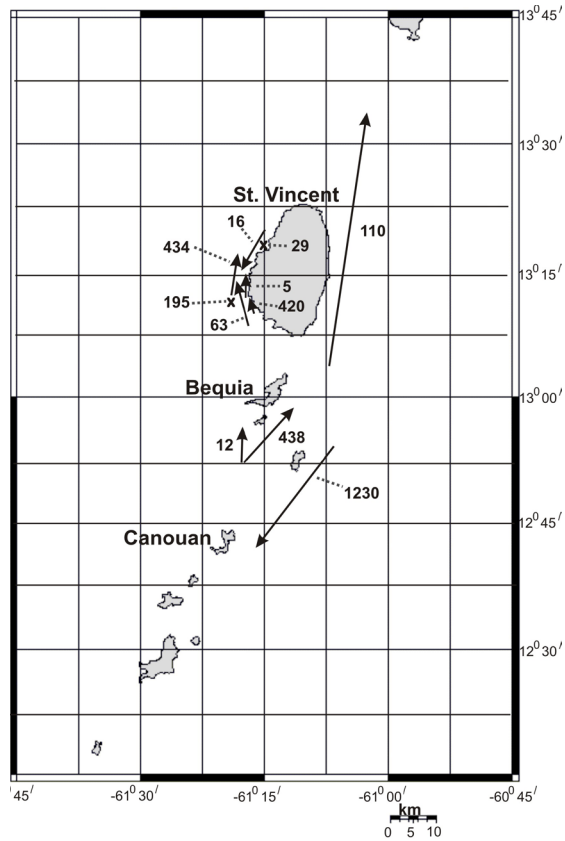


**Figure 1.** Chart showing island areas in the Eastern Caribbean in which fish tagging activities occurred during the implementation of CFRAMP's Large Pelagic Fish Tagging Program.

species (Fable 1990). After tagging, the fish was quickly returned to the water and observed to ensure that it swam away normally. Any signs of distress were recorded.

During fish tag releases, we recorded tag number, release date, tagger's name, release location, species released, fish size, gender of fish for dolphinfish, fish condition, fish activity upon release, gear and bait used, and depth of fishing. Fish recapture data included tag number, species recaptured, recapture date and location, fish size, gender of fish (if known), fishing gear type, fisher contact details, and data recorder's name. Tag release and recapture data were recorded on data cards, and tag recapture cards were printed in English, Spanish, French, and Portuguese, to facilitate reporting by the range of countries present in and adjacent to the Caribbean region.

We explored several arrangements to facilitate fish tag and release activities. Collaborative partnerships with national fisheries administrations in Dominica, St. Vincent and the Grenadines, and Grenada facilitated tagging during 1-day commercial fishing trips. Fish tagging was also conducted during 3 sportfishing tournaments. A 1-day tournament was held in St. Lucia in May 1997 involving 7



**Figure 2.** Chart showing the release and recapture positions of 11 blackfin tuna. Each arrow links the release and recapture sites indicating general direction of movement, and the number adjacent to each arrow gives the total number of days at liberty. The symbol 'X' indicates those fish released and recaptured at the same site.

boats. Two 1-day tournaments were held on the Grenadine island of Bequia in July 1996 and July 1997, involving 3 and 7 boats, respectively. Collaborative partnerships with 2 individual commercial fishers in St. Vincent and the Grenadines allowed Tagging Program staff to participate in 1-day commercial fishing trips in this area on a regular basis from March 1997 to June 1999. The commercial fishers received payment for every fish tagged and released, based on the estimated weight. A recreational fisher volunteer program was active during June 1996 to June 1999 and included over 20 volunteers in Antigua and Barbuda, St. Lucia, St. Vincent and the Grenadines and Trinidad and Tobago.

The Tagging Program was advertised using posters, brochures, tee-shirts, and newspaper and television media. A network of tagging correspondents within the Caribbean region was established, and posters were printed in the same 4 languages as tag recapture cards. A cash reward and a Program tee-shirt were offered to fishers for recaptured fish and for providing data.

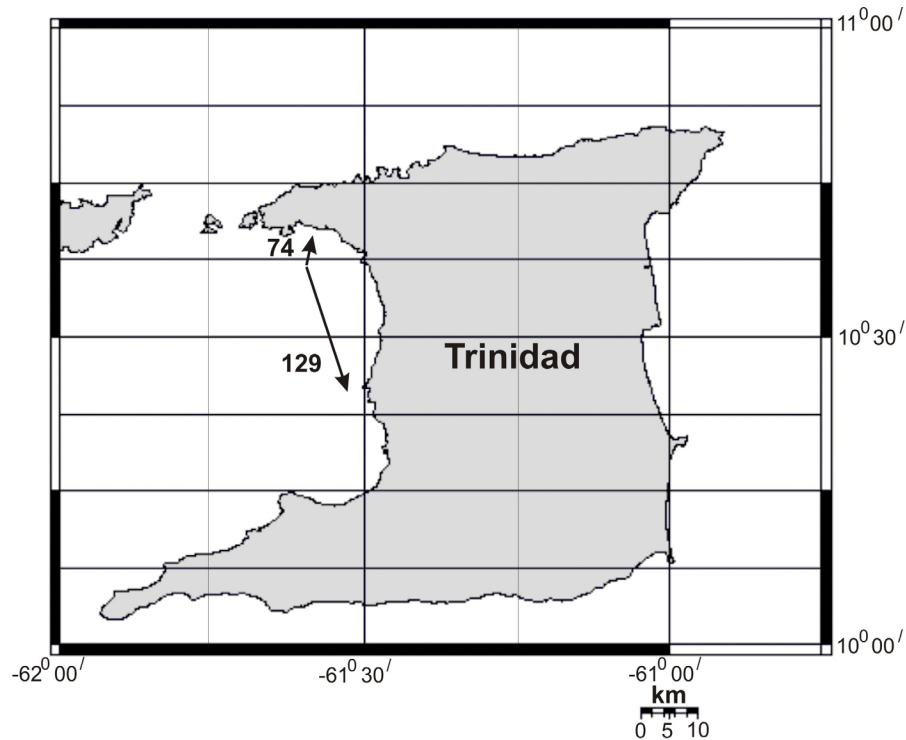


Figure 3. Chart showing the release and recapture locations of 2 king mackerel. Each arrow links the release and recapture sites indicating general direction of movement, and the number adjacent to each arrow gives the total number of days at liberty.

## RESULTS AND DISCUSSION

The tagging procedure worked well, and fish were tagged, measured, and released within 30 sec or less, using minimal effort and space. Also, the single-barb dart tags were securely fixed in the observed recaptures, although, the recapture rate for taggers varied notably, with a maximum recapture rate of 22%. Additional studies will be needed to estimate the effects of both tag shedding and tag reporting. The 3 national fisheries administrations completed 9 field trips and tagged and released 35 fish. During the 3 fishing tournaments, 35 fish were tagged and released. Individual recreational fisher volunteers recorded 294 fish tag releases. By far, the most productive, as well as cost-effective, method involved working directly with individual commercial fishers which facilitated 256 fishing trips and 779 fish tag releases.

Most fish tag releases occurred in St. Vincent and the Grenadines (997), with some fish tag releases achieved also in the waters of Antigua and Barbuda (86), Dominica (18), St. Lucia (13), Grenada (15), and Trinidad and Tobago (14) (Figure 1). A total of 1,143 fish were tagged and released: 787 blackfin tuna; 250 wahoo; 89 dolphin-fish; and 17 king mackerel. The variation in number of fish tag releases with species was influenced primarily by market preferences (commercial fishers) and personal taste

preferences (recreational fishers) that favoured the tag and release of blackfin tuna above the other 3 species. Fish tag releases occurred throughout the year, except for king mackerel which were tagged and released during a 1-day recreational fisher volunteer effort in Trinidad and Tobago. The size range of fish tagged and released was 15–89 cm FL for blackfin tuna, 35–130 cm FL for dolphinfish, 50–96 cm FL for king mackerel, and 46–125 cm FL for wahoo.

The rate of tag returns varied among the species. This may have been due to species differences in tag shedding and reporting rates, as well as species differences in survival rate and movement and migration patterns. Reported fish tag recaptures were 11 blackfin tuna and 2 king mackerel. The blackfin tuna were originally released in the coastal waters of St. Vincent and the Grenadines and were recaptured near to, or at, release sites after a time at liberty ranging from 5 to 1,230 d (Figure 2). The 2 king mackerel recaptures also occurred near release sites off the west coast of Trinidad after 74 and 129 d at liberty (Figure 3).

Large pelagic fish, especially tunas, aggregate in areas of upwelling (Ramos and Sangra 1992) and ocean fronts that provide favorable feeding conditions (Fiedler and Bernard 1987). It may be argued that large pelagic fish would take advantage of high prey densities occurring on a local scale, and local occurrence of schools of prey species may attract these migratory fish to stay longer than expected in small sea areas.

When recaptures from different areas of St. Vincent and the Grenadines are compared, the higher number of fish recaptures taken near, or at their release sites along the west coast may be linked to the fact that these are inshore areas. These areas are characterized by tidal currents that interact with a narrow shelf edge and submerged banks to create a local upwelling action that tends to concentrate and attract schools of small prey. These local prey concentrations have the potential to attract predatory fish such as the blackfin tuna on a regular basis for periods of time. In contrast, the 2 blackfin tuna recaptures that were furthest from their release site, had originally been caught, tagged and released off the east coast of St. Vincent and the Grenadines in offshore areas with more oceanic conditions, and where prey might be expected to be more patchily distributed and also more mobile.

In the case of king mackerel, the 2 fish recaptures appeared to have moved only short distances despite one fish being at liberty for 129 d. As with blackfin tuna, these fish were tagged in an area where the tidal currents interact with shoreline features to produce local areas of comparatively high productivity. While food supply and currents may influence residence time, as well as the rate of movement for the king mackerel in this area, other factors such as salinity are thought to affect the movement of king mackerel around the island (Sturm 1978, Sturm et al. 1984). Further studies are needed to confirm the proposed patterns and their causes.

#### ACKNOWLEDGMENTS

This study was made possible by CFRAMP, which was supported financially by the Canadian International Development Agency (CIDA) and the 12 Caribbean governments that participated in CFRAMP. We are very grateful to all those fisheries officers, fishers, and other individuals who contributed to fish tag releases and who assisted with the reporting of tag recaptures.

#### LITERATURE CITED

- Battaglia, A. 1993. Les Grands Poissons Pélagiques à La Martinique et en Région Caraïbe. Biologie et pêche. Institut Français de Recherche pour l'Exploitation de la Mer (IFREMER), Le Robert, Martinique, 86 p.
- Constantine, S.L. 2002. RAPD analysis of genetic variation in wahoo, *Acanthocybium solandri*, in the western central Atlantic. M.Sc. Research Paper. University of the West Indies, Barbados, 97 p.
- George, S., S. Singh-Renton, and B. Lauckner. 2001. Assessment of wahoo (*Acanthocybium solandri*) fishery using Eastern Caribbean data. In: S. Singh-Renton, ed. Report of the 2000 Caribbean Pelagic and Reef Fisheries Assessment and Management Workshop. CARICOM Fishery Report No. 9. CRFM, Belize City, Belize, p. 25–40.
- Parker, C., S. Singh-Renton, A. Hackett, and F.B. Lauckner. 2001. Assessment of dolphinfish (*Coryphaena hippurus*) fishery using Eastern Caribbean data. In: S. Singh-Renton ed. Report of the 2000 Caribbean Pelagic and Reef Fisheries Assessment and Management Workshop. CARICOM Fishery Report No. 9. CRFM, Belize City, Belize, p. 41–53.
- Fable, W.A. Jr. 1990. Summary of king mackerel tagging in the southeastern USA: Mark-recapture techniques and factors influencing tag returns. In: N.C. Parker, A.E. Giorgi, R.C. Heidinger, D.B. Jester Jr., E.D. Prince, and G.A. Winans, eds. American Fisheries Society Symposium, 7, Proceedings of the International Symposium and Educational Workshop on Fish-Marking Techniques, Seattle, WA, USA, p. 161–167.
- Fiedler, P.C. and H.J. Bernard. 1987. Tuna aggregation and feeding near fronts observed in satellite imagery. *Continental Shelf Research* 7:871–881.
- Hunte, W. 1987. Summary of the available data base on oceanic pelagic fisheries in the Lesser Antilles. In: R. Mahon ed. Report and Proceedings of the Expert Consultation on Shared Fishery Resources of the Lesser Antilles Region. FAO Fisheries Report, No. 383. FAO, Rome, Italy, p. 125–176.
- Ortiz, M. 2001. Review of tag releases and recaptures for yellowfin tuna from the U.S. CTC program. ICCAT Collective Volume of Scientific Papers 52:215–221.
- Ortiz, M., E.D. Prince, J.E. Serafy, D.B. Holts, K.B. Davy, J.G. Pepperell, M.B. Lowry, and J.C. Holdsworth. 2003. Global overview of the major constituent-based billfish tagging programs and their results since 1954. *Marine and Freshwater Research* 54:489–507.
- Oxenford, H. and W. Hunte. 1986a. A preliminary investigation of the stock structure of the dolphin, *Coryphaena hippurus*, in the Western Central Atlantic. *Fishery Bulletin* 84:451–460.
- Oxenford, H. and W. Hunte. 1986b. Migration of the dolphin (*Coryphaena hippurus*) and its implications for fisheries management in the Western Central Atlantic. *Proceedings of the Gulf and Caribbean Fisheries Institute* 37:95–111.
- Porch, C.E. 1999. Estimating Atlantic bluefin tuna mortality from the release and recapture dates of recovered tags. ICCAT Collective Volume of Scientific Papers 49:327–333.
- Ramos A.G. and P. Sangra. 1992. Características oceanográficas en al Area de Canarias: Relación con la Pesquería de Listado (*Katsuwonus pelamis*). ICCAT Collective Volume of Scientific Papers 39:289–296.
- Sturm, M.G. 1978. Aspects of the biology of *Scomberomorus maculatus* (Mitchell) in Trinidad. *Journal of Fish Biology* 13:155–172.
- Sturm, M.G., M. Julien, and P. Salter. 1984. Exploitation and biology of the mackerel fishery in Trinidad. *Proceedings of the Gulf and Caribbean Fisheries Institute* 36:142–151.