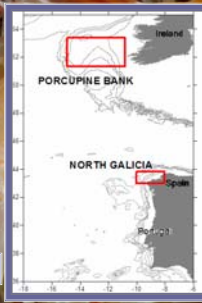


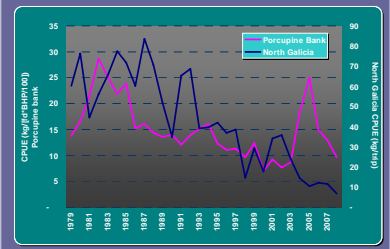
SITUATION



Location of the fishing grounds



Nephrops catch-per-unit-effort (CPUE) of the Spanish fleets in both Porcupine bank and North Galicia fishing grounds have shown an overall decreasing trend in the time series (1979-2008).



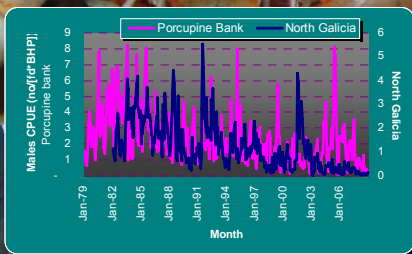
Annual *Nephrops* CPUEs from Porcupine bank and North Galicia

OBJECTIVE

Explore the dynamic of the two *Nephrops* populations and its relation with environmental and population key factors

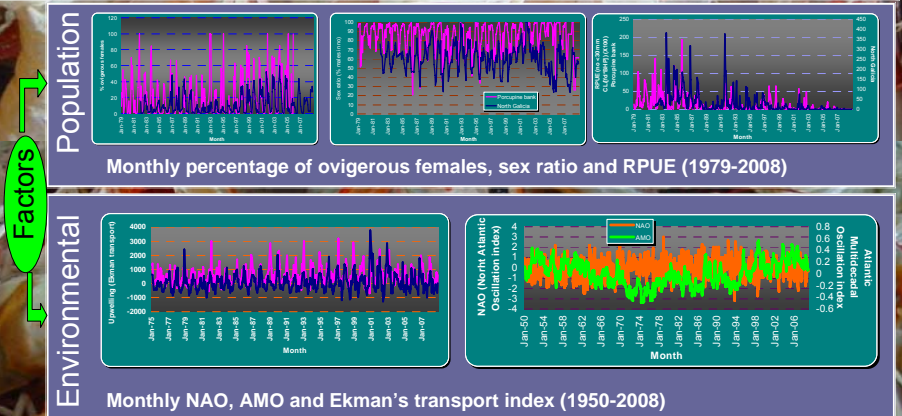
HOW

CPUEs were considered population density indexes. Males CPUEs series (1982-2008) were used, since the catchability of ovigerous females decrease in the incubation period. To explore the CPUE trend in each population, a seasonal decomposition of the CPUE time series was carried out. Multivariate ARIMA models were applied to study the relation of environmental and population key factors with the CPUEs.

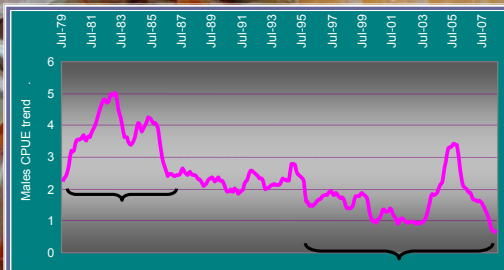


Series for modelling (monthly CPUEs)

ARIMA dynamic regression



RESULTS & COMMENTS:



PORCUPINE

Factors that univariately outperform the Porcupine CPUE ARIMA model

Variable	Lag	Coefficient	Confidence Level
RPUE	6 years	0.008	>99%
RPUE	9 years	0.008	>99%
Sex ratio (SR)	4 years	-0.11	>99%
Sex ratio	6 years	-0.02	>99%
Sex ratio	9 years	-0.02	>99%

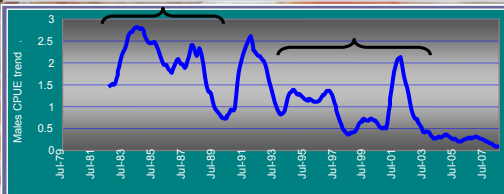
Factors that univariately outperform the Porcupine CPUE ARIMA model (2)

Variable	Lag	Coefficient	Confidence Level
% ovigerous females (OV)	none	-0.009	>99%
% ovigerous females	3 years	-0.009	>99%
% ovigerous females	9 years	-0.01	>99%
NAO	5.5 years	0.16	>99%
Ekman's transport	3 years	-0.0002	>97%

PORCUPINE CPUE MULTIVARIATE ARIMA MODEL

(Model Standar Error = 0.97 ; P [all parameters] ≤ 0.05; m.a.: months ago; y.a.: years ago)

$$CPUE_{now} = 0.4CPUE_{1m.a} + error_{now} - 0.2CPUE_{1y.a} + 0.008RPUE_{1y.a} - 0.01SR_{4y.a} - 0.01SR_{6y.a} - 0.007SR_{9y.a} - 0.009OV_{3y.a} + 0.2NAO_{5.5y.a}$$



NORTH GALICIA

Factors that univariately outperform the Galician CPUE ARIMA model

Variable	Lag	Coefficient	Confidence level
RPUE	none	0.007	>99%
RPUE	7 years	-0.004	>99%
RPUE	10 years	-0.001	>99%
Sex ratio	4 years	0.002	>99%
Sex ratio	6 years	-0.01	>99%

Factors that univariately outperform the Galician CPUE ARIMA model (2)

Variable	Lag	Coefficient	Confidence level
Sex ratio	1 year	-0.008	>99%
% ovigerous females	10 years	-0.001	>99%
% ovigerous females	8 years	-0.01	>97%
NAO	3 years	0.06	>97%
% ovigerous females	6 months	-0.008	>96%

GALICIA CPUE MULTIVARIATE ARIMA MODEL (Model Standar Error = 0.46 ; P [all parameters] ≤ 0.05; m.a.:months ago; y.a.:years ago)

$$CPUE_{now} = 0.7CPUE_{1m.a} + error_{now} - 0.2CPUE_{1y.a} + 0.003RPUE_{1y.a} + 0.002RPUE_{7y.a} - 0.008RPUE_{10y.a} - 0.01SR_{4y.a} - 0.01SR_{6y.a} + 1.1$$

CPUE trends: Comparing the CPUE trends between the two areas, episodic analogous patterns were observed in different periods.

ARIMA models: In both areas RPUE (4-10 years lag) and NAO (3-5 years lag) outperformed positively the model; while sex ratio and percentage of ovigerous females (both 4-9 years lag) did it negatively. AMO index (10 years lag) fit negatively the model for North Galicia and Ekman's transport factor (3 years lag) did it in Porcupine bank model.

Nephrops population dynamics are probably influenced by density dependent factors. Population factors significance may reflect temporal variations in the reproductive effort of the population. The effects of environmental factors on population abundance are complex. NAO is related with changes in the biomass of lower trophic levels (*Nephrops*'s food) and with the survival of the own *Nephrops* larval phases, which subsequently may affect the abundance, recruitment and reproductive strategy.