

# Stock assessment of elasmobranchs

*suitable approaches  
for situations of limited data  
(General issues)*

*Alvaro J. Abella ARPAT Italy  
GFCM Workshop on Stock Assessment of  
Selected Species of Elasmobranchs  
Brussels, 12-16 December 2011*

## Main biological features

- Slow growing
- Relatively long lived
- Late age of maturity
- Reduced fecundity
- ...but fairly good survival rate of eggs(?)
- Low natural mortality rates
- Direct relationship between spawning stock and recruits?

## Productivity and resilience

- **Linked with natural history traits**
- **General low productivity**
- **Smaller sized species somewhat more productive**

## RESILIENCE

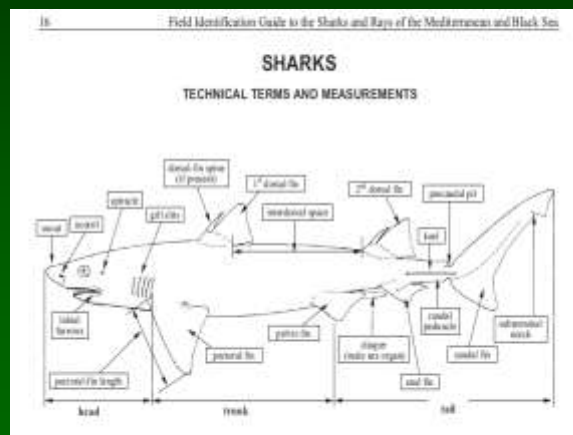
**“The ability of a system to utilize, profit from, and absorb natural variation” (Hilborn & Walters, 1996)**

- **“Age and size at maturity and adult size/longevity more important predictors of resilience to fishing pressure than fecundity or eggs survival...”**
- **“Large elasmobranch species with late maturation more vulnerable to heavy fishing pressure...” (Walker & Hislop, 1998, Frisk et al, 2001, 2002)**

Stock assessment needs of information on both the fish population and the fishery

In the case of elasmobranch species, most of the times such information is lacking or is partial.

Species identification difficult due to misidentification and/or lack of complete recordings



# Species identification field identification guides

24 Field Identification Guide to the Sharks and Rays of the Mediterranean and Black Sea

**HEXANCHIDAE**

*Heptranchias perlo* (Bonmatteo, 1788) (Plate 1, 1)

**Frequent synonyms / misidentifications:**  
*Heptranchias cinctus* (Gmelin, 1789) / None.

**FAO names:** En - Sharpnose seven-gill shark; Fr - Requin perlon; Sp - Carlabota bocadulce.

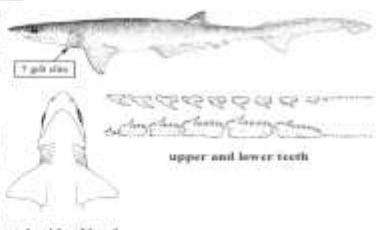
**Size:** From 100 to 140 cm TL.

**Habitat and biology:** Usually benthic at depths from 50 to 400 m, occasionally to 1 000 m, often near shelf edge, in warm waters. Oviparous, litters of about 8 to 20.

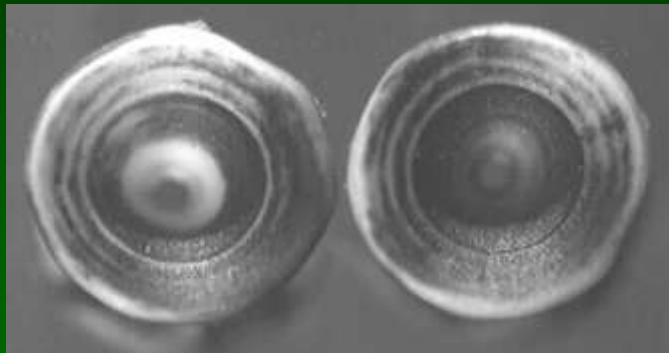
**Distribution:** Whole Mediterranean, absent in the north Adriatic and Black Sea and north African coasts. Atlantic northern limit in the Bay of Biscay. Probably worldwide in tropical and subtropical waters but nowhere common.

**Importance to fisheries:** Seldom caught as bycatch by bottom trawls and longlines in epibathyal and bathyal grounds.

**Conservation and exploitation status:** FAO, B1; IUCN, Near Threatened; Mediterranean, threatened.

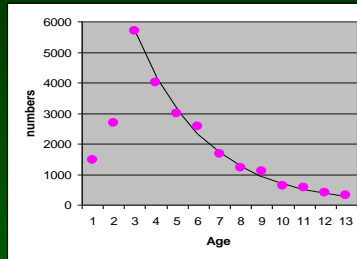


**Growth**  
no otoliths no scales but vertebrae or  
spines  
difficulties of LF analysis



## Mortality

difficulties for estimation due to data shortage, small catches, age determination



$$N_t = N_0 \cdot \exp(-Zt)$$

$$\log_{10} M = 0.006 \square 6 - 0.279 \log_{10} L_{\infty} + 0.6543 \log_{10} K + 0.4634 \log_{10} T$$

$$\ln Z = 1.44 - 0.982 \ln t_{\max}$$

$$Z = K \frac{(L_{\infty} - \bar{L})}{(L_{\infty} - L')}$$

## Fecundity

difficult to estimate the total number of eggs/embryos that will successfully develop up to hatching

- The number of eggs or new born individuals that a female produce is relatively small. The annual average offspring can be from only **one** to about **300**

## Unit of stock

Under a management point of view, in the frame of GFCM, it has been decided, when the lack of any evidence does not allow suggesting an alternative hypothesis, that inside each one of the GSAs boundaries inhabits a single, homogeneous stock that behaves as a single well-mixed and self-perpetuating population.

## Biological features

- Not considered priority species
- Few species well known
- Limited material for studies
- Difficulties for ageing

• **Data sources: data derive from direct (fisheries independent) and indirect (fisheries dependent) methods**

- **Trawl surveys available data**
- Biological (growth, maturity, etc)
- Catch rates (catch per unit of area or time)
- Demography (age/size structure at sea)

The modest number of individuals caught by species makes some times unsuitable the **analysis of time series** and the application of many other approaches of stock assessment

## **Commercial catch available data**

- **Biological (growth, maturity, etc)**
- **Catch rates (cpue or lpue)**
- **Demography (age/size structure of the catch or of landed fraction)**

The modest number of individuals caught by species and the lacking of reliable information on size structure, total catches and directed effort make unsuitable the use of traditional **production models, VPA** or of many other approaches of stock assessment.

## fisheries

- In the Med few fisheries targeting elasmobranchs
- Elasmobranchs are BY-catch of demersal and pelagic fisheries
- due to their low commercial interest most of them are discarded
- lacking of recording of landings and discards of elasmobranchs .
- Landed in mixed spp boxes
- Misidentification

## Special research needs (1)

- Conduct studies on mortality during discard at sea (survival rates)
- Research of gear selectivity and by-catch of elasmobranchs per gear/fishery/area/season
- Enhancement of at-sea and at landings species identification
- Collection of data on life history and their changes (in growth, maturity...)
- Integrated ecosystem management. Research on the influence of physical factors on shifts in predator-prey interactions with other bottom fish and competition with other elasmobranch species