

**MERISTICS****Fins:**

Dorsal rays - 17-18  
 Anal rays - 17-18  
 Pelvic rays - 6-8  
 Pectoral rays - 16-17

**Myomeres:**

Total number – (preanal) 36-41

**LIFE HISTORY**

**Range:** Northeast Atlantic: from Iceland (rare) and North Sea, southward to Bay of Gorée, Sénégal. Mediterranean (common in the western part and in Adriatic Sea, rare in the eastern part), Sea of Marmara and Black Sea.

**Habitat:** Coastal pelagic, at 25-55 m by day and 15-35 m by night; shoaling, migratory.

**Spawning season:** Eggs and larvae found throughout the whole year; peak spawning periods, spring, autumn-winter.

**ELH pattern:** Oviparous, planktonic eggs and larvae.

**MAIN REFERENCES**

- Cunningham, J.T. (1889). Studies of the reproduction and development of teleostean fishes occurring in the neighbourhood of Plymouth. *J. mar. bio. Ass. U.K.*, 1: 370-375.
- M'intosh, W. S., A. T. Masterman (1897) - *The life-histories of the British marine food-fishes*. C. J. Clay London: 467p.
- Ehrenbaum, E. (1905-1909) - Eier und Larven von Fischen. *Nordisches Plankton*: 413p.
- Fage, L. (1920) - Engraulidae, Clupeidae. *Rep. Dan. Oceanogr. Exped. 1908-10 Medit. adjac. Seas*, 2, Biology A9: 140p.
- Lebour, M. V. (1921) - The larval and post-larval stages of the pilchard, sprat and herring from the Plymouth district. *J. mar. bio. Ass. U. K.*, 12: 427-457.
- Gamulin, T., T. Hure (1955) - Contribution à la connaissance de l'écologie de la ponte de la sardine (*Sardina pilchardus* Walb.) dans l'Adriatique. *Acta Adriatica*, 8 (8): 1-22.
- Munk, P., J. G. Nielsen (2005). *Eggs and larvae of North Sea fishes*. Biofolia, Denmark: 215pp.
- Saville, A. (1964) - Fiches d'identification des oeufs et larves de poissons, n° 1 Clupeoidei. *ICES Fich. Ident. Oeufs et Larves Poissons*, 1: 1-5.
- Russell, F.S. (1976). *The eggs and planktonic stages of British marine fishes*. Academic Press, London: 524pp.
- Ré, P. (1984). Ictioplâncton da região central da costa portuguesa e do estuário do Tejo. *Doctoral Thesis, University of Lisbon*: 425p.
- Ré, P. (1986). Sobre a identificação dos primeiros estados larvares planctônicos de *Sardina pilchardus* (Walbaum, 1792) e de *Engraulis encrasicolus* (Linnaeus, 1758). *Ciência Biológica. Ecology Systematics*, 6 (1/2): 135-140.
- Ré, P. (1986). Otolith microstructure and the detection of life history events in sardine and anchovy larvae. *Ciência Biológica. Ecology Systematics*, 6 (1/2): 9-17.
- Varagnolo, S. (1964). Calendario di comparse di uova pelagiche di teleostei marini nel plancton di Chioggia. *Archiv. Oceanogr. Limnol. (Centro Naz. Stud. Talassogr. Venezia)*, 13, Fasc.2: 249-279.

**EARLY LIFE HISTORY DESCRIPTION****EGGS**

Capsule diameter - 1.4-1.8 mm  
 No. of oil globules - 1  
 Shell surface - smooth  
 Pigment - none  
 Yolk - segmented  
 Diameter of oil globules - 0.09-0.19 mm  
 Diagnostic features: spherical, 1.4-1.8 mm diameter, segmented yolk, 0.80-0.95 mm diameter, single oil globule 0.09-0.19 mm diameter, large perivitelline space

**LARVAE**

Hatching length - 3.2-4.0 mm  
 Yolk-sac absorption - 4.0-5.5 mm  
 Flexion length - 10-12.5 mm  
 Transformation length - 40-50 mm  
 Pigmentation - yolk-sac: many small scattered melanophores in the dorsal region extending from the head to the tail, with one ventral caudal melanophore. Late larvae: melanophores on head and trunk, tail with single melanophore.  
 Diagnostic features - newly hatched larva tube-like (typical clupeid form). Easily distinguishable from other clupeids by the presence of the oil globule. Yolk-sac absorption at 4.0-5.5 mm. Mouth and jaws undeveloped and unpigmented eyes at hatching. 7 to 8 larval sense organs along each side of the body. Typical larval pigmentation develops around 5-6 mm. Dorsal fin formation (31<sup>th</sup> myomere) 7.5 mm. Swim-bladder formation at 10 mm. Notochord flexion occurs at 11-12.5 mm. Formation of pelvic fins (level with pylorus) at 20 mm. Complete dorsal fin formation at 26 mm. Complete anal fin formation at 28 mm. Number of preanal myomeres: 36-41.

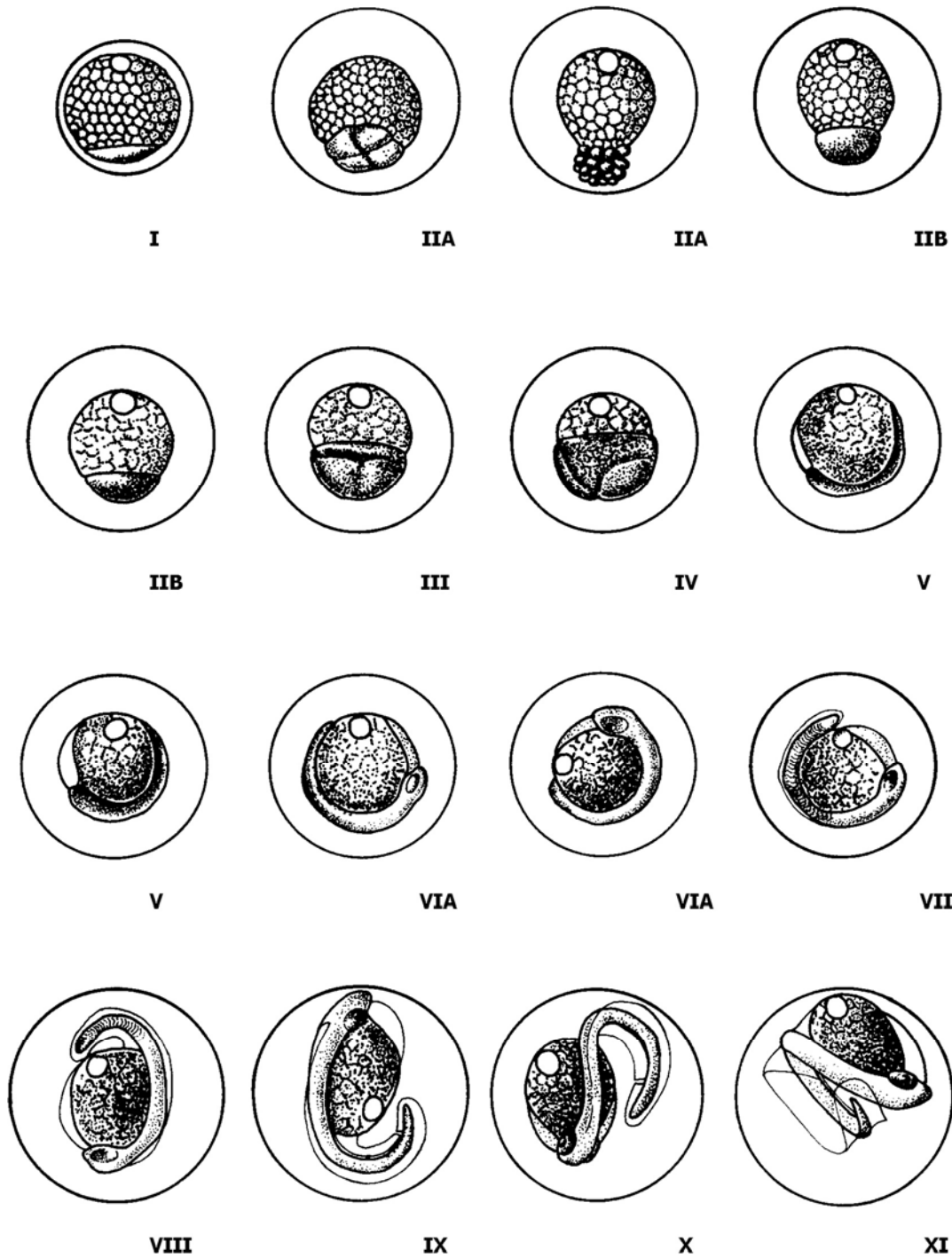
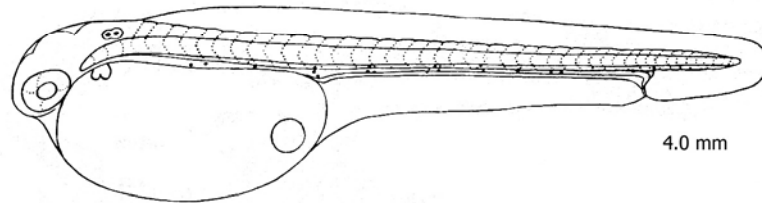


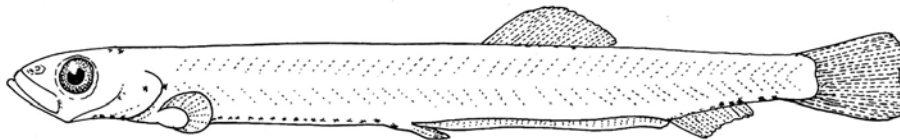
Plate 1- Stages of development of *Sardina pilchardus* eggs. Ré *et al.* (1988).



4.0 mm



11.0 mm



29.8 mm

Plate 2- Early life history stages of *Sardina pilchardus*. Varagnolo (1964), Fage (1920).

**MERISTICS**

**Fins:**

Dorsal rays – 15-19  
 Anal rays – 17-21  
 Pelvic rays - 7  
 Pectoral rays– 16-17

**Myomeres:**

Total number – (preanal) 35-37

**LIFE HISTORY**

**Range:** Northeast Atlantic; North Sea and Baltic south to Morocco, Mediterranean, Adriatic and Black seas.

**Habitat:** Coastal pelagic. Usually inshore schooling, sometimes entering estuaries (especially the juveniles) and tolerating low salinities. Strong migrations between winter feeding and summer spawning grounds.

**Spawning season:** eggs and larvae are most abundant from February to March. Spawning season extends from January to July.

**ELH pattern:** oviparous, planktonic eggs and larvae.

**MAIN REFERENCES**

- Cunningham, J.T. (1889). Studies of the reproduction and development of teleostean fishes occurring in the neighbourhood of Plymouth. *J. mar. bio. Ass. U.K.*, 1: 370-375.
- M'intosh, W. S. and A. T. Masterman (1897) - *The life-histories of the British marine food-fishes*. C. J. Clay London: 467p.
- Ehrenbaum, E. (1905-1909) - Eier und larven von Fischen. *Nordisches Plankton*, 1: 413p.
- Fage, L. (1920) - Engraulidae, Clupeidae. *Rep. Dan. Oceanogr. Exped. 1908-10 Medit. adjac. Seas*, 2, Biology A9: 140p.
- Lebour, M. V. (1921) - The larval and post-larval stages of the pilchard, sprat and herring from the Plymouth district. *J. mar. biol. Ass. U. K.*, 12: 427-457.
- Lee, J. Y. (1966) - Oeufs et larves planctoniques de poissons. *Rev. Trav. Inst. Scient. techn. Pêches marit.*, 30: 171-208.
- Munk, P. and J. G. Nielsen (2005). *Eggs and larvae of North Sea fishes*. Biofolia, Denmark: 215pp.
- Russell, F.S. (1976). *The eggs and planktonic stages of British marine fishes*. Academic Press, London: 524pp.
- Ré, P. (1999). *Ictioplâncton estuarino da Península Ibérica (Guia de identificação dos ovos e estados larvares planctónicos)*, 163pp, 51 fig. Prémio do Mar, 1996. Câmara Municipal de Cascais. ISBN 972-637-065-5.
- Varagnolo, S. (1964). Calendario di comparse di uova pelagiche di teleostei marini nel plancton di Chioggia. *Archiv. Oceanogr. Limnol.* (Centro Naz. Stud. Talassogr. Venezia), 13, Fasc.2: 249-279.

**EARLY LIFE HISTORY DESCRIPTION**

**EGGS**

Capsule diameter - 0.8-1.3 mm  
 No. of oil globules - 0  
 Shell surface - smooth  
 Pigment - none  
 Yolk - segmented  
 Diameter of oil globules -  
 Diagnostic features - spherical, segmented yolk, no oil globule, small perivitelline space.

**LARVAE**

Hatching length - 3.0-3.6 mm  
 Yolk-sac absorption - 5.0-6.0 mm  
 Flexion length - 11 mm  
 Transformation length - 32-41 mm  
 Pigmentation - yolk-sac: small scattered melanophores in head and dorsal region (visible in the embryo).  
 Diagnostic features - newly hatched larva tube-like (typical clupeid form). Prominent sense organs (6) on each side of the body. Pigmented eyes at the end of yolk-sac absorption. Dorsal fin formation (28<sup>th</sup> myomere) at 8 mm. Formation of pelvic fins 4 to 5 myomeres behind pylorus 17-20 mm. Number of preanal myomeres 35-37. Tail length less the six times into total length.

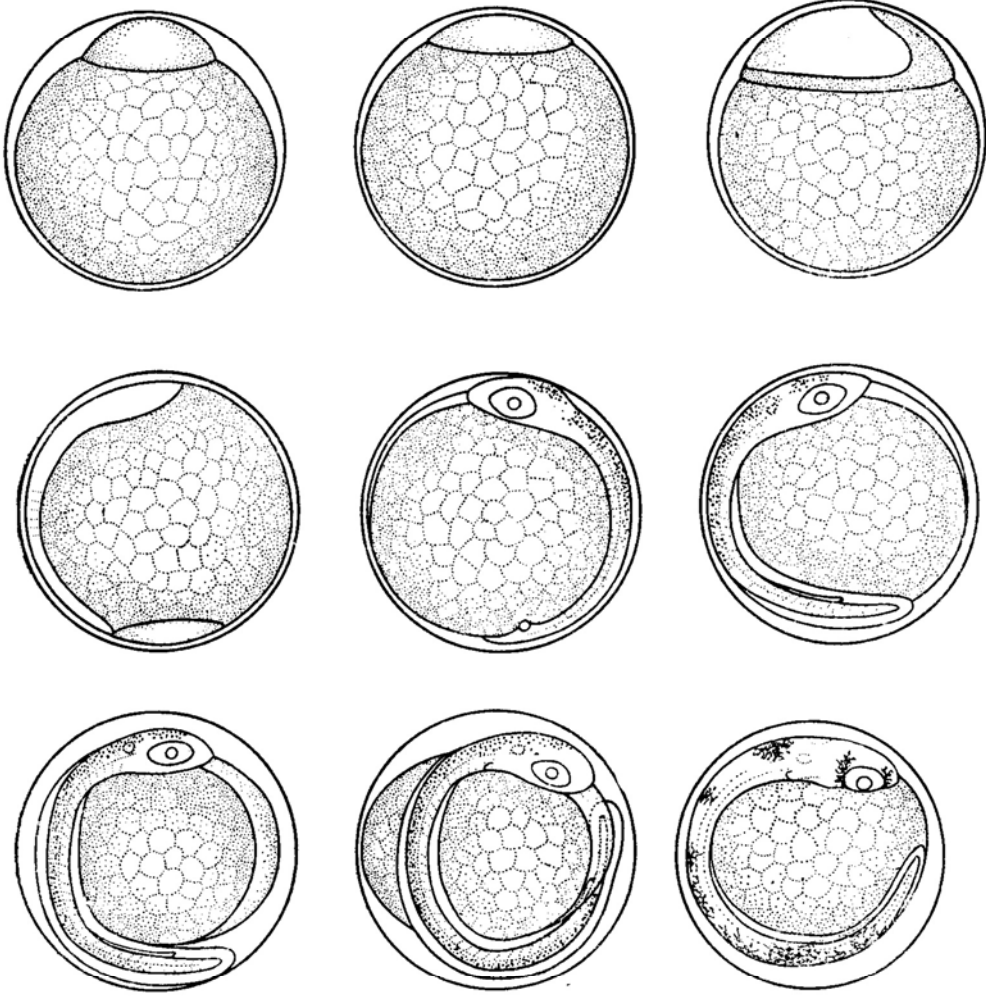


Plate 3 - Stages of development of *Sprattus sprattus* eggs. Dekhnik (1973).

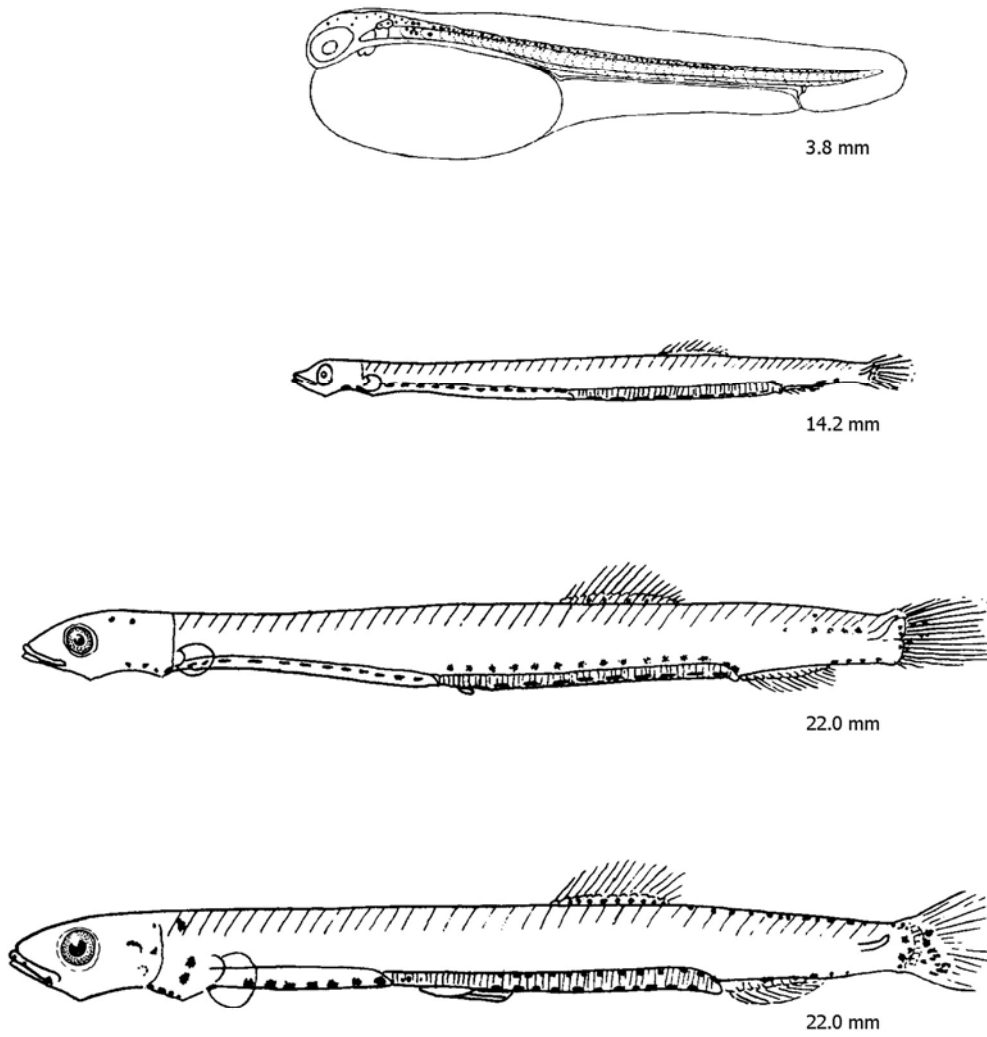


Plate 4 - Early life history stages of *Sprattus sprattus*. Varagnolo (1964) and Russell (1976).

## ENGRAULIDAE

## *Engraulis encrasicolus* (Linnaeus, 1758)

### MERISTICS

#### Fins:

- Dorsal rays - 15-18
- Anal rays - 16-18
- Pelvic rays - 7
- Pectoral rays - 15-17

#### Myomeres:

- Total number – 44-47

### LIFE HISTORY

**Range:** Eastern Atlantic; Bergen, Norway to South Africa. Mediterranean, Black and Azov Seas.

**Habitat:** Coastal marine species, forming large schools. Tolerates salinities of 5-41 ‰ and in some areas enters estuaries and lagoons, especially during spawning. Tends to move further north and into surface waters in summer, retreating and descending in winter.

**Spawning season:** Spawns from March to November with peaks usually in summer.

**ELH pattern:** oviparous, planktonic eggs and larvae.

### MAIN REFERENCES

- Raffaele, F. (1888) - Le uova galleggianti e la larve dei Teleostei nel Golfo di Napoli. *Mitt. zool. Stn Neapel*, 8: 1-85.
- Ehrenbaum, E. (1905-1909) - Eier und larven von Fischen. *Nordisches Plankton*, 1: 413p.
- Fage, L. (1920) - Engraulidae, Clupeidae. *Rep. Dan. Oceanogr. Exped. 1908-10 Medit. adjac. Seas*, 2, Biology A9: 140p.
- Lee, J. Y. (1966) - Oeufs et larves planctoniques de poissons. *Rev. Trav. Inst. Scient. techn. Pêches marit.*, 30: 171-208.
- Munk, P. and J. G. Nielsen (2005). *Eggs and larvae of North Sea fishes*. Biofolia, Denmark: 215pp.
- Russell, F.S. (1976). *The eggs and planktonic stages of British marine fishes*. Academic Press, London: 524pp.
- Ré, P. (1996). Anchovy spawning in the Mira Estuary (southwestern Portugal). *Scientia Marina, The European Anchovy and its Environment I. Palomera and P. Rubiés (eds)*, 60 (Supl. 2): 141-153.
- Ré, P. (1986). Sobre a identificação dos primeiros estados larvares planctônicos de *Sardina pilchardus* (Walbaum, 1792) e de *Engraulis encrasicolus* (Linnaeus, 1758). *Ciência Biológica. Ecology Systematics*, 6 (1/2): 135-140.
- Ré, P. (1999). *Ictioplâncton estuarino da Península Ibérica (Guia de identificação dos ovos e estados larvares planctônicos)*, 163pp, 51 fig. Prémio do Mar, 1996. Câmara Municipal de Cascais. ISBN 972-637-065-5.
- Varagnolo, S. (1964). Calendario di compare di uova pelagiche di teleostei marini nel plancton di Chioggia. *Archiv. Oceanogr. Limnol. (Centro Naz. Stud. Talassogr. Venezia)*, 13, Fasc.2: 249-279.

### EARLY LIFE HISTORY DESCRIPTION

#### EGGS

- Capsule diameter - 1.2-1.9 mm x 0.5-1.2 mm
- No. of oil globules - 0
- Shell surface - smooth
- Pigment - none
- Yolk - segmented
- Diameter of oil globules -
- Diagnostic features - Ovoid in shape. Segmented yolk, no oil globule, small perivitelline space.

#### LARVAE

- Hatching length - 3.0-4.0 mm
- Yolk-sac absorption - 5.0 mm
- Flexion length - 9.0-10.0 mm
- Transformation length - 25 mm
- Pigmentation - Early larvae: two melanophores on abdominal wall behind pylorus, two on anal papilla, one or two in tail region. Late larvae: Row of melanophores on top of the gut.
- Diagnostic features - Head more than five times into total length, dorsal fin opposite to anus. Pelvic fins on level with pylorus. Late larvae: Head with characteristic adult shape. Dorsal and anal fins overlapping.

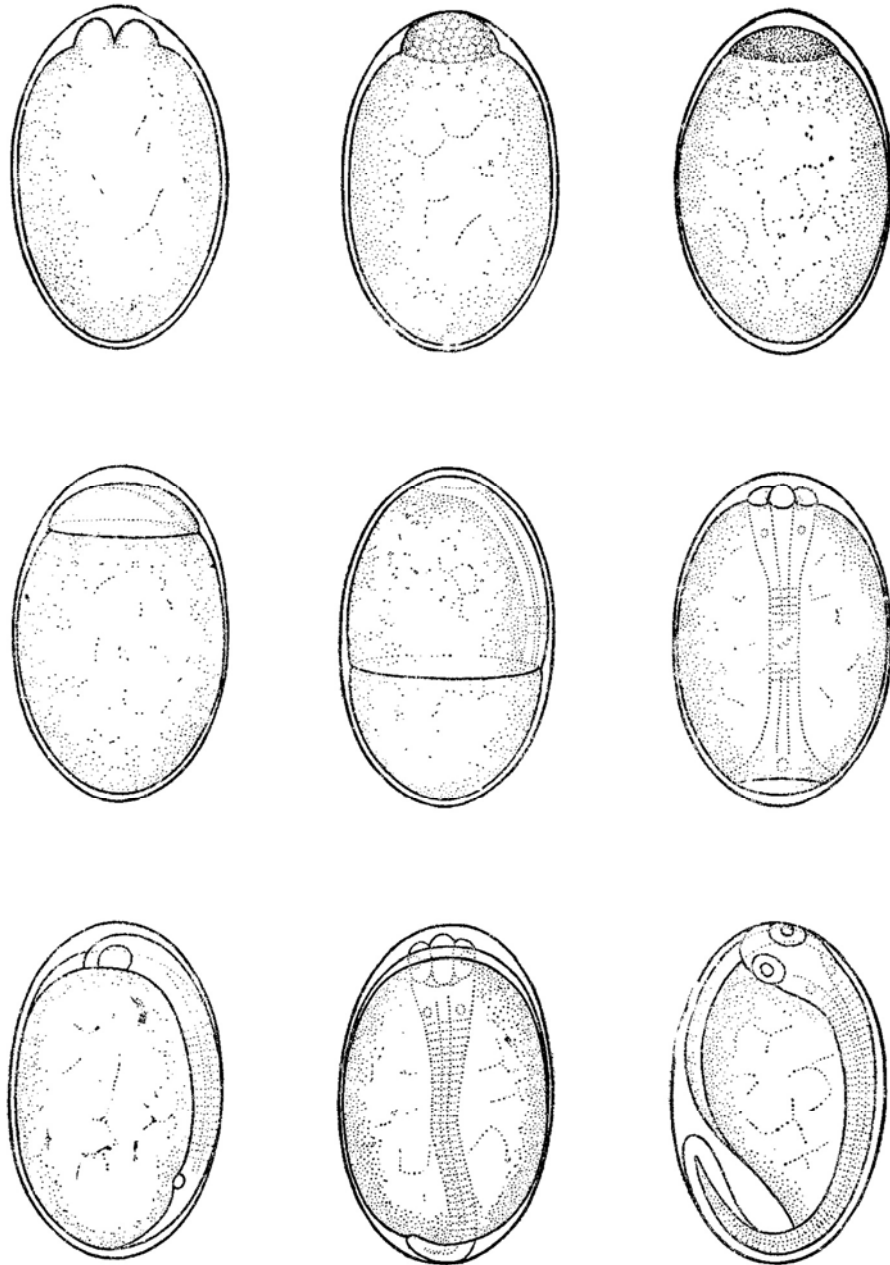


Plate 5 - Stages of development of *Engraulis encrasicolus* eggs. Dekhnik (1973).



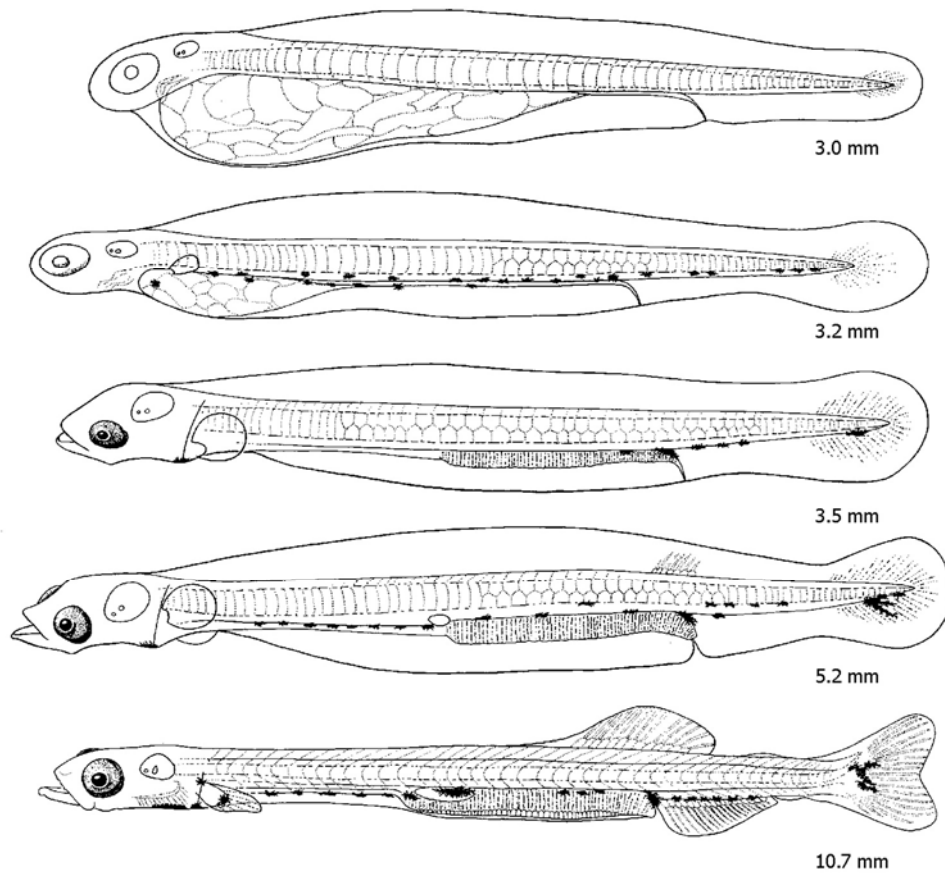


Plate 6 - Early life history stages of *Engraulis encrasicolus*. Ré (unpublished data).