



GBYP WORKSHOP ON BFT REPRODUCTIVE BIOLOGY
ICCAT MADRID, 26-28 NOVEMBER 2018



Recruits from farmed ABFT in Murcia?

Fernando de la Gándara y Aurelio Ortega (IEO)





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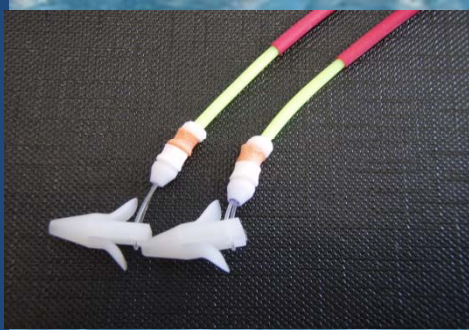


It has been demonstrated at least in the Murcia area, that the captive ABFT (*Thunnus thynnus*) for fattening activities reproduce actively in the farming cages in the natural spawning season (early June – middle July).



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GnRH_a (6 mg/fish)



Mylonas CC., Bridges C.R, Belmonte A., Gordin H., Garcia-Gómez A., Fauvel C., Rosenfeld H., Medina A., Corriero A., Demetrio G., Vassallo-Agius R. and Zohar Y. (2008). Induction of spermiation, ovulation and spawning in Atlantic bluefin tuna (*Thunnus thynnus*) using GnRH_a delivery systems. *Proceedings of the EAS 2008 Krakow (Poland)*, 456-457



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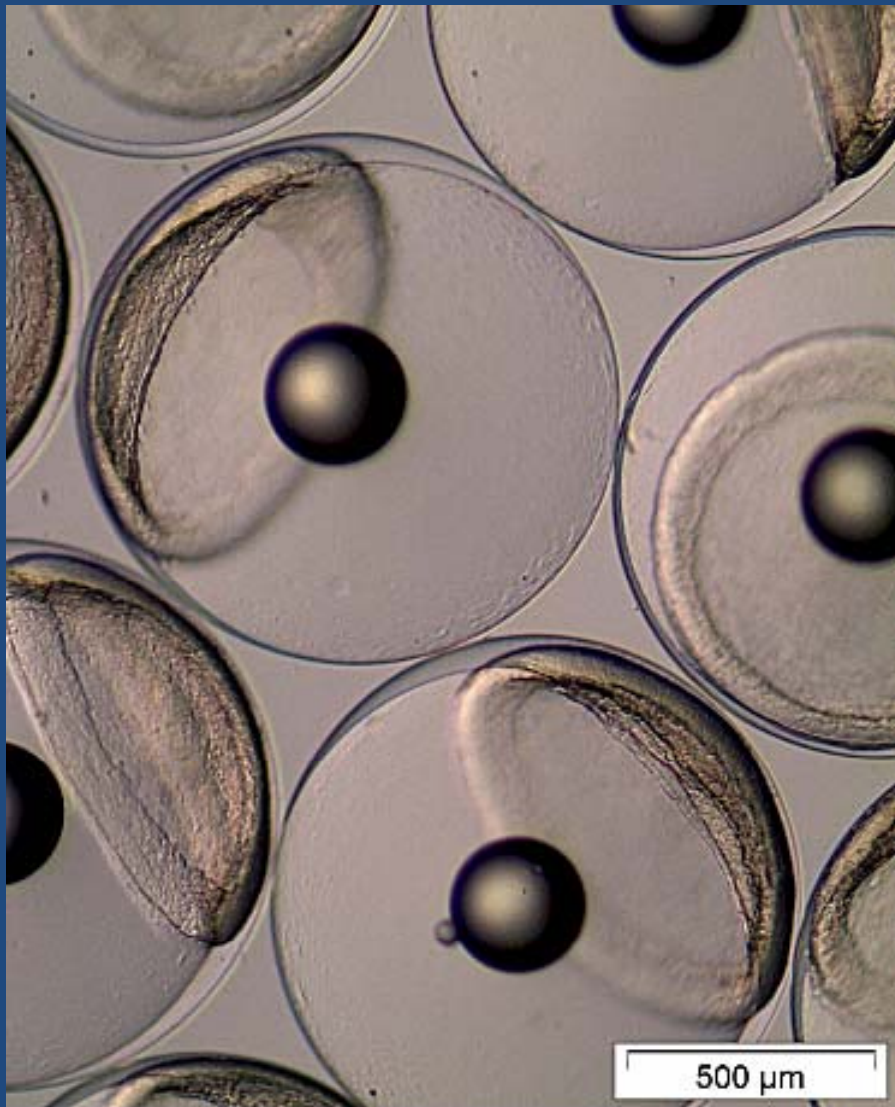
De la Gándara, F., Mylonas, C.C., Coves, D., Bridges, C.R., (Eds.), 2012. SELFDOTT Report 2010-2011, 488 p.



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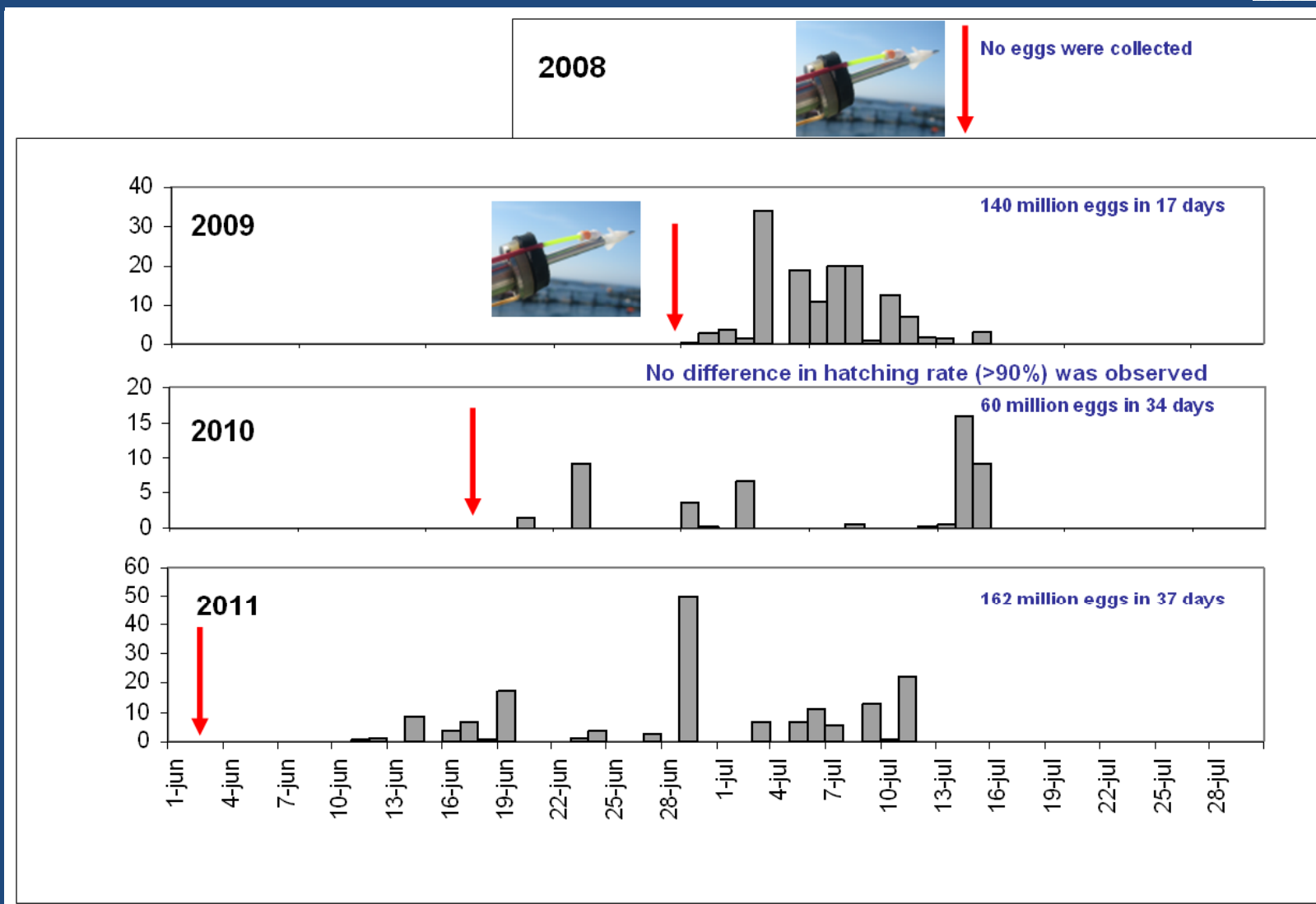


Tens of millions of fertilized eggs coming from these cages had been collected in the last years and cultured in the facilities of the Spanish Institute of Oceanography (IEO) in Mazarrón (Murcia, SE Spain) and grown up to juveniles, demonstrating as well their viability.





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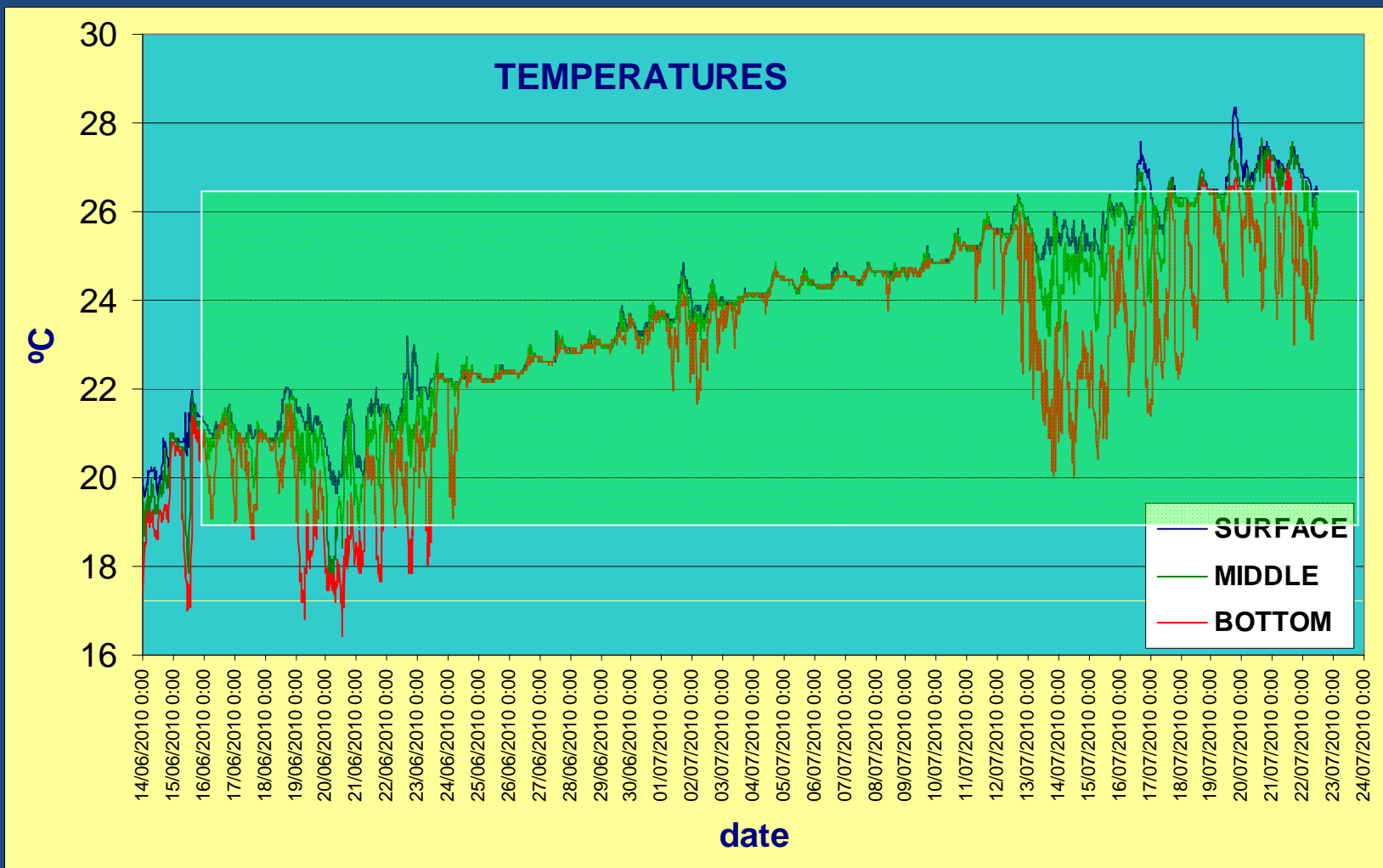




Table I: ABFT juveniles produced in the IEO during last years

Year	2011	2012	2013	2014	2015
Nº juveniles	3.900	3.400	3.700	2.300	14.800

Ortega, A., & De la Gándara, F. (2017). Closing the life cycle of the Atlantic bluefin tuna *Thunnus thynnus* in captivity. In *Proceedings of the Aquaculture Europe 17* (pp. 857–858). Dubrovnik (Croatia) 17-20 October 2017.



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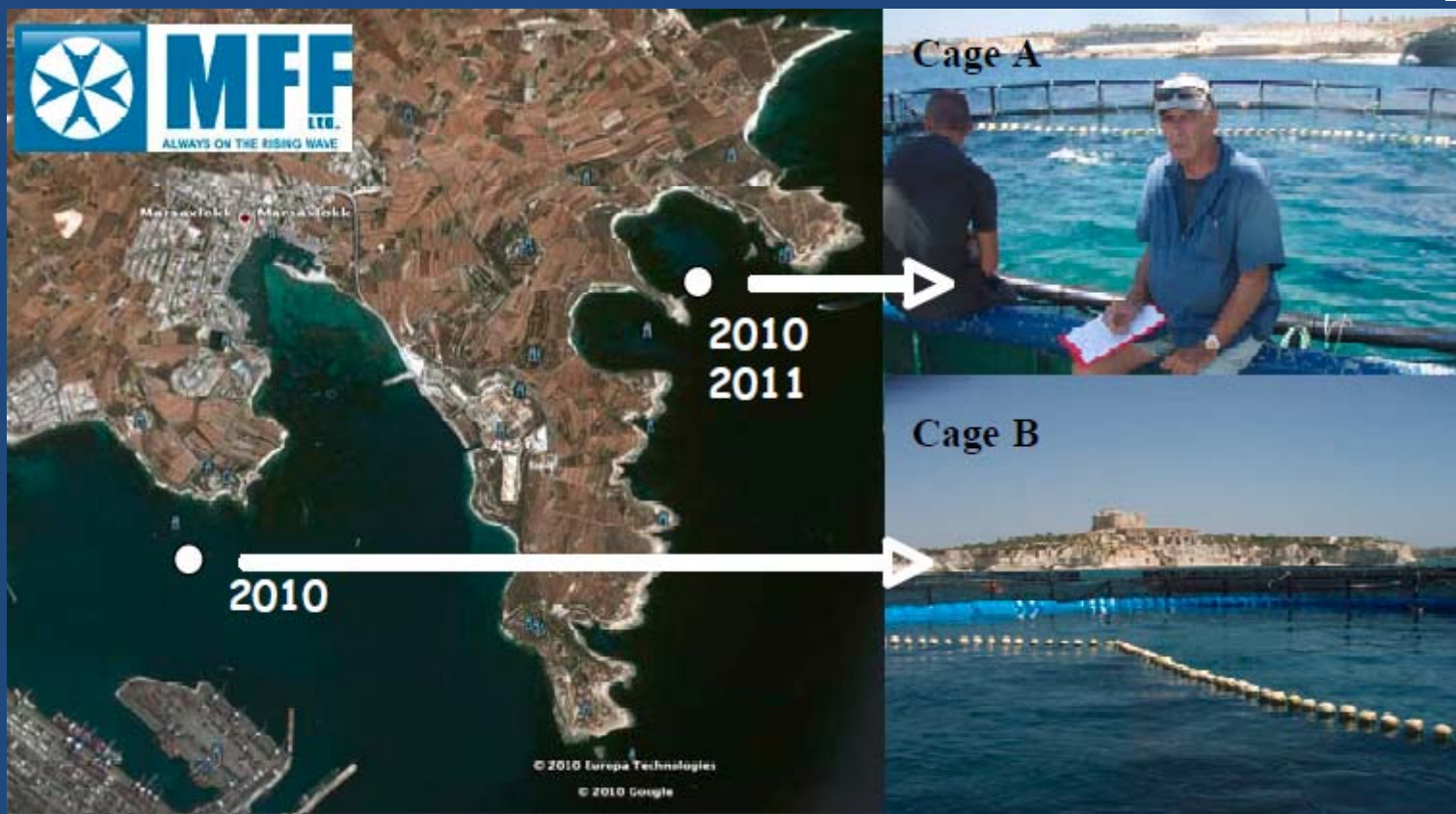


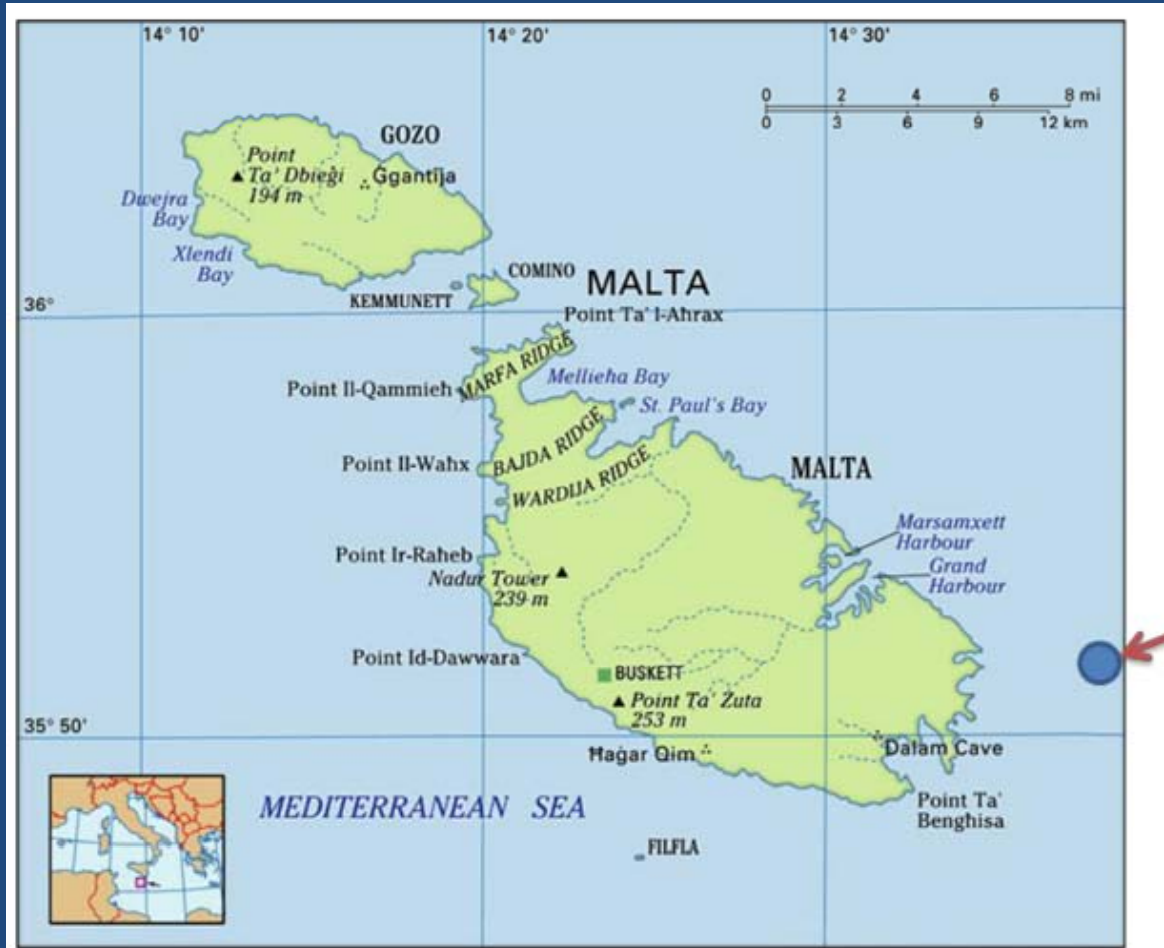
Table 2.2.1. Egg collection data from the Malta broodstock in 2010.

Date	Seawater Temp. (°C)	Bouyant Eggs	Fertilization Rate (%)	Average Egg Diameter (µm)	Hatching Rate (%)
20th June	20.4	10,000	94.0	n.a.	42.3
21st June	20.4	2,000	96.0	n.a.	52.0
25th June	20.9	10,000	100.0	n.a.	58.0
26th June	20.2	40,000	94.0	1055	48.0
28th June	20.6	70,000	90.0	1070	59.0
30th June	21.6	10,000	98.0	n.a.	48.0
2nd July	20.7	110,000	88.0	1023	30.0
4th July	22.5	2,000	98.0	n.a.	54.0
5th July	22.7	40,000	100.0	1050	n.a.
7th July	23.9	30,000	100.0	1050	n.a.

De la Gándara, F., Mylonas, C.C., Coves, D., Bridges, C.R., (Eds.), 2012. SELFDOTT Report 2010-2011, 488 p.



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Deguara, S. (2011). Natural spawning of captive Atlantic bluefin tuna, *Thunnus thynnus* L., in farm cages in Malta. SCRS, SCRS/2011/, 1–4.



Croatian tuna farm spawns bluefin

By SeafoodSource staff
October 7, 2009

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Kali Tuna, a Croatian tuna farming company, on Tuesday announced it achieved a vital step in closed containment farming of Atlantic bluefin tuna (NBT).

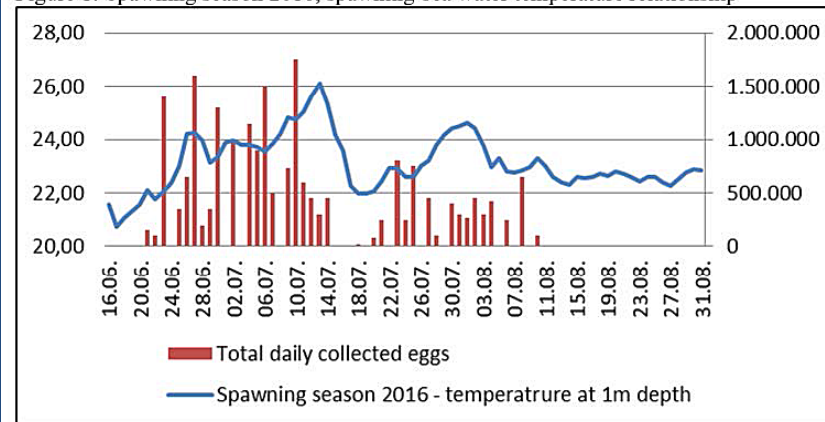


Marine scientists at Split University in Croatia recently confirmed that gametogenesis was completed and a number of bluefin tuna eggs were spawned in cages off the coast of Croatia, at Kali Tuna's Adriatic farming sites.

More than 800 brood stock were kept in a special cage since spring 2006, and the fish spawned successfully in the cage early this summer. Most of the eggs were released naturally into the water, while others were collected and later successfully hatched in a Split-based laboratory.

The fact that the captive tuna has spawned without hormones or human assistance makes this a unique event," said Dr. Ivan Katavic, Split's Institute of Oceanography and Fisheries head of laboratory and former assistant minister of fisheries in Croatia. "Our project was designed to break the code of the NBT's reproduction habits. We aimed to create a closed life cycle for the farming of the species and relieve the pressure on the existing fish in the world's oceans. This result is a significant step in that direction. The combination of the farming techniques of Kali Tuna and the location of their cages are the key to our achievement. Kali Tuna grows its fish for a longer period than most other farms. The combination of good husbandry and unique site conditions allows Kali Tuna to meet physiological requirements of brood stock to complete reproductive cycle in captivity."

Figure 1: Spawning season 2016, spawning-sea water temperature relationship



Cinoti, N., Katačić, V., Gomezjurado, J., & Zohar, Y. (2017). OVERVIEW OF ATLANTIC BLUEFIN TUNA *Thunnus thynnus* SPAWNING PROGRAMME IN KALI TUNA GROUP. In *Proceedings of the Aquaculture Europe 17* (pp. 219–220).



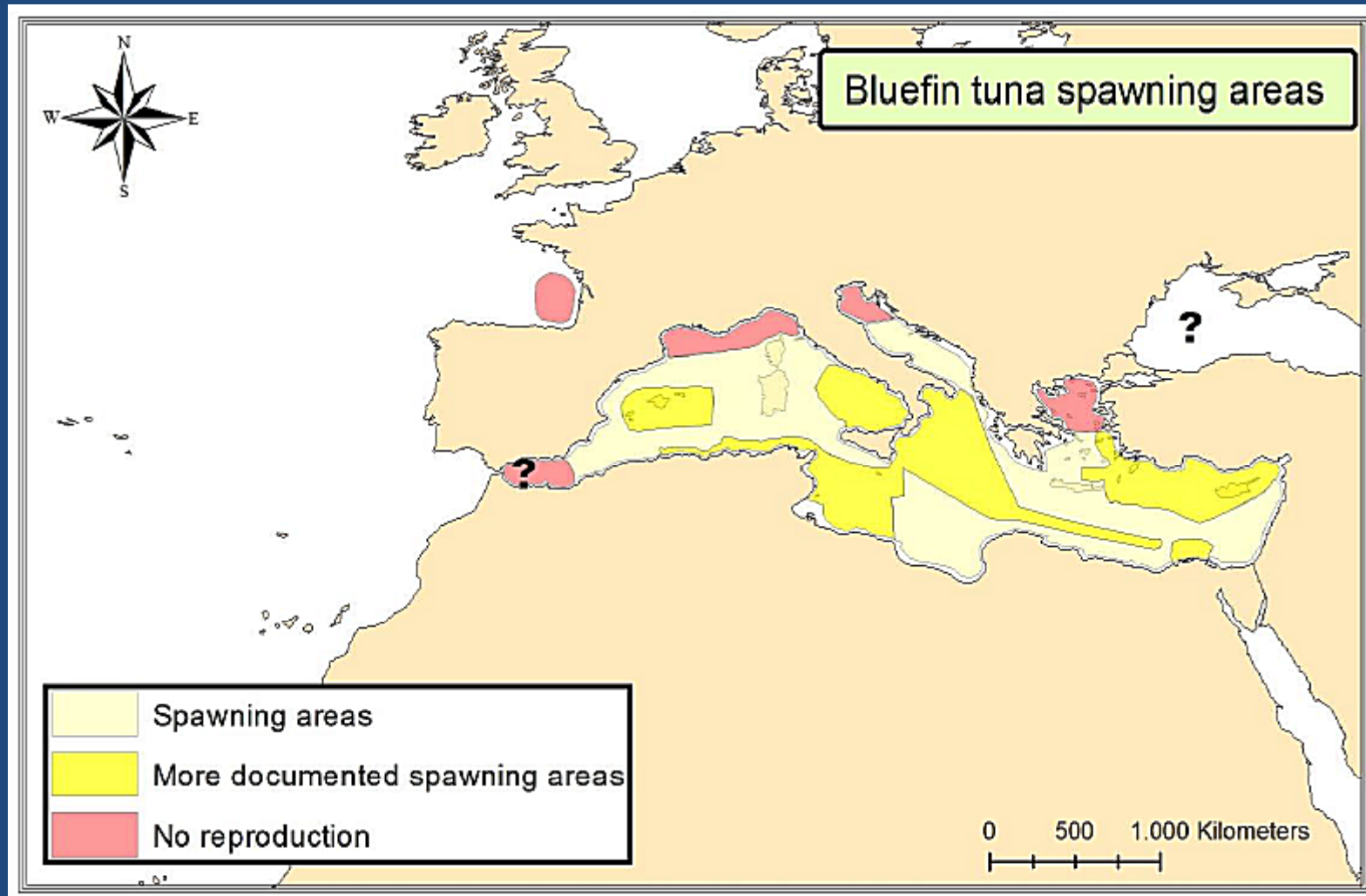
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Gordoa (2011) estimated the impact which the purse seine catch in the Balearic Islands has on bluefin tuna recruitment .



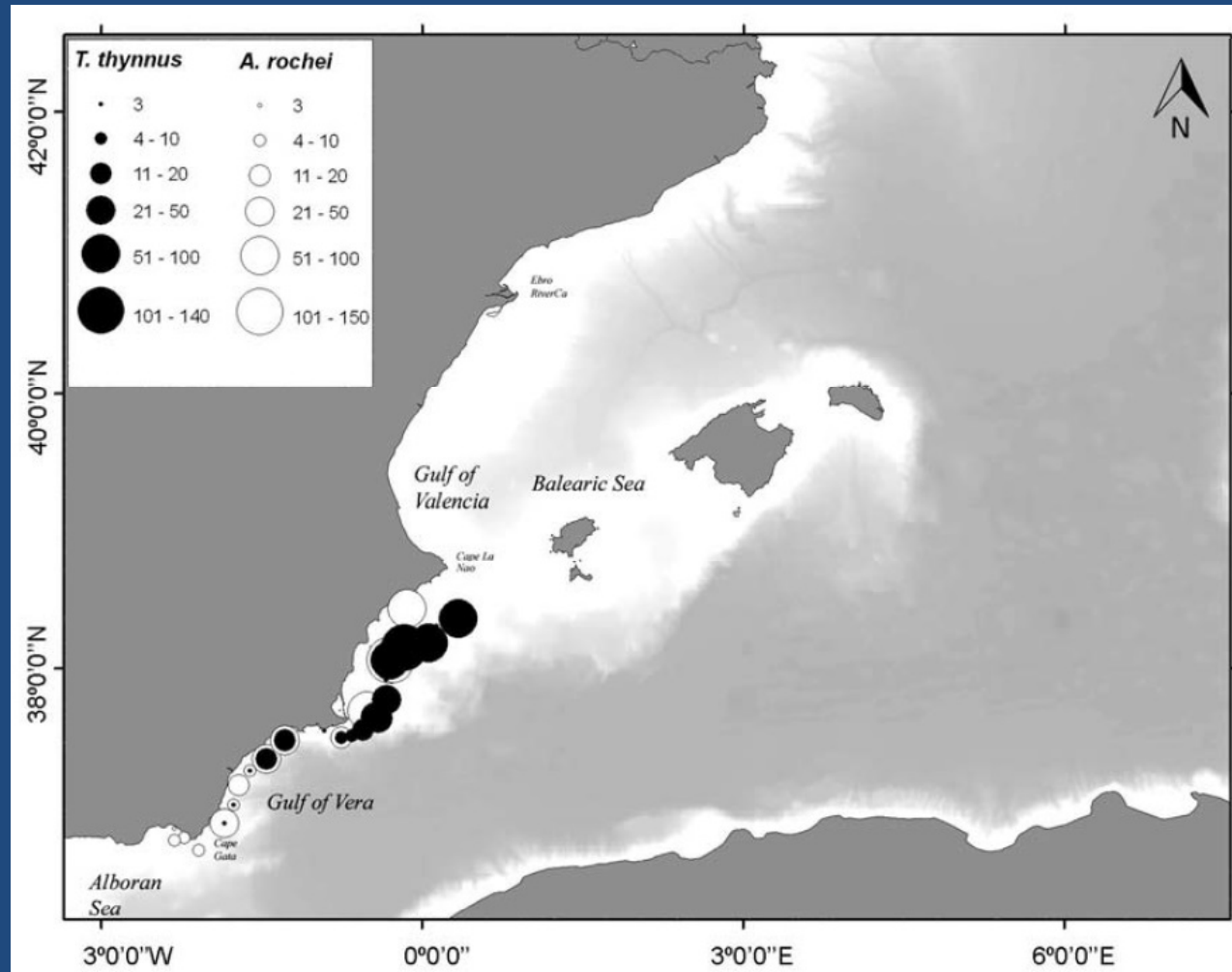
Gordoa, A. (2011). Aproximación al impacto sobre el reclutamiento del atún rojo (*Thunnus thynnus*) de las capturas de cerco en Baleares con el actual periodo de veda. Collective Volume of Scientific Papers ICCAT, 66(2), 835–838.



PICCINETTI, C., DI NATALE, A., & ARENA, P. (2013). Eastern bluefin tuna (*Thunnus thynnus*, L.) reproduction and reproductive areas and season. Collective Volume of Scientific Papers ICCAT, 69(2), 891–912.



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Bluefin (*T. thynnus*) and bullet tuna (*A. rochei*) larval catches of the 2011 MEDIAS survey.

GARCIA, A., LAIZ, R., QUINTANILLA, J., CORREGIDOR, F., & ALEMANY, F. (2013). Report on abundant bluefin larval concentrations (*Thunnus thynnus*) found off the shelf/slope area in the Spanish levantine coasts. Signs of recovery? Collective Volume of Scientific Papers ICCAT, 69(1), 292–296.

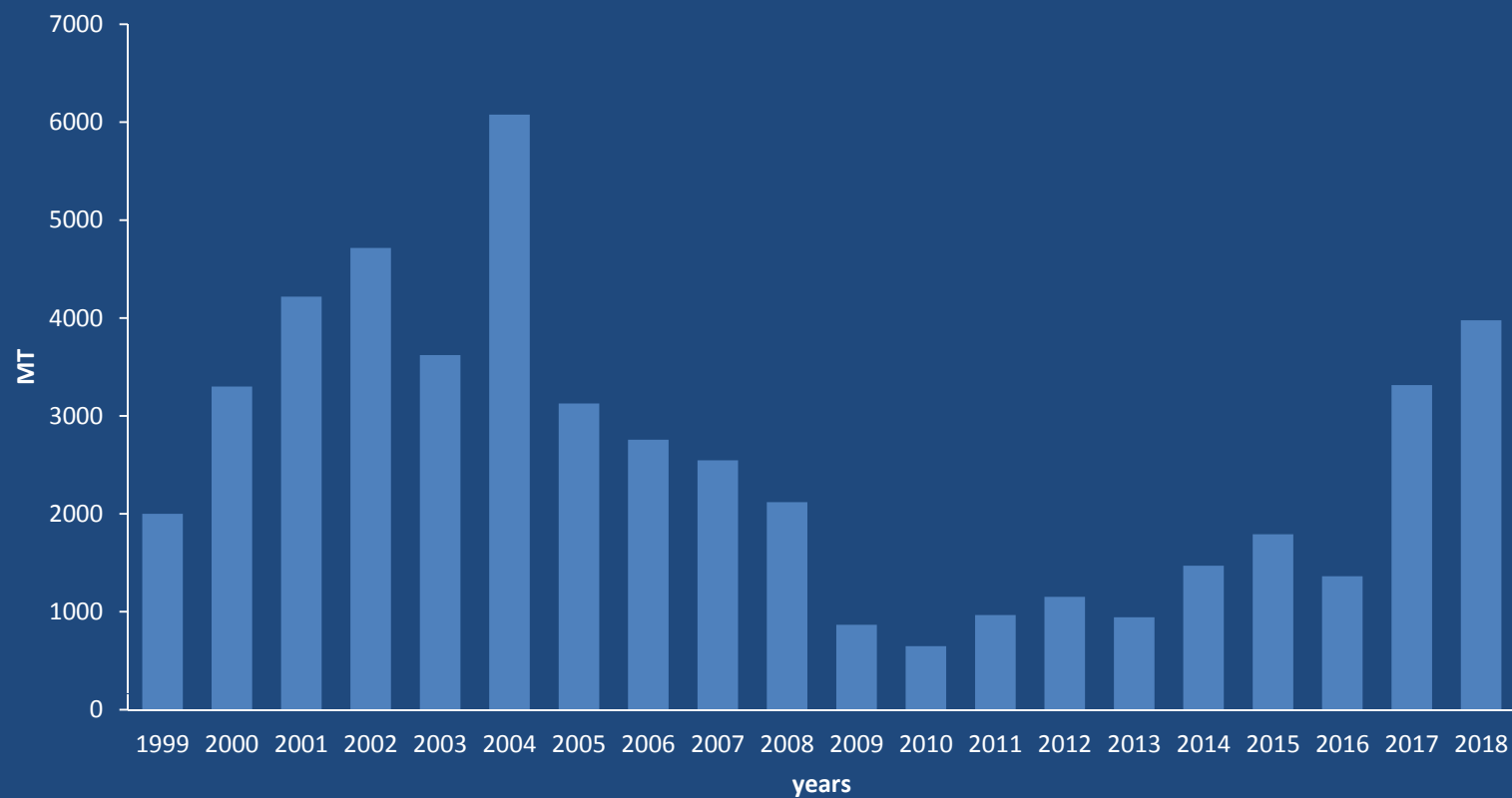


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ABFT PRODUCTION IN MURCIA REGION



Jacumar, 2018

<https://www.mapa.gob.es/es/pesca/temas/acuicultura/junta-asesora-de-cultivos-marinos/>



A ROUGH CALCULATION

Medina et al, 2007. Relative fecundity : 702 .000 eggs / Kg

ABFT females mantained in captivity every year in Murcia: 10^6 kg
Number of eggs produced by a ABFT females a year: 10^6 eggs / kg

Number of ABFT eggs produced in Murcia every year: 10^{12} kg

Taking into account that an ABFT female could spawn roughly hundred thousands of eggs per kg during all the spawning season and thousands of tones of ABFT adults have been farmed in the Murcia coast during the last years, the total fertilized eggs could reach hundreds of billions every year.

Gordoa, A. (2011). Aproximación al impacto sobre el reclutamiento del atún rojo (*Thunnus thynnus*) de las capturas de cerco en Baleares con el actual periodo de veda. Collective Volume of Scientific Papers ICCAT, 66(2), 835–838.

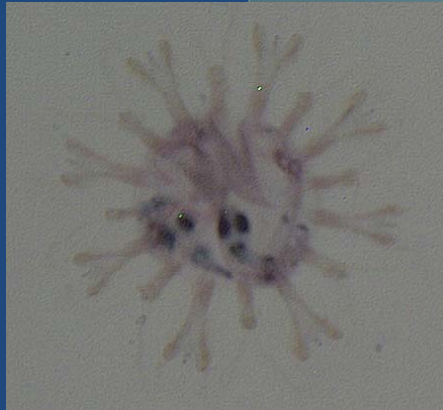
Medina, A., Abascal, F., Aragón, L., Mourente, G., Aranda, G., Galaz, T., Belmonte, A., De la Serna, M., & García, S. (2007). Influence of sampling gear in assessment of reproductive parameters for bluefin tuna in the western Mediterranean. Marine Ecology Progress Series, 337, 221–230.



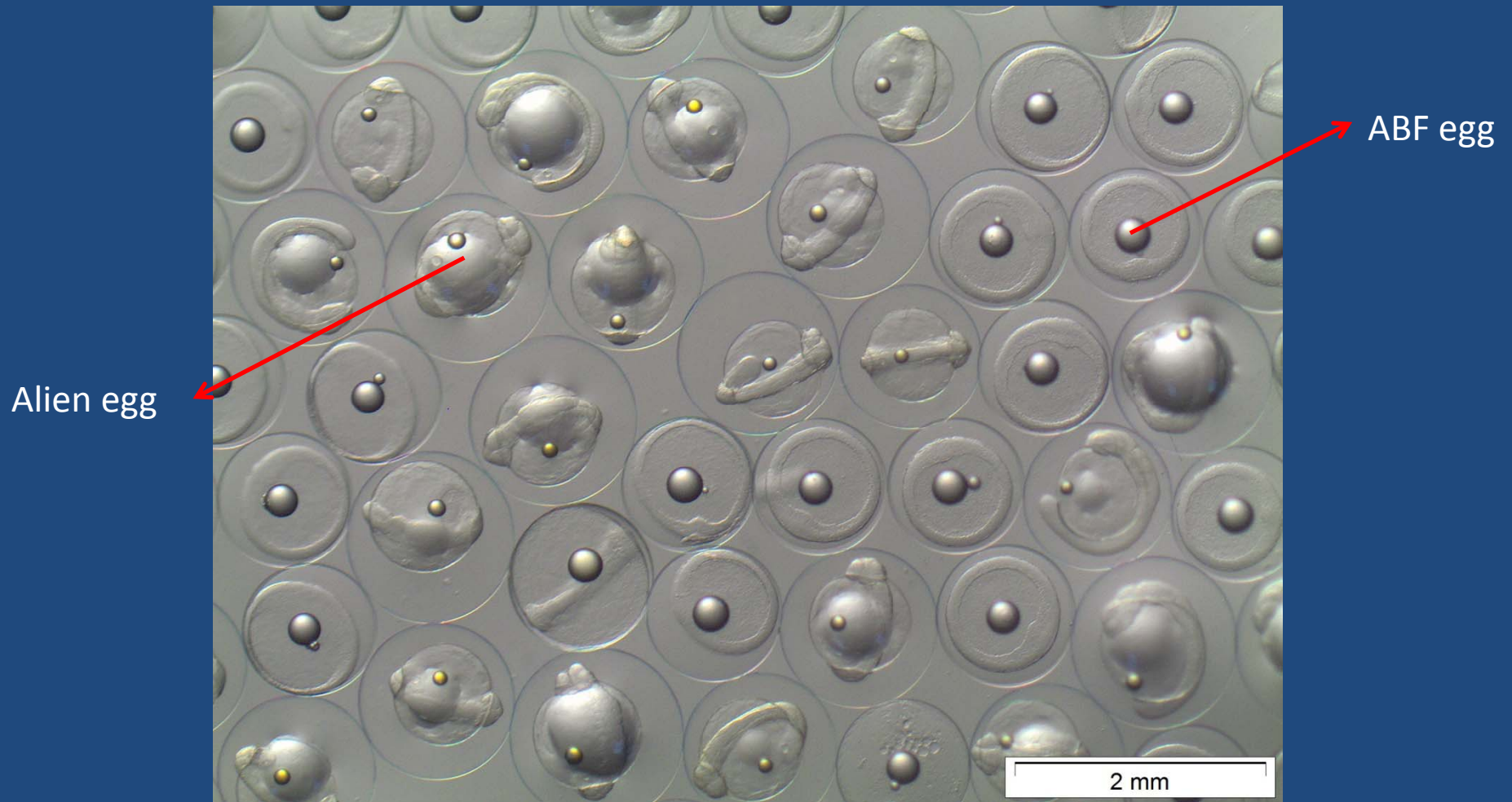
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Obviously the conditions in the Murcia coast are different of the natural spawning areas not only regarding the feeding availability but also the massive presence of many egg and larvae predators.



Gordoa, A., Acuña, J. L., Farrés, R., & Bacher, K. (2013). Burst Feeding of *Pelagia noctiluca* ephyrae on Atlantic Bluefin Tuna (*Thunnus thynnus*) Eggs. *PLoS ONE*, 8(9), e74721–e74721. <https://doi.org/10.1371/journal.pone.0074721>



DE LA GANDARA, F., & ORTEGA, A. (2017). Eliminación de huevos de especies no deseadas en puestas de atún rojo (*Thunnus thynnus*) recogidas en el mar. In Actas del XVI Congreso Nacional de Acuicultura. Zaragoza 3-5 Octubre 2017: 398-399



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CONCLUSION

Taking into account that an ABFT female could spawn roughly hundred thousands of eggs per kg during all the spawning season and thousands of tones of ABFT adults have been farmed in the Murcia coast during the last years, the total fertilized eggs could reach hundreds of billions every year.

Obviously the conditions in the Murcia coast are different of the natural spawning areas not only regarding the feeding availability but also the massive presence of many egg and larvae predators.

It would be recommendable to carry out prospecting surveys in the aim to shed some light on this possible effect of farmed ABFT on the recruitment at least in Murcia region.



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Many thanks for your attention

