



Co-funded by
the European Union

PILOT PROJECT TO TEST THE USE OF STEREOSCOPIC CAMERAS DURING THE FIRST TRANSFER OF BLUEFIN TUNA AND THE AUTOMATION OF VIDEO FOOTAGE ANALYSIS

ICCAT CIRCULAR #02226/2024 OF 11 MARCH 2024

Pau Muñoz-Benavent, Joaquín Martínez-Peiró, Jordi Capó-Calabuig, Gabriela Andreu-García, Sergio Morell-Monzó, Vicente Puig-Pons, Víctor Espinosa.

Universitat Politècnica de València (UPV)



OBJECTIVES

- Evaluate the use of stereoscopic cameras during the first transfers of Bluefin Tuna from purse seine vessels to transport cages for estimating weight at this stage.
- Analyze the use of software and artificial intelligence to automatically determine the number of fish and their weight in first transfers.

SCENARIOS

2024

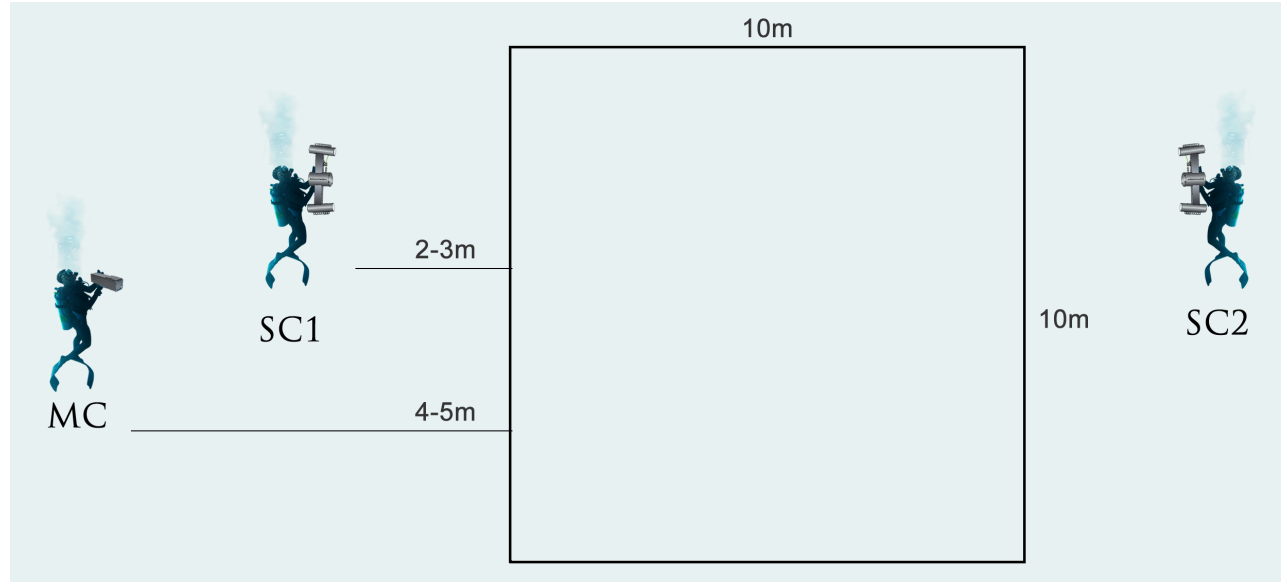
- First transfer from a purse seiner to a transport cage in the Mediterranean.
- First transfer from a purse seiner to a transport cage in the Adriatic.

2025

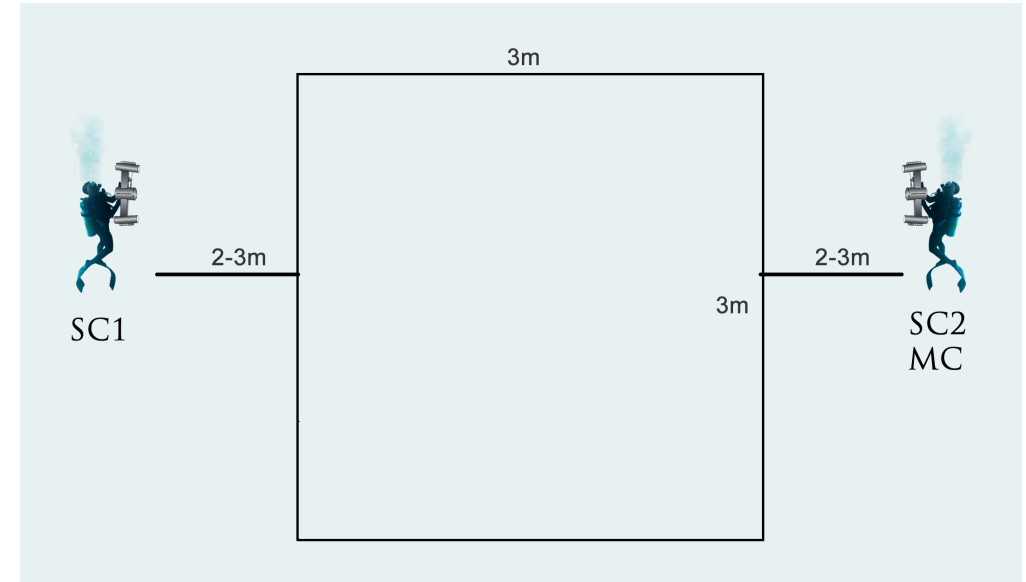
- First transfer from a trap to an associated farming cage in Portugal.

RECORDING SETUPS

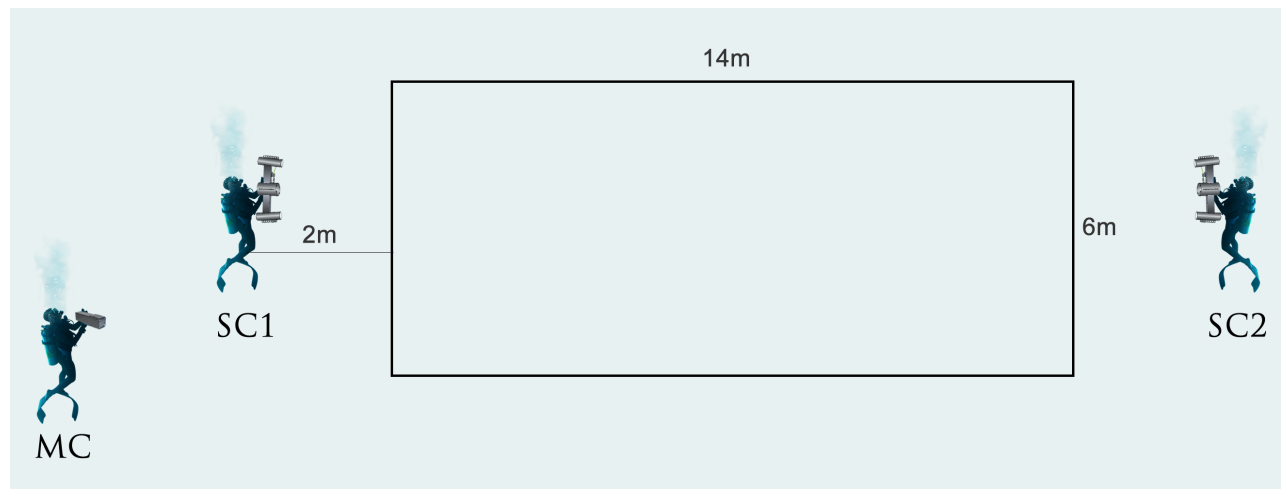
MEDITERRANEAN: 10x10 meters gate



TRAP: 3x3 meters gate



ADRIATIC: 14x6 meters gate



Further details in Objective 1
presentation

FIRST TRANSFERS RECORDED

8 first transfers:

- 4 from purse seiners in the Mediterranean (M1-4) with Balfegó Tuna
 - 3 caging transfers in the Mediterranean and partially harvested
 - 1 from purse seiners in the Adriatic (A) with Jadran Tuna
 - 3 from traps (TR1-3) with Tunipex
-
- For all transfers:
 - Manual and automatic counting
 - Manual and automatic length estimation

COUNTING IN FIRST TRANSFERS

ID	M1	M2	M3	M4	A1	TR1	TR2	TR3
Manual counting	308/430	282	1379	688	290/300	129	368	91
Automatic counting	Poor visibility	267 (95%)	1093 (79%)	638 (93%)	65 (61%)	155 (120%)	495 (135%)	67 (74%)

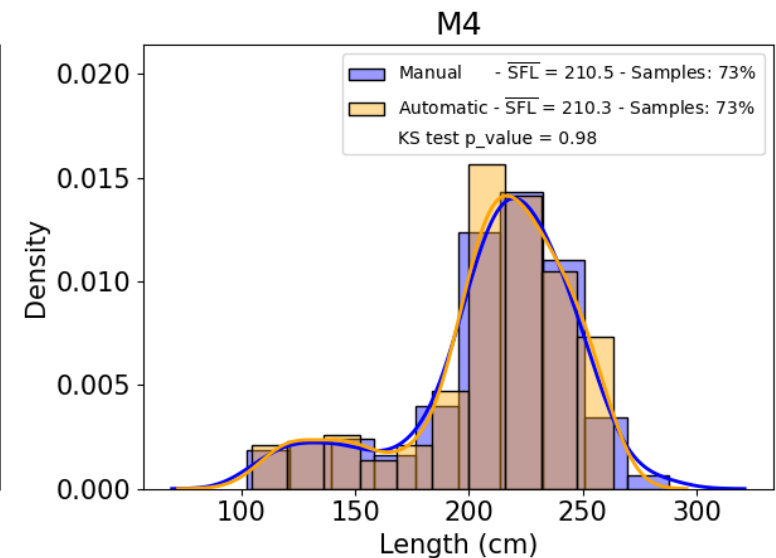
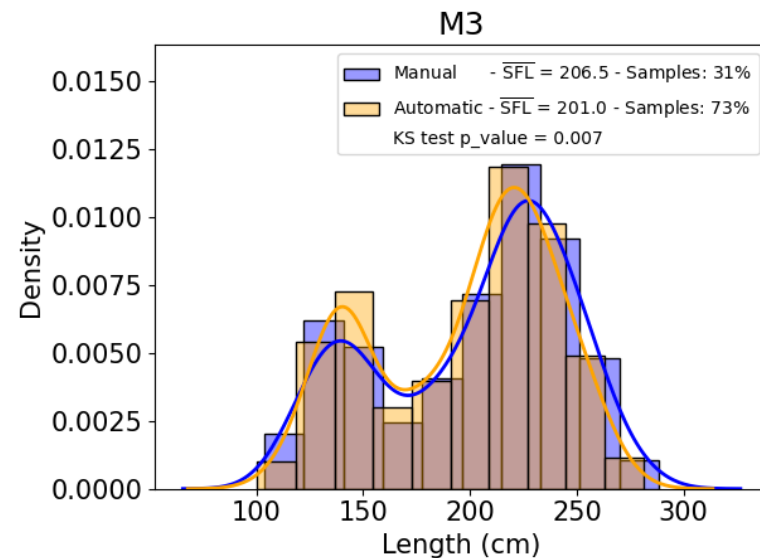
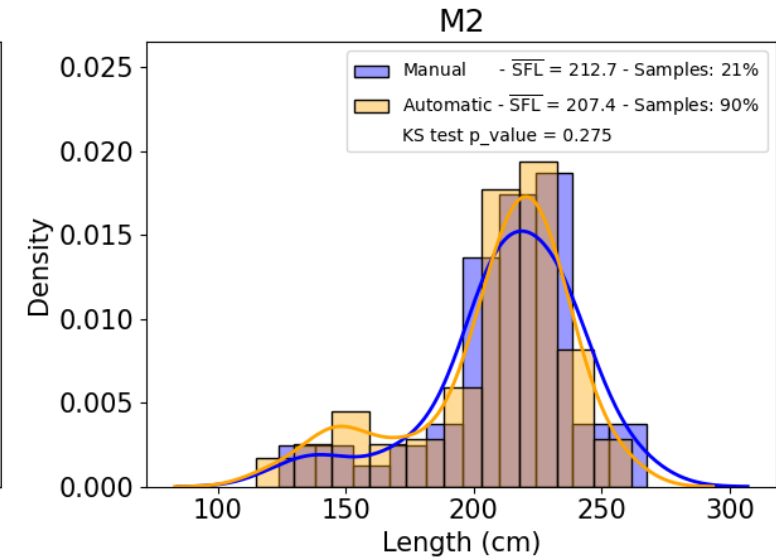
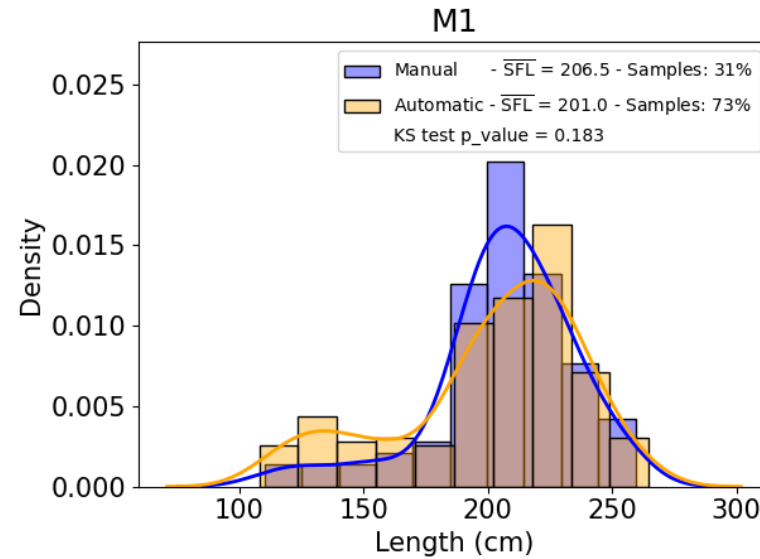
- Automatic counting:
 - In the Mediterranean, it achieved 79–95% of manual counts under good visibility.
 - Performance in the Adriatic was limited (61%) due to the difficulty of detecting fish within dense schools.
 - In trap transfers, it achieved 74%-135% of manual counts, indicating the need for further refinement of the algorithm.

SIZING IN FIRST TRANSFERS

- Effective automatic length estimation:
 - Estimating a high percentage of the fish (>59% in the Mediterranean, 45% in the Adriatic and >48% in traps).
 - Reducing the time invested by up to 90%.
 - With similar average lengths compared to manual measurements (averaging 2.1%)
 - First transfers in Med: -1.7%, -2.0%, -2.0%, +1.5%
 - In Adriatic: -2.5%
 - In traps: -2.7%, +0.4%, -3.9%.
 - Length-frequency distributions from automatic software closely matching manual results, with no statistically significant difference according to Kolmogorov-Smirnov test in 6 of 8 first transfers.

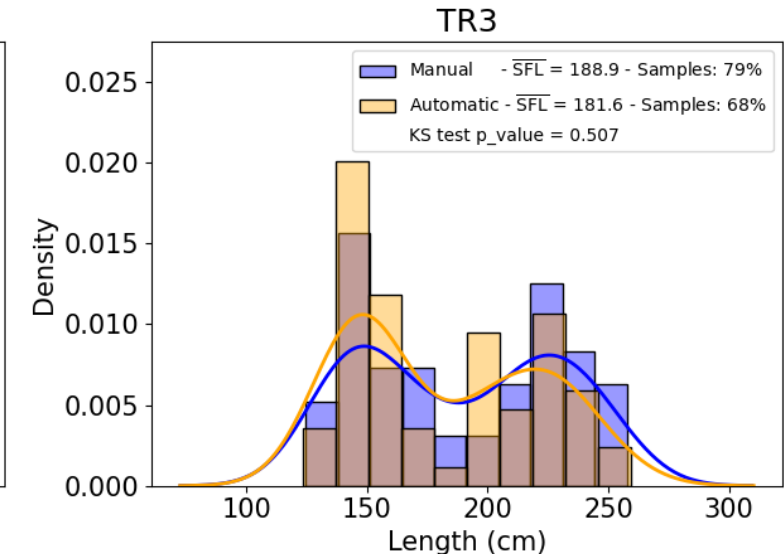
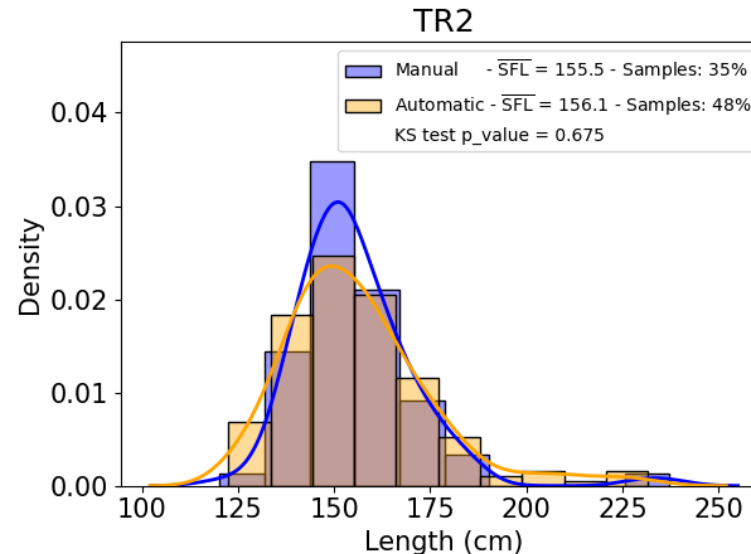
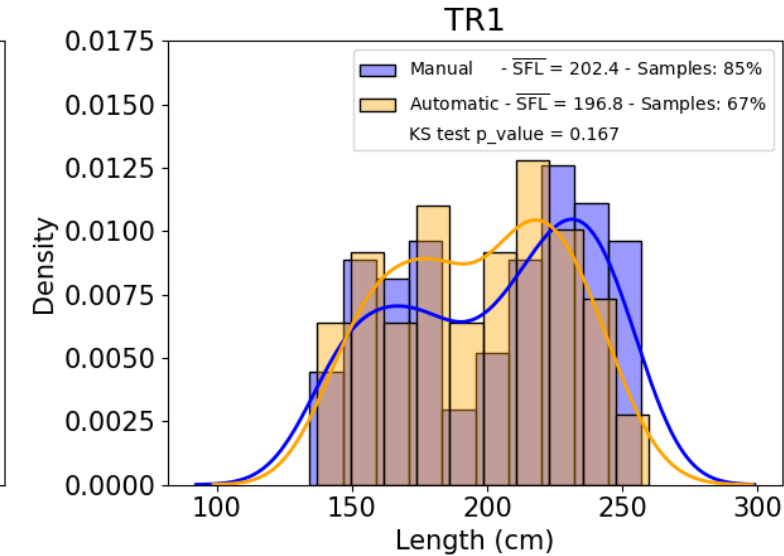
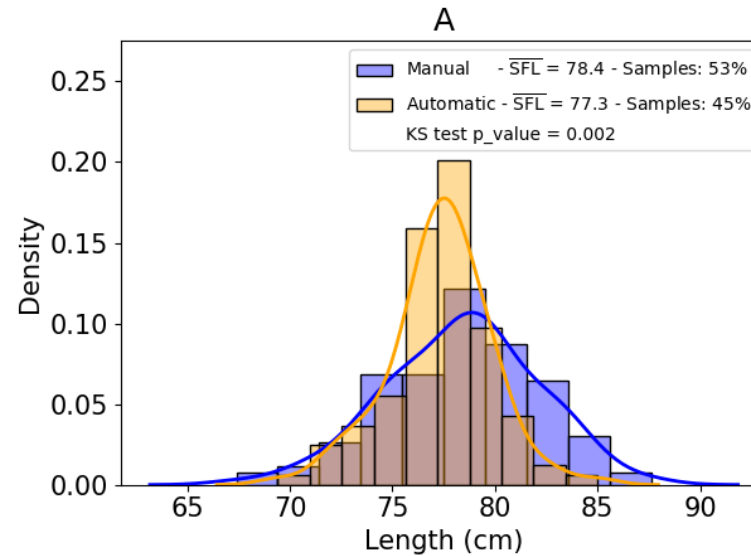
SIZING IN FIRST TRANSFERS

ID	M1	M2	M3	M4
KS p-value	0,18	0,27	0,007	0,98
Auto vs manual avg length	-1,7%	-2.0%	-2.0%	+1.5%
Manual Sample size	31%	21%	45%	73%
Auto Sample size	73%	90%	75%	73%



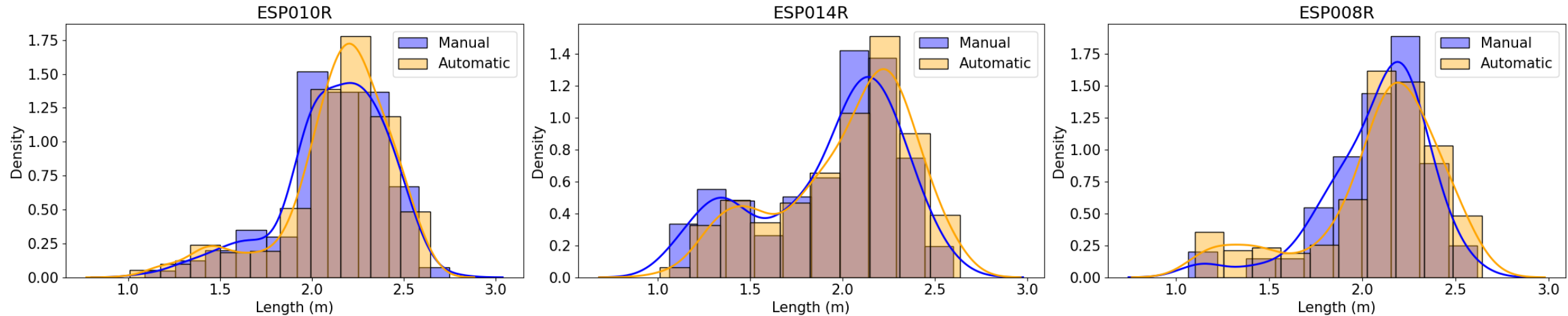
SIZING IN FIRST TRANSFERS

ID	A1	TR1	TR2	TR3
KS p-value	0,002	0,17	0,68	0,51
Automatic vs manual avg length	-1.4%	-2.7%	+0.4%	-3.9%
Manual Sample size	53%	85%	35%	79%
Auto Sample size	45%	67%	48%	68%



SIZING IN SECOND TRANSFERS IN MED

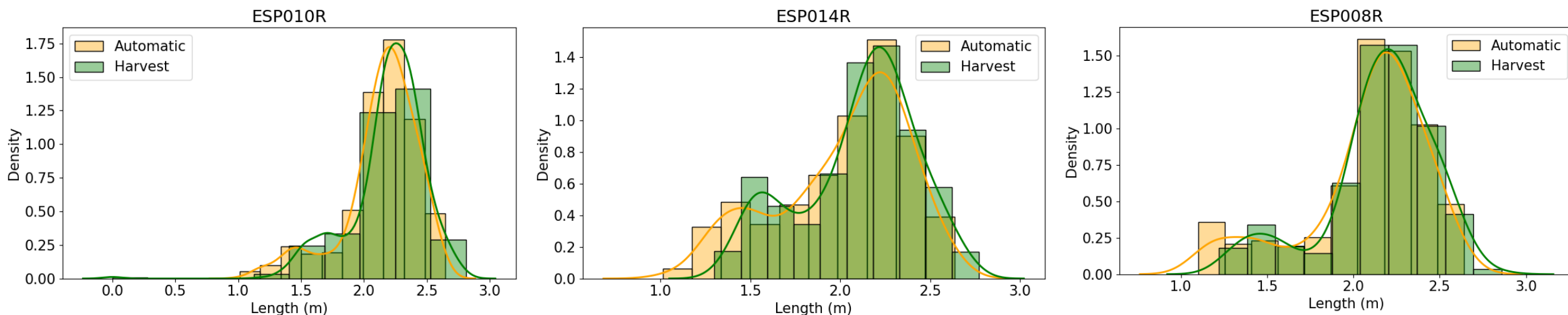
Auto vs manual results



ID	ESP010R	ESP014R	ESP008R
KS p-value	0,022	0,005	0,14
Manual Sample size	20%	20%	20%
Auto Sample size	71%	36%	49%

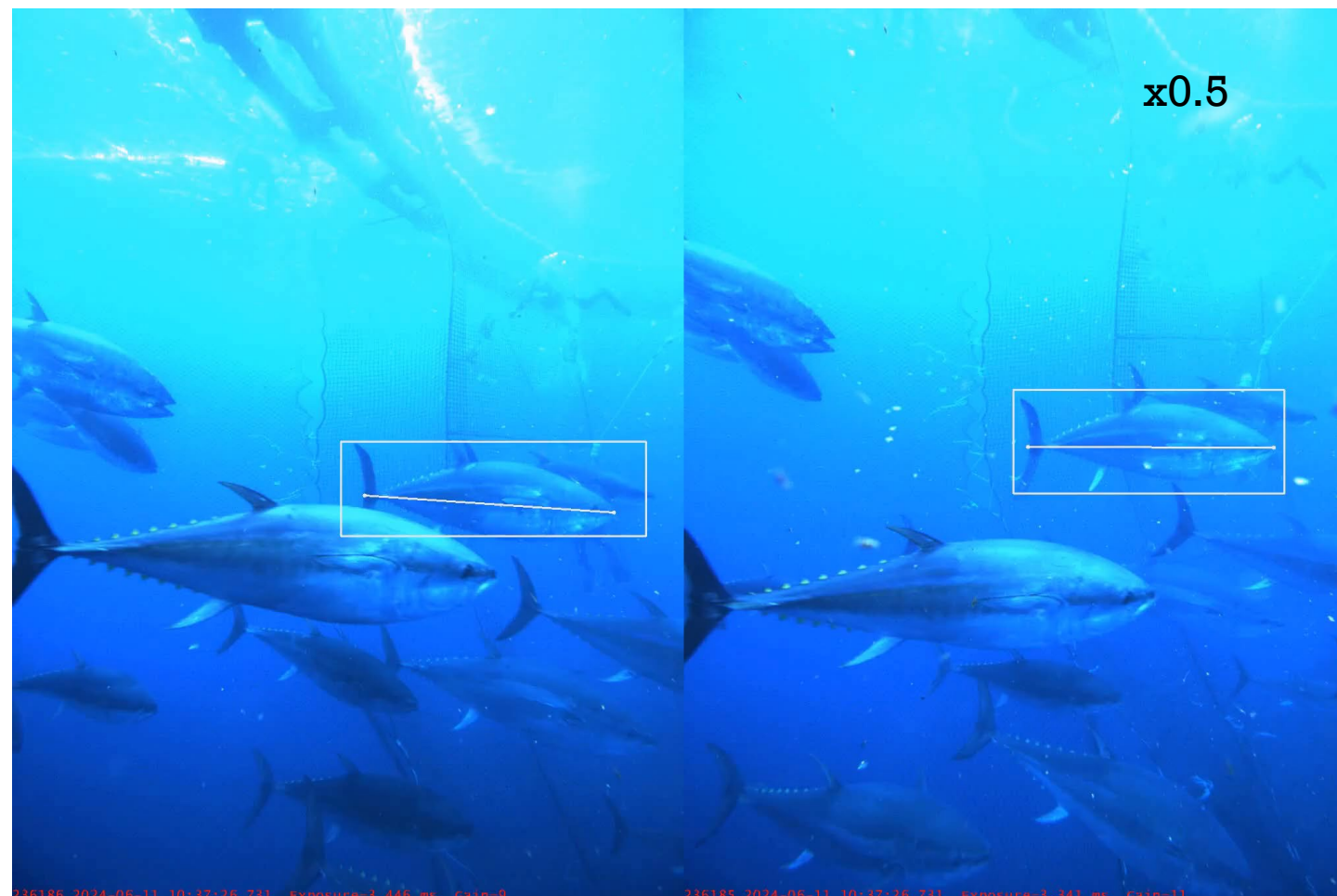
SIZING IN SECOND TRANSFERS IN MED

Auto vs harvest results



ID	ESP010R	ESP014R	ESP008R
KS p-value	9e-05	0,012	0,102
Auto Sample size	71%	36%	49%
Harvest Sample size	73%	68%	52%
Harvest date	+ 5.5-6 months	+2-5 months	+3.5-4 months
Manual vs harvest avg length	-1,8%	-3,7%	-3,3%

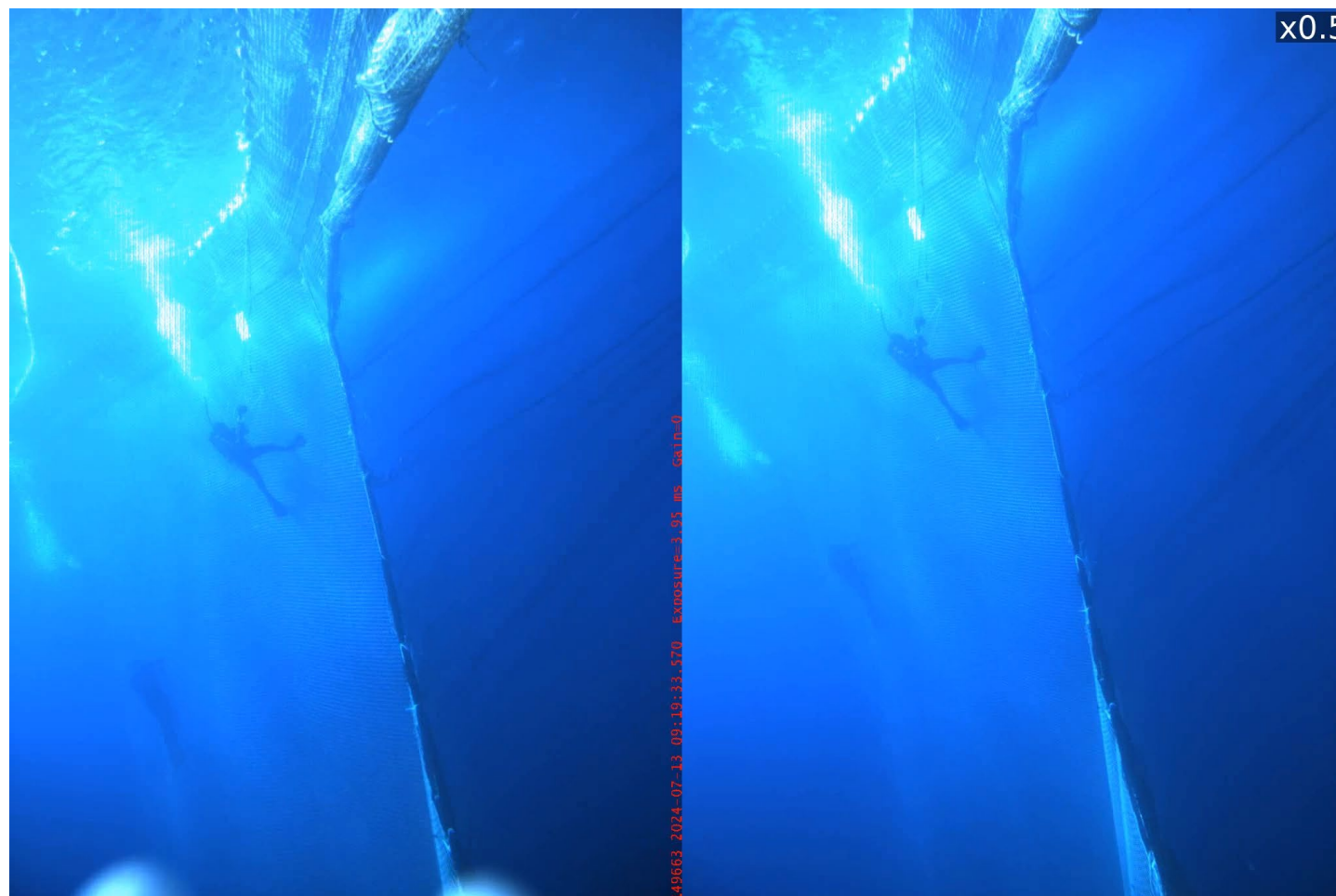
DEMO: FISH SIZING IN MED



MED_autosizing_demo.mp4



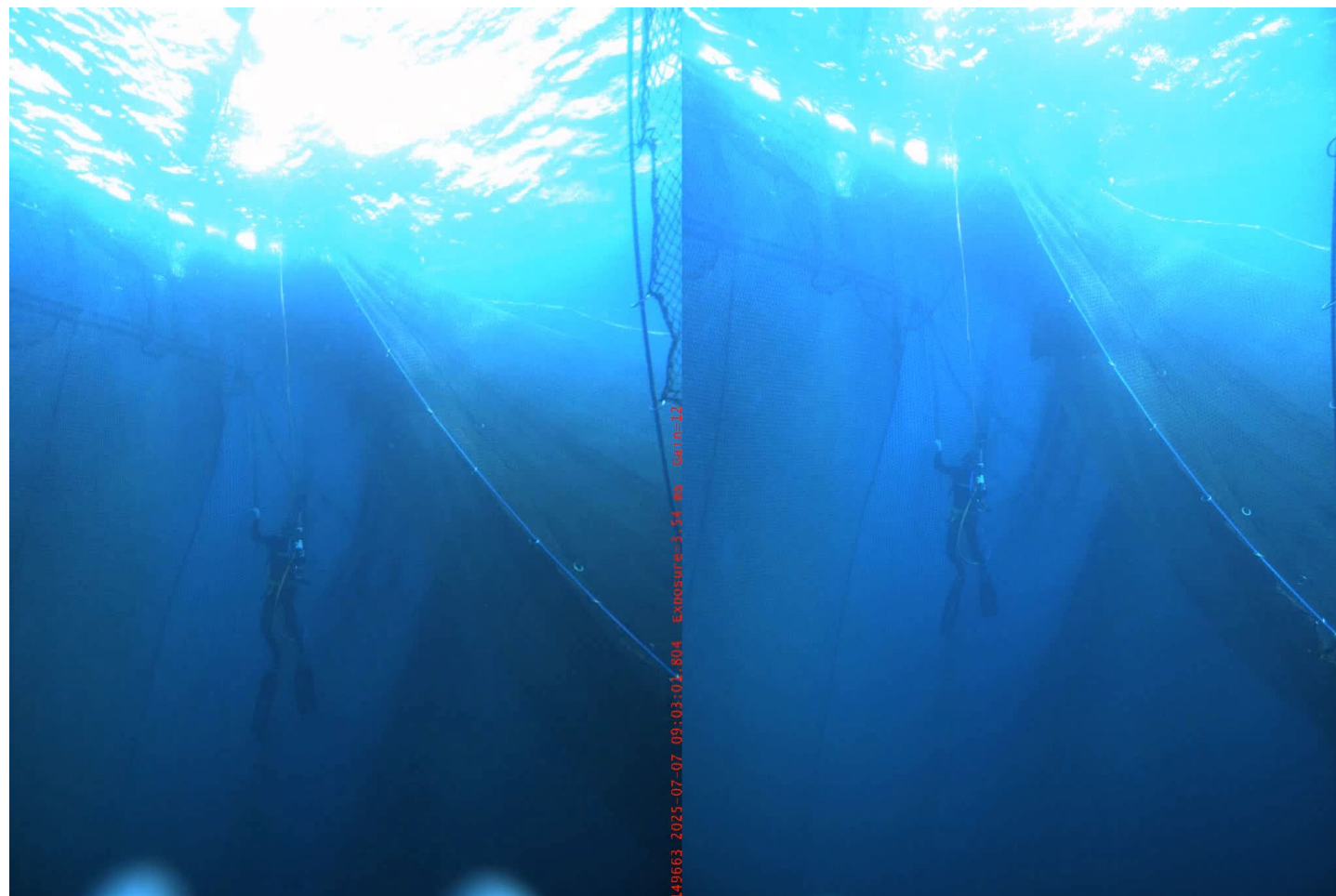
DEMO: FISH SIZING IN ADRIATIC



[ADRIATIC_autosizing_demo.mp4](#)



DEMO: FISH SIZING FROM TRAPS

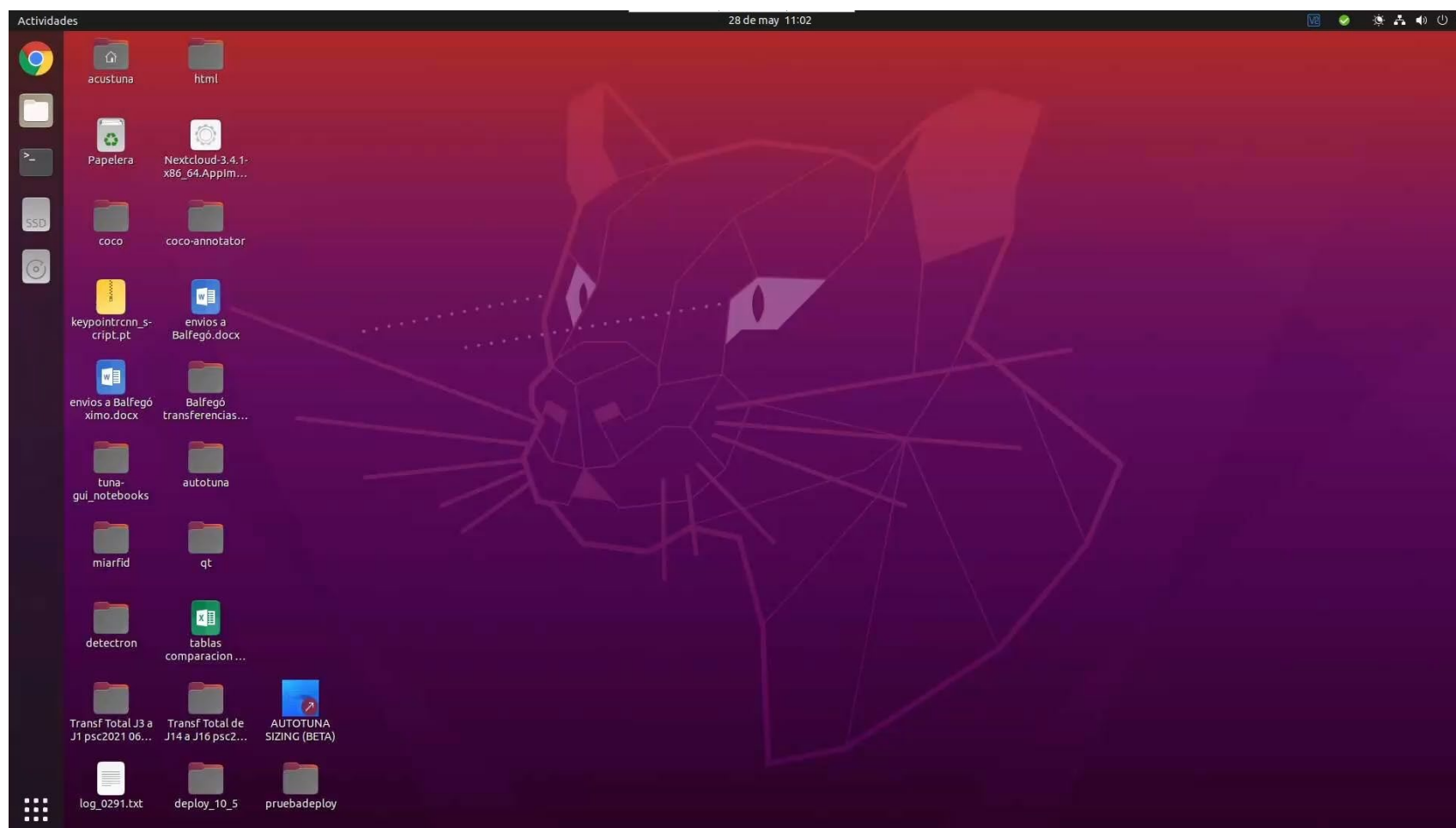


[TRAPS autosizing demo.mp4](#)

DEMO SOFTWARE



Co-funded by
the European Union



Software_demo.mp4

CONCLUSIONS

Objective 2: Analyze the use of software and artificial intelligence to automatically determine the number of fish and their weight in first transfers.

- **Automatic fish counting** achieved 79–95% of manual counts in the Mediterranean, 65% in the Adriatic, and 74–135% in traps, indicating the need for further refinement of the algorithm.
- **Automatic length estimation** proved more robust, covering at least 45% of fish in all scenarios. Length-frequency distributions derived from automatic measurements closely matched both manual results and aligned with harvesting data obtained several months later. Across scenarios, analysis time was reduced by up to 90%.

ACKNOWLEDGMENTS

- This work has been carried out within the scope of the project REM-BFT (project acronym), and co-funded by the European Union through the EU Grant Agreement No. 101103829, and a voluntary contribution by the United States.
- The UPV team acknowledge the collaboration of Balfegó Tuna and the Spanish Navy in the Mediterranean. Appreciation is also extended to Jadran Tuna and the Croatian Ministry of Agriculture for their support in the Adriatic transfers, and to Tunipex for their assistance with the trap transfers.

COMMERCIAL DEVELOPMENT

- Agreement
 - Balfegó Tuna (www.balfego.com).
 - Zunibal (www.zunibal.com)
 - Chrome Motion Electronics (www.chromemotion.es)
 - Universitat Politècnica de València (UPV, www.upv.es)
- To develop a commercial version for automatic fish counting and sizing based on the presented findings.
- European-based, with Zunibal's internationalization capabilities of covering worldwide the technology market for tuna fisheries, offering both hardware and software solutions.
- Available for the 2026 fishing campaign.