Best practice standards for inserting body cavity tags in tropical tunas

Over the past 30 years, technological progress has enhanced biologging science, providing access to biological and environmental data in otherwise difficult to access habitats. The miniaturisation of electronic boards and sensors, and improvements in memory storage capacities and battery life has facilitated the use of animal-attached tags, such as those deployed in tropical tunas. The literature on best practices is limited for marine species, and near absent for tunas despite their regular application. In late 2022, the Fisheries and Ecosystem Monitoring and Analysis Section of the Pacific Community (SPC) collaborated with several tuna scientists to produce a manual listing *Recommendations towards the establishment of best practice standards for handling and intracoelomic implantation of data-storage and telemetry tags in tropical tuna* (Leroy et al. 2023). The present article summarises some of these recommendations.

The collection of data on animal movements and behaviour linked to their environment is now playing an important role in the conservation of some highly mobile marine species (e.g. turtles, birds, cetaceans). In recording some of the habitat parameters these species rely on, biologging also serves to augment oceanographic data collections.

The archival and telemetry tags, also called body cavity tags (BCTs), that SPC deploys on tropical tunas (see Fig. 1) have revealed fascinating information on the behaviour of these fish (see article in SPC Fisheries Newsletter 141) and their interaction with the fishing gear used to harvest their population all around the world.

The behaviour and physiology of those very active predators determines the internal implantation (Fig. 1) of the tags in their body cavity for the achievement of long-term deployments and appropriate data-series records. To maximise fish survival chances and minimise the potential for fish stress to induce post-release abnormal behaviour records, fish handling and surgical process require adoption of carefully established practices that are summarised in Figure 2 and described in detail in our recently published article (Leroy et al. 2023).

Figure 1: Two types of BCTs (on the left), and a tag implantation in a yellowfin tuna (right) demonstrating:
1 an insertion point for a sea-water hose to irrigate fish gills; 2 the positioning the fish ventral side up, taking care not to damage any fins;
3 positioning the tail to avoid possible contact with hard parts of the cradle frame when the fish's length is larger than the cradle length;
4 securing of the cradle on the vessel working deck; and 5 the cradle design with stable legs that ensures it is at a comfortable height for BCT implantation.

Some important tips (illustrated in Fig. 3)

- Bright lights increase the stress on a fish as soon as it is removed from the water. To minimise this, the tuna's eyes should be covered as soon as possible by a seawater-soaked chamois that will be stay in place until the fish is returned to the ocean.
- Positioning the fish belly-up induces a "tonic immobilisation", a kind of natural paralysis that allows quick tag implantation. The V-shaped cradle facilitates the process by safely maintaining the fish ventral side up.
- The slime that covers fish skin and scales plays a vital role in a fish's bodily functions, and forms a protective barrier against bacteria, fungi and viruses. Slime preservation is, therefore, highly important and requires minimal and careful fish handling, with all contact surfaces smooth and wet.

The described recommended practices have been established with experience gained from 3195 surgeries performed during tagging experiments implemented in the western and central Pacific Ocean. Over 87% of those BCTs were deployed by the Pacific Tuna Tagging Programme since this project first started in 2006. The data downloaded from recovered BCTs was used to investigate the possible impacts from the surgery on tuna behaviour and survival. Although this data analysis revealed the existence of some effects on individual behaviour, some direct observation of short-term recoveries (3–90 days) gave evidence of rapid incision healing (healed and closed in less than a week) and a rapid return to common behaviour after release.

We believe that the recommended practices could be used as a reference guide to help minimise the negative impacts of BCT implantation, prioritise animal wellbeing, and lead to minimal long-term impacts on tagged individuals.

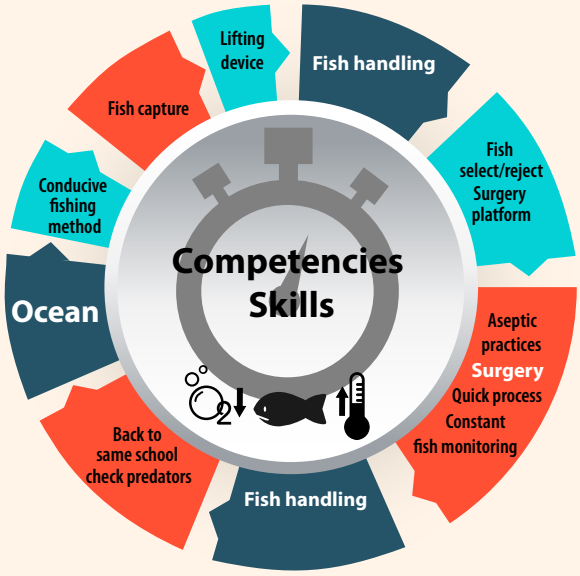

Figure 2: From the capture of a fish to its release back in the ocean, all processing steps need to be sensibly and quickly performed by trained and competent persons to minimise fish distress (enhanced by the raising of animal internal temperature and oxygen deficit) and maximise the fish's chance of survival.

Reference

Leroy B., Scutt Phillips J., Potts J., Brill R.W., Evans K., Forget F., Holland K., Itano D., Muir J., Pilling G. and Nicol S. 2023. Recommendations towards the establishment of best practice standards for handling and intracoelomic implantation of data-storage and telemetry tags in tropical tunas. Animal Biotelemetry 11(1):1–1. https://rdcu.be/c4jru

For more information:

Bruno Leroy
Fisheries Scientist (Ecosystem Monitoring), SPC
brunol@spc.int

Figure 3: This bigeye tuna's eyes are covered by a seawater-soaked chamois cloth, while it is brought belly-up to the V-shaped surgery cradle. Note the smooth and wet examination gloves and the soft vinyl covered cradle berth (made of plywood and closed-cell EVA foam). ©SPC