



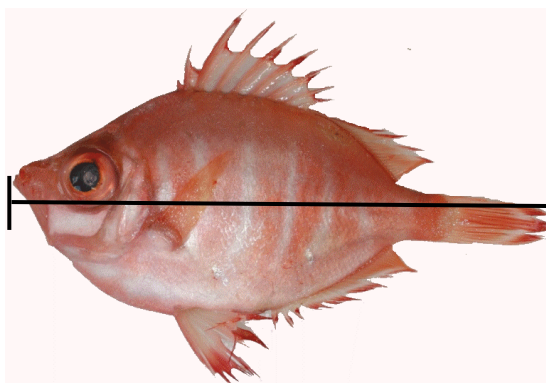
Boarfish (*Capros aper*) sampling protocols

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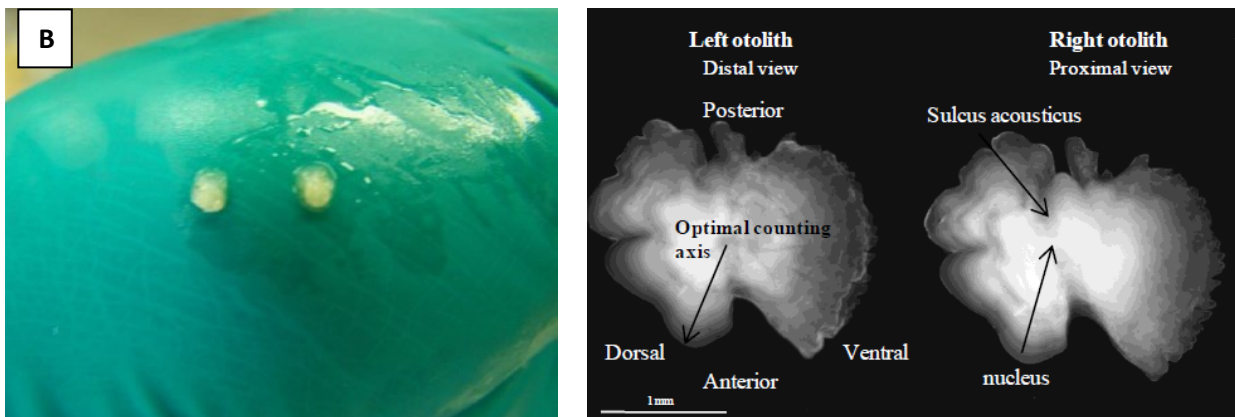
Length Frequency Sampling

- At least one sample should be collected per 1000 tonnes of landings.
- Samples should be spread according to landings across quarters and ICES Divisions.
- The fishery is mainly concentrated in Divisions VIIj and VIIh, although there may also be landings from VIa, VIIb and VIIIa.
- Each sample should comprise approximately 200 fish/6kg of boarfish.
- Total length is measured to the 0.5cm below from the tip of the snout, with the mouth in a naturally closed position, to the tip of the tail fin rays (see below).
- Poorly handled fish often have a broken tail fin and should not be included in the length frequency sample unless the sampler is confident with the length measurement.



Biological Sampling

- Five boarfish per 0.5 cm length class should be sampled for biological data and ageing.
- Sex and maturity should be assessed according to the maturity scale.
- Expose the otoliths by making a cut across the top of the eyes and opening the brain cavity (see A below).
- Otoliths should be removed using a fine forceps and rinsed in water.
- Each otolith is covered in a membrane which must be carefully scraped away (See B below).
- It is critical to remove the membrane when the otoliths are wet as it is difficult to remove after it dries and makes the otoliths unreadable.
- Otoliths should be stored in standard otolith trays.



Male



- Usually have red and white vertical stripes
- Stripes particularly evident around spawning
- Forehead slightly flatter and shorter than females
- Testes comprises two lobes loosely joined
- Lobes are slightly flattened and leaf-like
- Length at maturity = 9.7 cm TL

Mature Testes



Immature Testes



Female



- No vertical stripes
- Paler body colour than males
- Forehead more concave and longer than males
- Ovary comprises two lobes joined over 2/3 length
- Lobes are rounded and distinct from testes
- Reach a larger TL than males
- Length at maturity = 9.7 cm TL

Mature Ovary

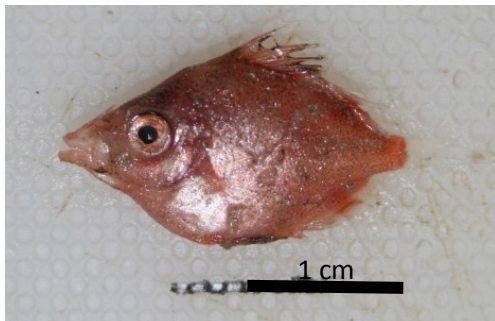


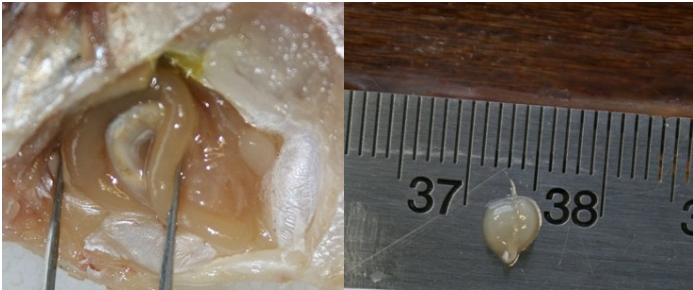
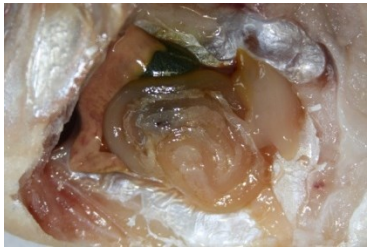

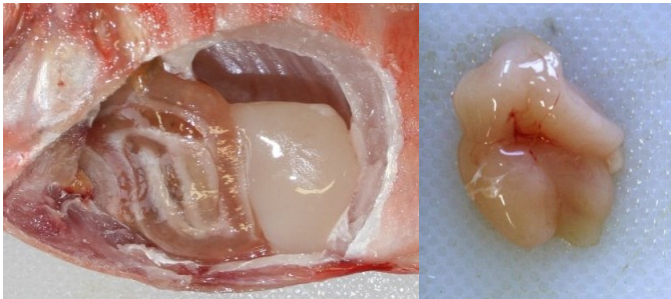
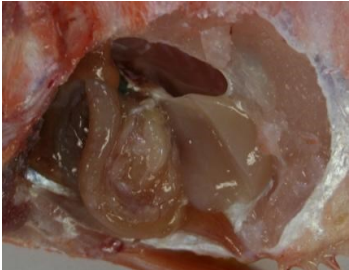
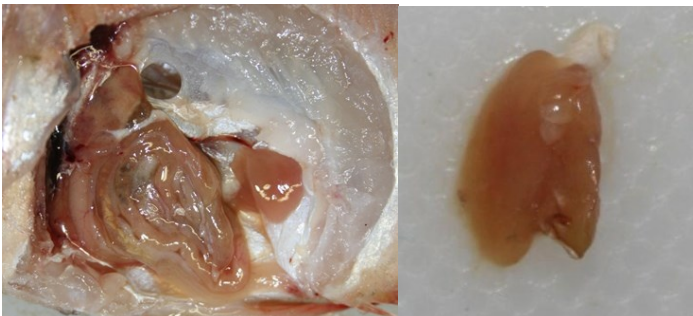
Immature Ovary



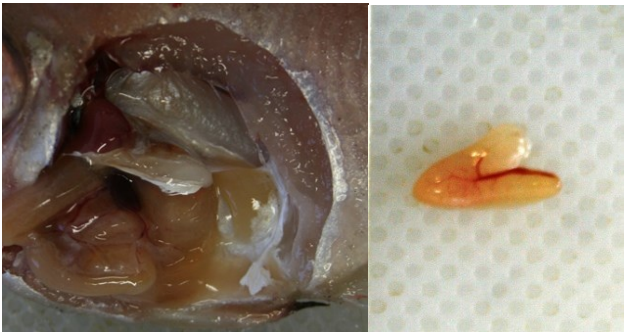
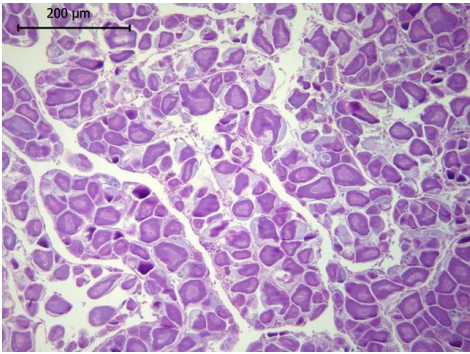
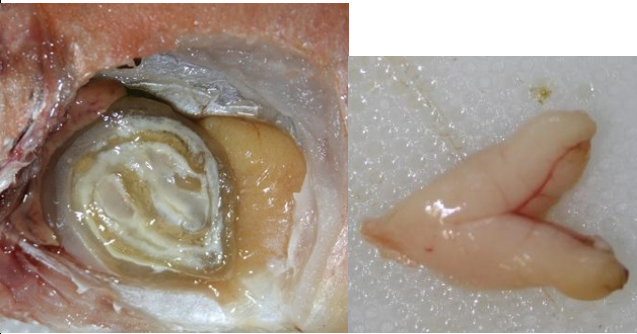
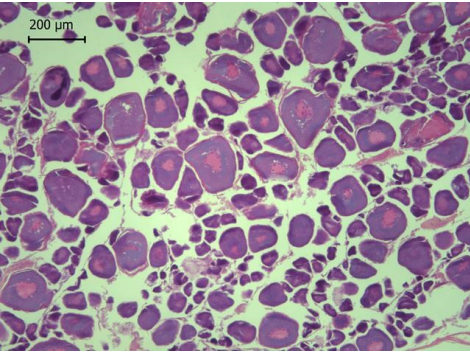
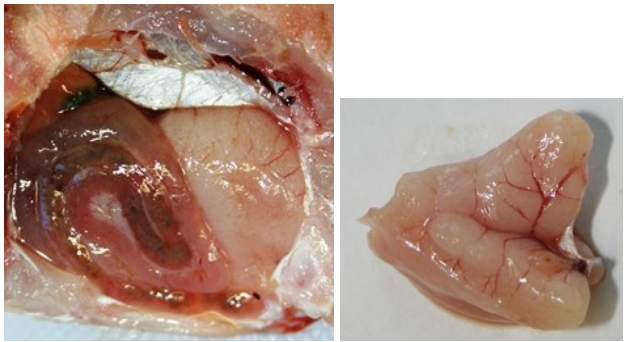
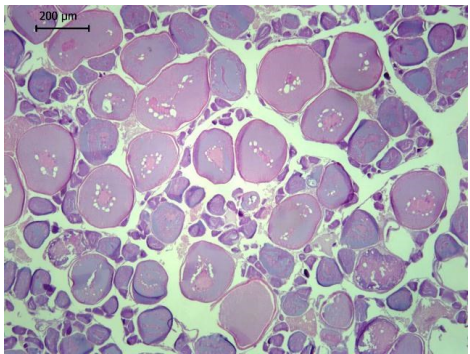
Juvenile

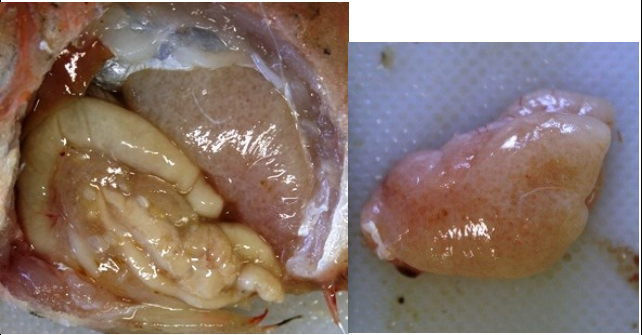
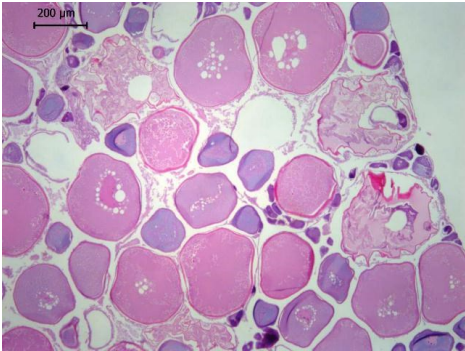
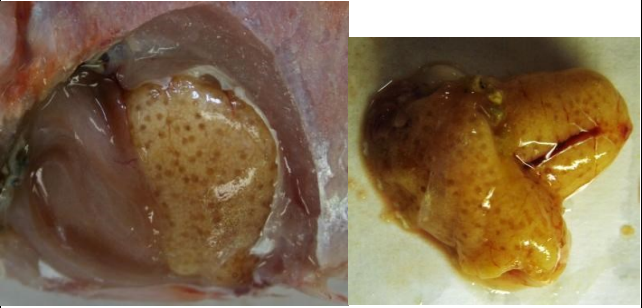
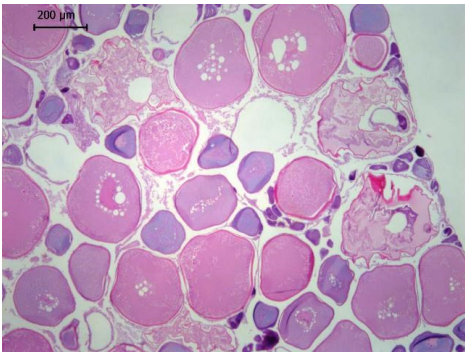

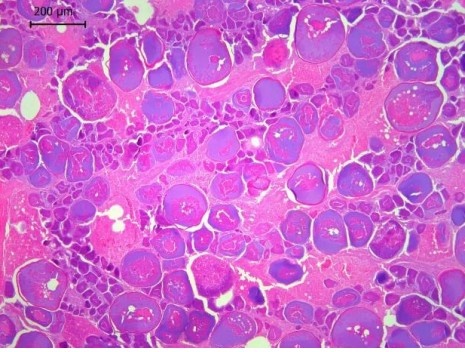
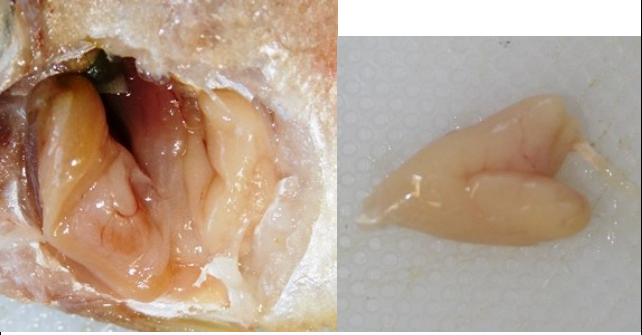
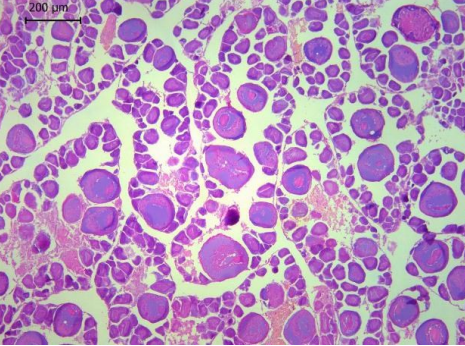
- < 9.7 cm TL
- Adult colouration not evident
- Difficult to determine sex
- Gonads are tiny and undistinguishable

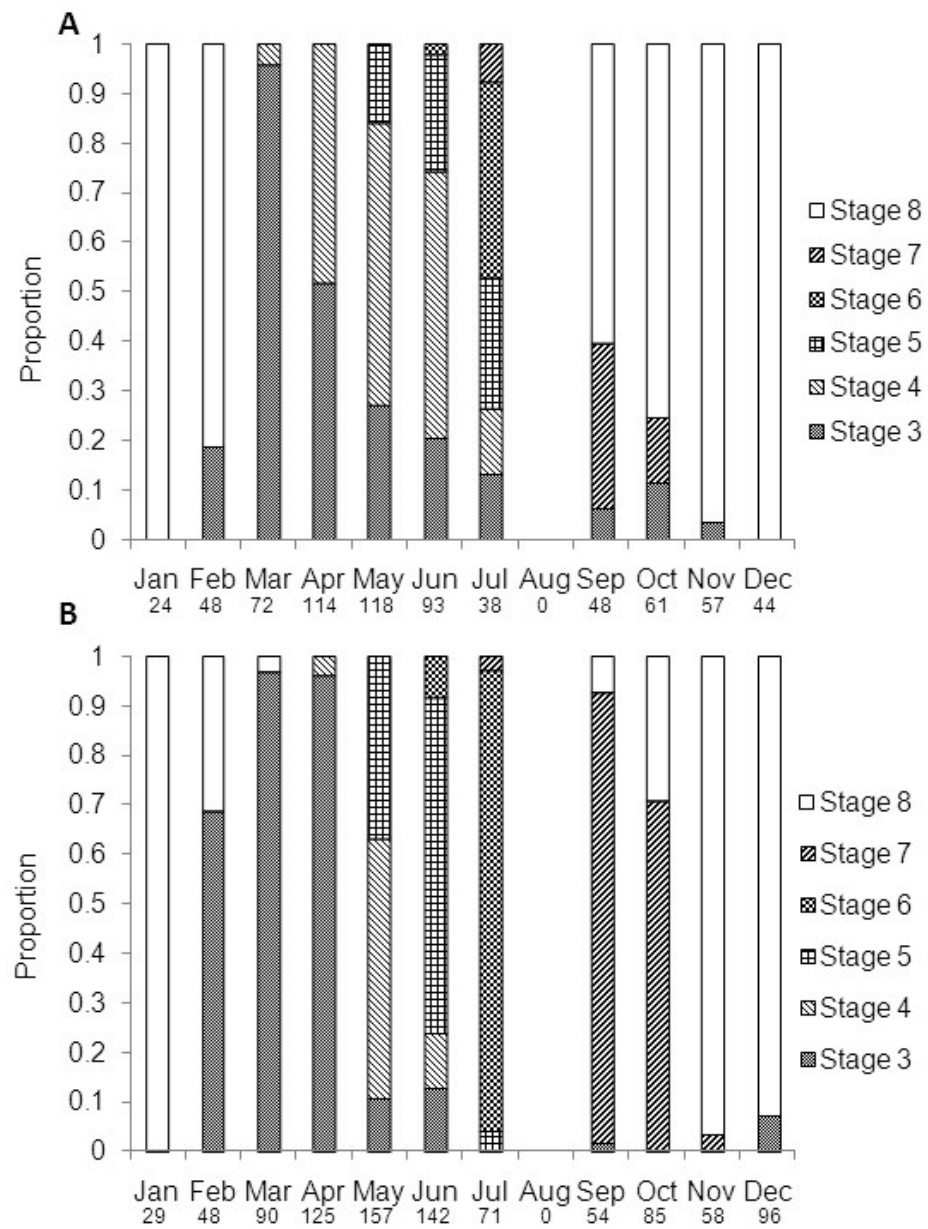


Stage	Male Maturity Scale	
1. Virgin	Testes are tiny, transparent and threadlike ($W < 0.01$ g and $GSI \leq 0.08$). Impossible to distinguish from ovary.	
2. Developing Virgin	Testes small ($W \leq 0.1$ g and $GSI = 0.05 - 0.7$) and opaque. Still slightly round in appearance, beginning to develop characteristic leaf-like lobes.	
3. Early Maturing	Testes small but obviously developed ($W = 0.03 - 0.76$ g and $GSI = 0.14 - 1.60$). Pale white in colour.	
4. Mature	Testes nearly full size but do not appear swollen or obviously white ($W = 0.15 - 2.9$ g and $GSI = 0.47 - 4.75$). No sperm visible when cut.	
5. Ripe	Testes very large, white and swollen ($W = 0.25 - 2.9$ g and $GSI = 1.0 - 5.0$). Sperm visible when cut.	
6. Spawning	Testes are the same as stage 5 except that sperm runs under pressure ($W = 0.5 - 2.2$ g and $GSI = 1.6 - 4.0$).	
7. Recently Spent	Testes appear bruised and reduced in size ($W = 0.1 - 1.4$ g and $GSI = 0.5 - 2.5$). Some small amounts of sperm may remain	
8. Inactive Adult	Testes small, similar size as stage 3 ($W = 0.03 - 0.70$ g and $GSI = 0.13 - 1.40$). Pinkish in colour.	

Female Maturity Scale

Stage	Macroscopic		Microscopic
1. Virgin	Ovaries are tiny, transparent and threadlike ($W < 0.01$ g and $GSI \leq 0.08$). Impossible to distinguish from testes and too small for histological processing.		
2. Developing Virgin		Ovaries very small ($W \leq 0.20$ g and $GSI \leq 1$) and opaque. Ovary occupies approx. 5% of body cavity. All oocytes are in the primary growth phase.	
3. Early Maturing		Ovaries developed but small and pale white colour ($W = 0.2 - 2.5$ g and $GSI = 1.0 - 3.5$). Firm to the touch. Secondary growth phase initiated with formation of cortical alveoli. Oocytes in primary growth phase also present.	
4. Mature		Ovaries not as swollen as stage 5, occupying 30-40% body cavity ($W = 0.5 - 3.9$ g and $GSI = 1.2 - 5.5$). No hydrated eggs present. More pink in colour than stage 3 but may also be orange. Most advanced oocytes undergoing vitellogenesis but previous stages also present.	

<p>5. Ripe</p>		<p>Ovaries heavily vascularised and obviously swollen, occupying 40-50% of body cavity (W = 1.0 - 6.0 g and GSI = 2.4 - 10.0). Hydrated eggs present. Colour varies from white-ish to deep orange. Ovaries do not run under pressure. All previous oocyte stages present.</p>	
<p>6. Spawning</p>		<p>Ovaries large and filling over 50% of body cavity (W = 1.0 - 8.0 g and GSI = 3.7 - 13.4). Lots of hydrated eggs clearly visible. Ovary membrane thin and easily torn. Runs under pressure. All previous oocyte stages present.</p>	
<p>7. Spent Resorption</p>		<p>The ovary is still quite large, approx. 30% of body cavity (W = 0.6 - 3.0 g and GSI = 2.0 - 6.0). Look similar to stage 4 but may have a bruised appearance. Generalised atresia of mature oocytes. Ovary appears to have a denser structure. This stage may be divided into early and late.</p>	
<p>8. Resting</p>		<p>Ovaries reduced in size and white (W = 0.2 - 2.5 g and GSI = 1 - 3). Similar to stage 3, except that they are softer to the touch. Remnants of atretic oocytes still present and lamellae are more loosely organised than stage 3.</p>	



The occurrence of the maturity stages of mature *Capros aper* by month for (A) males and (B) females. The number under each month indicates the number of samples.