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# INTERREG IVA project CRESH

## Recruitment success and resource abundance

### *Succès du recrutement et abondance de la ressource*

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# English Channel Cephalopods: a major group of resources

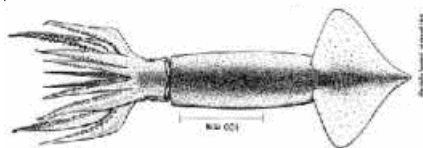


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- Northeast Atlantic productions:
  - Long fin squid (10 000 tonnes)  
(*calmars*)



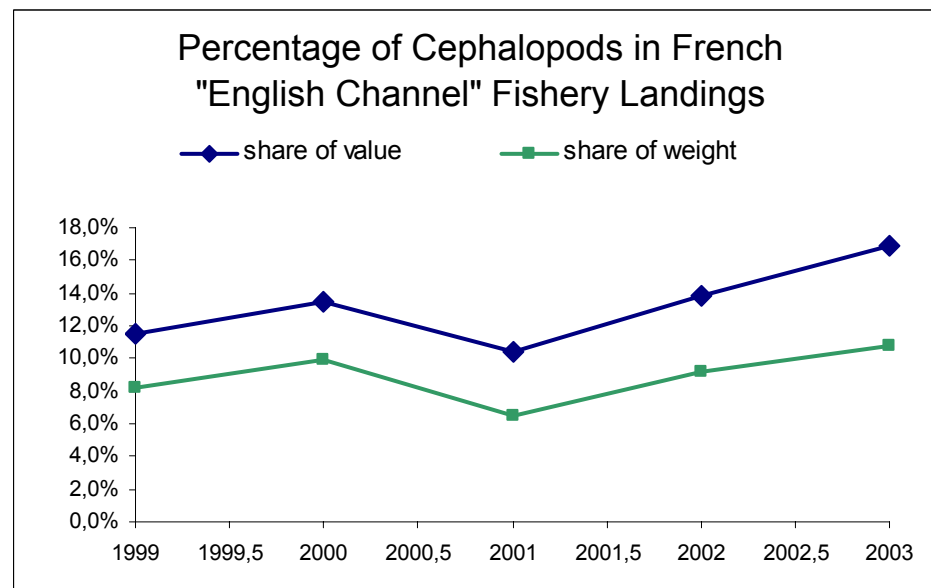
- Short fin squid (3 000 tonnes)  
(*encornets rouges*)



- Cuttlefish (30 000 tonnes)  
(*seiches*)

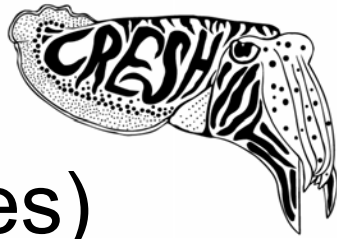


- English Channel productions:
  - Long fin squid (3 200 tons)
  - Cuttlefish (15 000 tons)
- Becomes an increasingly important source of income



Recruitment success and resource abundance

# English Channel Cephalopods: shared resource (non-quota species)



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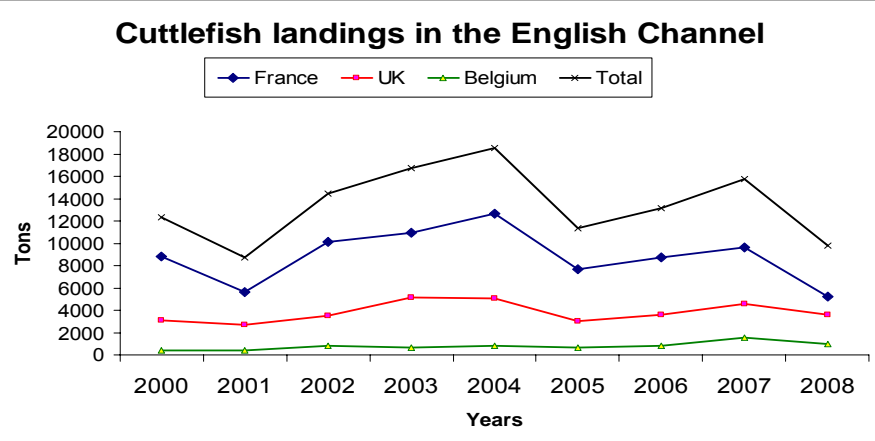
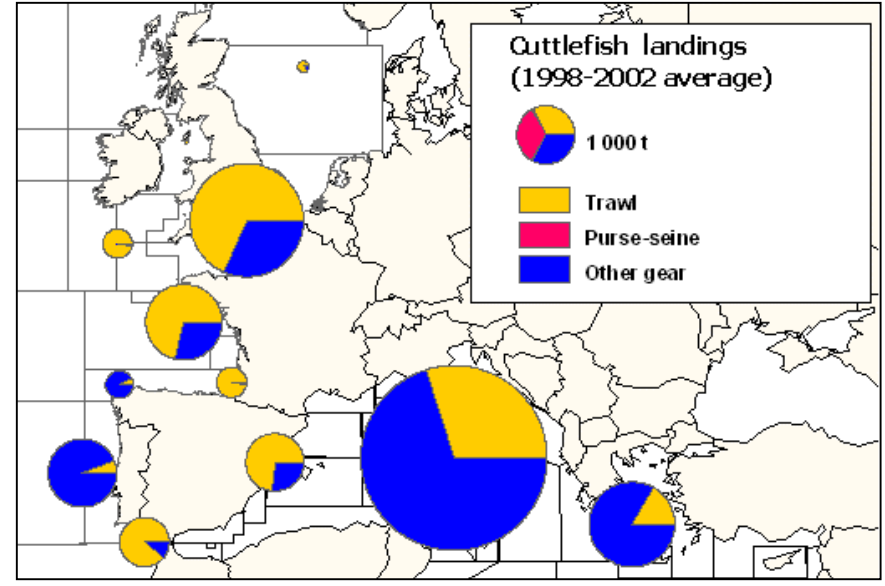
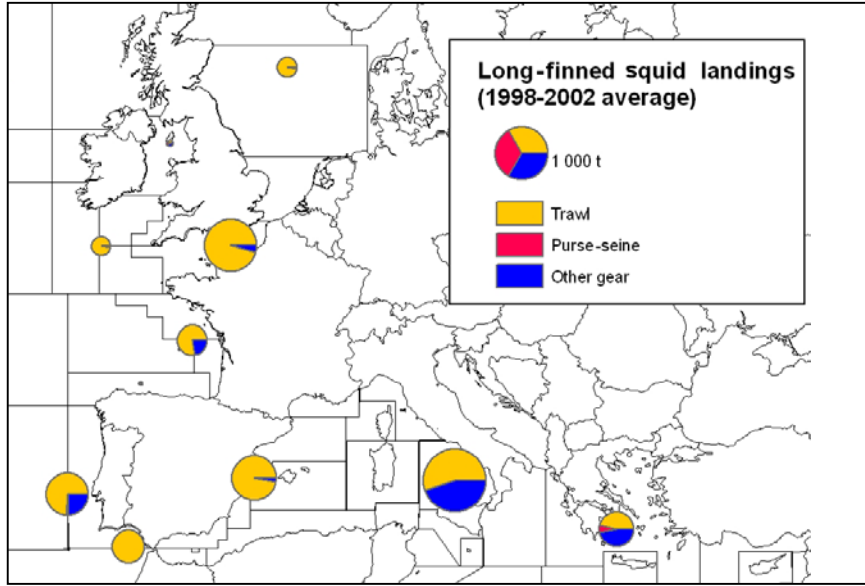


Photo: C. Zatylny

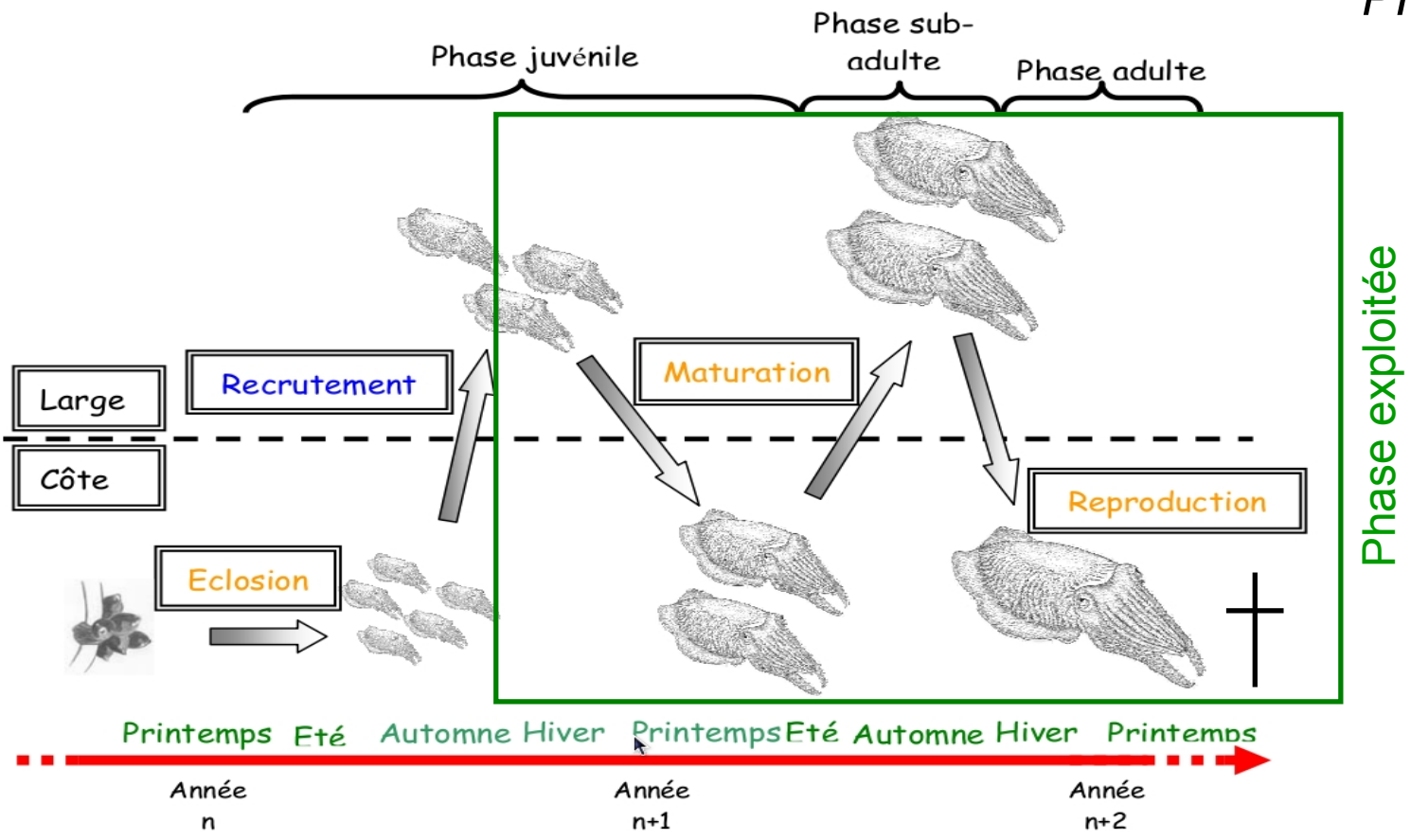




# *Sepia officinalis* life cycle

- Short life span (2-year)
- Resource exploited both inshore and offshore

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# Abundance indices used in stock assessment



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- Derived from commercial CPUE
  - Available every month of the year
  - Based on large fishing effort
  - Less biased in by-catch species (GLM corrections)
- Derived from survey indices
  - More consistent sampling scheme
  - Provided by CEFAS (July) and Ifremer (October)
- In season estimates of Recruitment limited by data availability (historical exercises could demonstrate how it works)





## Previous stock assessment exercises

- Depletion methods
  - Dunn (1999): English fleet for the cohorts 1994–1995
  - Royer (2002) for the cohorts 1995–1998
- Virtual Population Analysis:
  - With a monthly time scale (Royer *et al.* 2006)
  - Spatialized model with a quarterly time scale (Royer 2002)
- Preliminary diagnostics on the stock:
  - *Sepia officinalis* was under or fully exploited in the 90s
  - First analysis of interactions between métiers (inshore trap fishing sensitive to offshore trawlers catches)

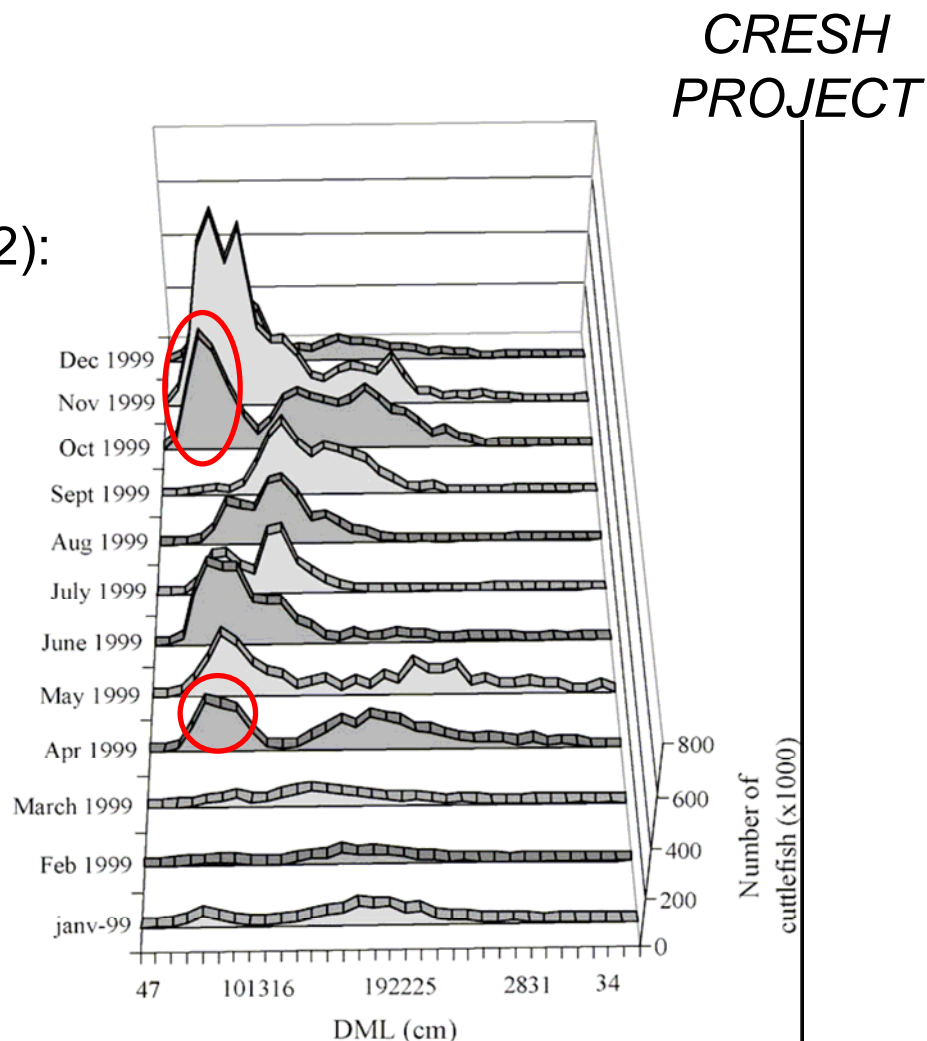
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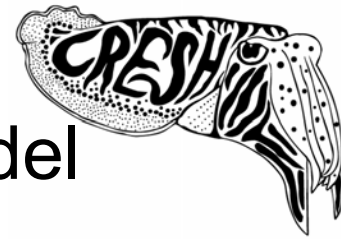




# Cuttlefish recruitment : timing and ages ?

- 2 recruitment periods (Royer 2002):
  - October
  - April
- Challier (2005) with statolith ring counts (recruits 3 to 6 month old)
- Similar pattern every year





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## Suggested new stock assessment model

- Biomass model :
  - Useful with paucity of data and when it is difficult to determine the age composition of a stock

$$B_{n+1} = B_n + C_n + R_n - M_n - C_n$$

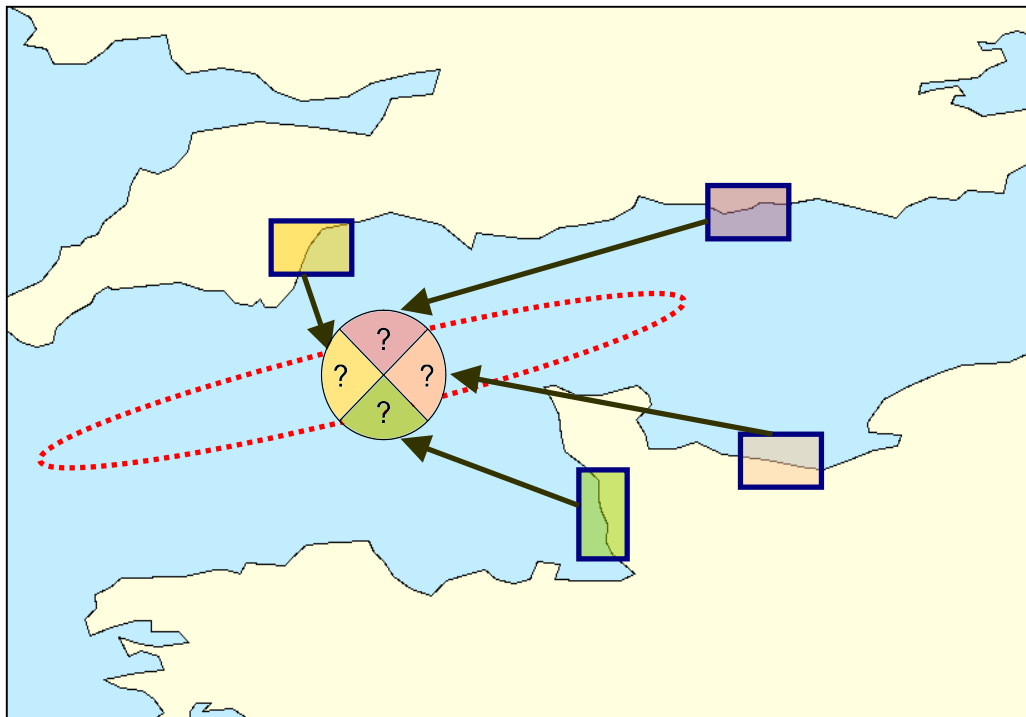
- Two stage biomass model (Roël 2000, 2009):
  - Applied to *Loligo vulgaris reynaudii* in South Africa and herring (*Clupea harengus*) stock between Celtic and Irish Seas
  - Can consider 2 recruitments in the population studied
- In a migrating species, spatial aspects and the origin of recruits have to be considered





# Pre-recruit stages and Recruitment

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- Use of trace elements to determine the origin of individuals
  - $\zeta^{13}\text{C}$  and  $\zeta^{15}\text{N}$
  - Heavy metals (Cd, Ag, Zn)
- Mixing models are useful in isotopic trophic studies
- Mixing models will be used to assess the contribution of each spawning area



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# First step: data compilation and analysis

- Data collected
  - French data :
    - Landings from 2000 to 2008
    - CGFS and COMOR Survey
  - UK data :
    - Landings data from 1992 to 2008
    - IBTS survey
  - Stored in a PostgreSQL database
- Data analysis
  - Spatial distribution of effort and catches using QGIS
  - Biomass model and simulation of management rules using R



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# Expected results

- Assessment of the contribution of the coastal spawning areas in the cuttlefish recruitment
- Development of predicting tools for cohort abundance
- Discussion about the relevance of various management rules:
  - Protected areas (including other human activities in the coastal zone than fisheries)
  - Minimum catch size
  - Biological rest, fishery closures or Métiers restrictions
- Advice will be provided to various institutions:
  - NWW-RAC and CRP (local institutions)
  - WGCEPH (ICES)



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Thank you for your attention...

<http://www.unicaen.fr/cresh>



# Presentation of the CRESH project



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