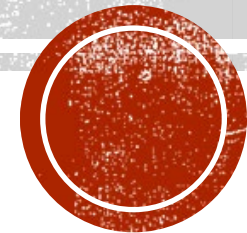


# PILOT PROJECT TO TEST THE USE OF STEREOSCOPIC CAMERAS DURING THE FIRST TRANSFER AND THE AUTOMATION OF VIDEO FOOTAGE ANALYSIS

OBJECTIVE 1 - ICCAT CIRCULAR #02226/2024 OF 11 MARCH 2024

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# OBJECTIVES

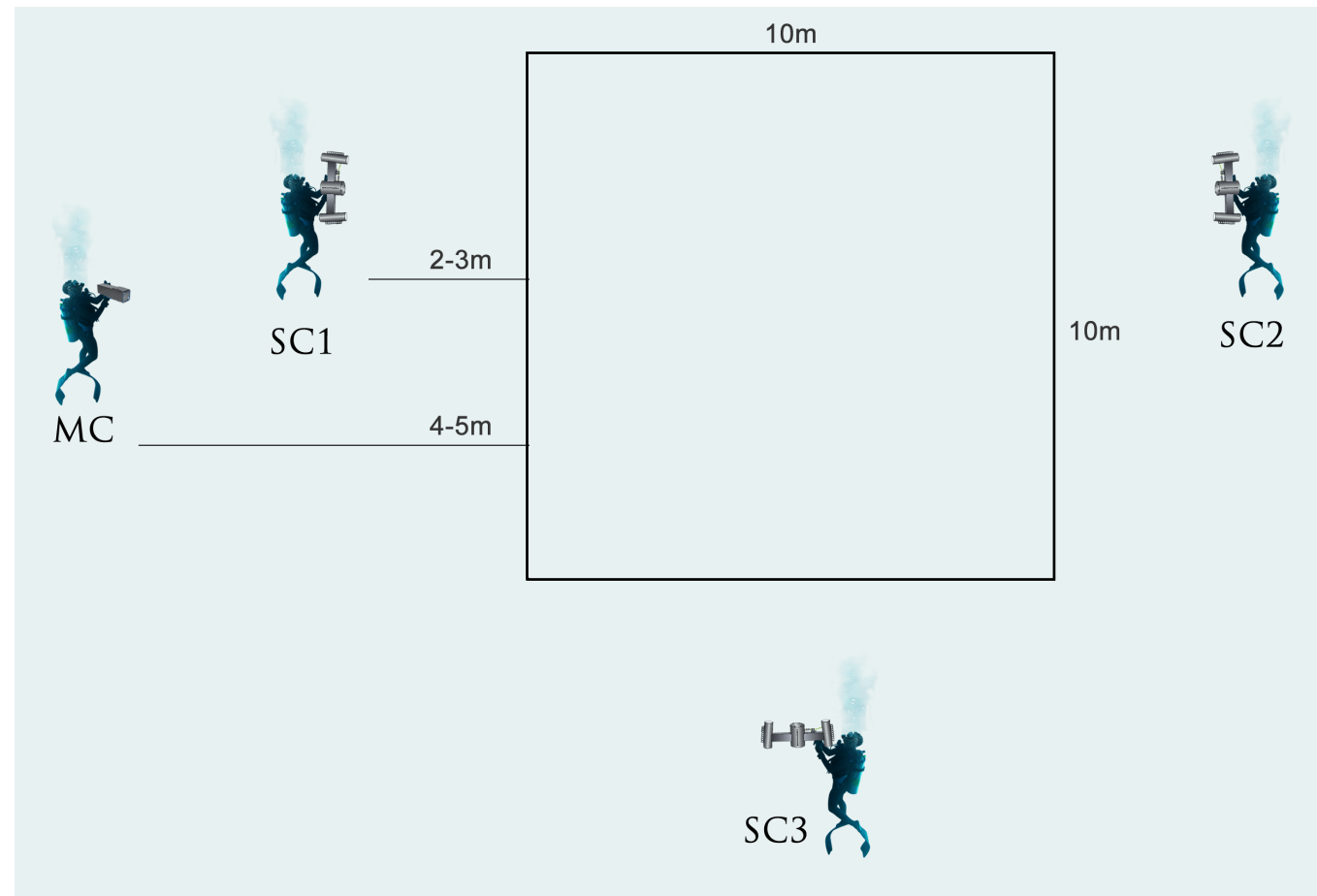
- Evaluate the use of stereoscopic cameras during the first transfers from purse seine vessels to transport cages for estimating weight at this stage.

# CAMPAIGNS 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.

# MED: RECORDING SETUP

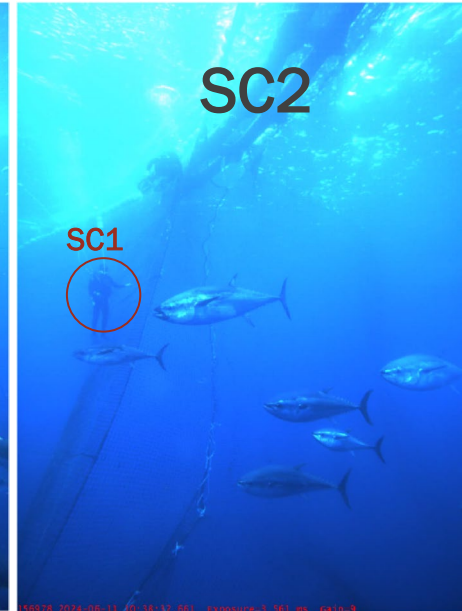
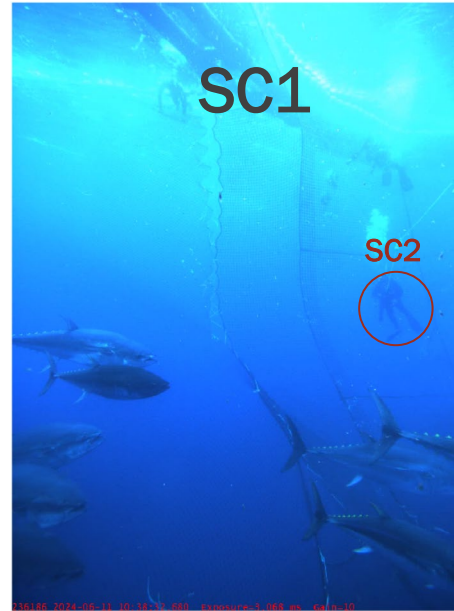
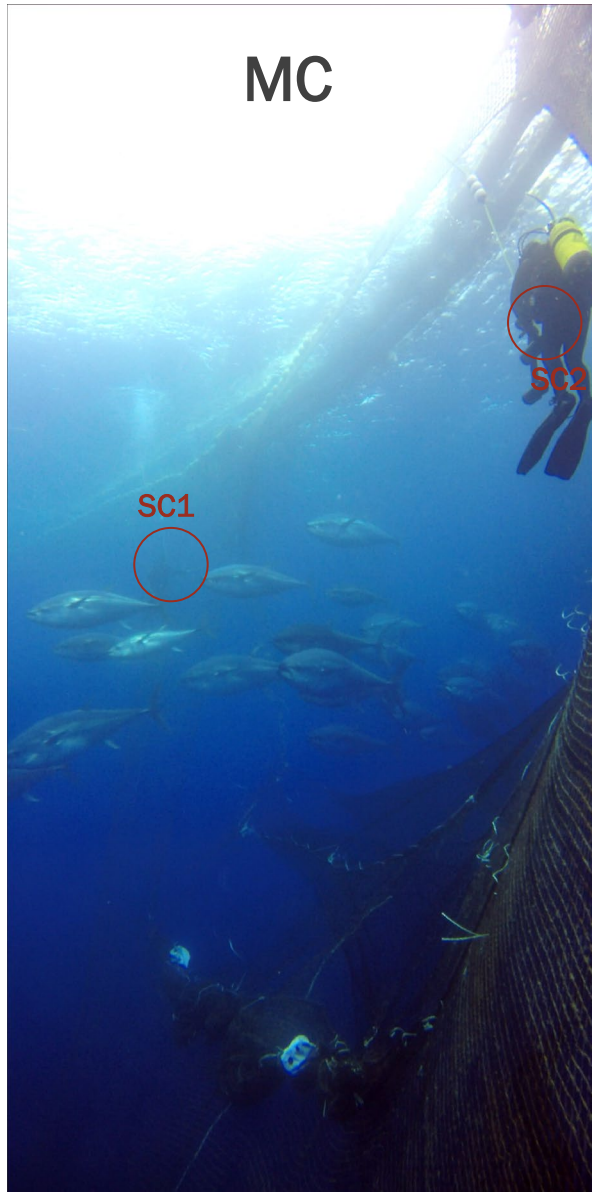
- Mimic the recording setup at caging (from transport cages to farming cages): monocamera for counting and stereocamera for sizing



# MED: RECORDING SETUP



Co-funded by  
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# MED: FIRST TRANSFERS

- 4 transfers from purse seine to transport cage in collaboration with Balfegó Tuna (Spain) were recorded

Transfer ID	11	12	20	21
Date and time	04/06/2024 17:23 – 18:34	05/06/2024 10:46 – 11:52	11/06/2024 10:07 – 10:57	13/06/2024 07:05 – 08:16
Video duration (min)	71	66	50	71
Number of cameras	2 lateral SC 1 ventral SC 1 MC	2 lateral SC 1 ventral SC 1 MC	2 lateral SC 1 MC	2 lateral SC 1 MC
Transport cage	ESP010R (with another transfer)		ESP014R	ESP008R

- For transfers 20 and 21 the ventral view was discarded due to operational constraints.
- For transfers 20 and 21 no additional fish were added, so the weights estimated during first transfers could be compared to those from subsequent transfers to farm cages

# MED: FISH COUNTING

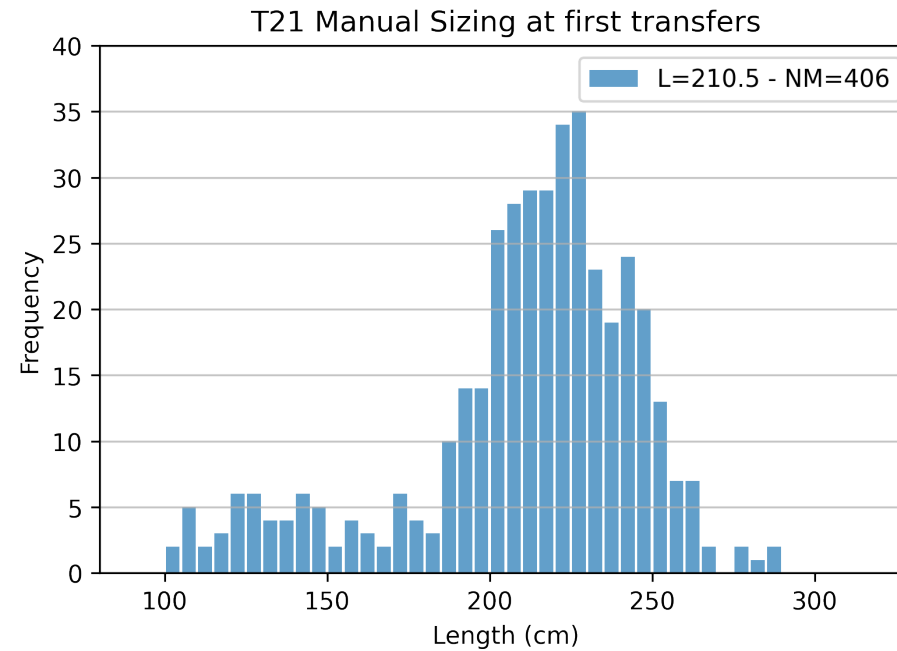
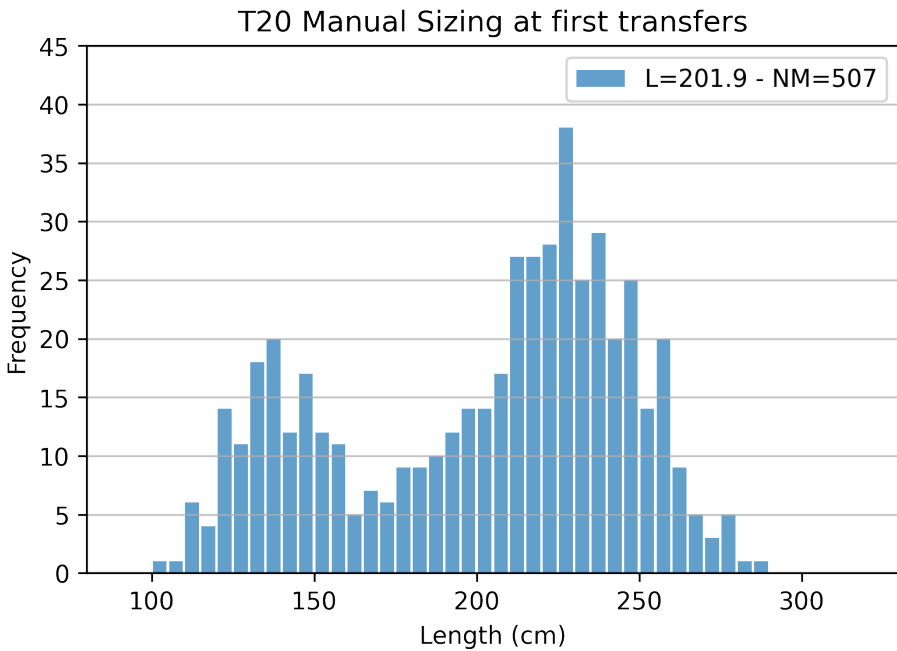
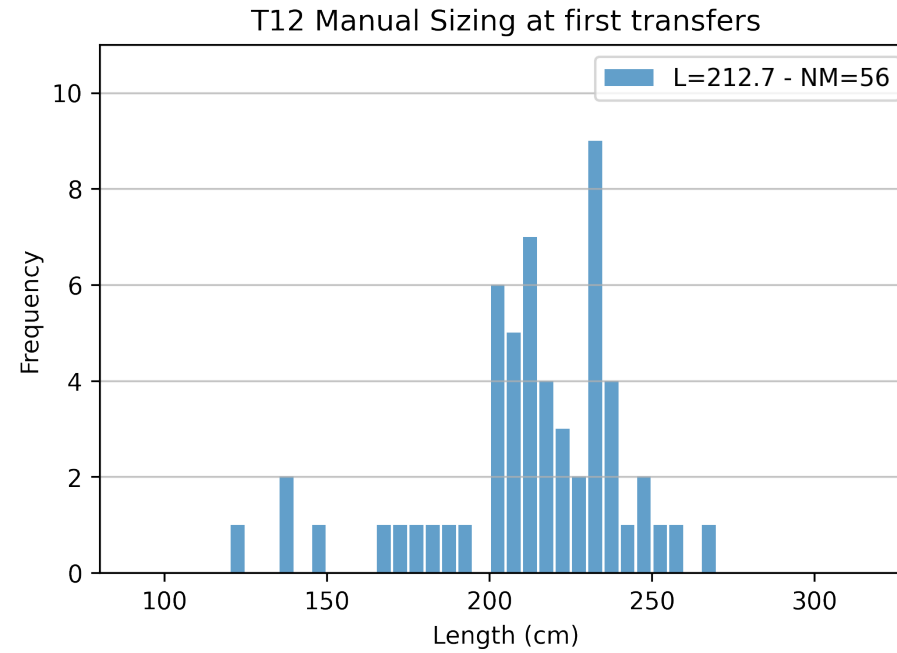
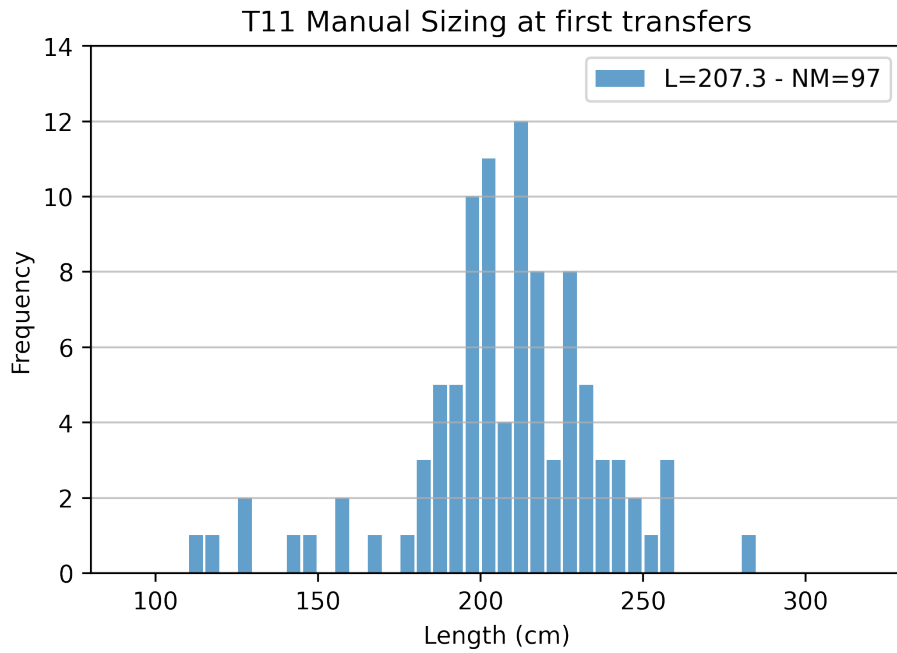
First transfers ID	11	12	20	21
MC at first transfers	308/430	280/285	1379/1391	687/689
SC at first transfers	313 (-12%)	272 (-4%)	1138 (-18%)	559 (-19%)
MC at caging (fishing inspection)	1129		1315 (-5%)	653 (-5%)
Transport cages	ESP010R (with another transfer)		ESP014R	ESP008R

- At first transfers, fish can be counted with the monocal camera, but not with stereocameras due to narrower camera field of view.
- In transfers 20 and 21, where no additional fish were added to the transport cage, the counting with monocal camera at first transfers and at caging differs by 5%.
  - Since all fish fit within the camera's field of view, this disparity can be attributed to variations in water turbidity, differences between operators, and the inherent difficulty of counting fish in overlapping schools

# MED: FISH SIZING

First transfers ID		11	12	20	21
Manual counting with monocamera		308/430	280/285	1379	687/689
Manual counting with stereocamera		313	272	1138	559
Manual	Number of samples (%SC - %MC)	97 (31% - 23%)	56 (21% - 20%)	507 (45% - 37%)	406 (73% - 59%)
	Average length (cm)	207.3	212.7	201.9	210.5
	Average distance (m)	5.6	5.6	5.8	5.4
	Time (min)	150 (2.5h)	80 (1.3h)	570 (9.5 h)	180 (3h)
Caging: transport cage ID		ESP010R (with another transfer)		ESP014R	ESP008R
Manual	Number of samples	Not available		Not available	Not available
	Average length (cm)	Not available		Not available	Not available

- Length measurements were obtained manually from stereocamera recordings (32%, 21%, 45%, and 73% for four transfers in the Mediterranean, and 65% for one transfer in the Adriatic)

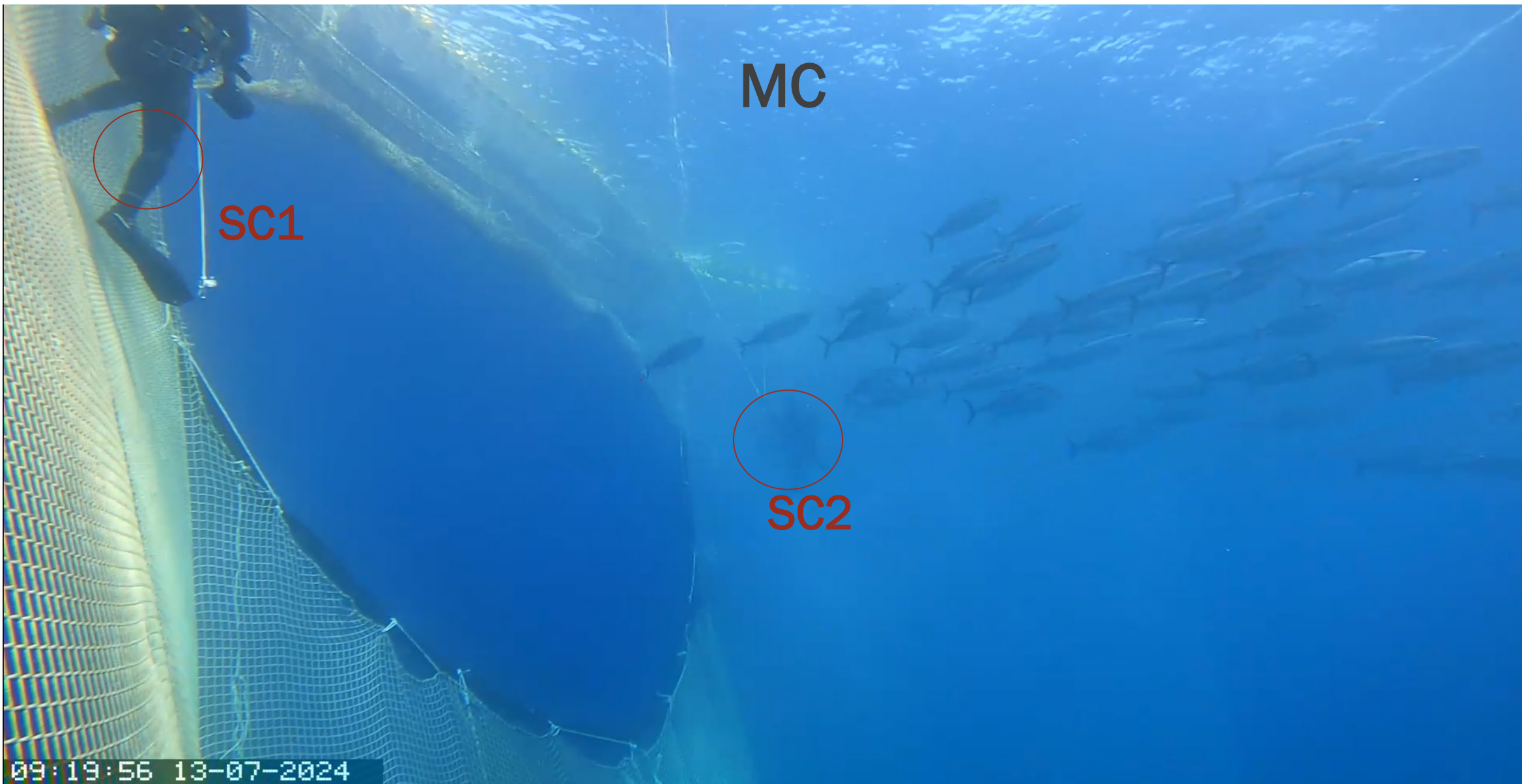


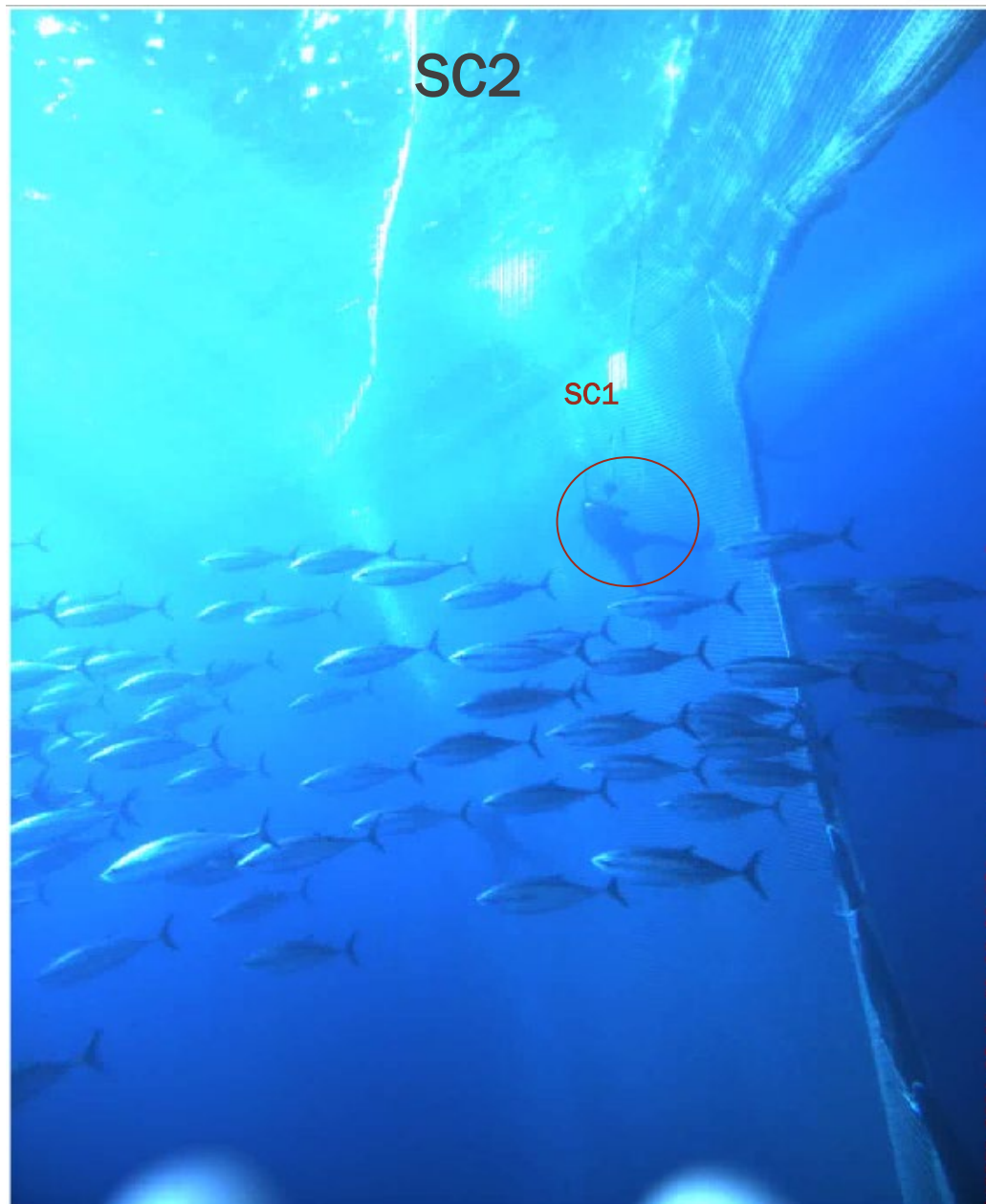
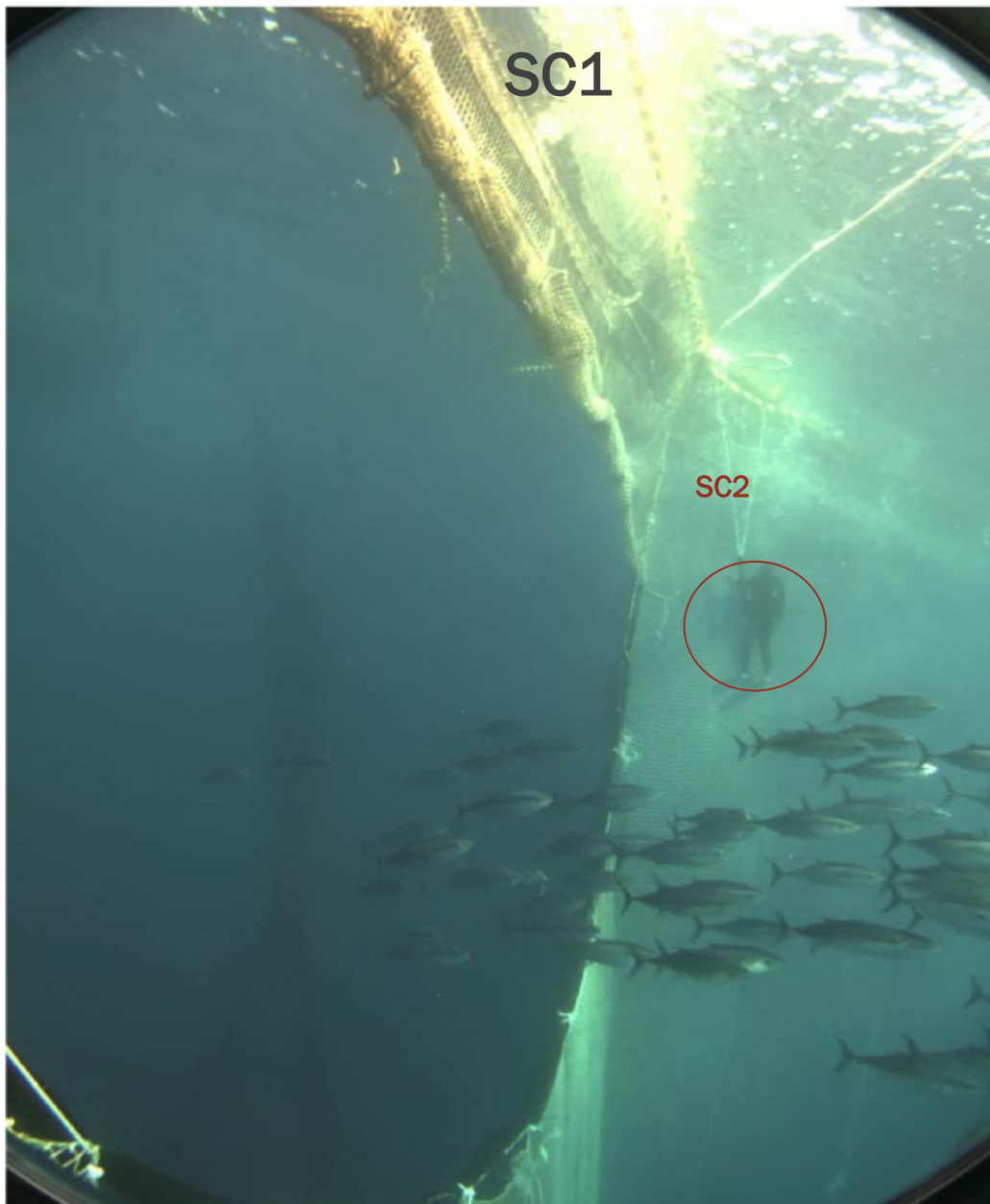


# ADRIATIC: RECORDING SETUP

- Cannot mimic the recording setup at caging: very different gate sizes (4x3m at caging, 14x6m at first transfers)
- Two alternative recording setups were agreed upon with the operators:
  - Use a 14x6 meter gate and record with two stereocameras, positioned on either side of the gate, to accommodate large catches.
  - Use a 7x6 meter gate and record with one stereocamera for small catches, up to 500 fish averaging 8-10 kg.
- The only transfer recorded was done with 2 SC separated 12m, what results in an approximate gate size of 10x6m.







# ADRIATIC: FIRST TRANSFERS

- One transfer from purse seine to transport cage in collaboration with Jadran Tuna (Croatia) was recorded

Transfer ID	T_CRO
Transport cage	EUHRV013 (with other 4 transfers)
Date and time	13/07/2024 08:59-9:30
Video duration (min)	31
Number of cameras	2 lateral SC and 1 MC

- Why only one?
  - Scarcity of catches during our 17-day extended stay in Croatia, primarily caused by unfavorable weather and sea conditions.
  - The tests were conducted late in the season, by which time most of the quota had already been captured, as per the operators' request.
- A comparison of fish counting and sizing between first transfers and caging could not be performed, as fish from four other first transfers were placed into the transport cage.



# ADRIATIC: FISH COUNTING

Transfer ID	T_CRO
Date and time	20240713 08:59-09:30
Video duration (min)	31
Counting in First Transfers	
Manual with moncamera	290/300
Manual with stereocamera	243/250 (-16.7%)
Counting at caging	
Manual with stereocamera	2668 (with other 4 transfers)

- All fish fit within field of view of both cameras, so the stereocamera could be used for counting, but a difference of 16.7% was observed.
- The slightly different perspective of the moncamera helps to better distinguish fish in such overlapping schools.

# ADRIATIC: FISH SIZING

Transfer ID		T_CRO
Date and time		20240713 08:59-09:30
Transport cage		EUHRV013 (with other 4 transfers)
Video duration (min)		31
Length estimation in First Transfers		
Number of fish with monocamera		290/300
Number of fish with stereocamera		243/250
Manual	Number of samples	160 (SC: 65% - MC: 54%)
	Average length (cm)	80.6
	Time (min)	180 (3h)
Length estimation at caging		
Manual	Number of fish	2668
	Number of samples	917 (34%)
	Average length (cm)	79.1

- 65% of the transferred individuals counted with the stereocamera recording were measured manually



# CONCLUSIONS

- Estimating weight at first transfers with stereoscopic and conventional cameras is feasible.
- **Length measurements** were obtained **manually** from stereocamera recordings by marking the snout and fork tail points of individuals (32%, 21%, 45%, and 73% for four transfers in the Mediterranean, and 65% for one transfer in the Adriatic), while **fish counts** were determined from monocamera recordings.

# ACKNOWLEDGMENTS

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- The UPV team acknowledges the assistance provided by Balfegó Tuna and the Patrullero de Altura Alborán P-62 of the Spanish Navy in supplying boats and divers to record the transfers in the Mediterranean. Likewise, we acknowledge the assistance provided by Jadran Tuna and the Croatian Ministry of Agriculture in supplying boats and divers to record the transfers in the Adriatic.