Tagging of bluefin tuna (*Thunnus thynnus*) with microchips for the purpose of individual growth estimation in cage culture

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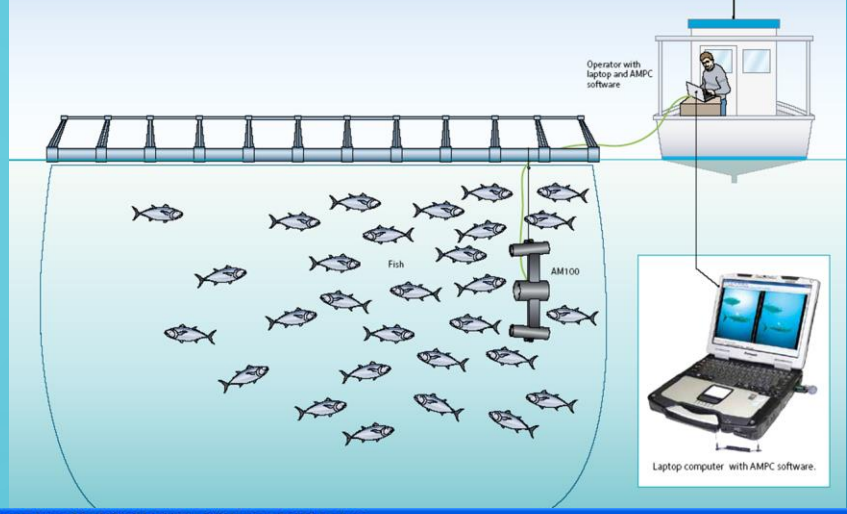
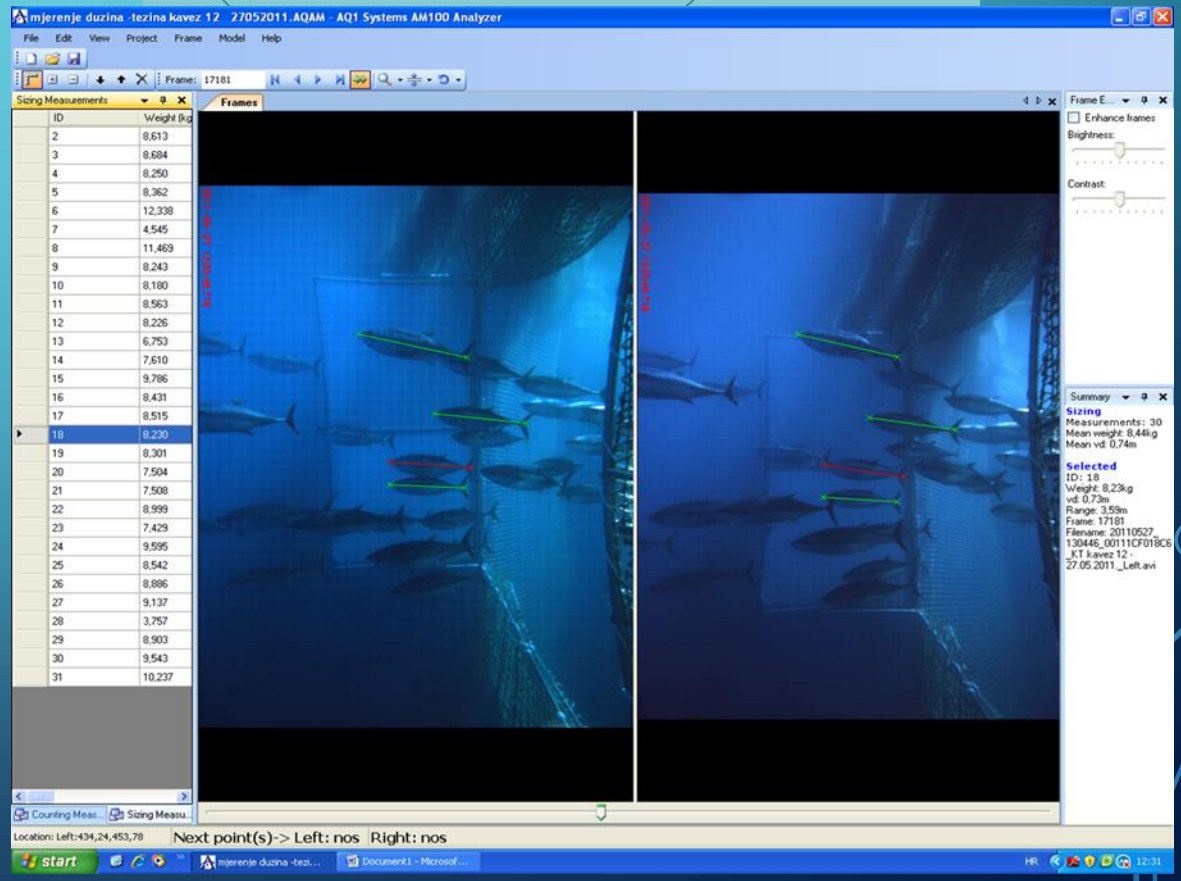
Pelagos NET FARMA

Following intensive fattening operations in several Mediterranean countries in the late 1990s a very strong impact on BFT fisheries and its management was made.

With the purse seine captured fish being transferred to fish farms, apparently, catches were frequently under reported, and the size composition of fish entering fish farms remains a challenge. The appropriateness of a non-invasive stereoscopic video monitoring with respect to the size estimates over the time of farming/fattening continue to be discussed. In spite of some available data on bluefin tuna size structure at caging, the size information at harvesting or from markets do not always match predicted growth factors.

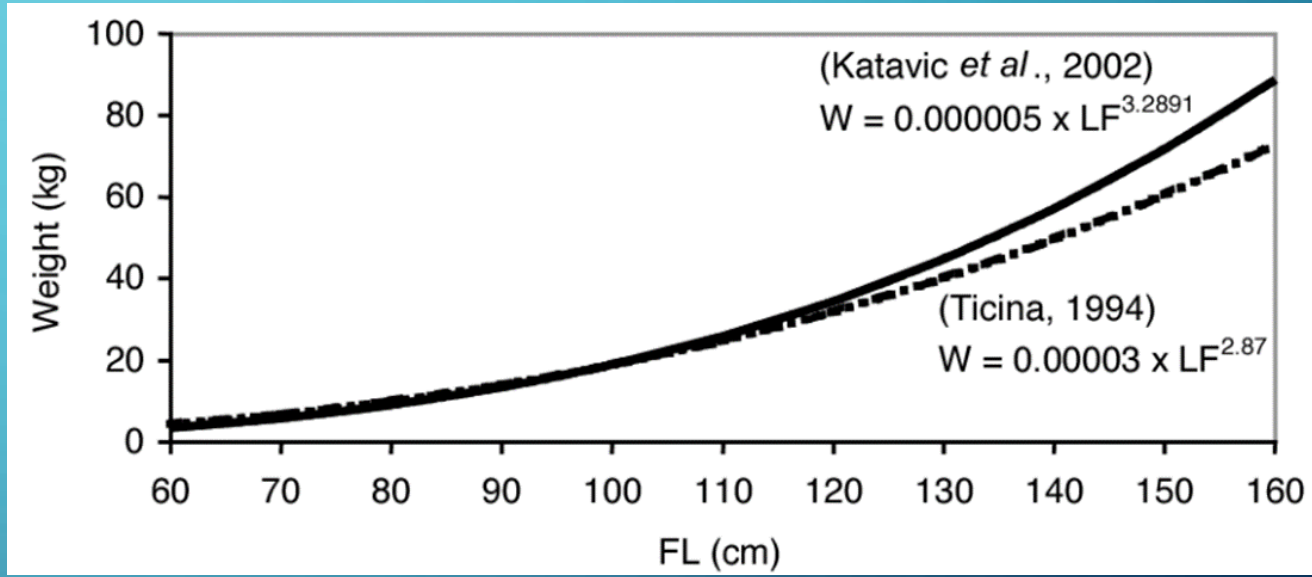




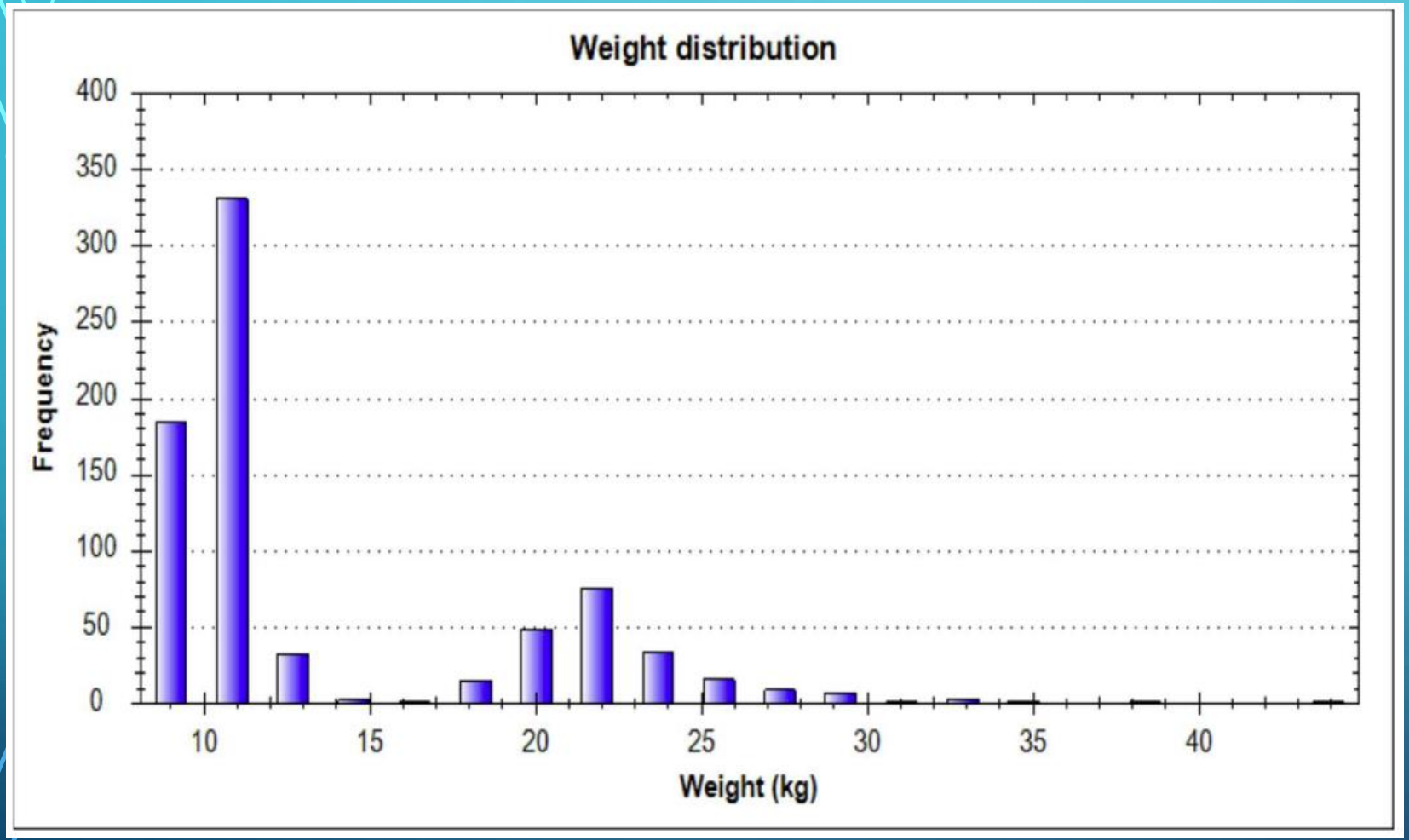
At the 21st Meeting of the Commission (ICCAT), the SCRS was requested to provide an update on the potential growth rates of bluefin tuna in farming/fattening facilities, with the aim of improving the consistency of the growth rates derived from eBCD s, as stipulated in paragraph 28 of Rec. 18-02. Namely, it is recognized that the growth rates derived from the eBCDs are not coherent with the SCRS tables and growth rates published in 2009 by the SCRS.

Therefore the SCRS has asked CPCs to undertake studies as to consider the difference among geographic area (including Atlantic and Mediterranean), and the different farming/fattening strategies in providing an update on the potential growth rates of bluefin tuna.

Consequently, the Atlantic-Wide Research Programme for Bluefin Tuna (GBYP) was committed to undertake scientific studies in selected farms to **identify growth rates including in weight and size gains of recognizable individual fish during the farming/fattening period** along the eastern Atlantic and Mediterranean.



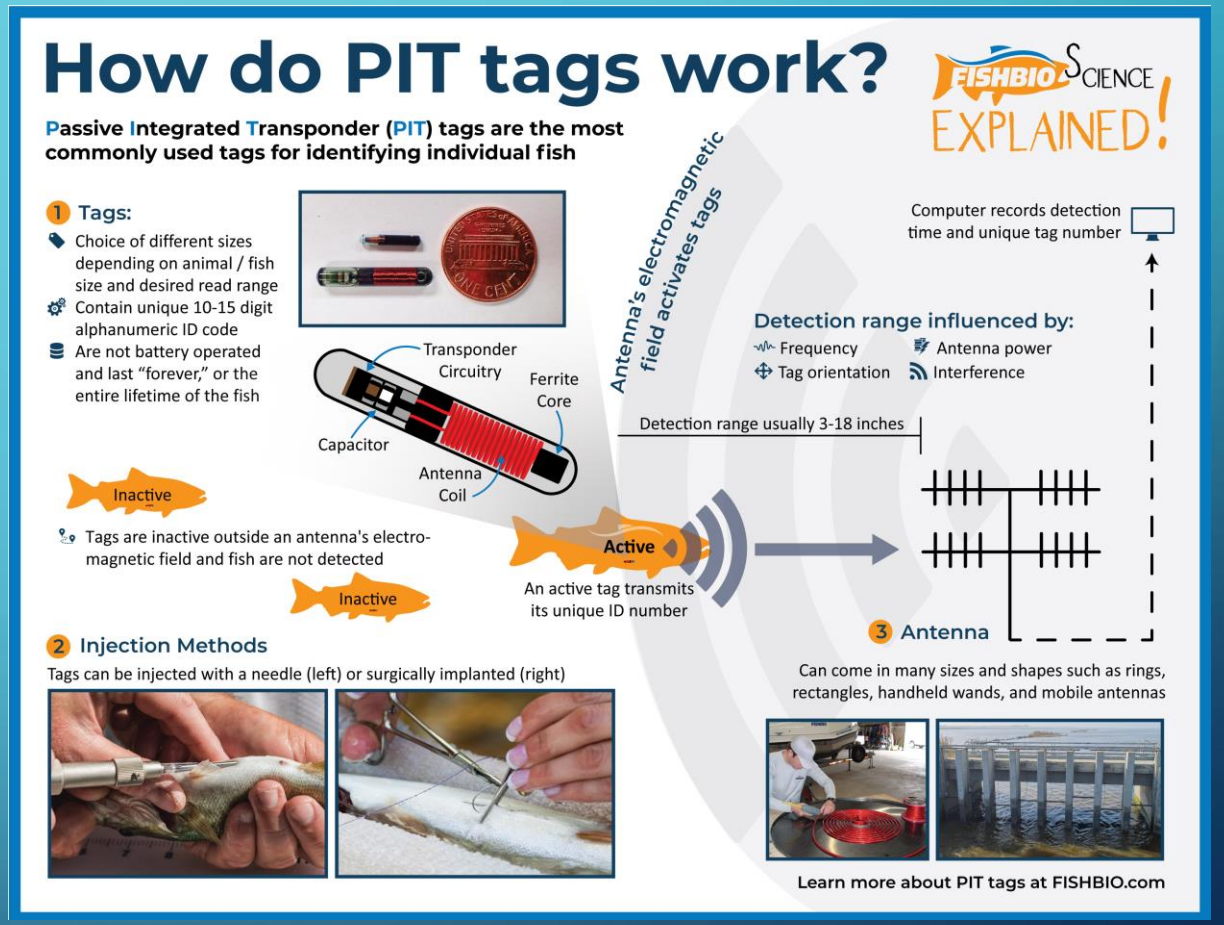
Juvenile Bluefin tuna were collected in 2019 from 6 individual purse seine catches during regular fishing season in the central Adriatic. The experimental trial was performed at the commercial tuna farm Balabra located in the central eastern Adriatic which capacity is 1.200 tonnes in 14 cages At rearing site fish were distributed into two experimental cages, one of this containing 1506 fish and 1688 respectively.



Based on standardized age-length key for the East Atlantic and Mediterranean (Rodriguez Marin at al., 2016) majority of fish belong to age 2+, and far less to age 3+. Captured fish estimated in total quantity of 3.194 pcs and 40.806 kg, average weight 13 kg were kept alive, transferred to towing cages.

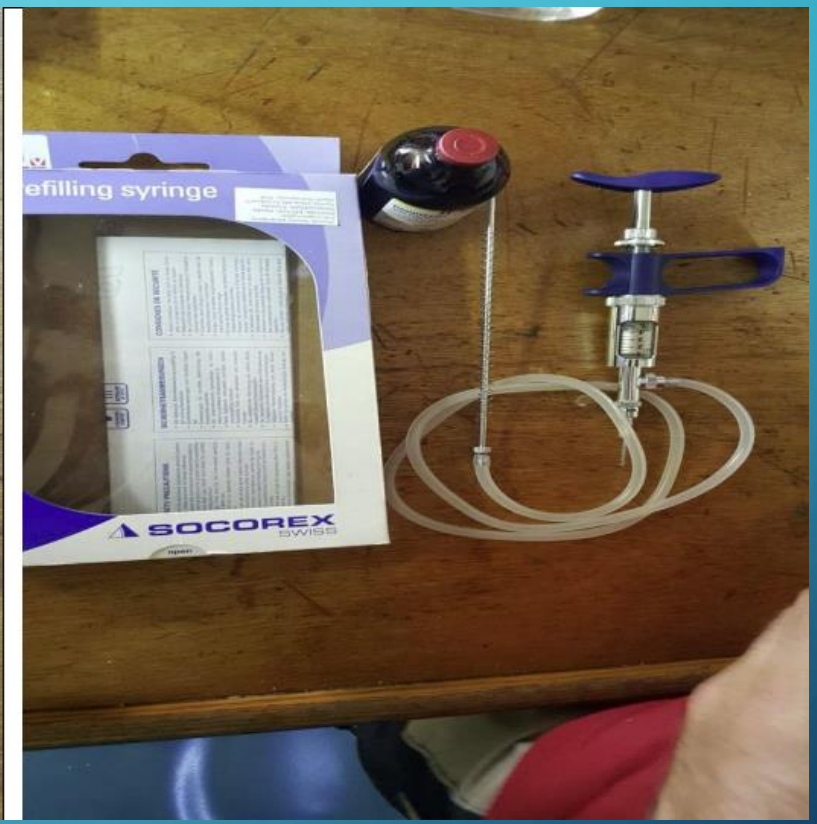
In total, 12 bluefin tuna juveniles were sampled from cage HRV011005, tagged with external clips combined with the cutting of the second dorsal fin. In the first week following tagging two fish died, both were examined and processed by the scientists involved. Unfortunately, the results were not promising. The markers fell from the anal or second dorsal fin.

PIT tags (Passive Intergrated Transmitter), are tracking tags that do not require power. Instead, they have an internal microchip that is activated when it passes close to a special antenna. The antenna is connected to a computer that records the identity of the tag.



During five days, total of 206 bluefin tuna juveniles were hooked and marked by inserting PIT
tag into a muscle on the top of the head. Age of tagged fish were estimated 2+ years (approx.
160 ind.) and 3+ years (>40 individuals).

- in order to prevent infection at the injection area, iodine based antiseptic cream (10% povidone iodine, propolis, cold-pressed herbal oils, lanolin and beeswax) was applied.
- creame properties: antimicrobial, anti-inflammatory and regenerative.
- oxytetracicline injectione during tagging applied to each tagged fish in a prescribed dose.

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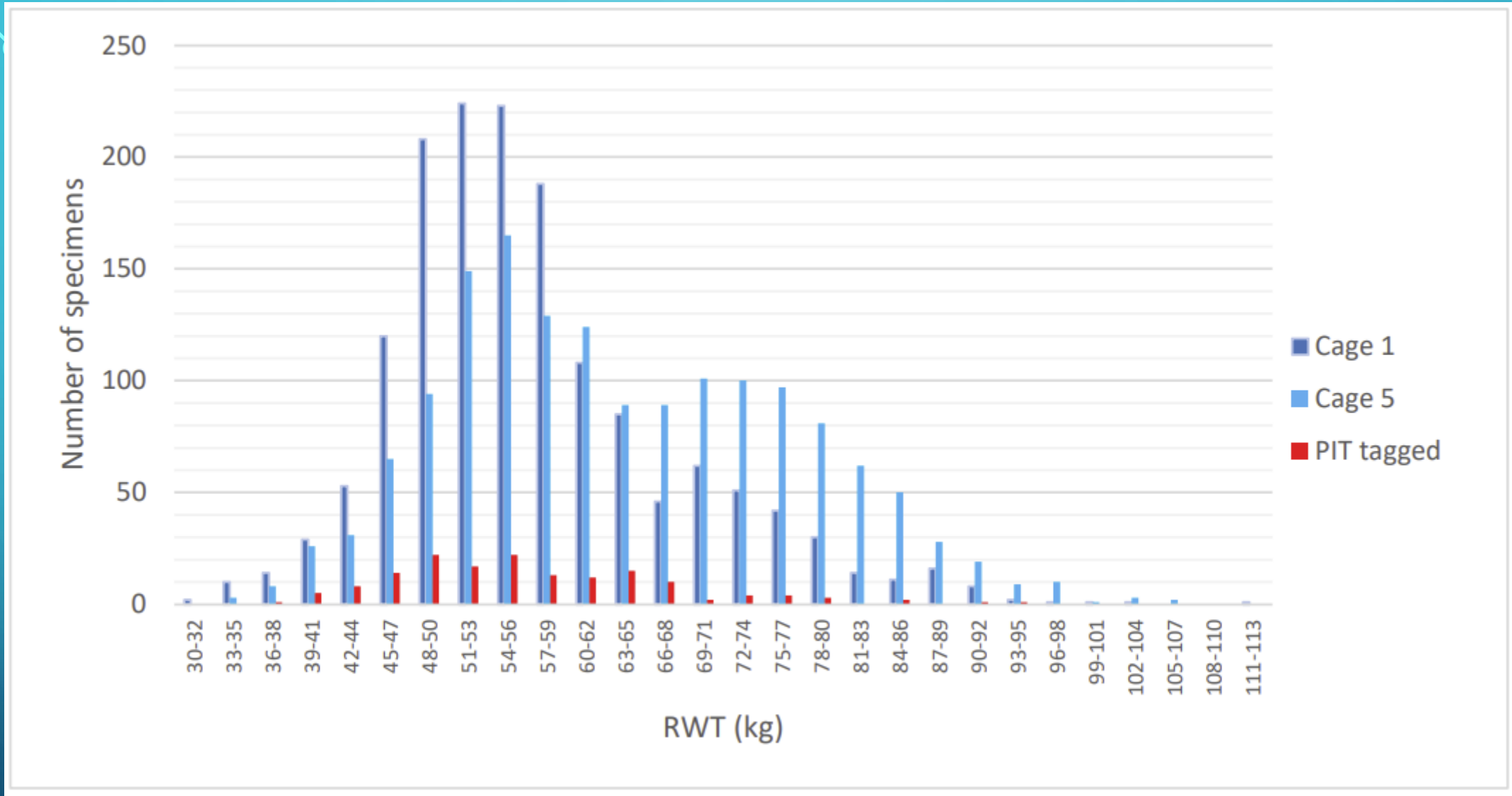
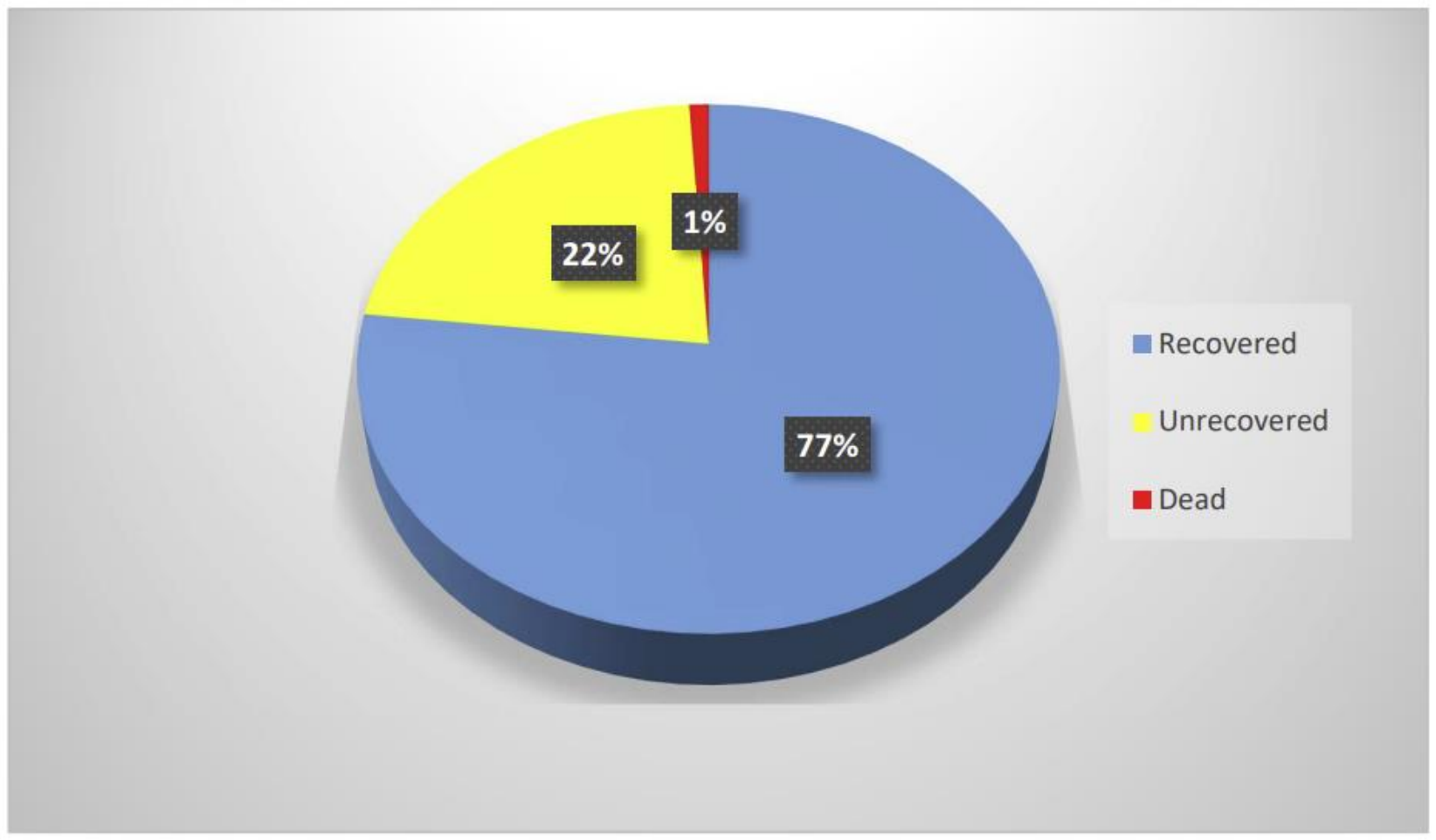
AFTER 19 MONTHS OF FARMING

Fish were sampled at regular harvesting, killed and individually measured for SFL with measuring callipers (MC) and subsequently weighted (±0.1 kg)



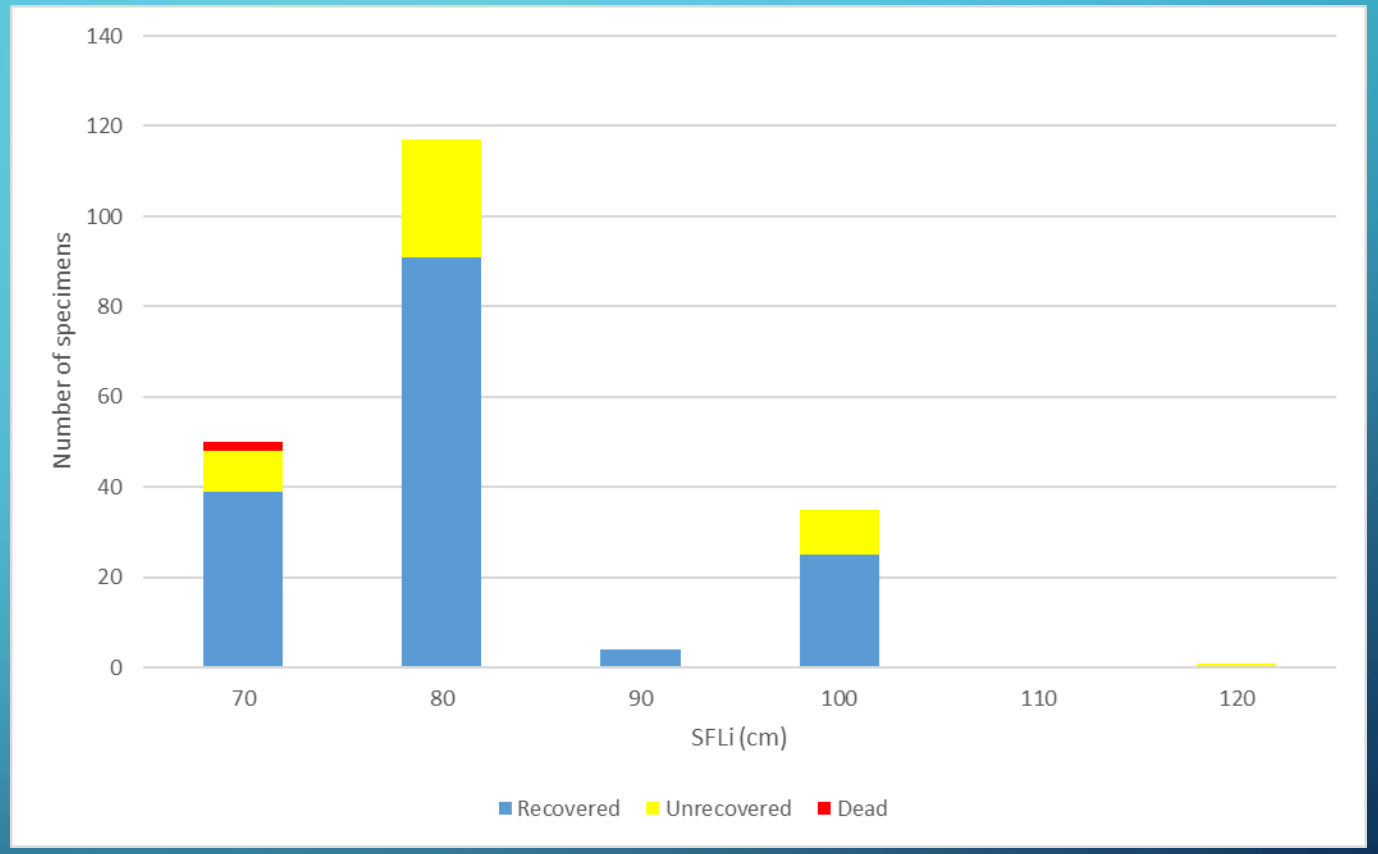
Size distribution of tagged bluefin tuna in cage 1 and cage 5 at harvesting

From the total tagged 206 fish, 158 were harvested, while 46 were not recovered. It is worthy to notice that only 2 fish died, both during tagging operation.

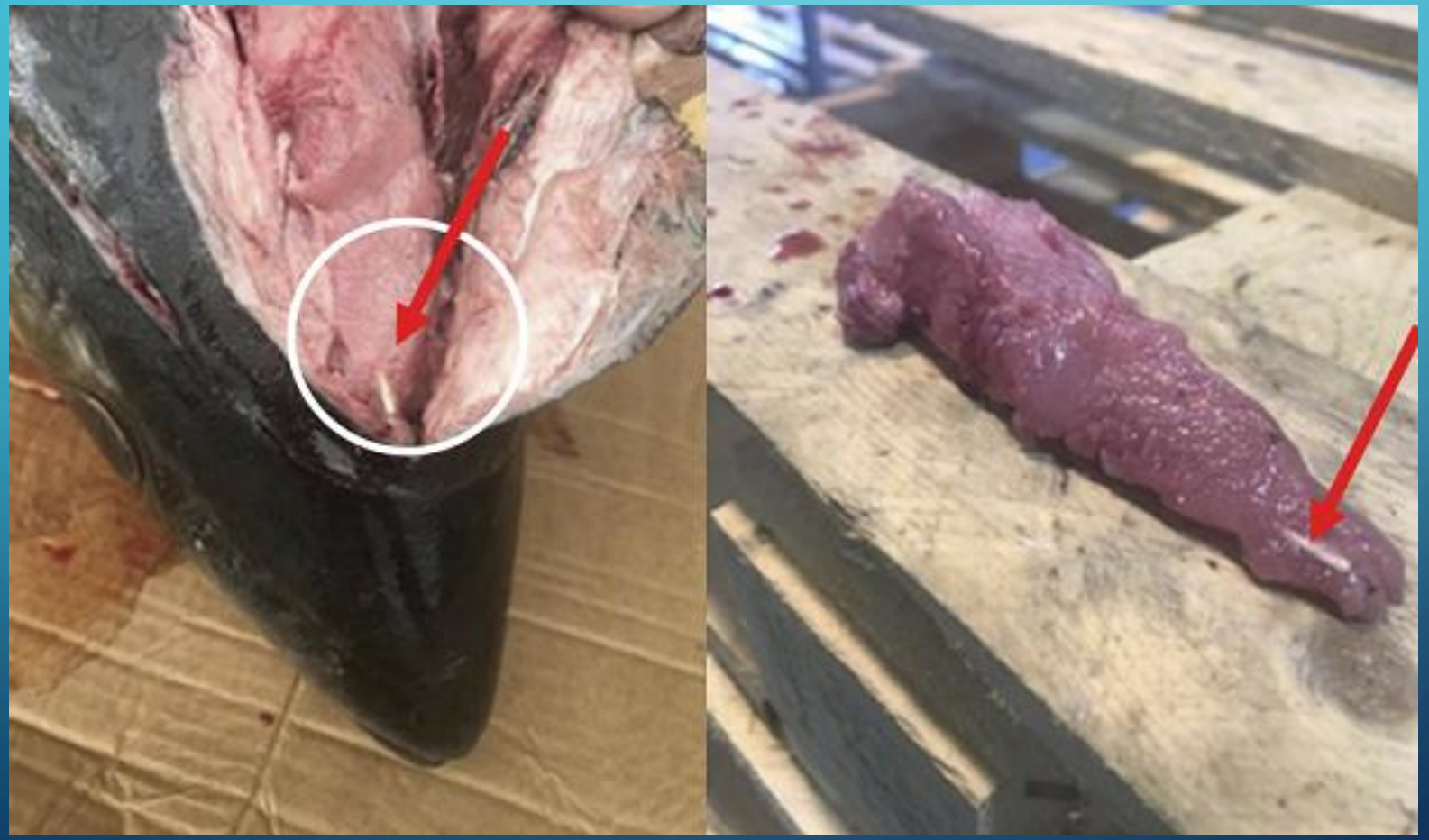


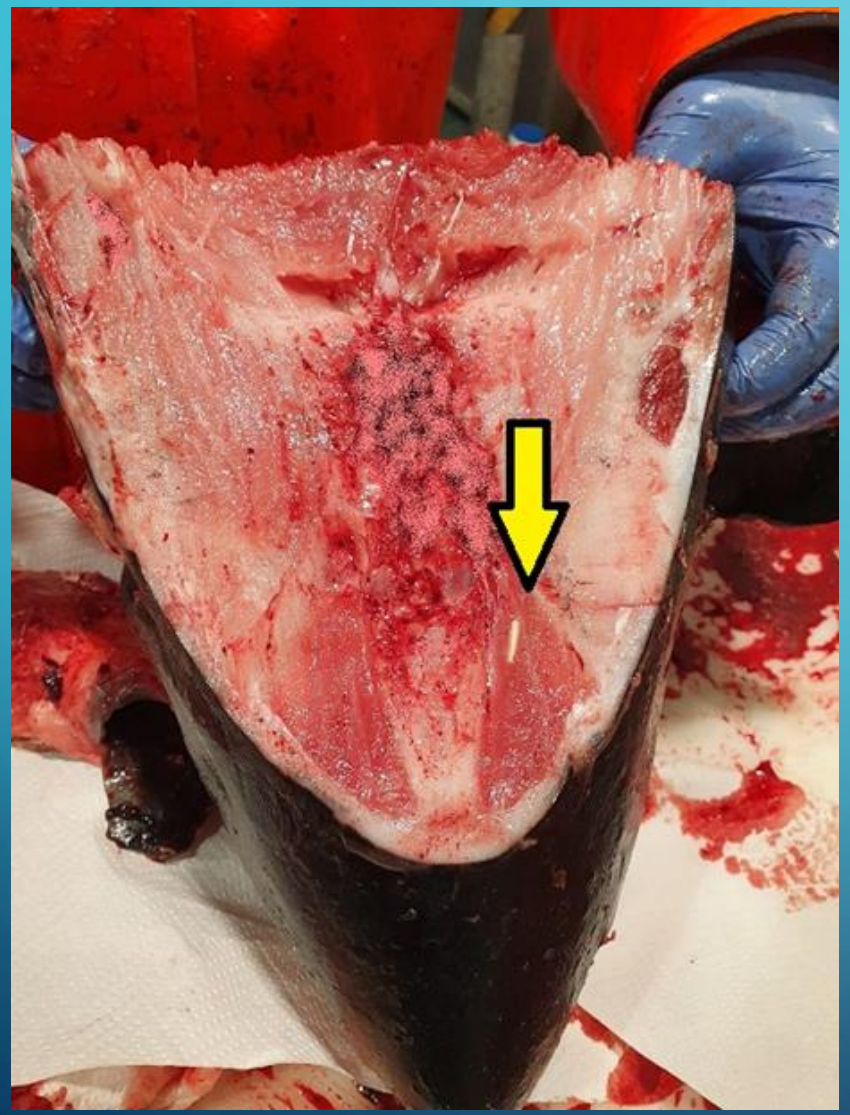
Sumarized results related to recovered, unrecovered and dead bluefin tuna juveniles tagged at Pelagos Net Farm after 19 months of caging.

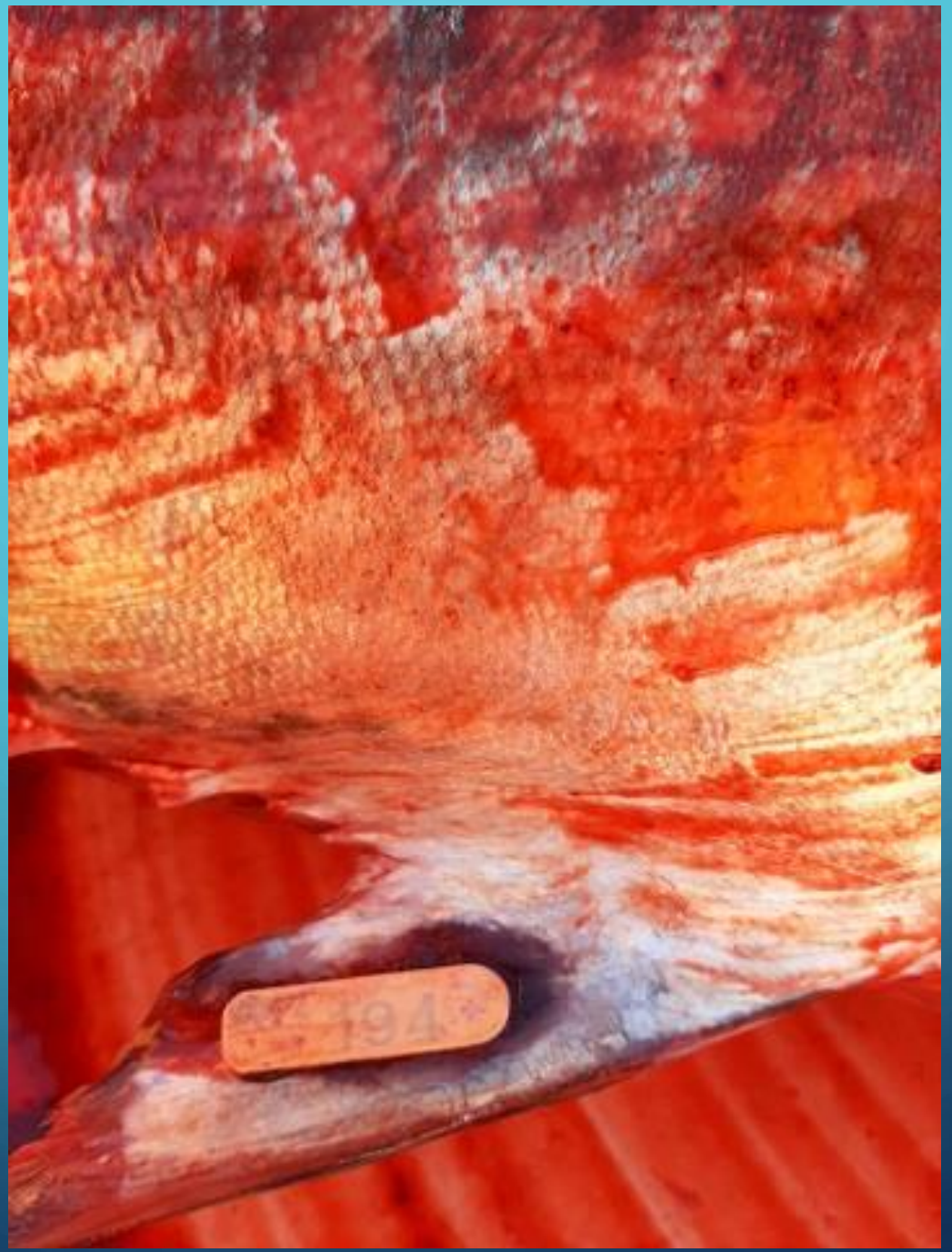
The proportion of the unrecovered fish could be result of a detector failure during harvesting operation as well as failure of readers being forced with harvesting routine procedures .
Further factor, at least theoretically, could be loss of the tag.



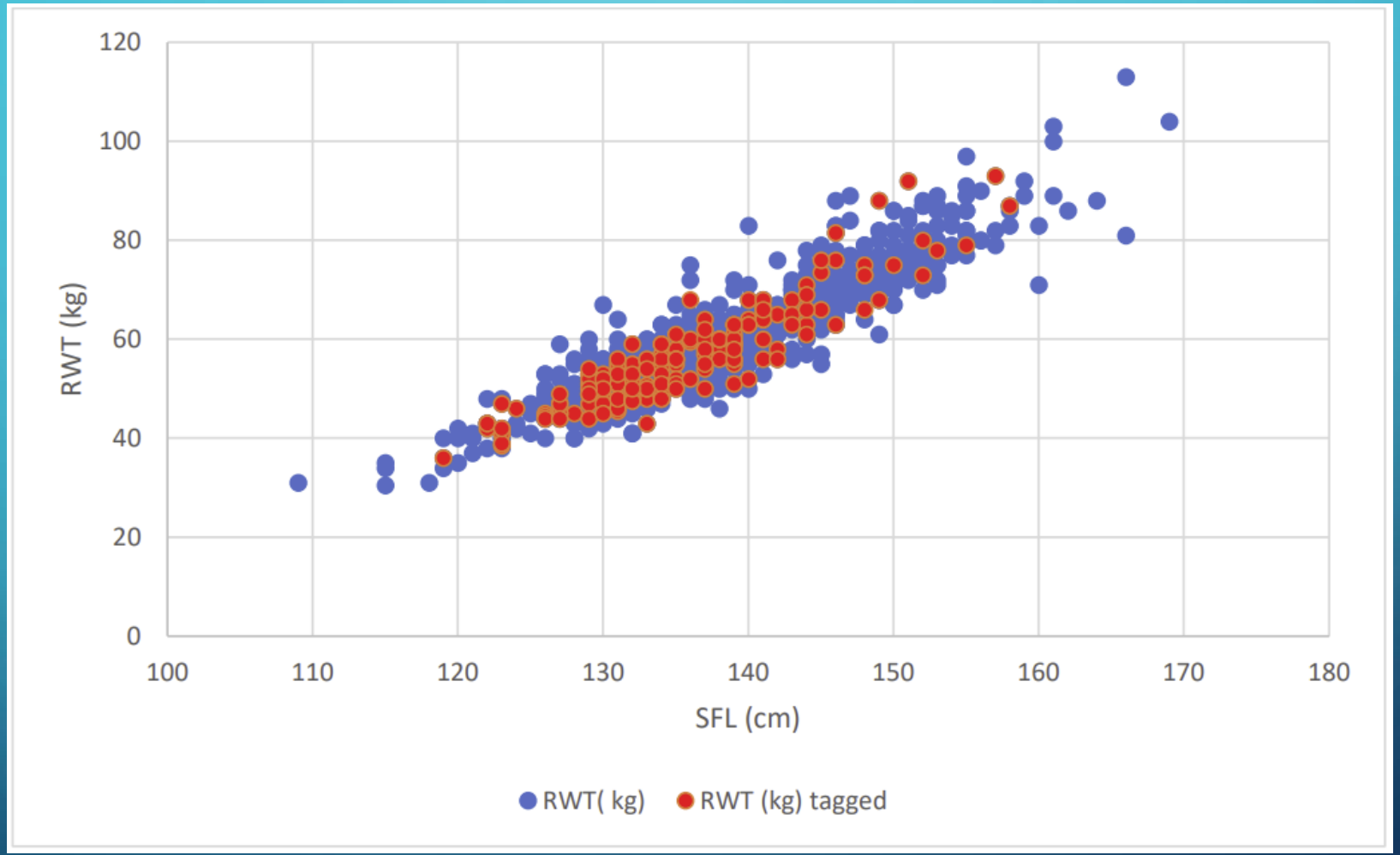
Following surgical examination, we have concluded that after a year and half in the host the tag was not encapsulated with surrounding tissue. Because of complete healing of wound site, and no visible signs of inflammation or rejection, it suggests that an encapsulated tag appears to be biologically inert and/or BFT did not recognize it as foreign body.







The presence of the tag did not apear to adversly affect the growth or condition (L-W relationship) of the tagged fish



LW distribution of tagged (n=156) and non tagged (n=938) bluefin tuna from experimental cages #1 and #5.

Dream team for tuna tagging.