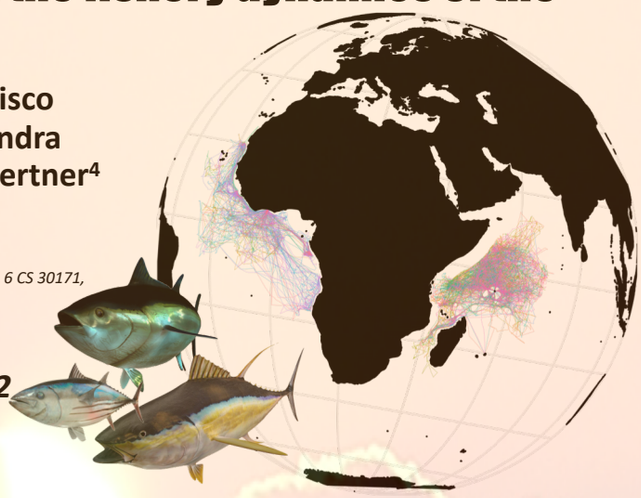
Contrasting the VMS vs AIS coverage on the fishery dynamics of the tropical tuna purse-seine fleet

Miguel Cabanellas-Reboredo[1*], Nathan A. Miller[2], Francisco Abascal[3], Patricia Reglero[1], Marina Sanz[1], Daniela Alexandra Chanto-García[1], Alejandro Carreño Castilla[1] & Daniel Gaertner[4]

[1]National Center Spanish Institute of Oceanography, CSIC. Balearic Islands CO, Spain
[2]Global Fishing Watch, Washington, DC 20036, USA.
[3]National Center Spanish Institute of Oceanography, CSIC. Santa Cruz de Tenerife CO, Spain.
[4] Institut de Recherche pour le Développement, UMR 248 MARBEC (IRD/Ifremer/UM/CNRS), Avenue Jean Monnet, 6 CS 30171, 34203 Sète Cedex, France.
**miguel.cabanellas@ieo.csic.es*

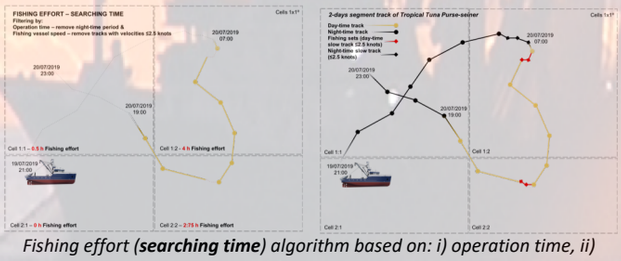


ICES CIEM

ICES Annual Science Conference 2022
Dublin (Ireland)

INTRODUCTION - One of the essential parameters to manage fisheries effectively is the effort developed by fleets[1]. In recent years, the Automatic Identification System (AIS) arises as an alternative monitoring tool to the common Vessel Monitoring System (VMS). Such novel tool provides a higher-resolution time-scale to deal with complex fisheries behaviours[2]. However, some handicaps could constraint the coverage of this promising technology, as for example the turn-off of AIS transistor to avoid piracy, AIS machinery efficiency or satellite reception[3].

OBJECTIVE - Contrast the traditional VMS *vs*. novel AIS tool coverage in term of the fishing effort estimated by this two fishing effort coverage providing an overview about the usefulness and limitations of the emergent AIS tool like a promising fishing monitoring system in on of the most important fishery of the world.

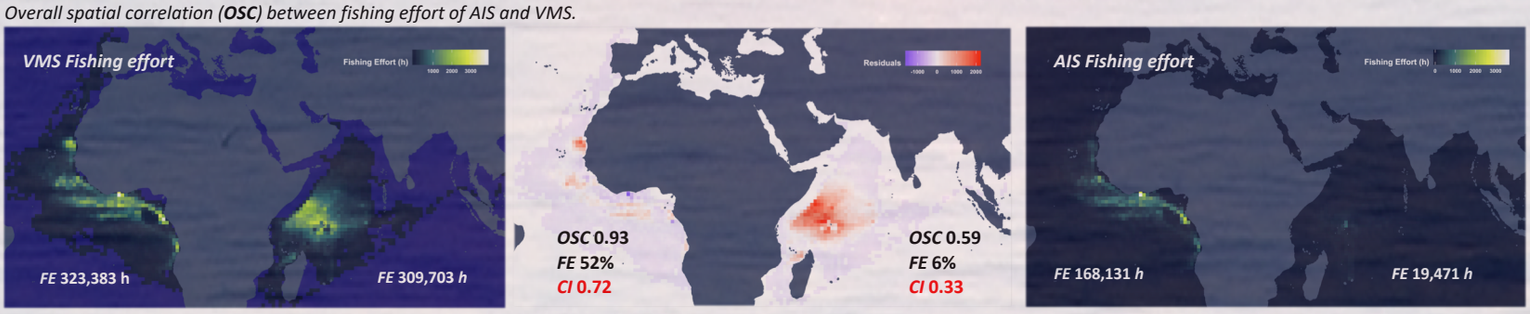


*Fishing effort (**searching time**) algorithm based on: i) operation time, ii) spatial-location activity and iii) fishing vessel speed.*

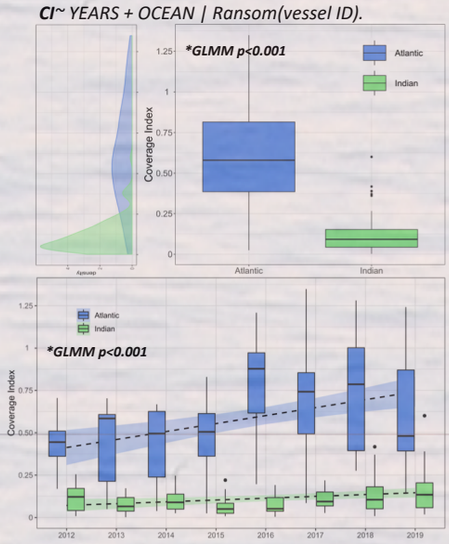
M&M - The spatio-temporal comparison has been conducted pooling the 8-years (from 2012 to 2019) big-data sets (VMS and AIS) from the Spanish and French tuna purse-seiners fleets, as one of the most important worldwide and the most important EU fisheries operating across Atlantic and Indian Ocean.

Quantitative coverage (***QC***) provides the proportion of fishing effort hours covered by AIS. The combination of both values (***OSC***+***QC***/2) provided a ***coverage index*** (***CI***) in which spatial and quantitative heterogeneity between VMS and AIS layers are taking into account.

*Overall spatial correlation (**OSC**) between fishing effort of AIS and VMS.*



Generalized Linear Mixed Models
CI~ *YEARS + OCEAN | Ransom(vessel ID).*



RESULTS & DICUSSION - The spatial heterogeneity analysis detected a big coverage gap across the Indian Ocean, where AIS underestimated in hundreds of thousands the fishing effort hours provided by VMS. Piracy and the behaviour to hide the fishing grounds could be related to this inter-oceanic pattern. A better coverage was observed across Atlantic Ocean, although AIS mainly underestimated oceanic areas while coastal areas were overestimated. Such pattern may be explained by the lower satellite coverage in oceanic areas and the signal reception support of terrestrial at coastal areas.

The aforementioned patterns were maintained along study period (2012-2019). However, the AIS coverage experienced a significant increasing trend over the years providing an encouraging scenario where AIS could become in a useful and high-detailed monitoring fishery and spatial management tool to deal with complex fisheries dynamics in a changing ocean increasingly affected by climate change.

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IJC2019-038852-I funded by MCIN/AEI /10.13039/501100011033
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