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Validation of Flemish Cap cod ageing

by

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Summary

Cod ageing by otoliths reading is validated by the Petersen method. Length distribution at age from the EU bottom trawl survey on Flemish Cap was analyzed.

Introduction

A permanent cause for concern as regards Flemish Cap cod has been age validation (Wells 1986, Pérez-Gándaras and Casas 1994), and it must be maintained.

Age determination is currently done by otoliths reading. Traditionally, otoliths was read for two or three persons and age was accepted when agreement. However, accuracy of ageing fish is not guaranteed by an agreement; age must be proved.

Recruitment of Flemish Cap cod has being very variable since data are available (Lilly 1986). Recruitment failure between 1993 and 2004 made length distribution quite simple, and it allows the application of the Petersen (1892) method for ageing validation.

Methods

In most recent years, the results of the EU bottom-trawl survey on Flemish Cap are currently used for tuning cod VPA. The EU bottom-trawl survey on Flemish Cap has been conducted in July from 1988 to 2010; even it was done one or two weeks early in some years.

Age interpretation was never based on *a priori* opinion on what structure the otoliths should have, but we learn how otoliths are from those with lengths in the peak of modal classes, particularly in the smallest length groups where age was easily identified. Figure 1 show some otoliths section and the age interpretation done. Photos were taken on otoliths thin sections 1 mm wide using transmitted light. Most of the photos have an arrow pointing to the ring identified as equivalent to the one observed in July in the border of the cod age 2 otoliths. This ring is the wider, best done, and more intense in the otolith, particularly in comparison with the contiguous ones. It also has around 3 mm long axis size. Age 1 otoliths seldom have a wide hyaline ring in the border in July as most otoliths from other ages have.

Results

Figure 2 shows the observed length distribution of cod in EU bottom trawl survey from 1988 to 2010 in July, including length distribution of each age class.

Mean length at age is presented in Figure 3 and it illustrates the increase that occurred since 1988.

Discussion

Flemish Cap cod spawning peaks in March (Serebryakov *et* al. 1984). The USSR conducted ichthyoplankton surveys on Flemish Cap in spring and summer of 1978-1981 and 1983. Cod eggs were mainly caught in March, but they were also caught in April May and even July. The maximum catch of cod larvae occurred in May (Serebryakov *et* al. 1984).

In 1981 Canada carried out four surveys on 2-9 May, 22-27 May, 26-30 June, and 1-4 August (Anderson 1982). Cod larvae were caught with a Bongo net and they had 6.00, 9.83, 18.87 and 34.06 mm mean length respectively. Similar surveys were carried out in the previous three years but cod larvae were not found. All these facts point to an abundant 1981 year class, more abundant than those of the three years before. Growth rate observed between surveys is consistent with cod modal length of 110 mm length in February 1982 being the same cohort (Anderson 1982). The growth rate observed also indicate that peak hatching of cod larvae on Flemish Cap in 1981 occurred about 23 April.

Cod on Flemish Cap spawn around March. The short time period of spawning allows length distribution of younger year classes be well separated and easily identifiable.

The length distribution observed in the Canadian survey in February is presented in Figure 4. The strong 1981 year-class was barely present in the 1982 catch, having a modal length of 10 cm, but their presence in following years was the prevailing modal class. It reaches 10, 22, 37 and 43 cm modal length in 1982, 1983, 1984 and 1985 respectively (Wells 1986).

Similar progression of modal length classes was observed in the EU bottom trawl survey. While the stock was comprised of many year-classes, making length distribution difficult to interpret, the occurrence of strong year-classes, those of 1991, 1993 and 2002, makes length distribution simple and modal classes easy to identify, as well to associate an age to them. This identification is favoured by the occurrence of very poor year-classes, those of 1995-1998, 2001 and 2003. These last two year-classes are still in the scope of the 2010 stock at age 9 and 7 respectively.

The length distribution of each age drawn over the overall length distribution of each year (Figure 2) is a good test for accuracy. The figure allows detecting possible inaccuracies, like could be the case in 2000 with ages 6 and 7, which are almost coincident in lengths. Along the EU bottom trawl survey series, the first modal group in July was around 20 cm (Figure 3), and it corresponds to age 1. A smaller size modal group never appears in July in the bottom trawl gear with 35 mm cod-end mesh size.

Similar analysis was done with Portuguese commercial length frequencies from 2009 and 2010 (Figure 5) (Vargas et al. 2010; 2011). Possible miss ageing is observed between ages 4 and 5 in 2009 as well in the 4th quarter 2010 because of the bimodal character of the age 5 length distribution.

References

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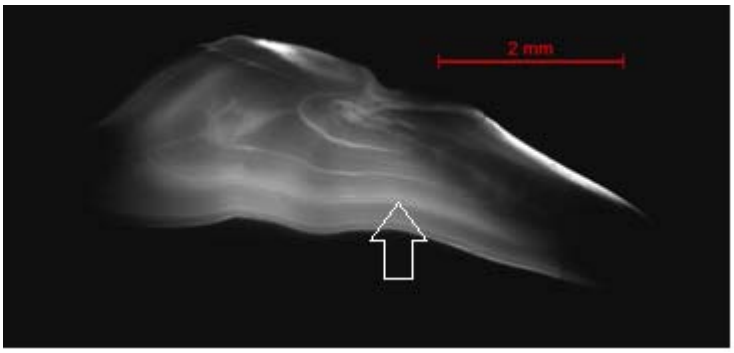
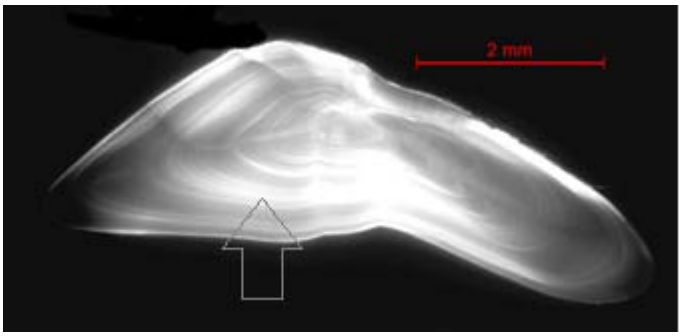
Vargas, J., R. Alpoim, E. Santos and A.M. Ávila de Melo – 2011. Portuguese Research Report for 2010. *NAFO SCS Doc.* 11/05.

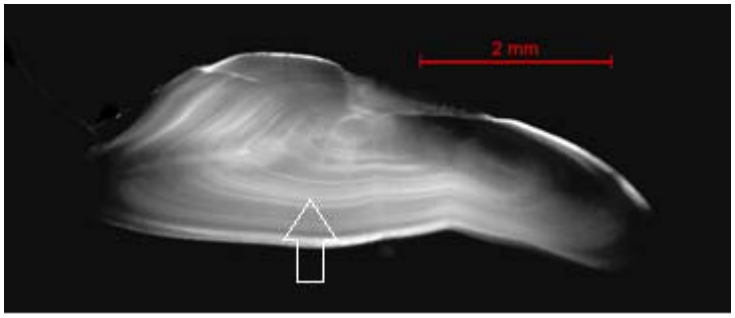
Wells, R.– 1986. On the validity of age determination of cod from Canadian research vessel cruises to Flemish Cap, 1977-85. *NAFO SCR Doc.*, 86/90.



Length age month: 56 3 OCT



Length age month: 48 3 DEC



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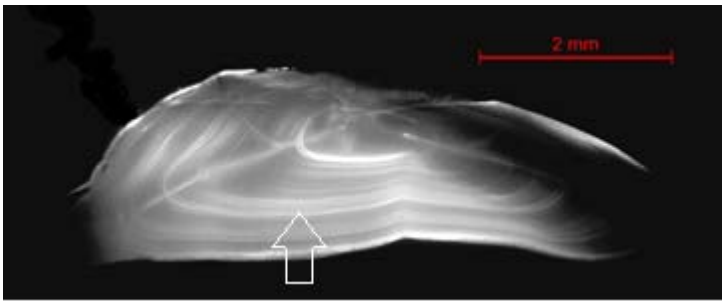
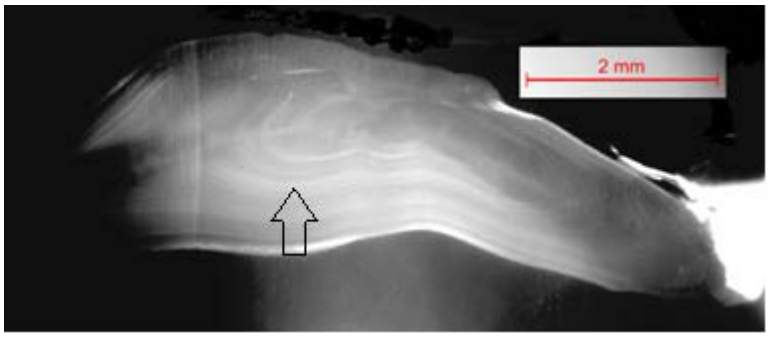
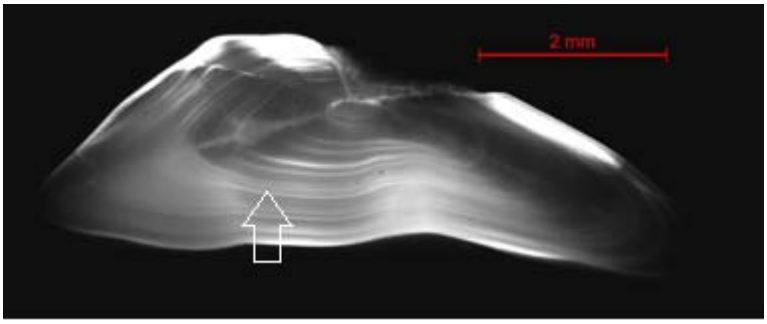


Length age month: 56 4 JUL

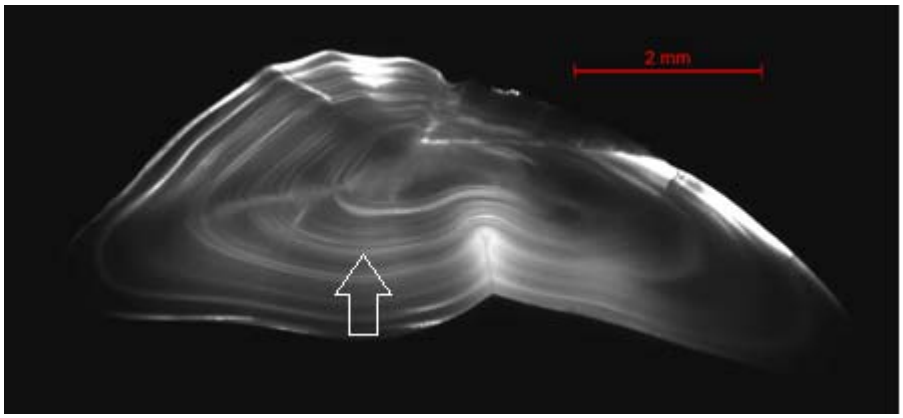
Figure 1 – Otoliths sections with transmitted light. Arows point to age 2 rings.



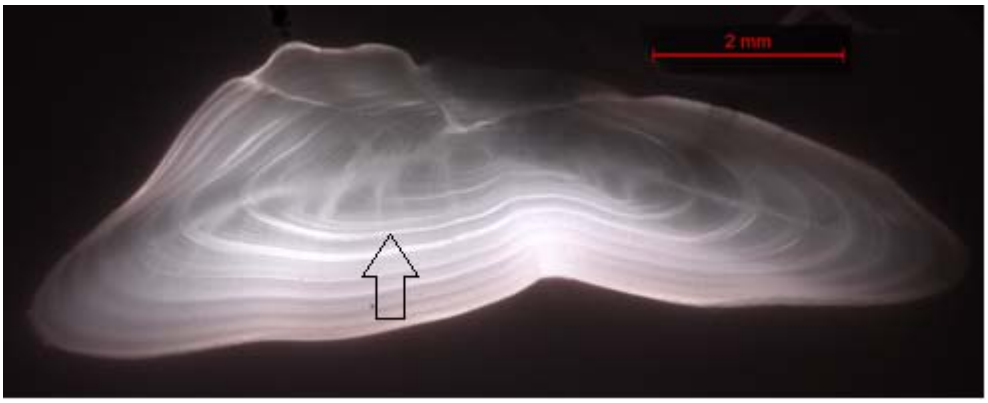
Length age month: 65 5 JUL



Length age month: 68 5 APR

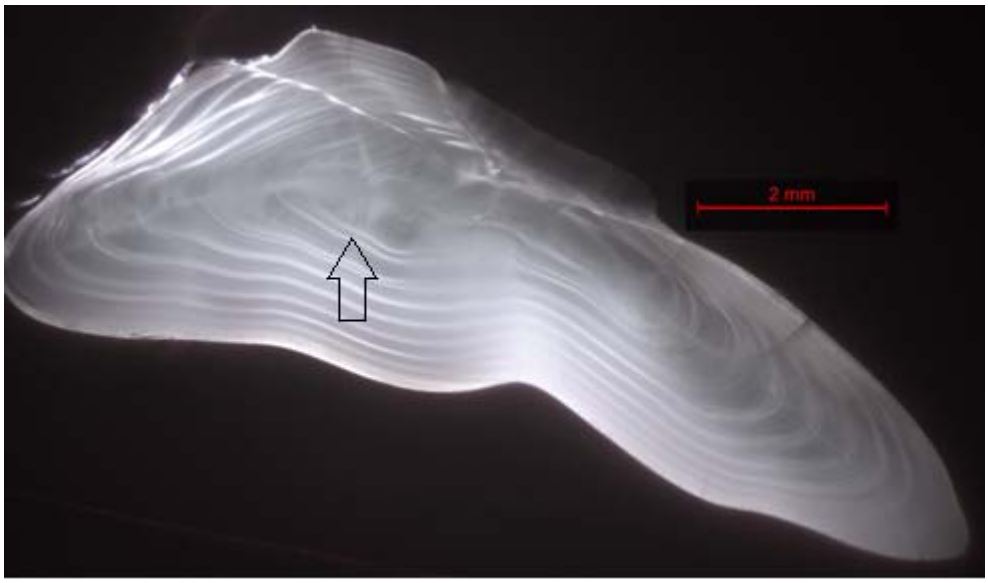


Length age month: 74 6 MAY

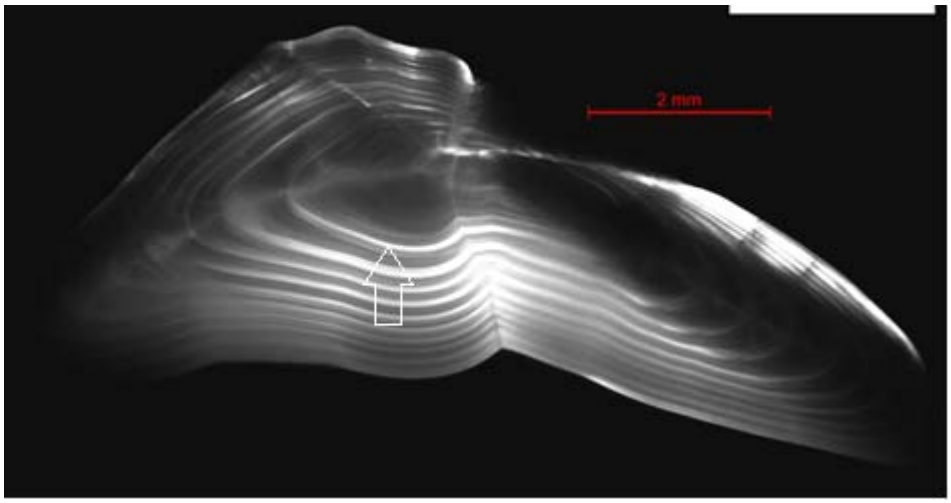


Length age month: 94 8 JUL

Figure 1 – (continuation)



Length age month: 108 10 JUL



Length age month: 102 10 OCT

Figure 1 – (continuation)

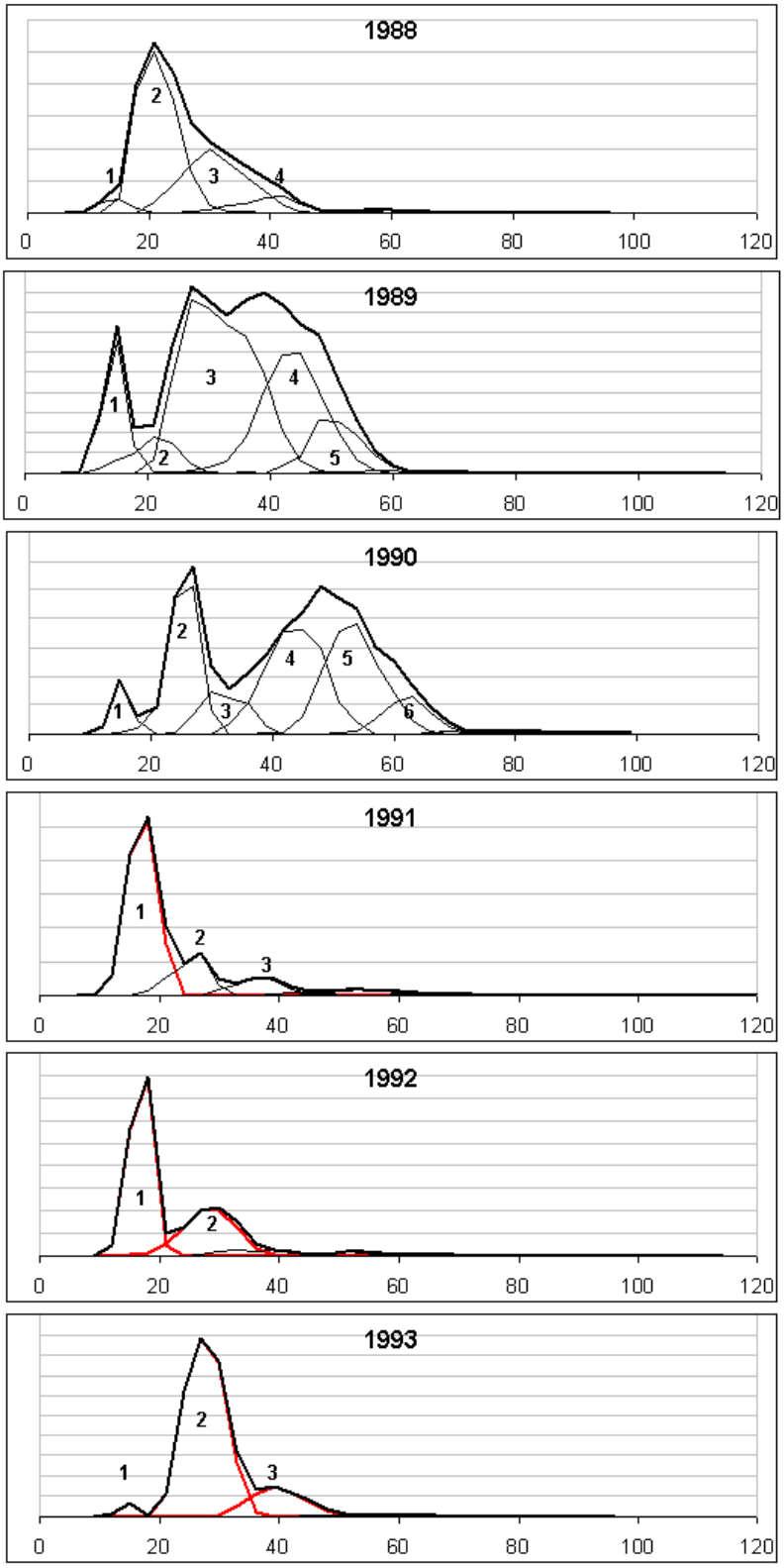
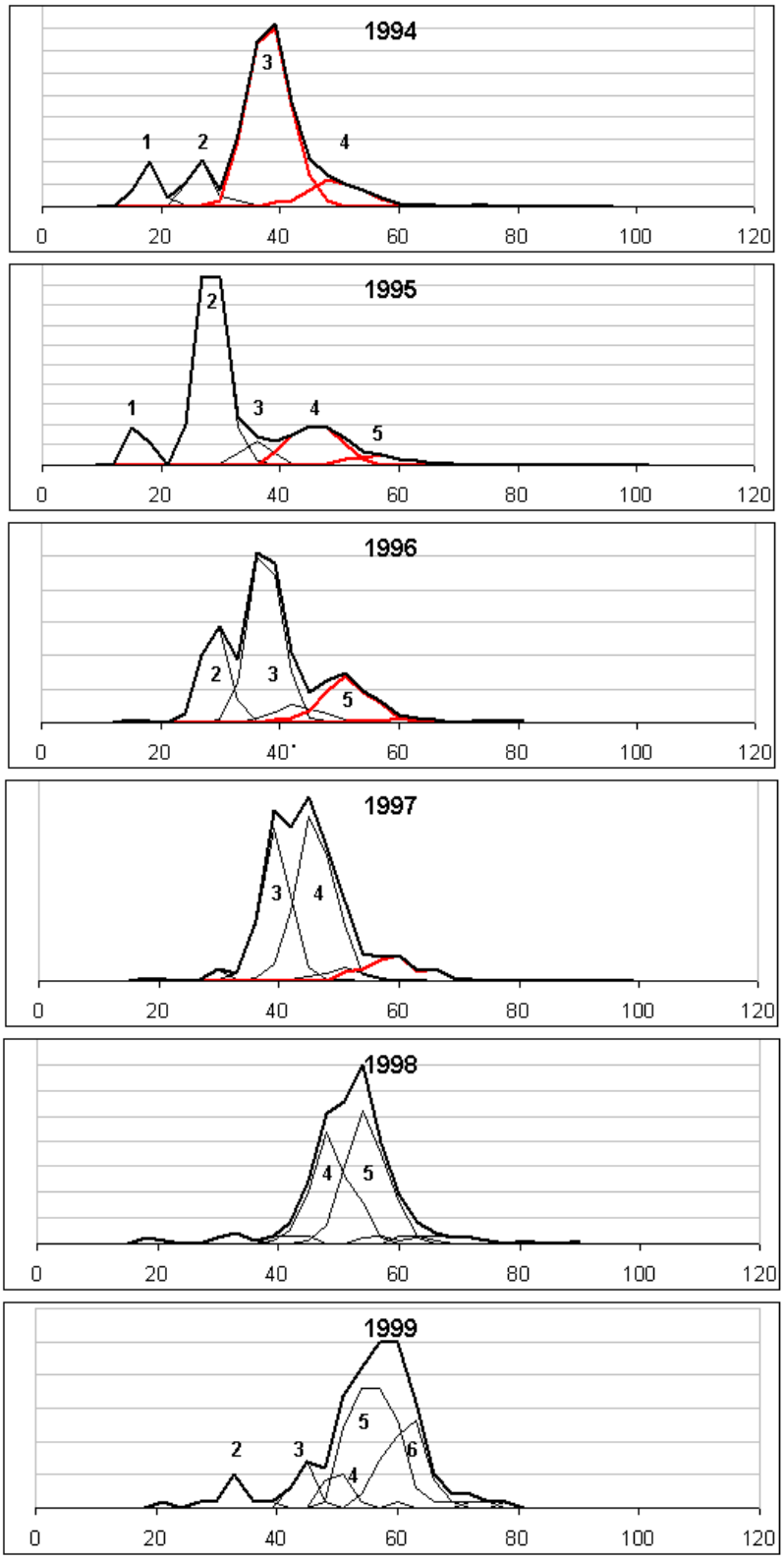


Figure 2 – Length distribution of cod in EU bottom trawl survey from 1988 to 2010 in July.



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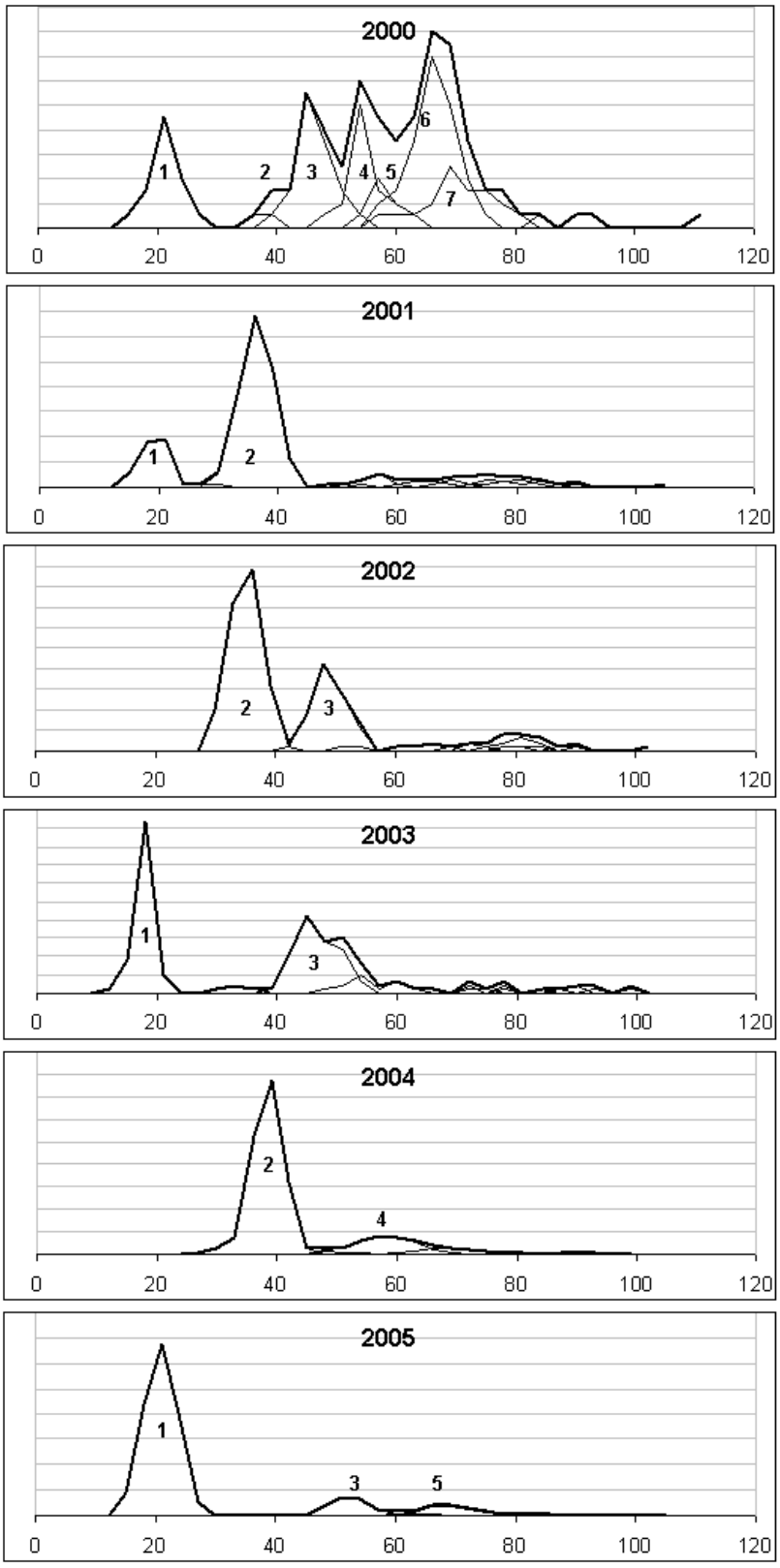

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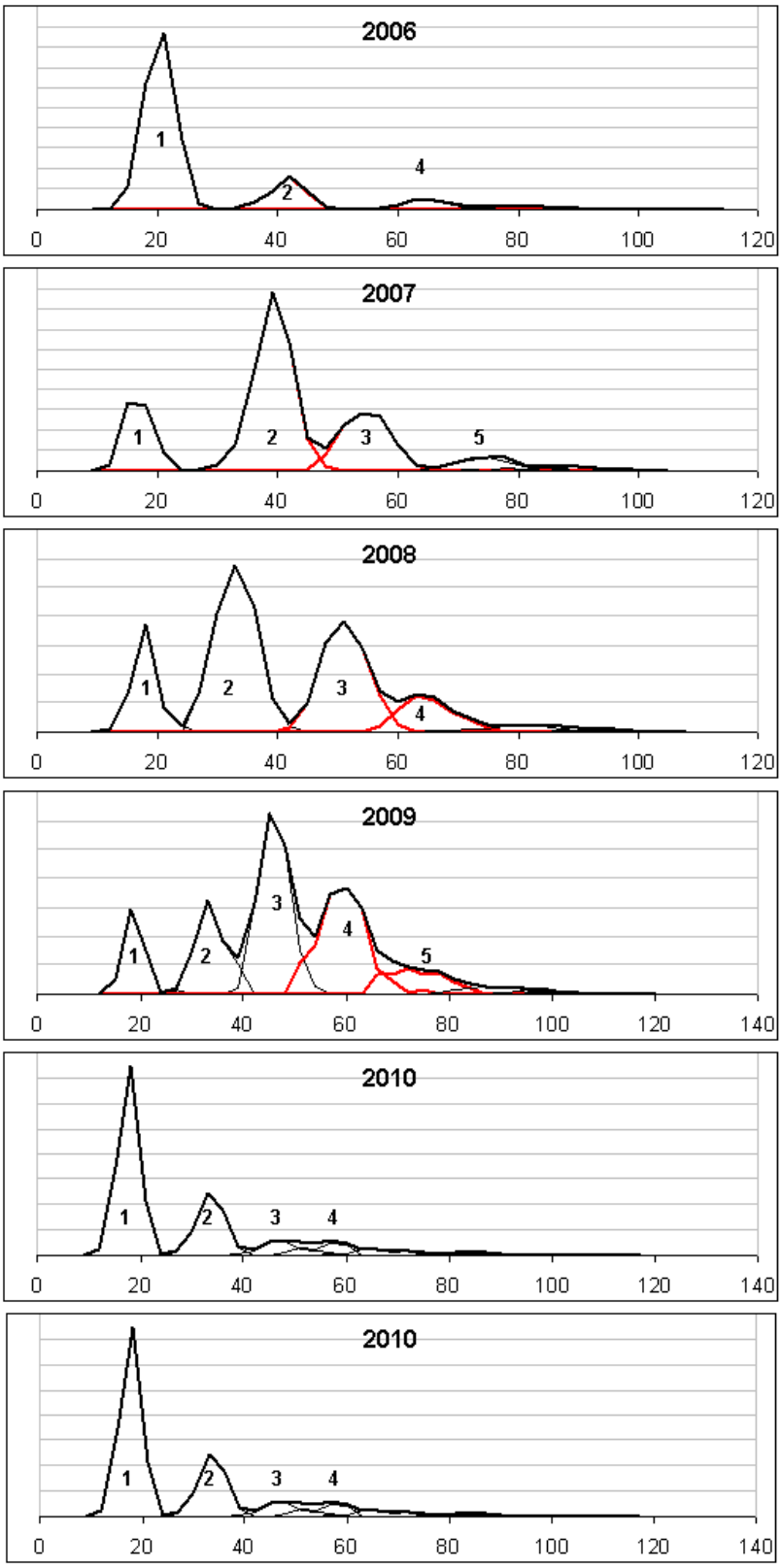

Figure 2 – (continuation)

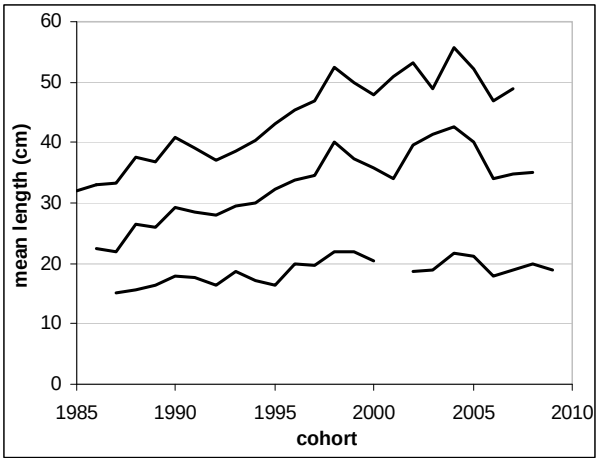

Figure 3 – Mean length of cod in July at ages 1, 2 and 3 by cohorts.

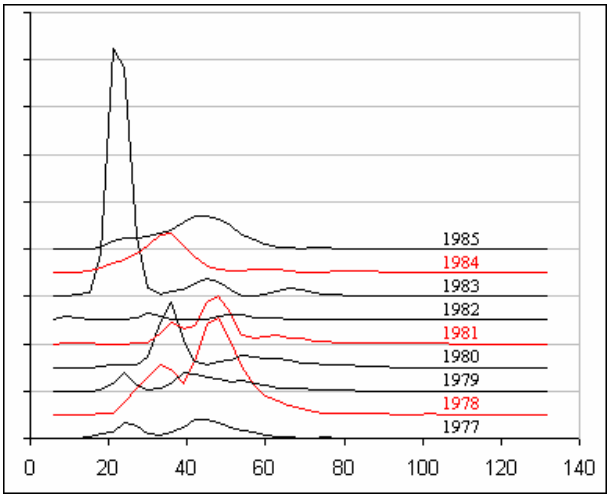

Figure 4 – Length distribution of cod taken in Canadian survey of Flemish Cap 1977-1985 in February (Wells 1986).

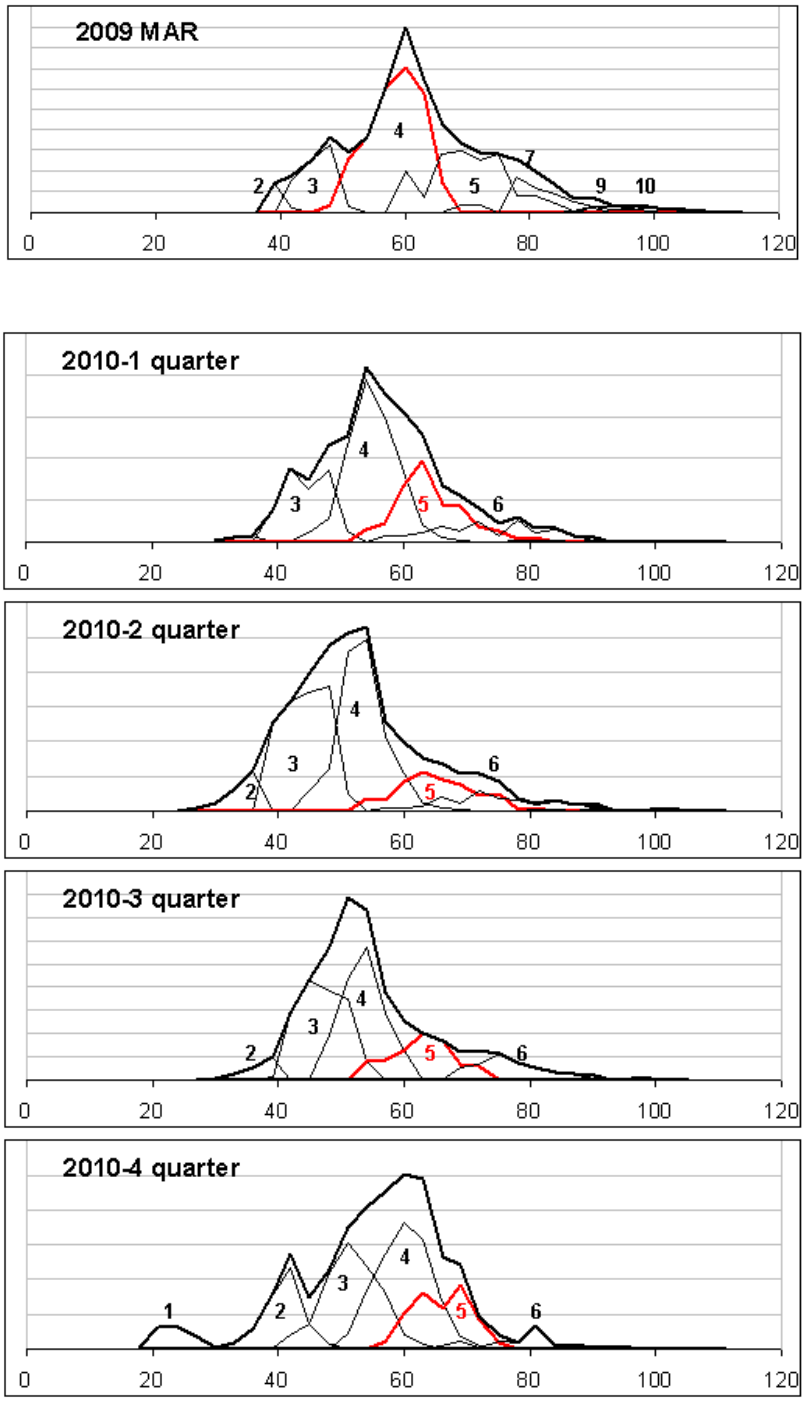

Figure 5 – Length distribution of cod in the Portuguese commercial catch in 2009 and 2010; month or quarter is indicated.