

The hake story : where are we ?



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Synopsis of mark-recapture studies

	Fishing gear	# days at sea	# tagged fish	# recaptures (time at liberty)
This experiment	trawl + 'new' codend	10	1307 (13 -58 cm)	40 (3.1%) (440 days)
Lucio et al. (2000)	longline	21	152 (22 -70 cm)	3 (1.9%) (195 days)
Belloc (1935)	trawl + 'open' codend	?	78	1 (1.2%) (259 days)

Do we underestimate the somatic growth of hake ?

- ✚ High inter individual variability for a period at liberty less than 100 days
- ✚ 5 fish lived at least 1 summer and 1 winter before recapture :

Mean growth rate : **$21.10 \pm 0.91 \text{ cm}\cdot\text{year}^{-1}$**



Do we underestimate the somatic growth of hake ?

- ✚ Estimation of expected growth using the following VB equation :

$$L_2 - L_1 = (L_\infty - L_1)(1 - e^{-K(t_2 - t_1)})$$

- ICES (1993)
- Lucio et al. (2000)

- ✚ Comparison to observed growth



Growth

- ✚ Estimation of a new growth model (K)

Do we over-age hake ?

- ✚ Otoliths are difficult to interpret



Otolith int

- ✚ Last international workshops:

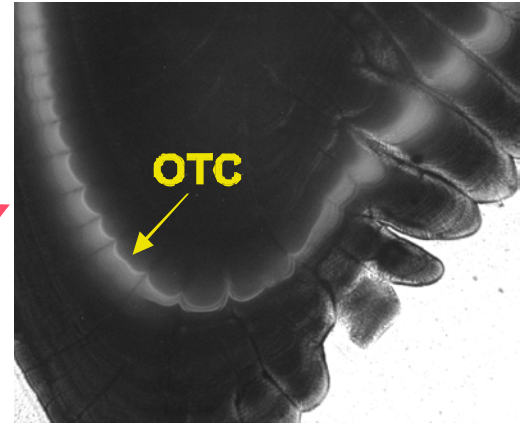
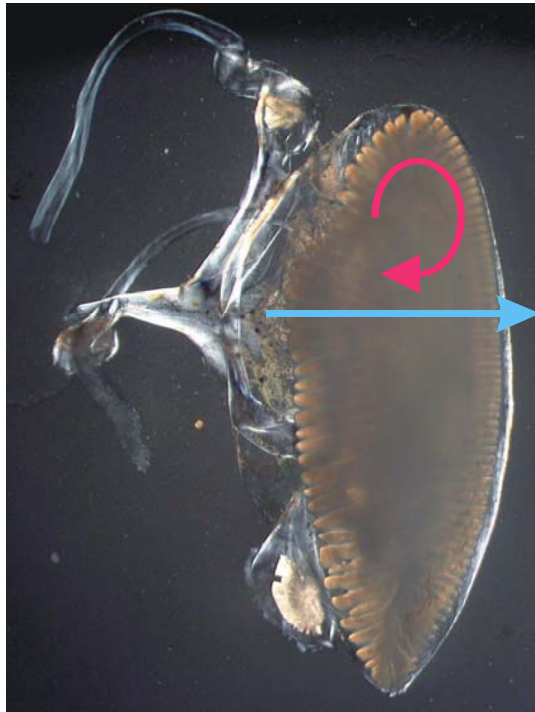
- good precision (% agreement between readers) until an estimated age of 5 years
- Agreement on **interpretation criteria** which have **not** been **validated** yet

- ✚ **OTC mark = ground-truth for ageing criteria**

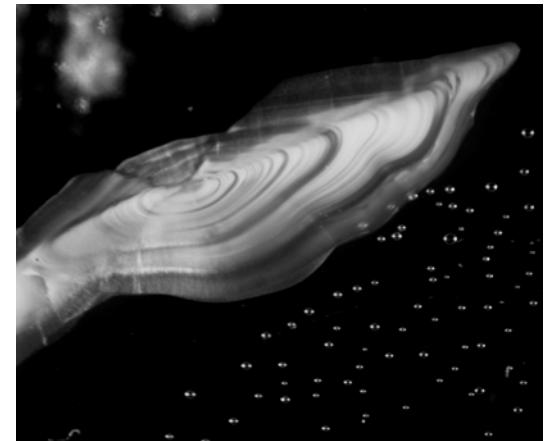


OTC mark

Do we over-age Hake ?



Sagittal section (UV light)



Transverse section
(reflected light)



Do we over-age hake ?

- ✚ **Blind reading by 2 experts (IEO, Ifremer)**
 - Only date of recapture was provided
 - Position of winter rings and false rings on images
- ✚ **New interpretation taking into account the position of the OTC mark and the fish length**
 - new interpretation provided younger ages often by a factor 2



new
interpretation

Do we over-age hake ?

- ✚ Adjustment of an otolith growth model using data from the 2002 international workshop on age estimation (provided by IEO)
- ✚ Comparison between observed growth and expected growth



Simulations of the impact on stock assessment (presented at WGHMM2004)

✚ Description of a preliminary simulation study

- Simulation of an age-length key assuming new growth parameters ($K*2$)
- ALK → new catch-at-age and abundance indices → XSA model
- Comparison between simulation and WGHMM2003 assessment

✚ Results

- Absolute levels of estimated fishing mortality increased and spawning stock biomass decreased
- Overall trends very similar → the perception of the stock would be broadly the same
- Stock would be more reactive which would affect catch forecast and advice



Simulations

Validation of daily increment deposition

- ✚ **13 sagittal sections (SS)**
 - Interpolation on blind zones
 - Age was slightly underestimated

- ✚ **5 SS with less than 5 % interpolated increments: regression slope and intercept not significantly different from 1 and 0 respectively.**



daily increments



daily validation

otolith microincrements of juvenile hake are daily deposited

Validation of daily increment deposit

- **age estimation of 0-group feasible**
- **alternative method for estimating the whole size range**

Conclusions

- ✚ **Large scale hake tagging experiments are now feasible**
- ✚ **Growth possibly underestimated**
- ✚ **Age possibly overestimated**
- ✚ **Consequences on management**

- # ***However these results based on scarce data***
- # ***They need to be confirmed on all size ranges and geographical areas***
- # ***Spatial structure of the population need to be investigated***

→ ***European project***

2004 Survey

Methodological improvements



cooling system



tagging tanks



releasing system

 **3128 fish had been released**

 **9 - 84 cm (modal size 26cm)**

 **5 fish recaptured during the survey**

 **To date :**

 **20 fish returned**

 **2 fish lost**

 **1 tag returned**



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