

Summary

Pilot project for the short-term live storage of bluefin tuna; trials onboard *MS VESTBRIS* 2023

(submitted by Norway)

In 2022, ICCAT adopted the *Resolution by ICCAT on a pilot project for the short-term live storage of bluefin tuna* (Res. 22-07), which authorizes a pilot project for the short-term live storage of bluefin tuna. Resolution 22-07 article 8 states that: "The CPCs who engaged in the pilot project shall report to the Commission on the implementation of this pilot by 1 October every year until the final report is due for assessment by the Commission." This document is a summary of the report from Norway.

Norway was historically a major bluefin tuna harvesting country. However, fishing for this species has experienced low profitability. One potential solution is short-term live storage so that the market can be supplied on demand. A national pilot project was established in 2020 to address knowledge gaps related to BFT live storage in Norway.

During the 14-day sea trials, three purse seine casts were performed. A total of 28 fish were caught (3 fish in Cast 1, 22 fish in Cast 2 and 3 fish in Cast 3). Of these, two fish were entangled in the seine netting and died before transfer. The other fish were successfully transferred into a transfer cage. Fish from Cast 3 were subsequently transferred successfully into an inshore storage cage and kept alive for 10 days. Pre-capture, capture, transfer and storage operations were monitored using various optical and hydroacoustic methods. Fish welfare was assessed using behavioural monitoring and physiological sampling. Meat quality was also recorded.

Multiple fish transfers and subsequent inshore storage is unprecedented in Norway and represent an important breakthrough for the BFT live storage industry. However, several challenges remain to be solved. These are mainly related to:

- i. Fish identification and catch control
 - Improve the precision of acoustic monitoring systems to detect and count fish.
 - Develop the surface ROV for reliable optical observation of gear and catch.
 - Ensure that infrastructure and additional vessels are available to handle larger catches.
- ii. Fish catch
 - Optimize the size and position of the small mesh panel as well as the number of floats.
 - Improve overall catch efficiency (especially late season when BFT has higher fat content but when aggregations are larger and more unpredictable).
- iii. Fish transfer
 - Develop a reliable camera system and optimize its placement to ensure compliance with ICCAT BFT transfer rules.
 - Redesign the transfer channel for better visualization and earlier transfer.
 - Utilize diver-operated stereo camera systems to improve biomass estimation procedures.
- iv. Fish welfare and quality
 - Develop protocols that allow the necessary monitoring of welfare and quality throughout the whole value chain.
 - Develop a low-stress and humane slaughter method that promotes good welfare and quality (e.g., diver-operated electrified / explosive harpoons).
 - Develop pre-delivery cold-storage protocols that optimize flesh quality.
 - Ensure that fat content of delivered fish meets market demands.

- v. Live storage
 - Increase storage cage size (e.g., ≥ 30 m diameter, with a larger mesh size).
 - Improve delivery logistics (e.g., different delivery sites along the coast, dedicated transfer vessels).
 - Determine the minimum feeding requirements for body weight maintenance.
 - Define feeding and temperature limitations and other challenges associated with live storage.

ICCAT Resolution 22-07 describes conditions associated with the authorization to conduct a “pilot project for the short-term live storage of bluefin tuna” in Norway. The resolution also requires answers within several research issues with the following status after the 2023 trials:

- i. Fish behavior: Preliminary fish behavior observations during capture and cage captivity have already been documented to some extent in the present report. This can be expected to continue and improve as experience with BFT capture and live storage grows.
- ii. Estimate BFT weight at the time of catch and caging: Direct measurement of weight during catch and caging is not practically feasible. Instead, weight may be estimated with reasonable accuracy using length measurements and an a priori established length-weight relationship. The stereo camera system tested during the trials provided fairly reliable length estimates using an AI-based software for recognition and length measurements of the fish. However, the system must be tested with larger volumes of fish and verified against individual length/weight measurements in future trials.
- iii. Whether feeding is needed to ensure animal health and, if so, how to avoid fattening: The present trial successfully caged and stored BFT for 10 days without feeding. However, dedicated cage trials are required to fully address this question. These will require stable catches and a reliable transfer and caging protocol. The aim is to start such feeding/caging trials in 2024 and report findings by 2027.
- iv. Extent of mortality and causes: The only cause of mortality registered to date is related to the capture process and BFT entanglement in the seine. No mortality was registered in the three captive BFT held for ten days in the stationary cage. To reach any firm conclusion, larger volumes of fish are needed in future trials.
- v. Meat quality: Preliminary meat quality analysis was conducted during the present trials. The physiological results demonstrate that the current slaughter method (electrical stunning and/or asphyxiation) induces stress that likely negates any quality improvements due to live storage. Lower stress slaughter methods (e.g., diver-operated electric/explosive harpoons) must be considered for future trials.
- vi. How to ensure traceability is consistent with the requirements of the BCD program, including exploring the use of tagging: To ensure that the traceability is consistent with the requirements of the BCD program, the different operations within the trials were recorded in the eBCD system as stipulated in the discussion paper on the application of the electronic bluefin catch documentation in the pilot project for the short-term live storage of bluefin tuna, which was presented by Norway and adopted at the 16th Meeting of the IMM (IMM_19A).
- vii. Harvesting processes: The main focus during the 2023 trial has been on improving the harvesting process. Despite some remaining challenges, the 100% capture success rate in 2023 is evidence of this. However, late-season (i.e., September/October) conditions are expected to create challenges for purse seine capture, and additional gear improvements and/or changes in fishing practices may be needed. Consequently, the harvesting process (as well as fish transfer and caging) will remain a focus area in 2024.

- viii. Marketing questions: Similar to traceability questions, marketing questions are yet to be prioritized until the volume of live-stored tuna can be increased beyond those obtained in the present trials. BFT caught with purse seiners in Norway still have serious marketing challenges that will require a lot of attention in the later seasons of the pilot project.

Yearly trials will be conducted and reported according to the conditions established in ICCAT Resolution 22-07 until the project is complete in 2027.