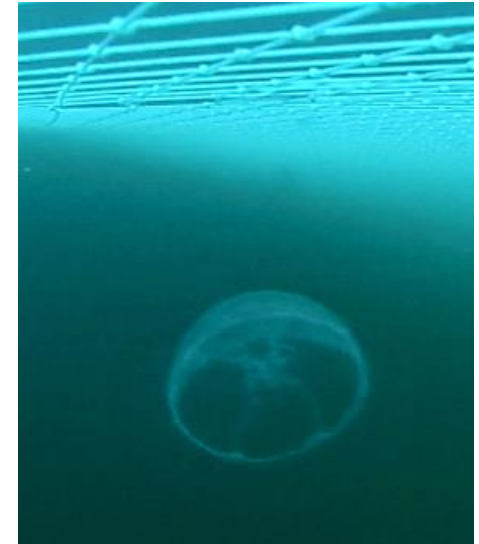


Enhancing the functionality of the net sampling using action cameras: jellyfish observations in the Black Sea during an acoustic survey.

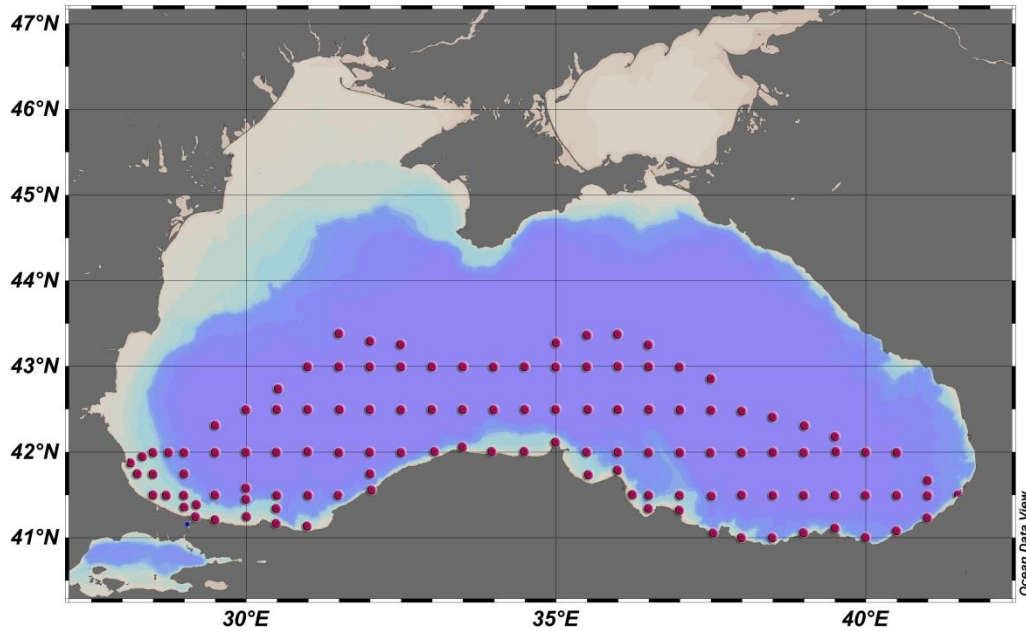
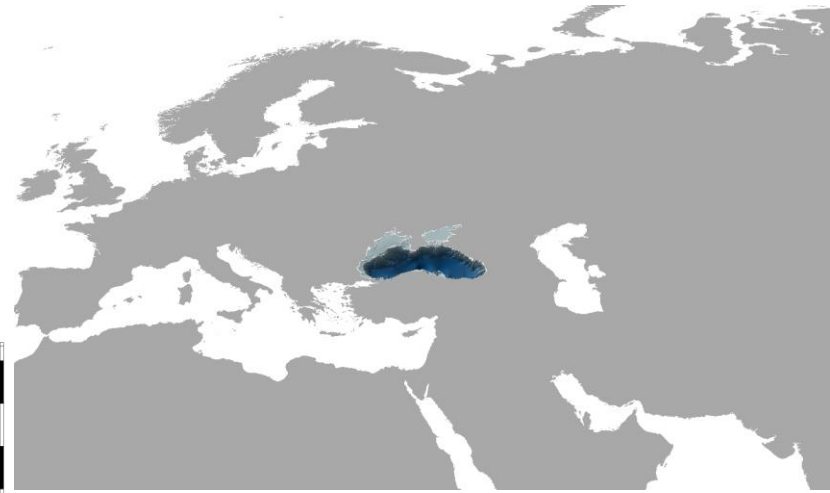
Serdar Sakınan¹ , Ebrucan Kalecik², Ali Cemal Gücü¹



1-Middle East Technical University, Institute of Marine Sciences, 33791 Erdemli, Mersin, Turkey

2-Mersin University, Fisheries Faculty, Yenisehir Campus, Mersin, 33169, Turkey

The Black Sea



The largest anoxic water body on earth



Aurelia aurata



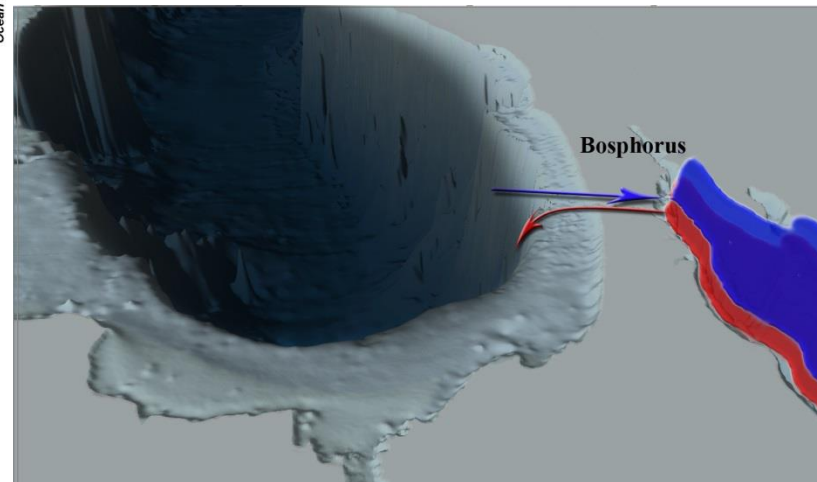
Mnemiopsis leidyi



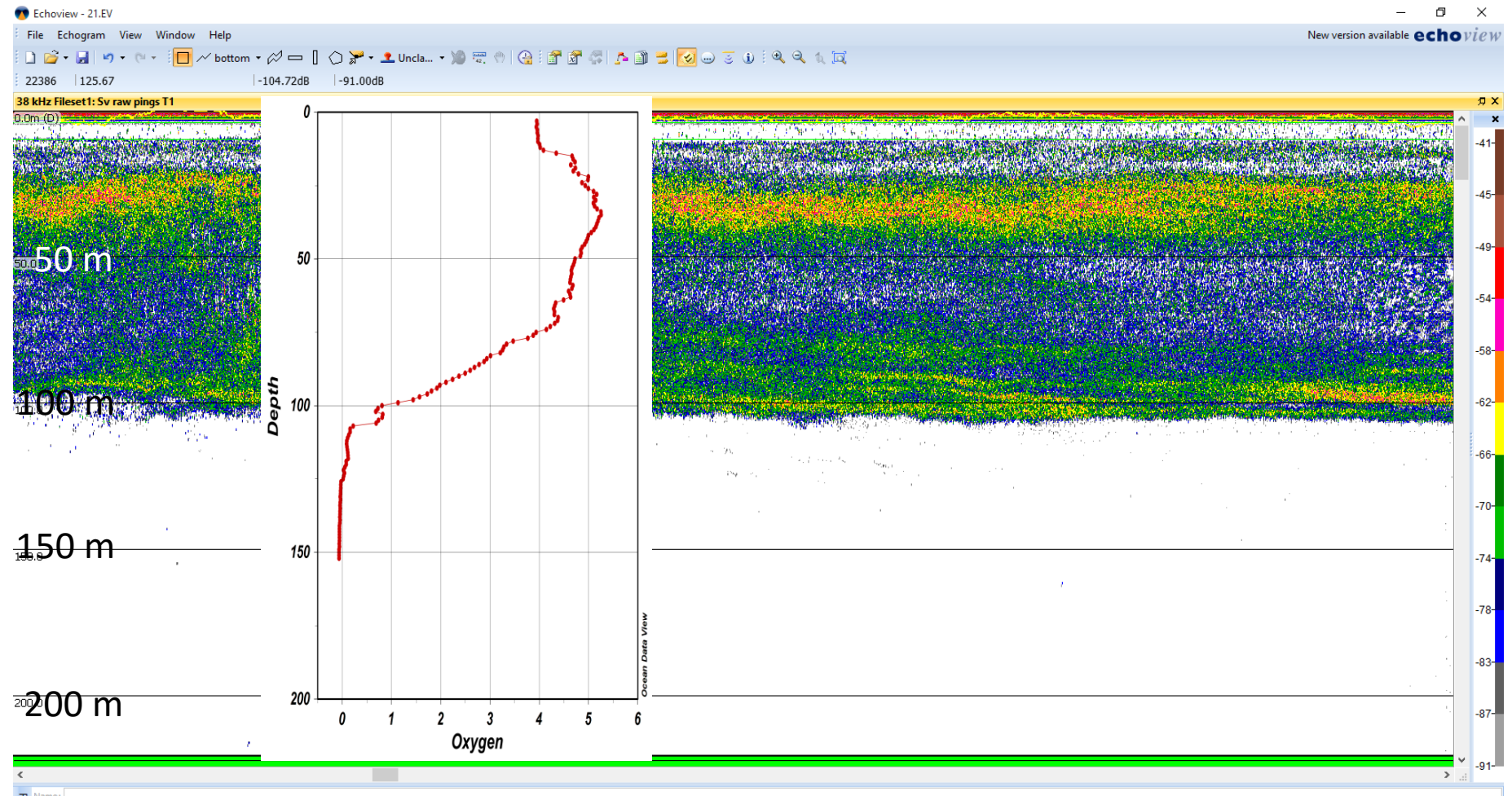
Pleurobrachia pileus



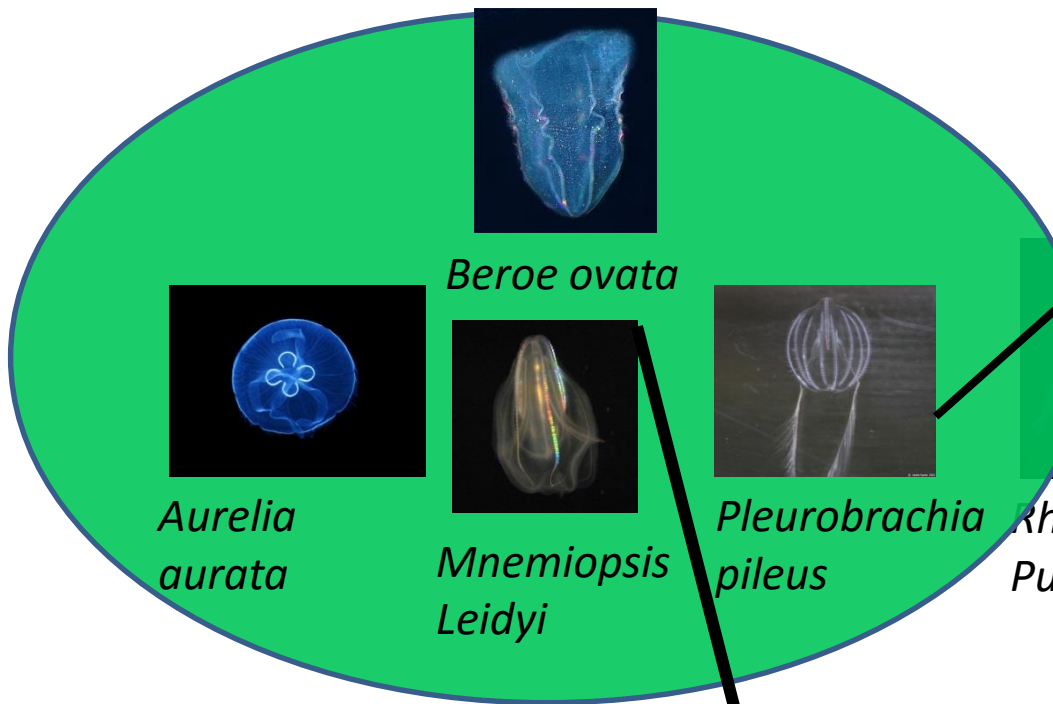
Rhisostoma Pulmo



Typical Summer Echogram in the Black Sea



Calanus euxinus



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Fall and Rise of the Black Sea Ecosystem

Ahmet E. Kideys ^[HN23]

+ Author Affiliations

Science 30 Aug 2002
Vol. 297, Issue 5586, pp. 1482-1484
DOI: 10.1126/science.1073002

Questioning the Rise of Gelatinous Zooplankton in the World's Oceans

ROBERT H. CONDON, WILLIAM M. GRAHAM, CARLOS M. DUARTE, KYLIE A. PITT, CATHY H. LUCA STEVEN H.D. HADDOCK, KELLY R. SUTHERLAND, KELLY L. ROBINSON, MICHAEL N. DAWSON, MA DECKER, CLAUDIA E. MILLS, JENNIFER E. PURCELL, ALENKA MALEJ, HERMES MIANZAN, SHIN-ICHI STEFAN GELCICH, AND LAURENCE P. MADIN



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J. Plankton Res. (2013) 0(0): 1–10. doi:10.1093/plankt/fbt063

HORIZONS

Beyond the jellyfish joyride and global oscillations: advancing jellyfish research

MARK J. GIBBONS^{1*} AND ANTHONY J. RICHARDSON^{2,3}

¹BIODIVERSITY AND CONSERVATION BIOLOGY DEPARTMENT, UNIVERSITY OF THE WESTERN CAPE, PRIVATE BAG X17, BELLVILLE 7535, RSA, ²CLIMATE ADAPTATION

PNAS

Recurrent jellyfish blooms are a consequence of global oscillations

Robert H. Condon^{a,1}, Carlos M. Duarte^{b,c}, Kylie A. Pitt^d, Kelly L. Robinson^{a,e}, Cathy H. Lucas^f, Kelly R. Sutherland^g, Hermes W. Mianzan^h, Molly Bogeberg^a, Jennifer E. Purcellⁱ, Mary Beth Decker^j, Shin-ichi Uye^k, Laurence P. Madin^l, Richard D. Brodeur^m, Steven H. D. Haddockⁿ, Alenka Malej^o, Gregory D. Parry^{p,2}, Elena Eriksen^q, Javier Quiñones^r, Marcelo Acha^h, Michel Harvey^s, James M. Arthur^d, and William M. Graham^t

^aDauphin Island Sea Laboratory, Marine Environmental Sciences Consortium, Dauphin Island, AL 36528; ^bUniversity of Western Australia Oceans Institute, University of Western Australia, Crawley, WA 6009, Australia; ^cDepartment of Global Change Research, Instituto Mediterráneo de Estudios Avanzados, Universidad de las Islas Baleares y el Consejo Superior de Investigaciones Científicas, 01790 Esporles, Spain; ^dAustralian Rivers Institute and Griffith School of

Jellyfish and Ctenophore Blooms Coincide with Human Proliferations and Environmental Perturbations

Jennifer E. Purcell

Shannon Point Marine Center, Western Washington University, Anacortes, Washington 98221; email: purcelj3@wwu.edu

Observing jellyfish is difficult

MEPS 295:105-111 (2005) - doi:10.3354/meps295105

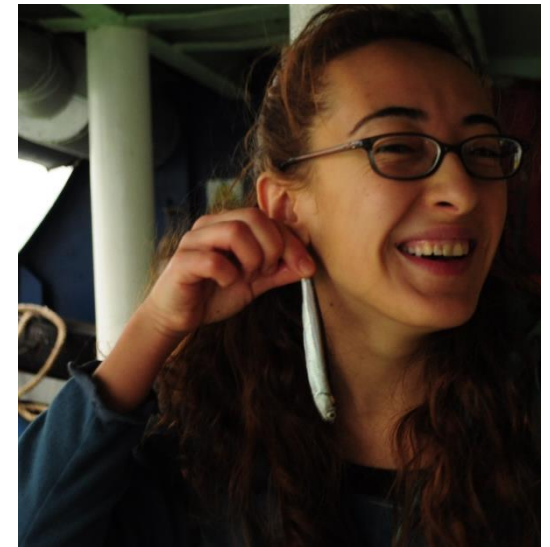
Towards the acoustic estimation of jellyfish abundance

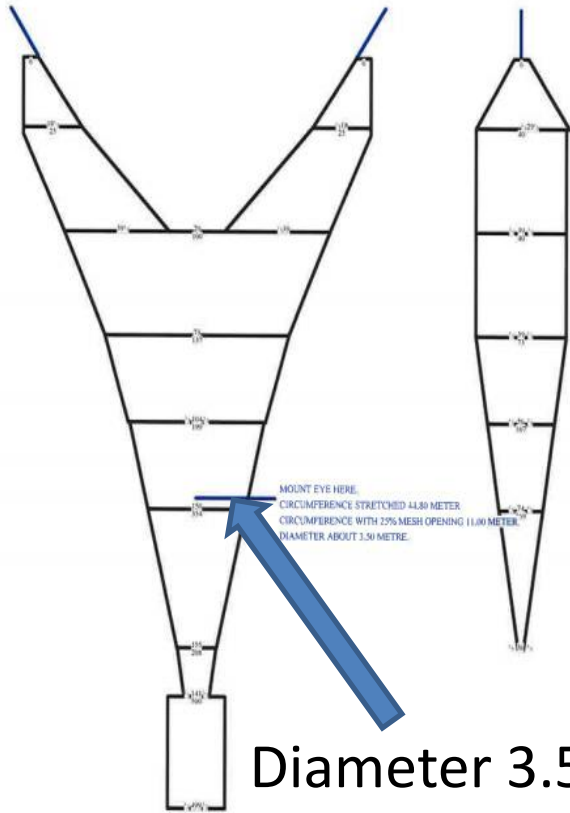
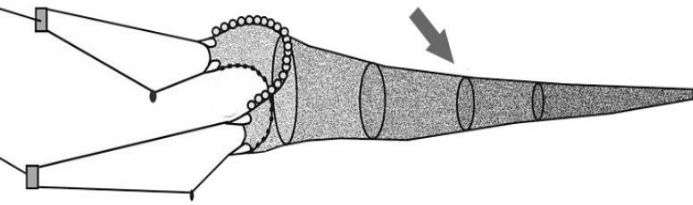
Andrew S. Brierley^{1,*}, David C. Boyer^{2,6}, Bjørn E. Axelsen³, Christopher P. Lynam¹, Conrad A. J. Sparks⁴, Helen J. Boyer², Mark J. Gibbons⁵

What did we do ?

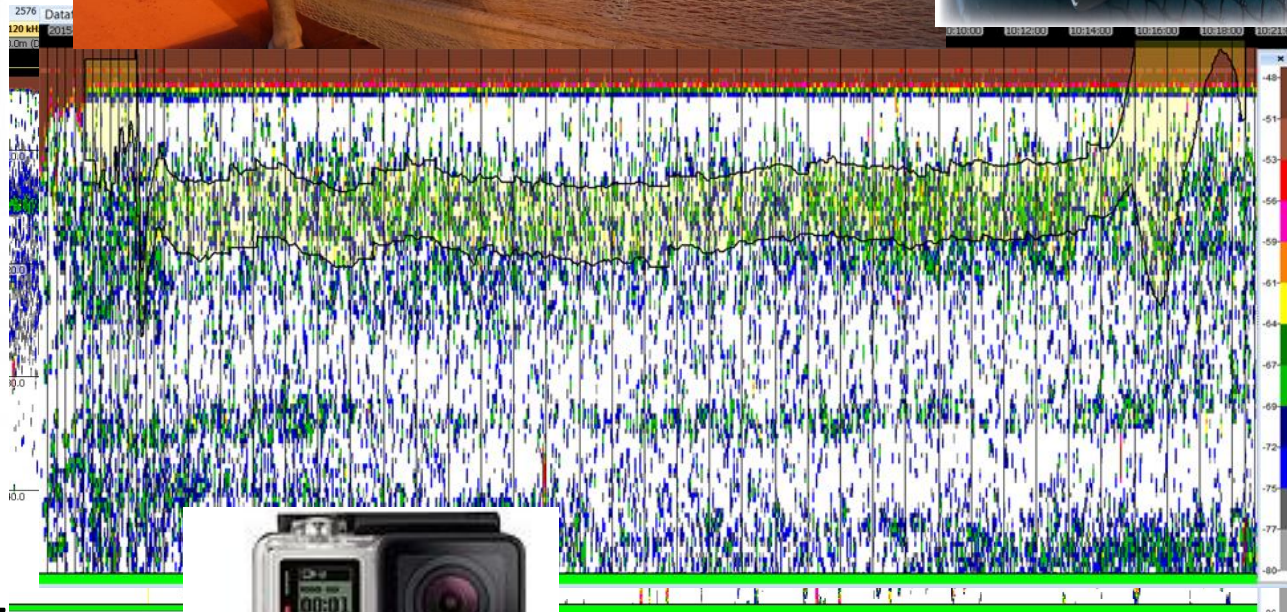
- Anchovy is one of the most important commercially exploited species in Turkey
- July 2015 Spawning stock survey

(July is the peak spawning time of the anchovies)

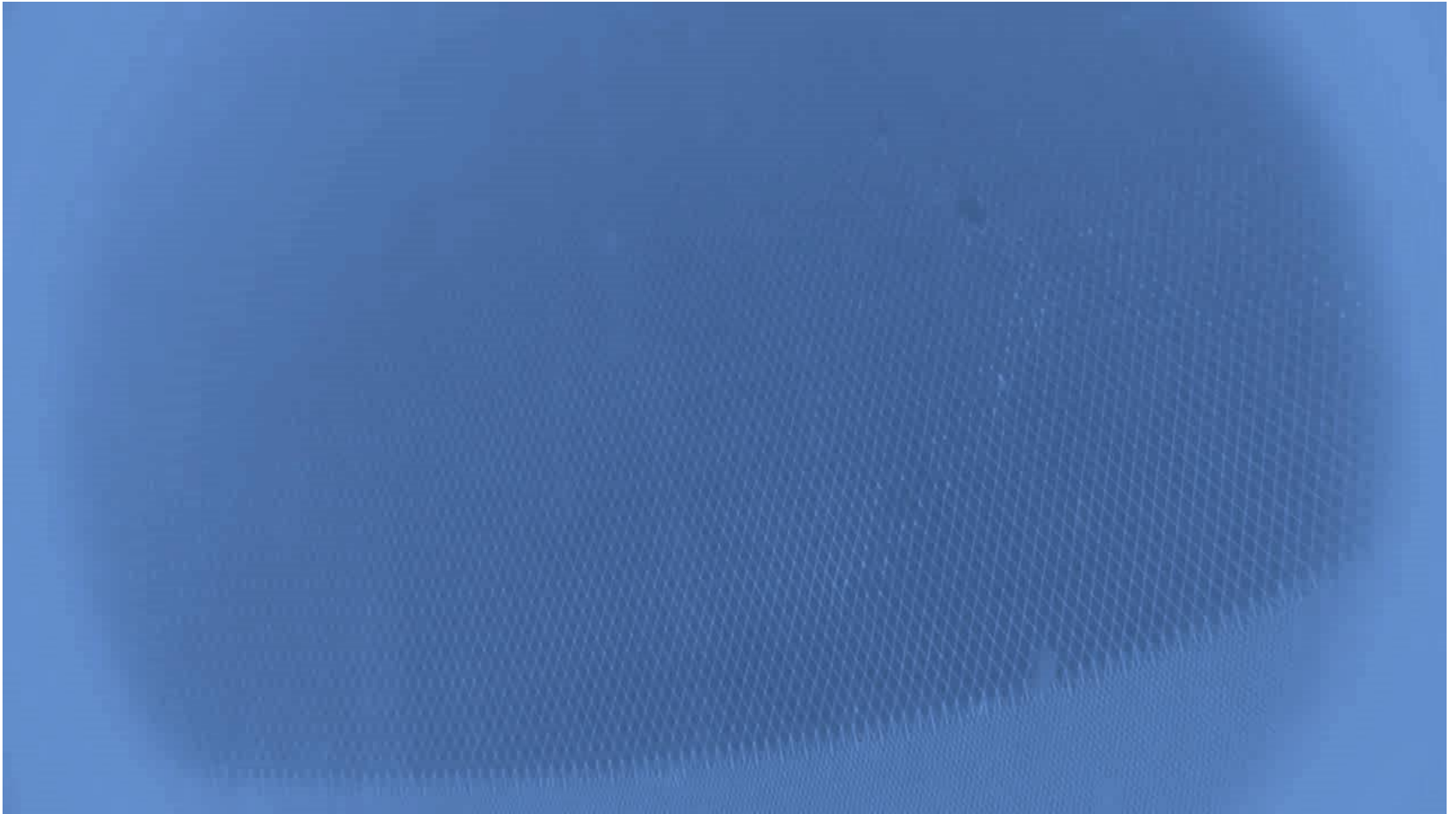




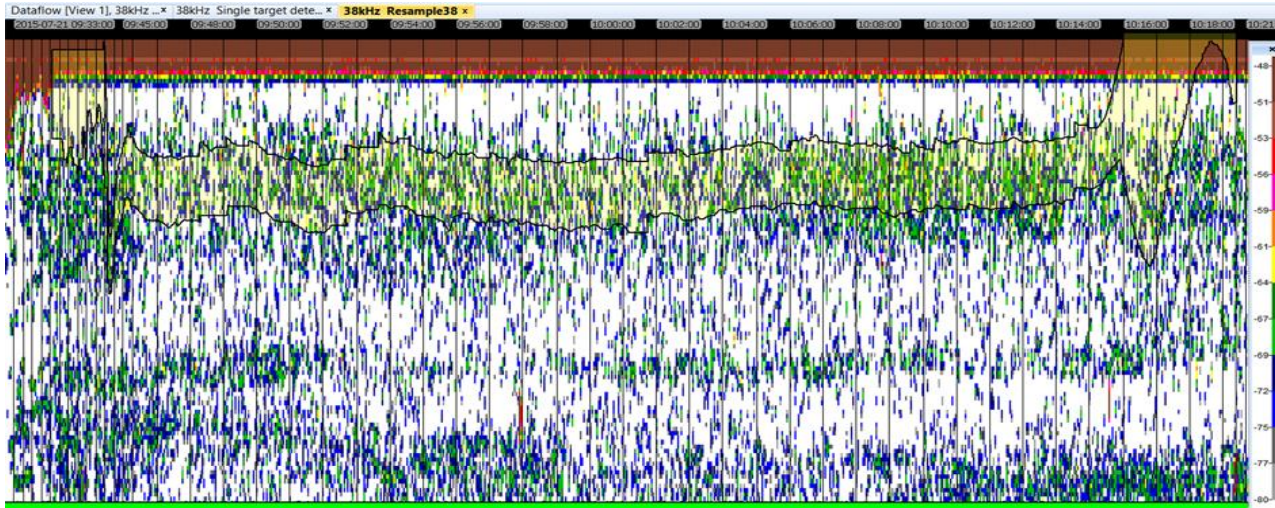
Diameter 3.5 m



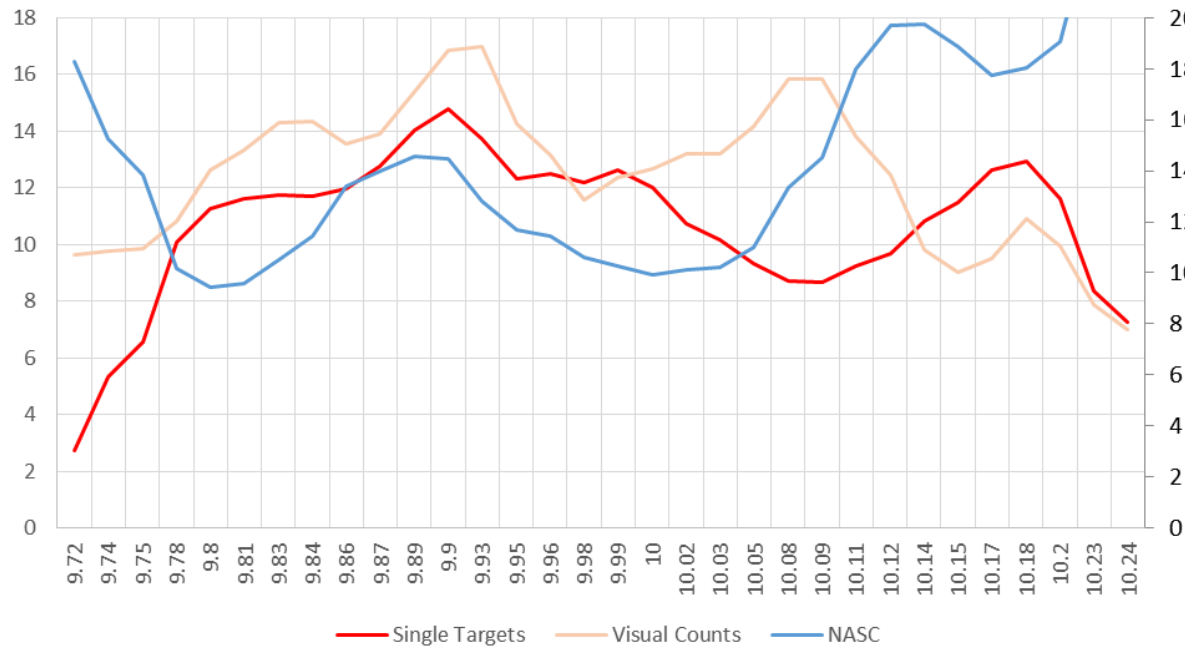
Jelly fish passing through the trawl

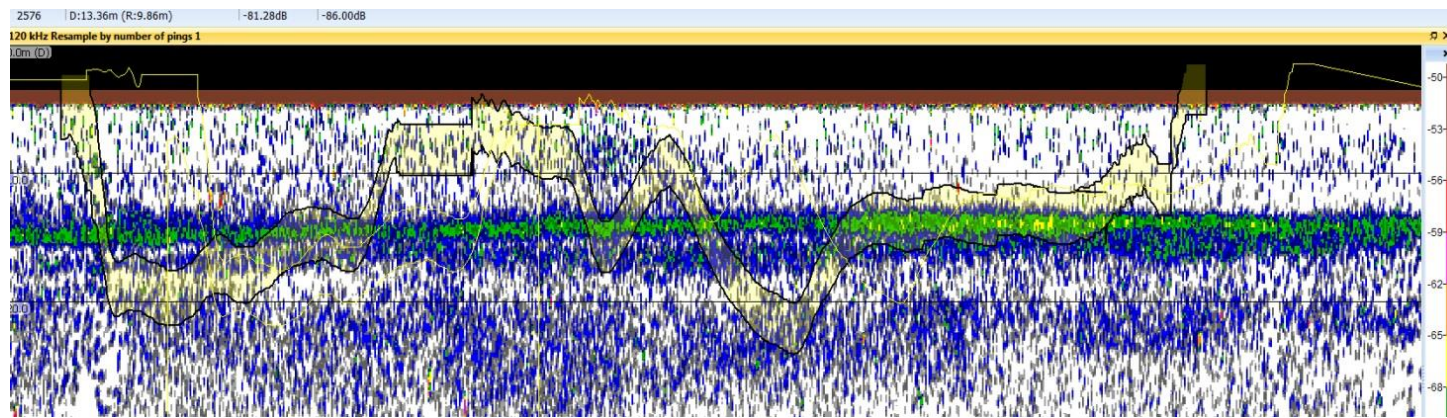


Results

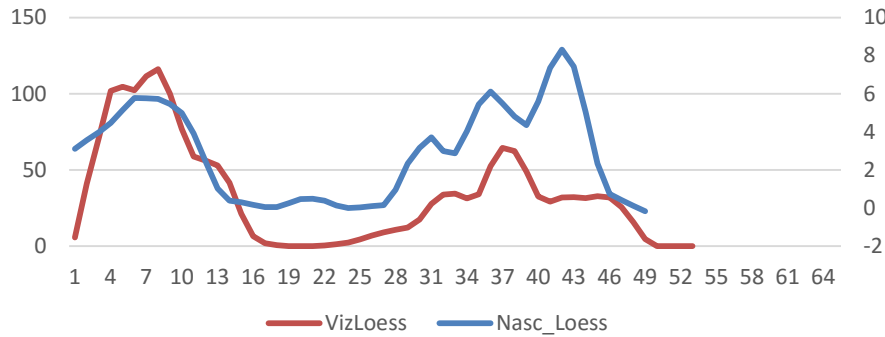


Comparison of the observations

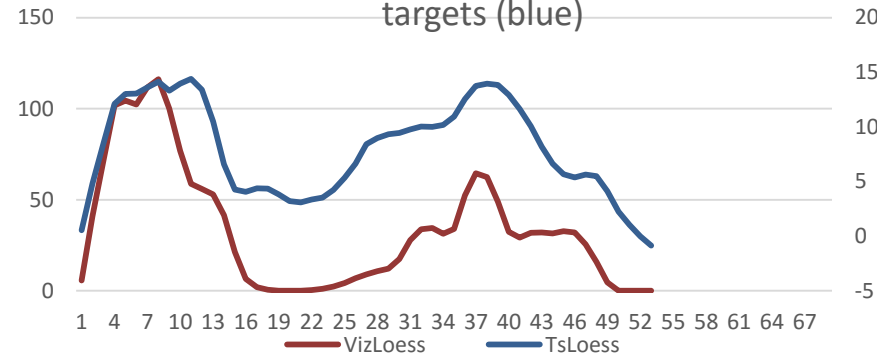




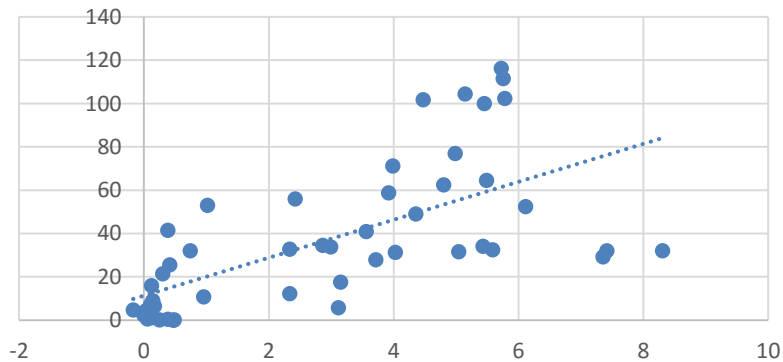
Visual counts (orange) – Volume backscattering(blue)



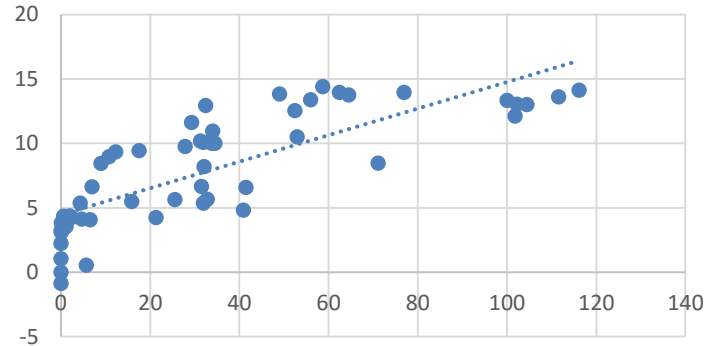
Visual counts (orange) – Number of single targets (blue)



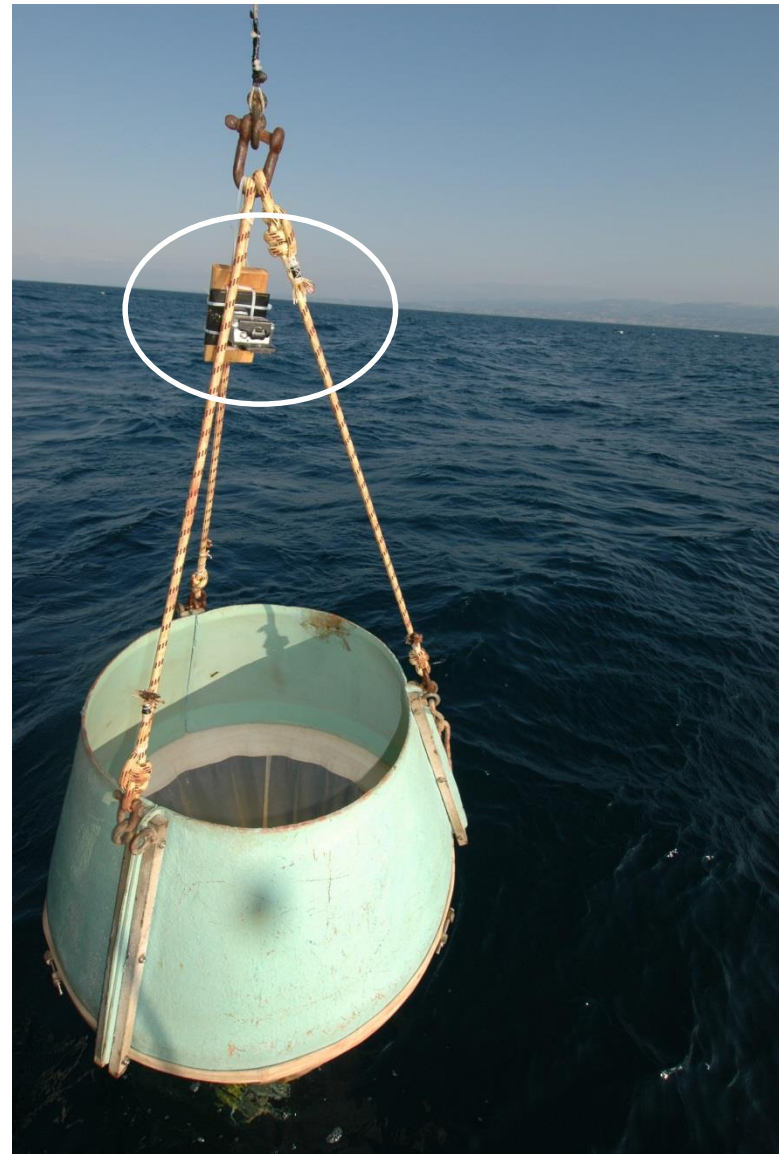
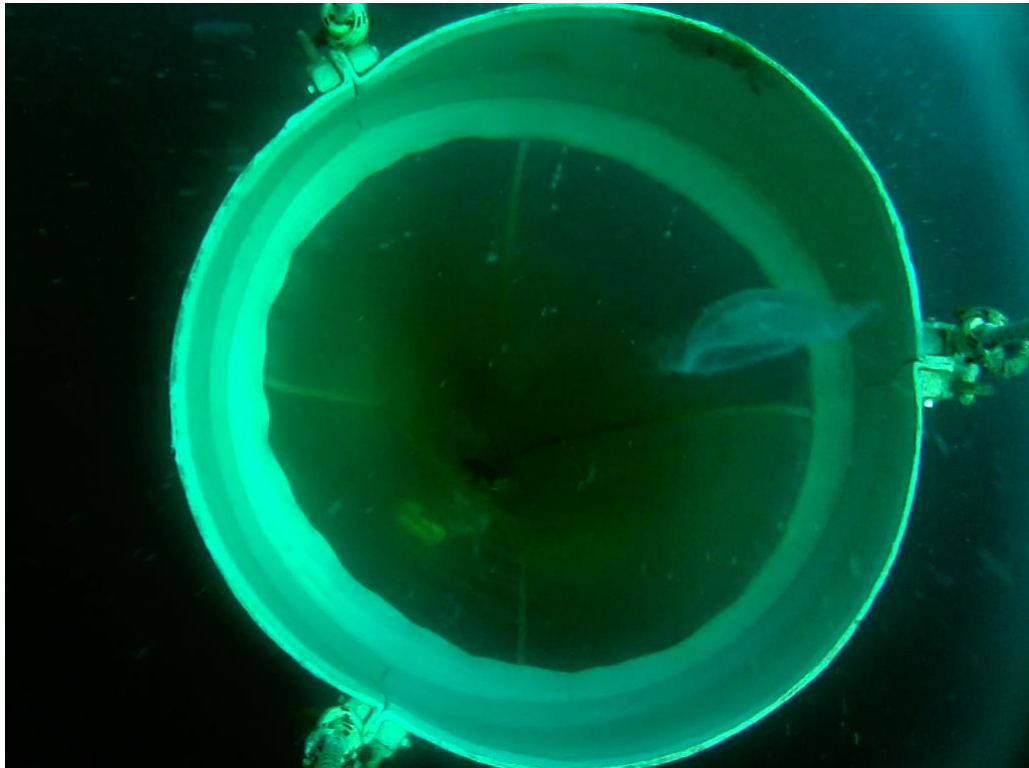
Visual Counts – Volume backscattering
 $R^2 = 0.4255$

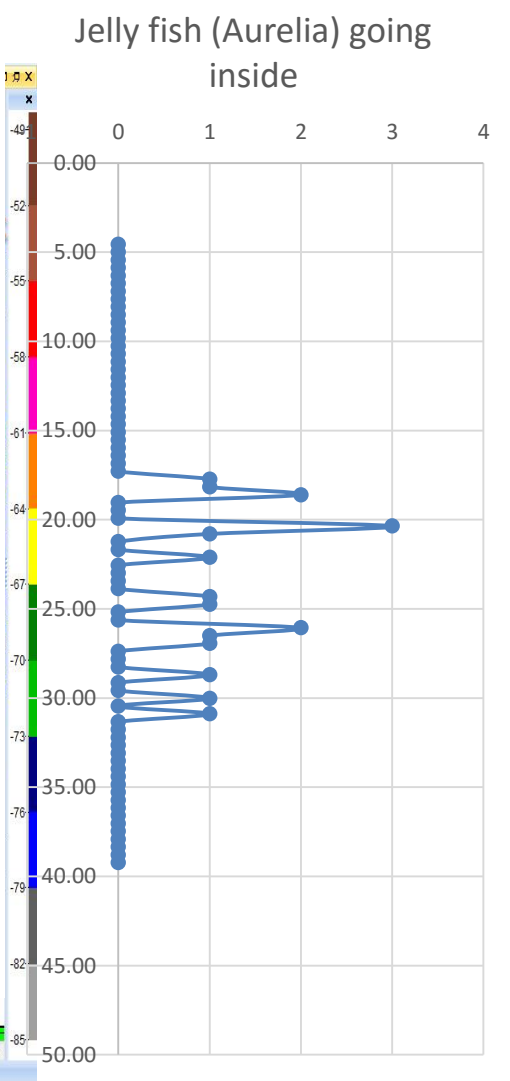
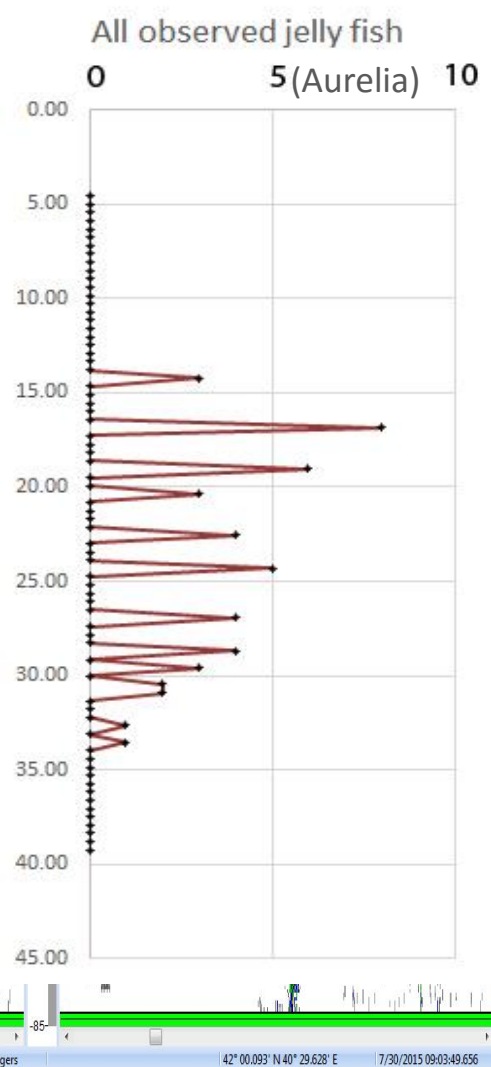
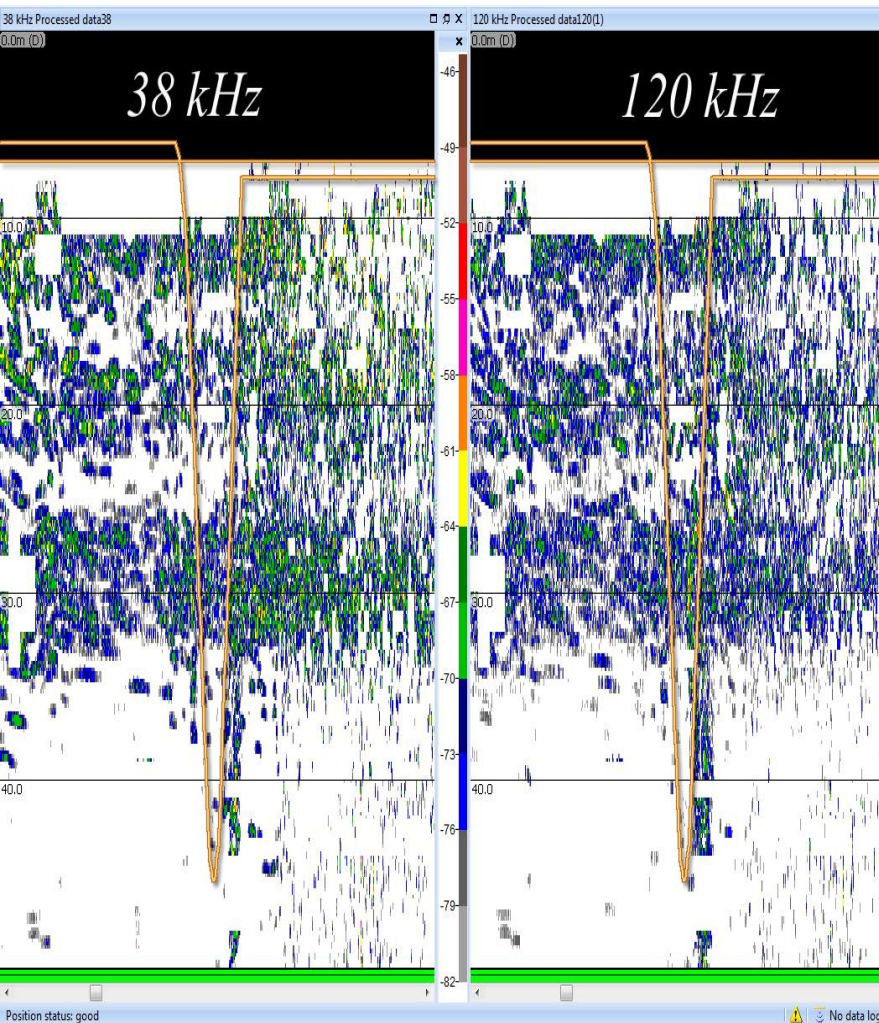


Visual counts– Number of single targets
 $R^2 = 0.6273$

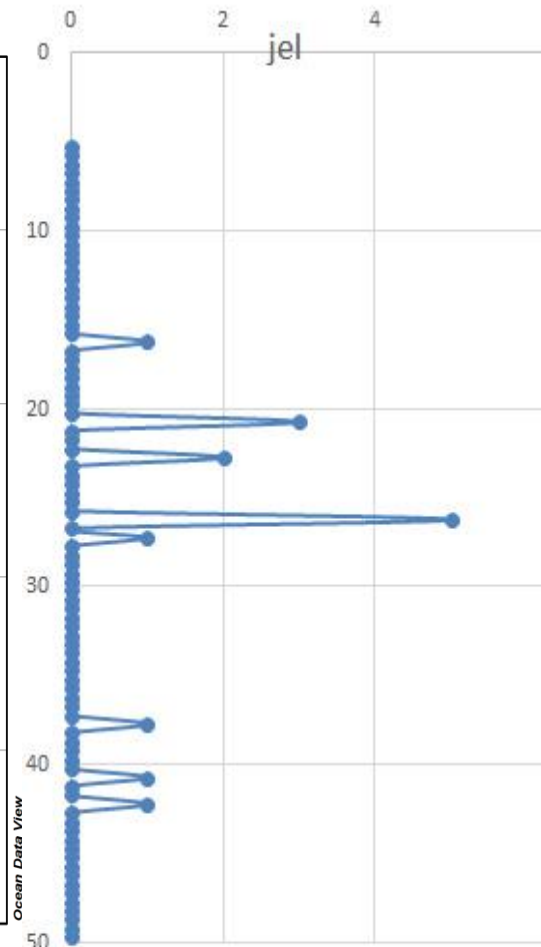
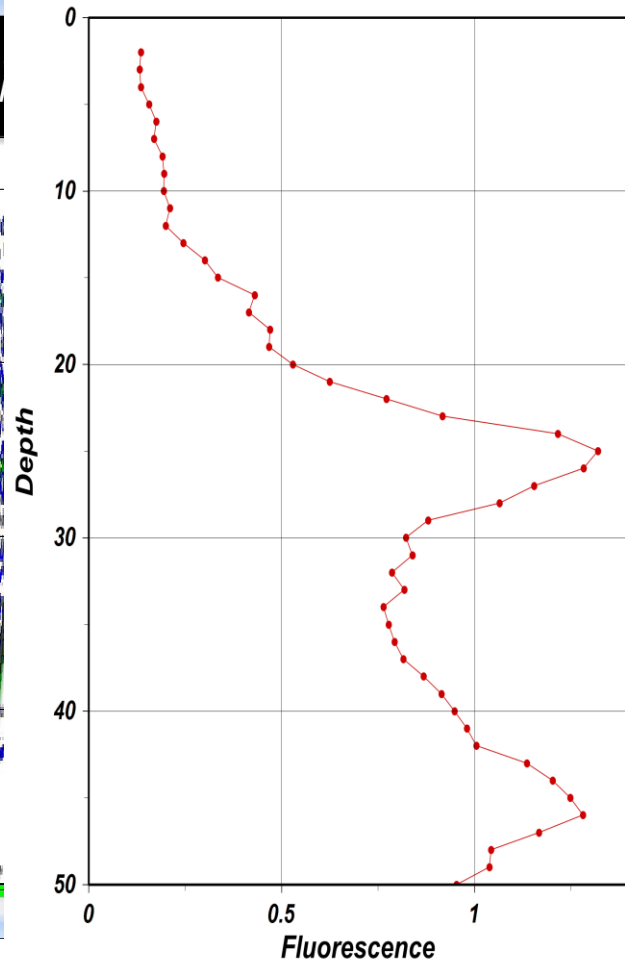
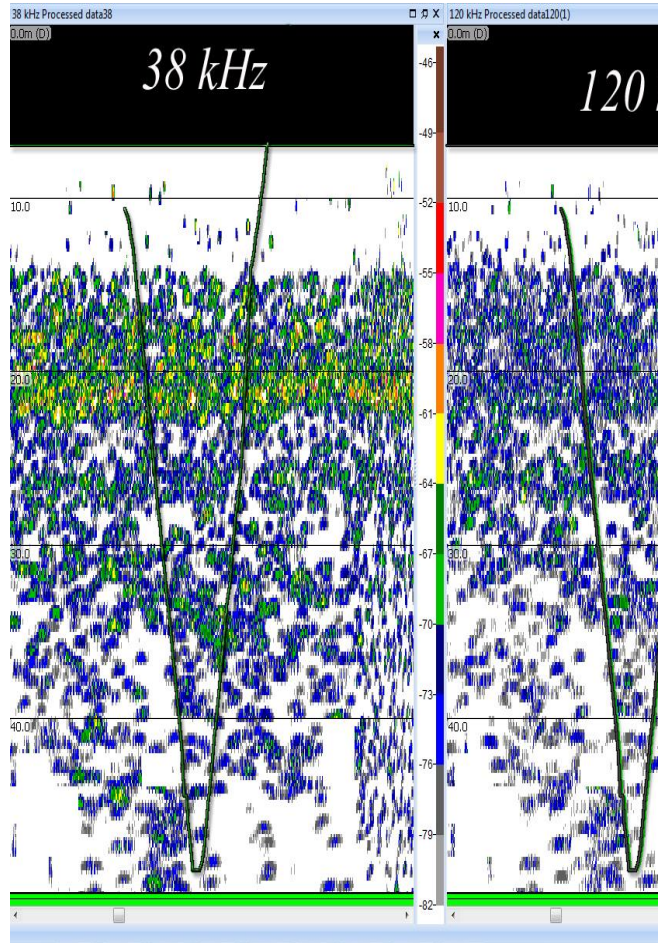


Hensen Egg net with a 70 cm
mouth diameter and 500 μm

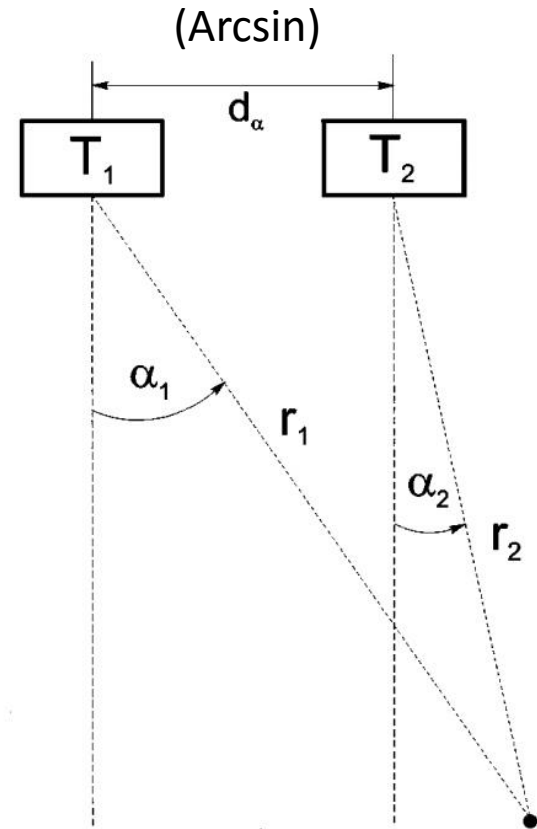
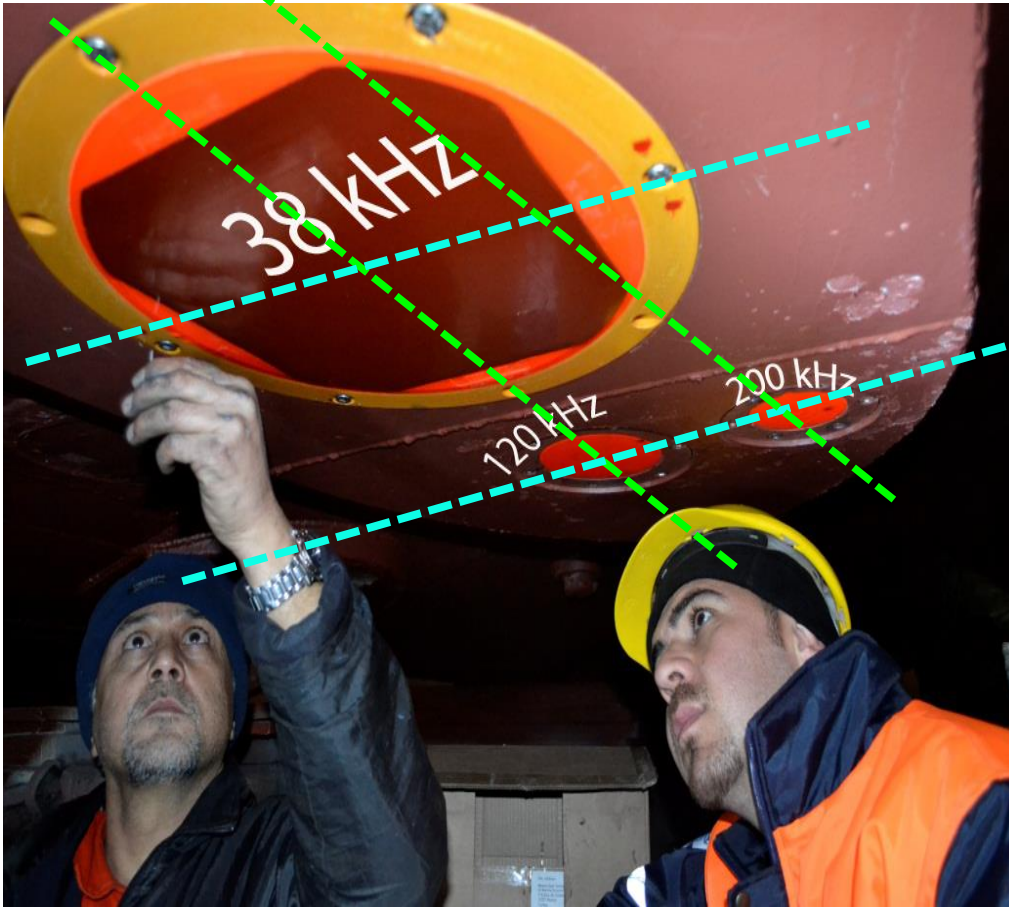




- Echo-integration (volume backscattering)
- Echo-counting (single targets)



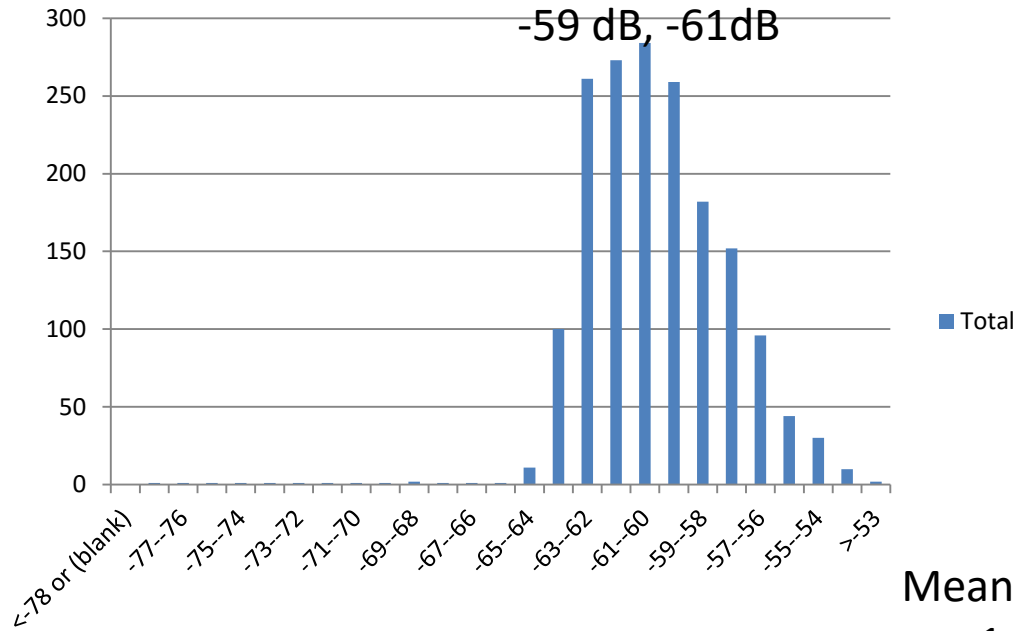
Multifrequency data



Korneliussen et al. 2009 "Proposal for the collection of multifrequency acoustic data." ICES Journal of marine Sciences

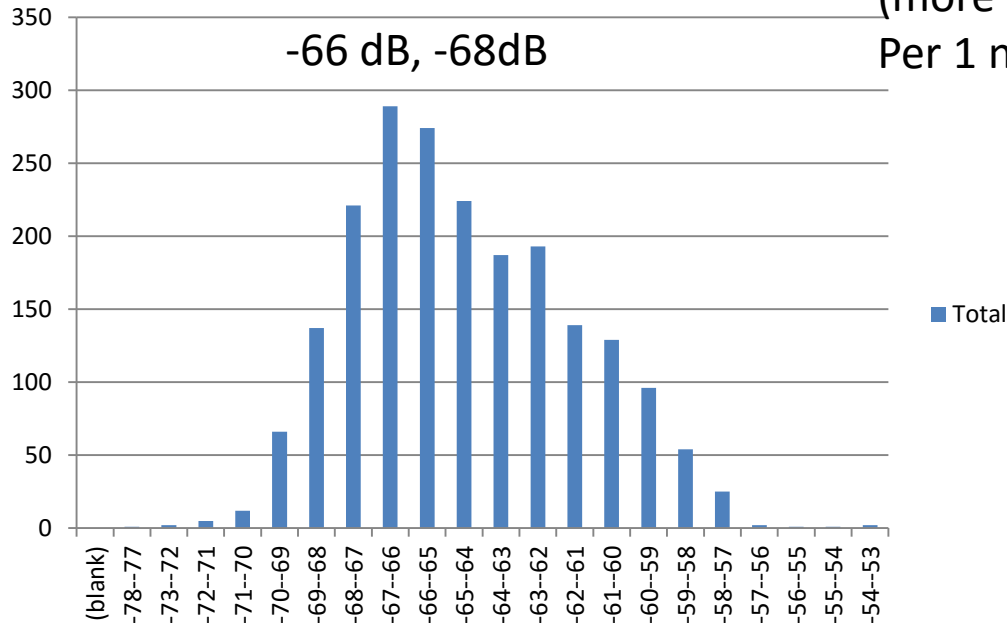
Demer et al. 1999 - "A multiple-frequency method for potentially improving the accuracy and precision of in situ target strength measurements" J. Acoust. Soc. Am.

38kHz kHz single targets

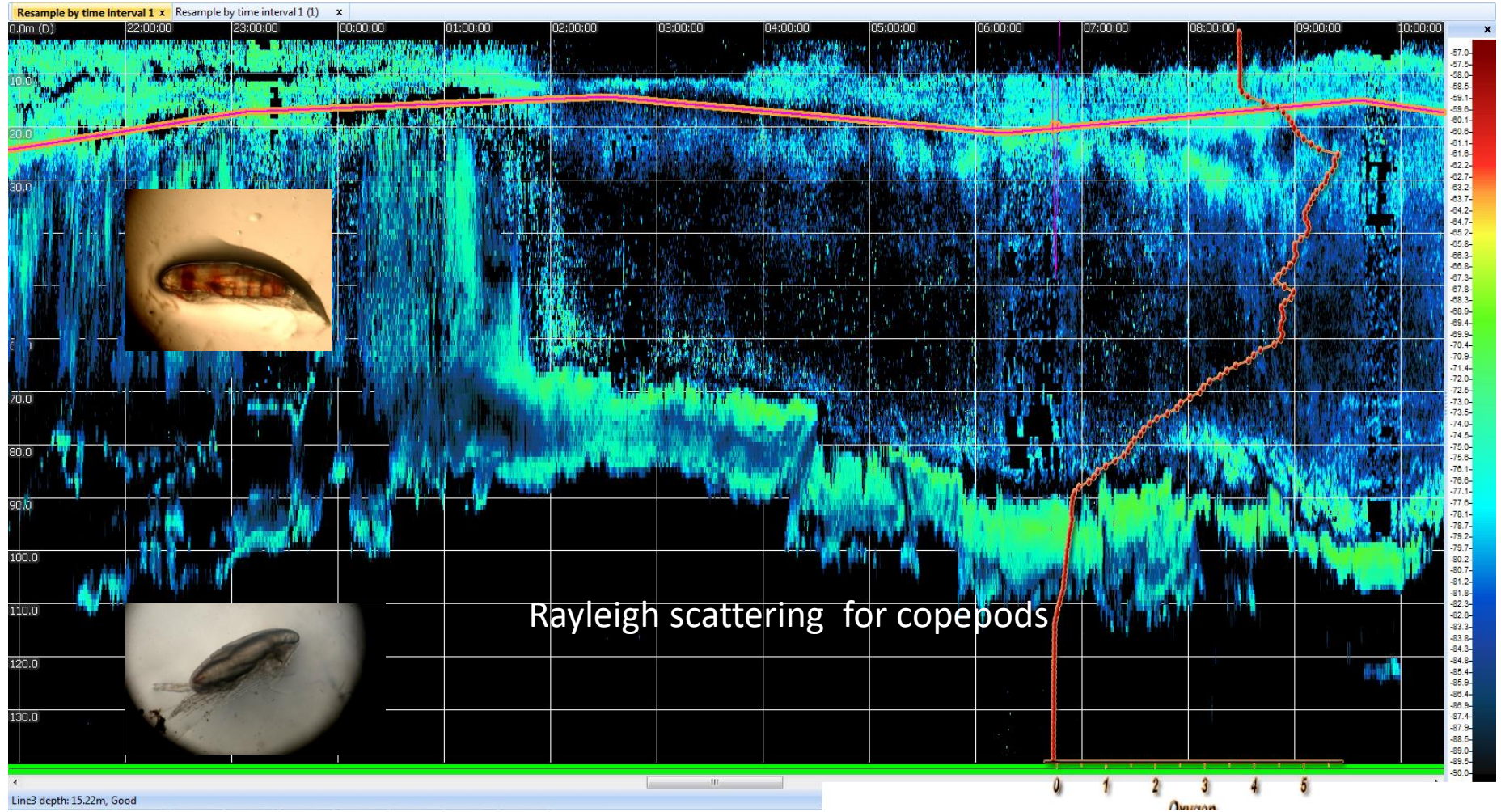


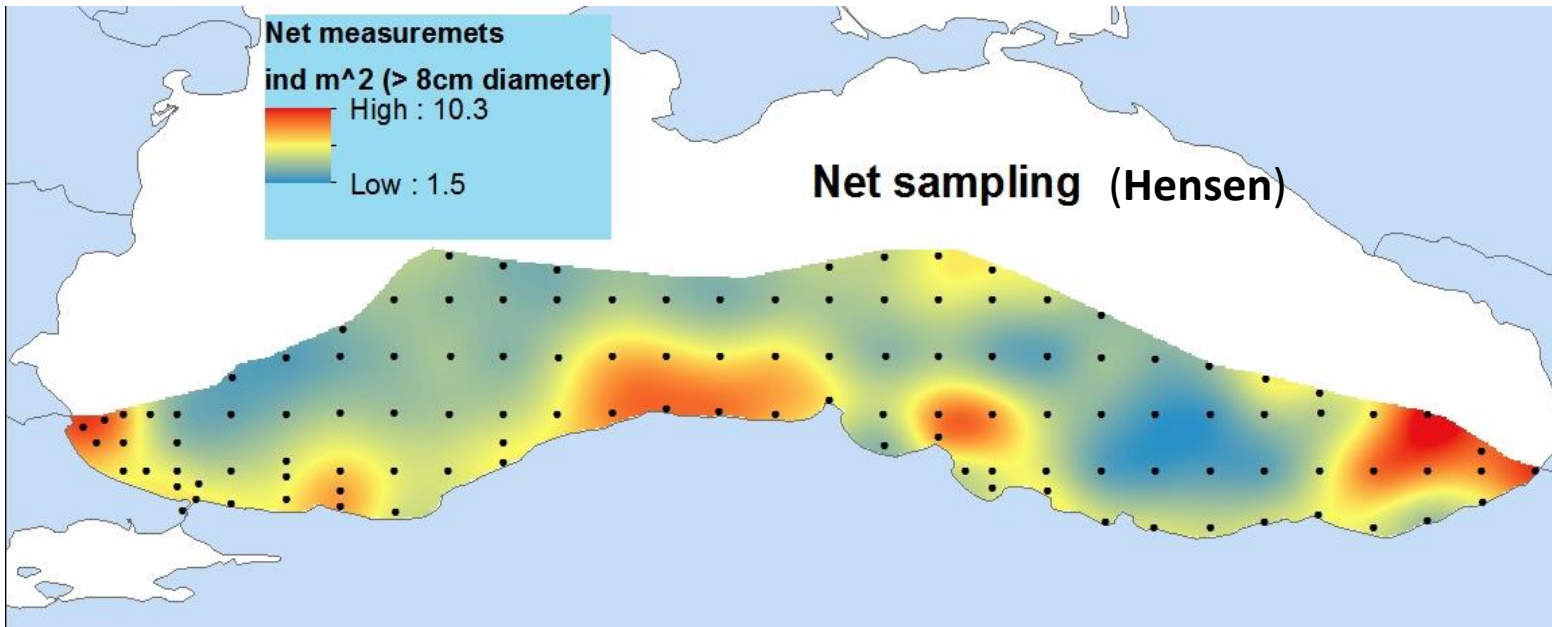
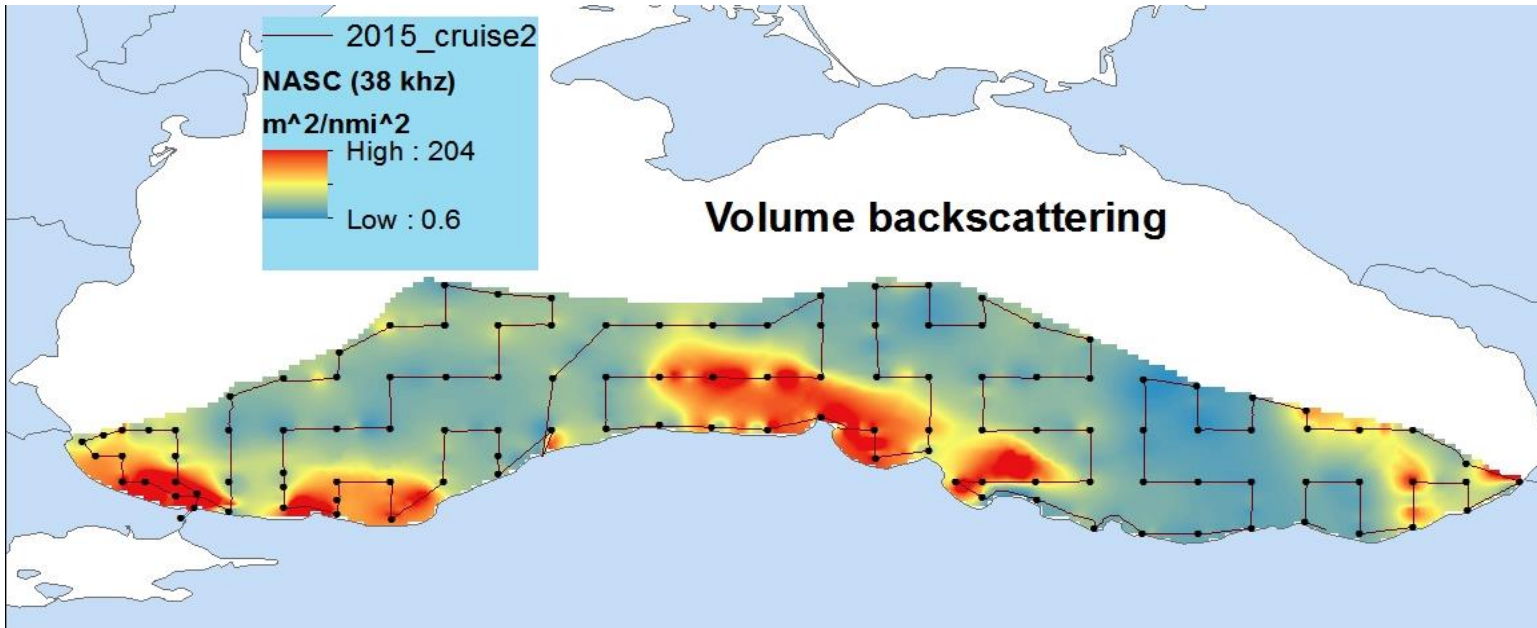
Mean of single target strengths per 1 nmi (more that 200 single target Per 1 nmi)

120 kHz single targets

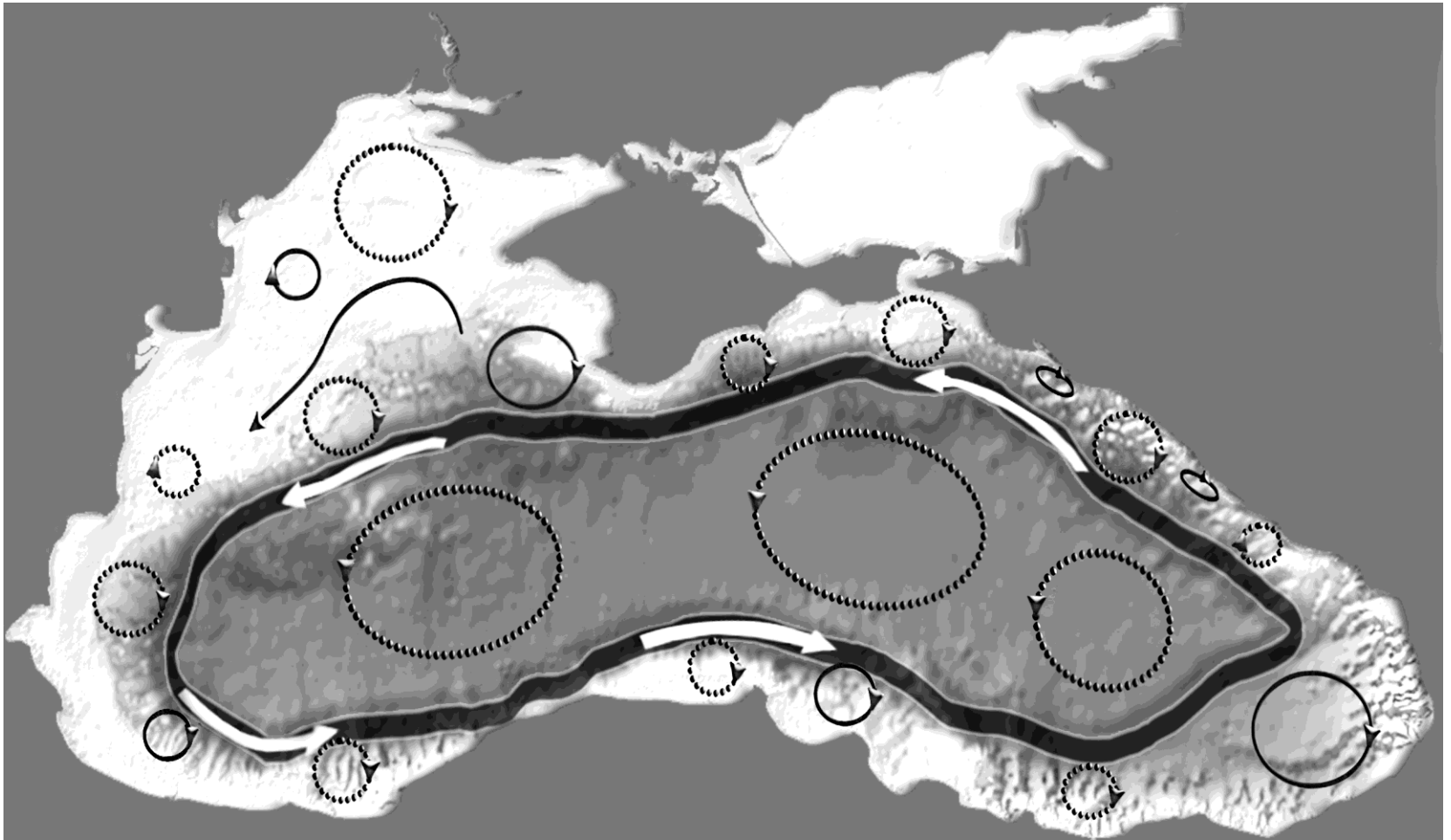


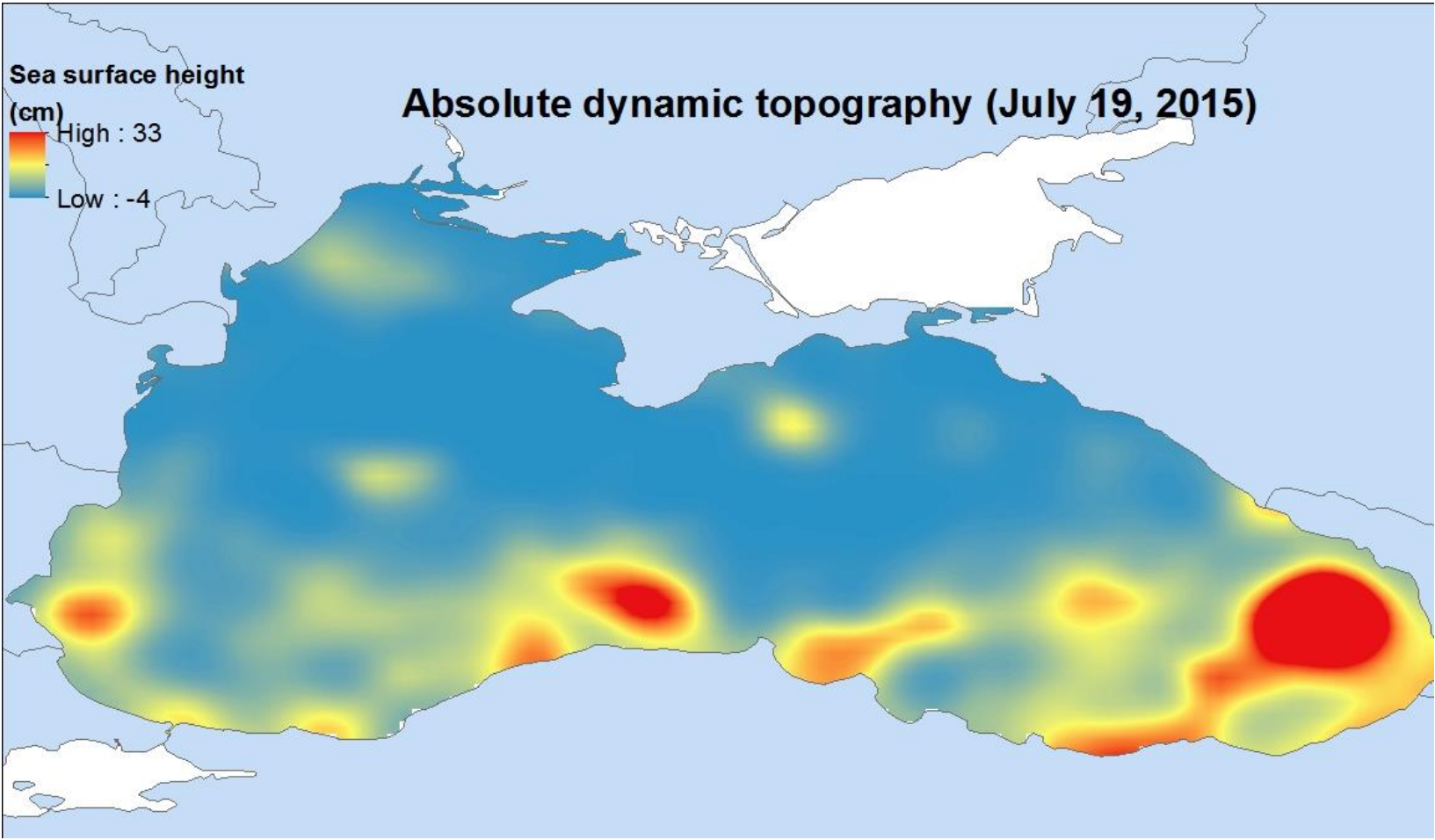
Processed - condensed echogram (120 kHz)

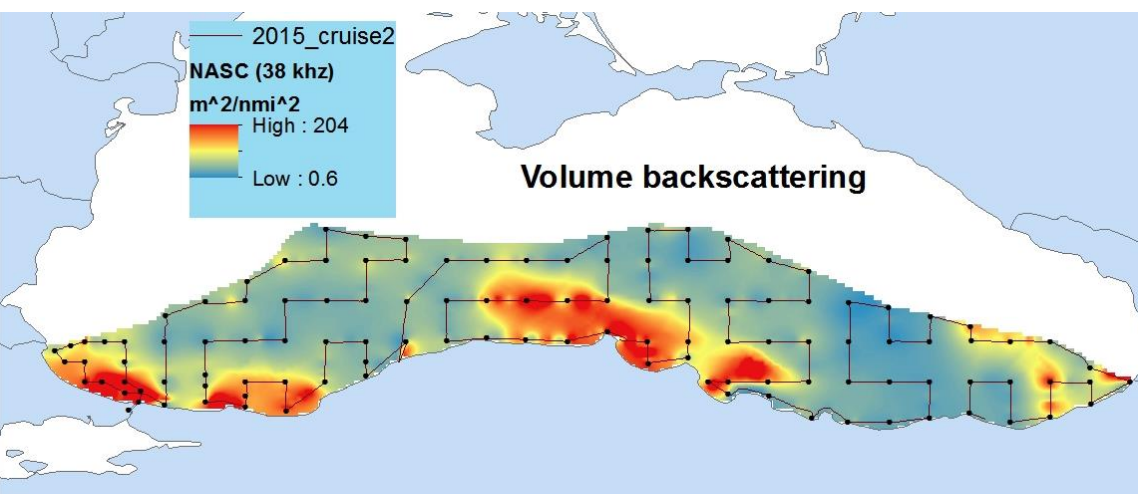
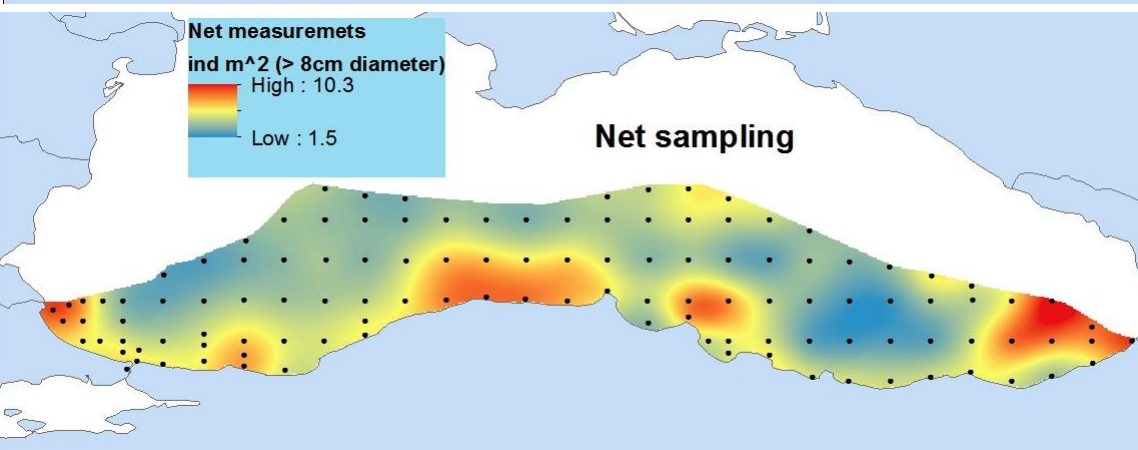
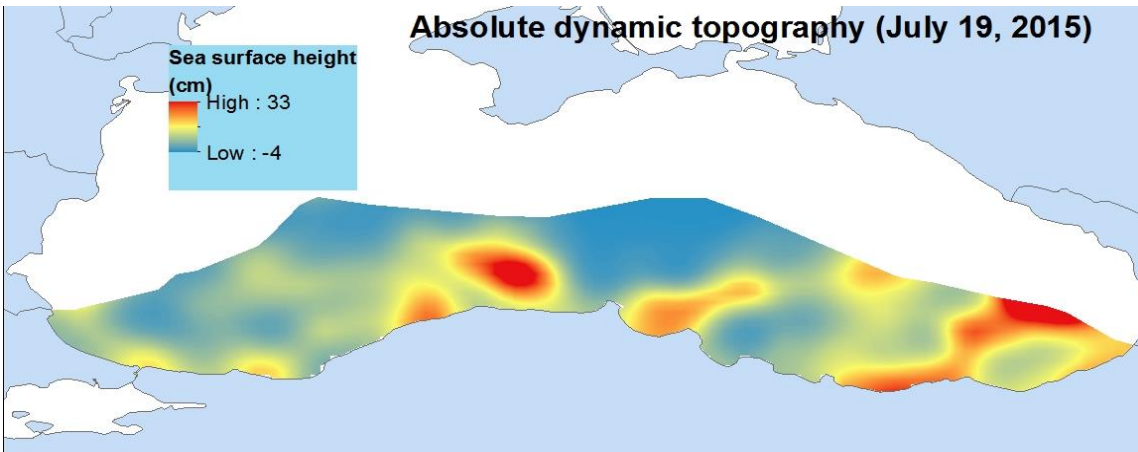




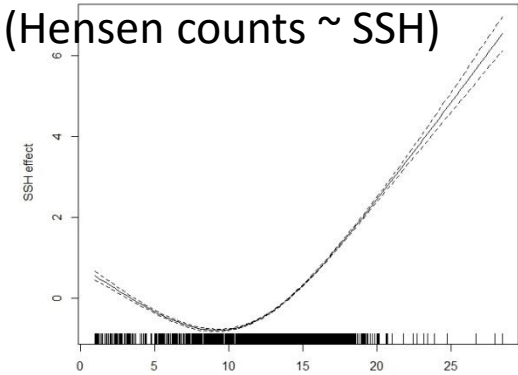
Black Sea Circulation



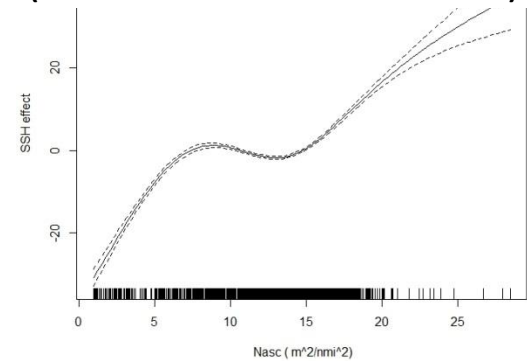




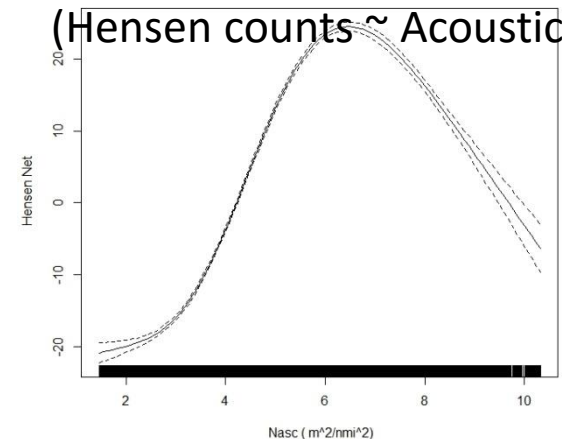
Deviance explained = 23.3%
 (Hensen counts ~ SSH)



Deviance explained = 5.03%
 (Acoustic estimation ~ SSH)



Deviance explained = 28%
 (Hensen counts ~ Acoustics)



Conclusions

- Low-cost , small action camera helped identification acoustical features as a complementary information.
- Vertical habitat partitioning and diel behaviour of different species revealed
- Main spatial features in terms of *Aurelia aurita* density revealed
- One more step towards the acoustic estimation of jelly fish abundance

Thank you!



This study was realized within the framework of a national anchovy fisheries project (KAMAG-110G124) funded by the Turkish Scientific and Technical Council, TUBITAK.