

Spatio-temporal distribution pattern of juvenile swordfish in the eastern Mediterranean

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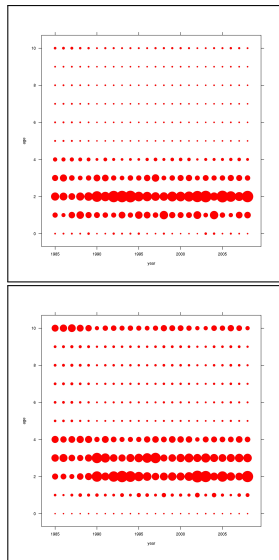
Study Objectives

Analyze fisheries data (longline catches) to identify areas/seasons with relatively higher catch/rates of juvenile fish (< 2 yr old)



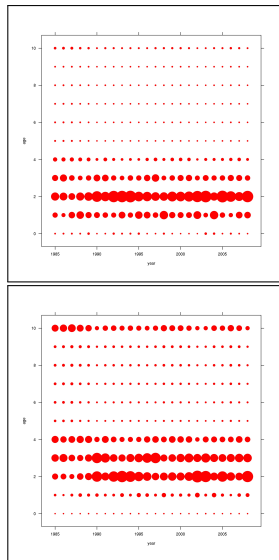
Background

- Juveniles dominate the Mediterranean swordfish catches (50-70% in terms of numbers, 20-35% in terms of weight).



Background

- Juveniles dominate the Mediterranean swordfish catches (50-70% in terms of numbers, 20-35% in terms of weight).
- Reduction of juvenile catches is essential for the rational management of the stock



Data used

Time series of observers data on board longline vessels targeting swordfish

For each fishing operation:

- Temporal information (dates, month, year)



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- Spatial information (geographical coordinates)



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For each fishing operation:

- Temporal information (dates, month, year)
- Spatial information (geographical coordinates)
- Effort (days or number of hooks)
- Detailed swordfish catch data (size composition of the catch)



Data used

- Eastern Mediterranean: ~300 operations



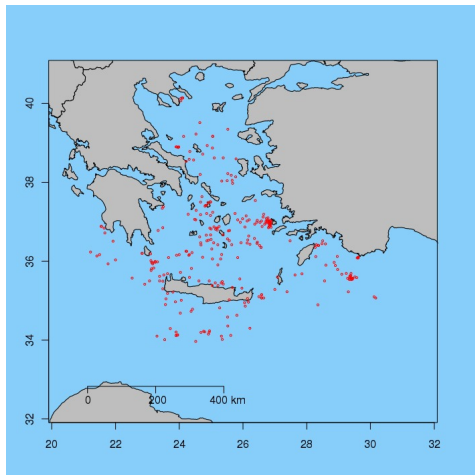
Data used

- Eastern Mediterranean: ~300 operations
- Period: 2004 - 2010. Months Feb-Sep



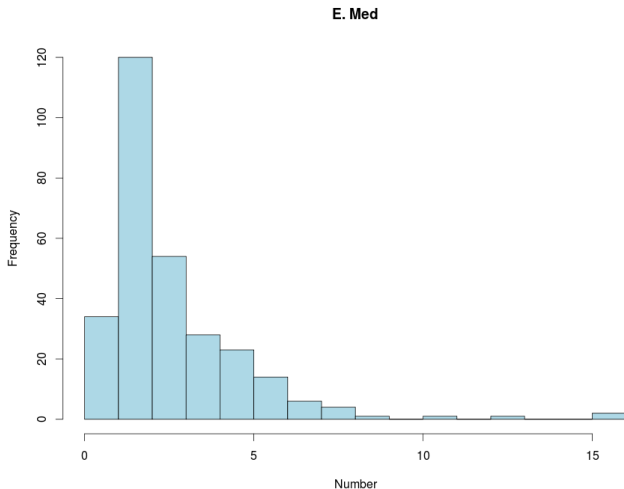
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Frequency of juveniles in the catches

28% of the catch



Effect of spatial and temporal predictors on the abundance (N/operation) of juvenile swordfish in the catches

GAM modelling

- *Final Model (poisson error):*
- *Abundance = Year + Month + s(LAT,LON, by=Month)*



Modelling results

Family: poisson
Link function: log

Formula:
Abundance ~ year + month + s(LAT, LON, by = month)

Parametric Terms:

	df	Chi.sq	p-value
year	6	58.41	9.48e-11
month	7	21.88	0.00266

Approximate significance of smooth terms:

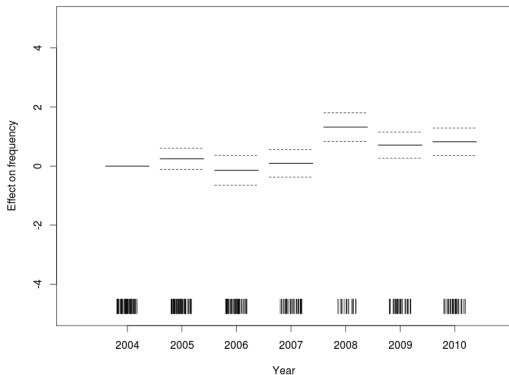
	edf	Ref.df	Chi.sq	p-value
s(LAT,LON):month2	2.000	2.000	1.136	0.566645
s(LAT,LON):month3	2.000	2.000	3.827	0.147541
s(LAT,LON):month4	2.000	2.000	0.055	0.972980
s(LAT,LON):month5	2.000	2.001	2.018	0.364726
s(LAT,LON):month6	5.197	6.734	12.935	0.064799
s(LAT,LON):month7	3.656	4.789	21.113	0.000639
s(LAT,LON):month8	2.000	2.000	13.584	0.001123
s(LAT,LON):month9	10.902	13.816	47.423	1.45e-05

Dev.expl = 0.53 |



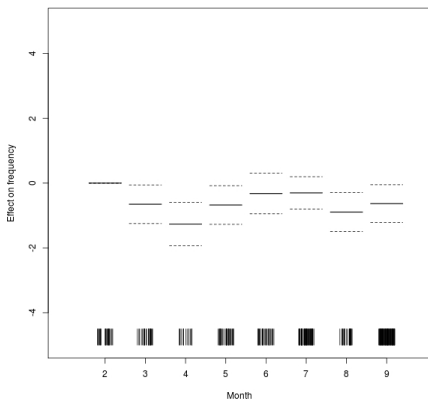
Effects on Juvenile abundance

Year effect



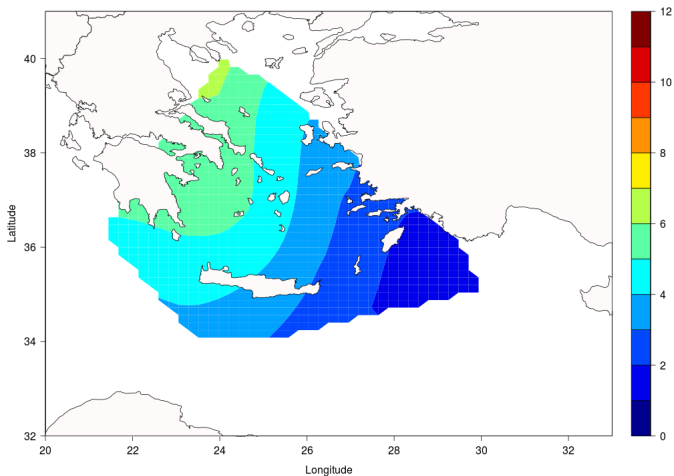
Effects on Juvenile abundance

Month effect



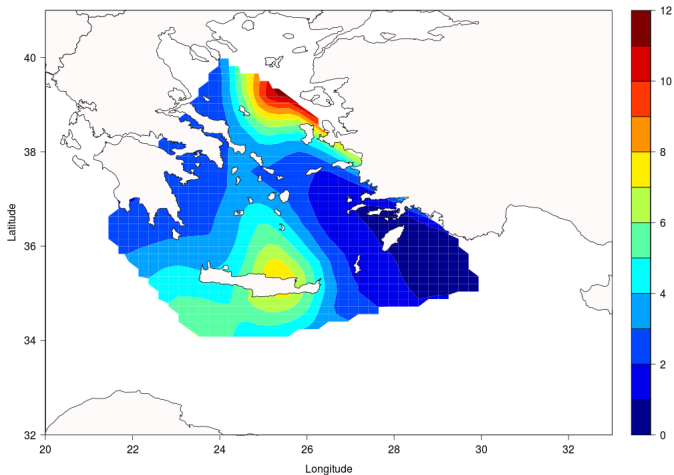
Mapping

Month 7



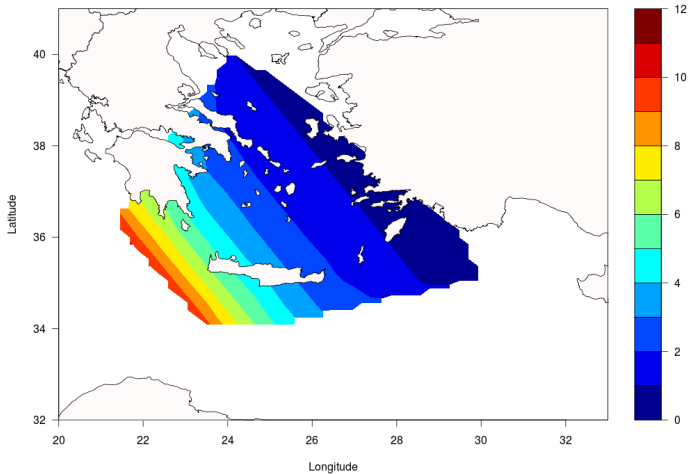
Mapping

Month 9



Mapping

Month 8



Conclusions

- The distribution pattern of juvenile swordfish varies in space and time and although some abundance "hot spots" can be identified they do not seem to be persistent



Conclusions

- The distribution pattern of juvenile swordfish varies in space and time and although some abundance "hot spots" can be identified they do not seem to be persistent
- Identification and protection of nursery areas seem to be a difficult task



Thank you!

