

# **Developmental stages and morphological characters of bony fish eggs**

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# Breeding modes of bony fish

## ● Oviparous

Producing eggs that develop outside the maternal body

**many bony fishes**

## ● Ovo-viviparous

Developing larvae (juveniles) within the maternal body in eggs

**Scorpaenidae, Cottidae, Hexagrammidae**

## ● Viviparous

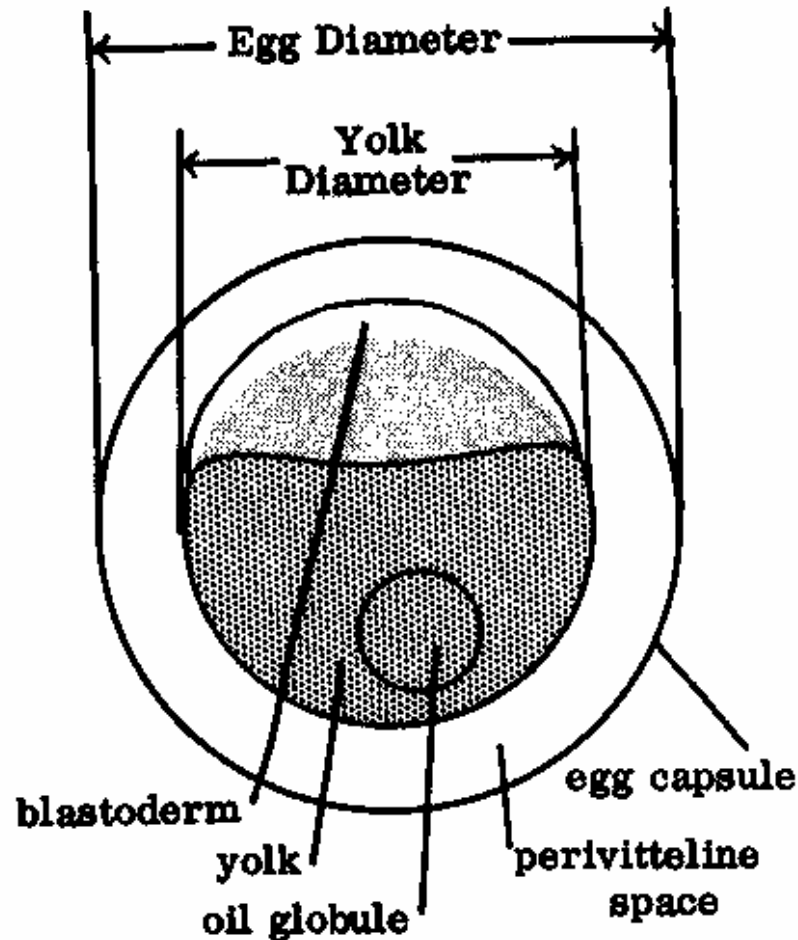
Developing juveniles within the parent body by maternal nutrition supply

**Embiotocidae, Poeciliidae (freshwater fish)**

✓ Mouth breeder: Apogonid fish males incubate eggs in the mouth.

# General structure and measuring method of fish egg

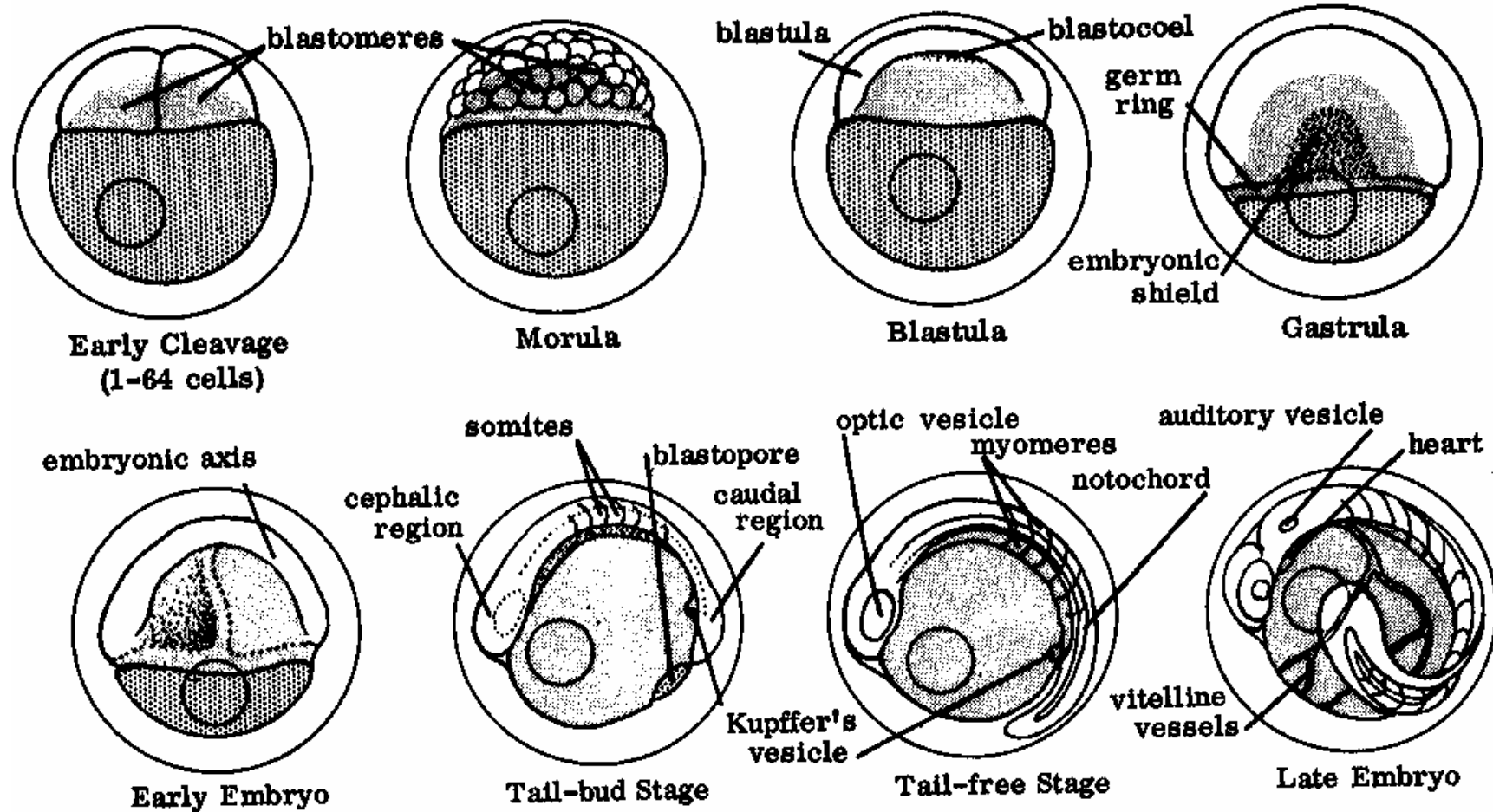
from Jones et al., 1978



Egg capsule  
(Chorion, Egg membrane)  
Oil globule  
(Oil drop)

Jones, P. W., Martin, F. D. and Hardy, J. D. Jr. 1978: Development of fishes of the Mid-Atlantic Bight. An atlas of egg, larval and juvenile stages. Volume I Acipenseridae through Ictaluridae. U. S. Dep. Interior, Fish Wildl. Serv., Biol. Serv. Prog. FWS/OBS-78/12. 366 pp.

# Developmental stages of fish eggs



Early stage: spawning – blastopore closure

**Middle stage:** blastopore closure – tailbud free

**Late stage:** tailbud free - hatching

from Jones et al., 1978

# Various types of fish eggs

modified Mito (1979)

## ● Pelagic eggs

### ✓ Isolated eggs (mostly)

The spawned eggs are isolated, not forming any mass

### ✓ **Agglutinated eggs** (Lophiidae)

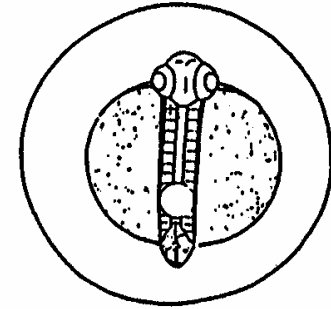
The spawned eggs are embedded in a gelatinous ribbon/balloon, or agglutinated to each other forming a mass

## ● Demersal eggs

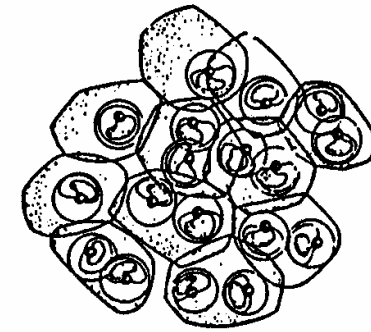
### ✓ **Adhesive eggs** (Exocoetidae, Gobiidae)

The spawned eggs adhesive to substratum with adhesive egg membrane or filaments

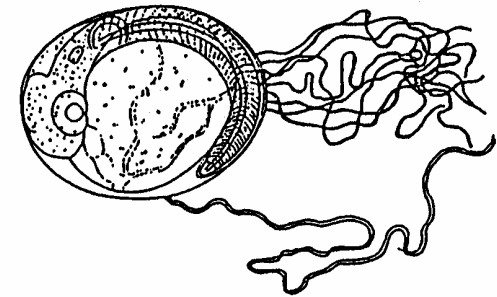
### ✓ **Non-adhesive eggs** (Salmonidae)



*Sardinops melanostictus*



*Lophiomus setigerus*



*Cololabis saira*

# Isolated pelagic eggs

## - Characters used for the identification -

Mito (1960a)

1. **Egg shape** (spherical, elliptical)
2. **Egg size** (ca 0.4 mm – ca 4.8 mm, mostly around 1.0 mm)
3. **Egg membrane** (color, thickness, sculpture, appendage)
4. **Perivitelline space** (narrow, wide)
5. **Yolk** (**color**: colorless, light yellow; **segment**: present, absent, large, small)
6. **Oil globule** (**color**: colorless, light yellow, copperish, pinkish; **number**: absent, single, many)
7. **Embryo** (melanophore, myomere, position of anus, fins, other appendage)

Mito, S. 1960a: Identification of fish eggs and yolk-sack larvae. Sci. Bull. Fac. Agric. Kyushu Univ., 18(1), 61-70. (in Japanese)

# Identification keys of **isolated pelagic** fish eggs

modified Mito (1960b)

## 1a. Single oil globule

2a: **non-smooth egg membrane** (*Ilisha elongata*, Myctophidae)

2b: **smooth egg membrane**

3a: **wide perivitelline space** (Japanese sardine)

3b: **narrow perivitelline space** (Carangidae, Scombridae)

## 1b. Non-oil globule

4a: **non-smooth egg membrane** (Synodontidae, Callionymidae)

4b: **smooth egg membrane**

5a: **wide perivitelline space** (Anguilliformes)

5b: **narrow perivitelline space** (Engraulidae, Chanidae)

## 1c. Multi-oil globules

6a: **non-smooth egg membrane** (Soleidae, Uranoscopidae)

6b: **smooth egg membrane**

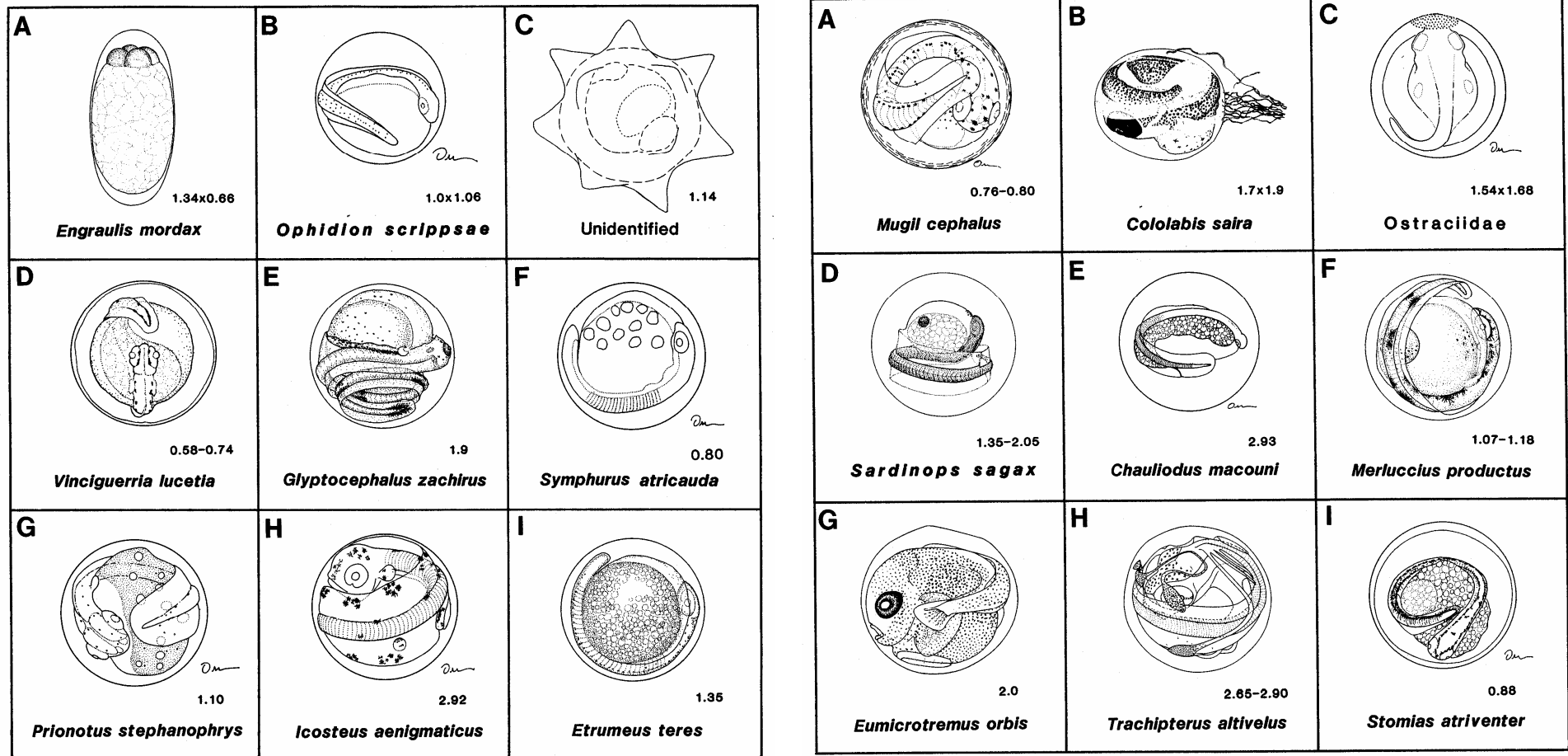
7a: **wide perivitelline space** (Anguilliformes)

7b: **narrow perivitelline space** (Cynoglossidae)

**non-smooth: sculptures in hexagons and pustules, projections**

# Various types of **isolated pelagic** fish eggs

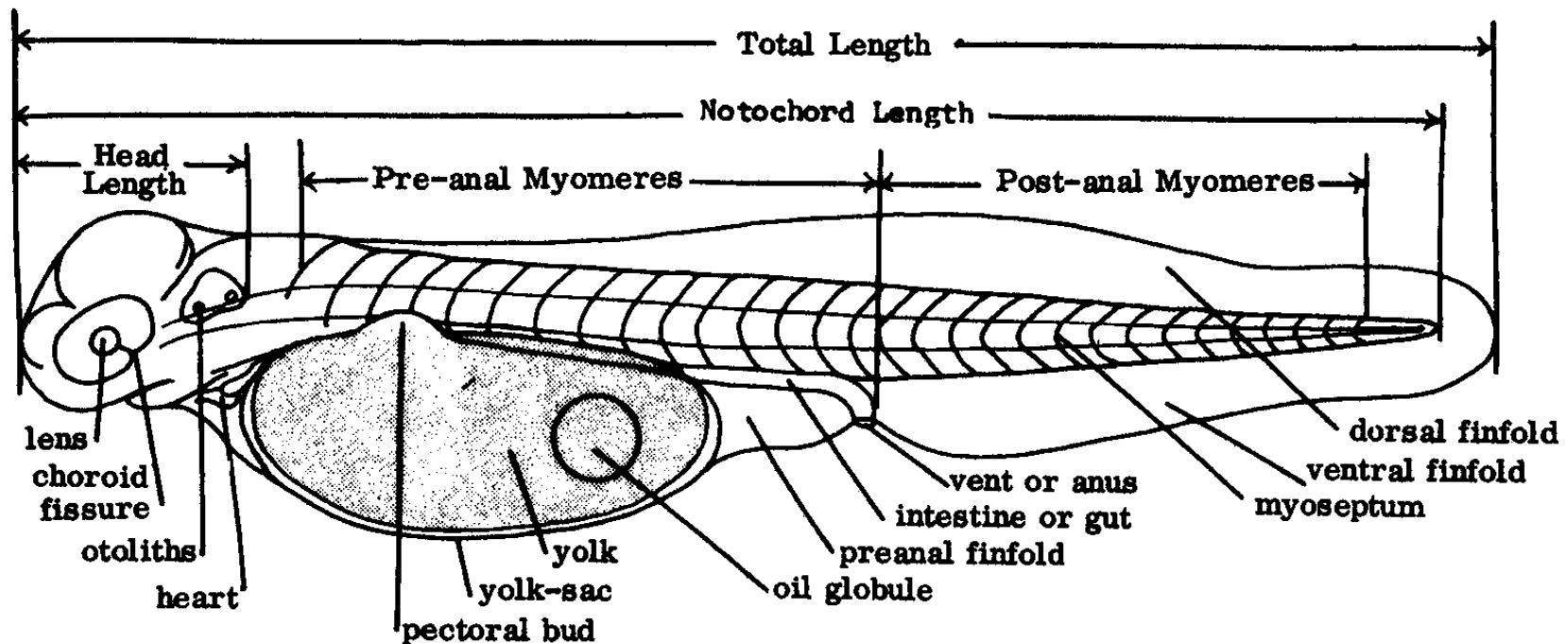
from Kendall et al., 1984



Kendall, A. W. Jr. 1984: Identification of fish eggs, p. 27-31. *in* Ontogeny and systematics of fishes. Moser, H. G., Richards, W. J., Cohen, D. M., Fahay, M. P., Kendall, A. W. Jr. and Richardson, S. L. (eds.) Amer. Soc. Ich. and Herp. Spec. Pub., No. 1.



# General structure and measuring method of **yolk-sack** (newly hatched) **larva**



from Jones et al., 1978

# Yolk-sac larvae

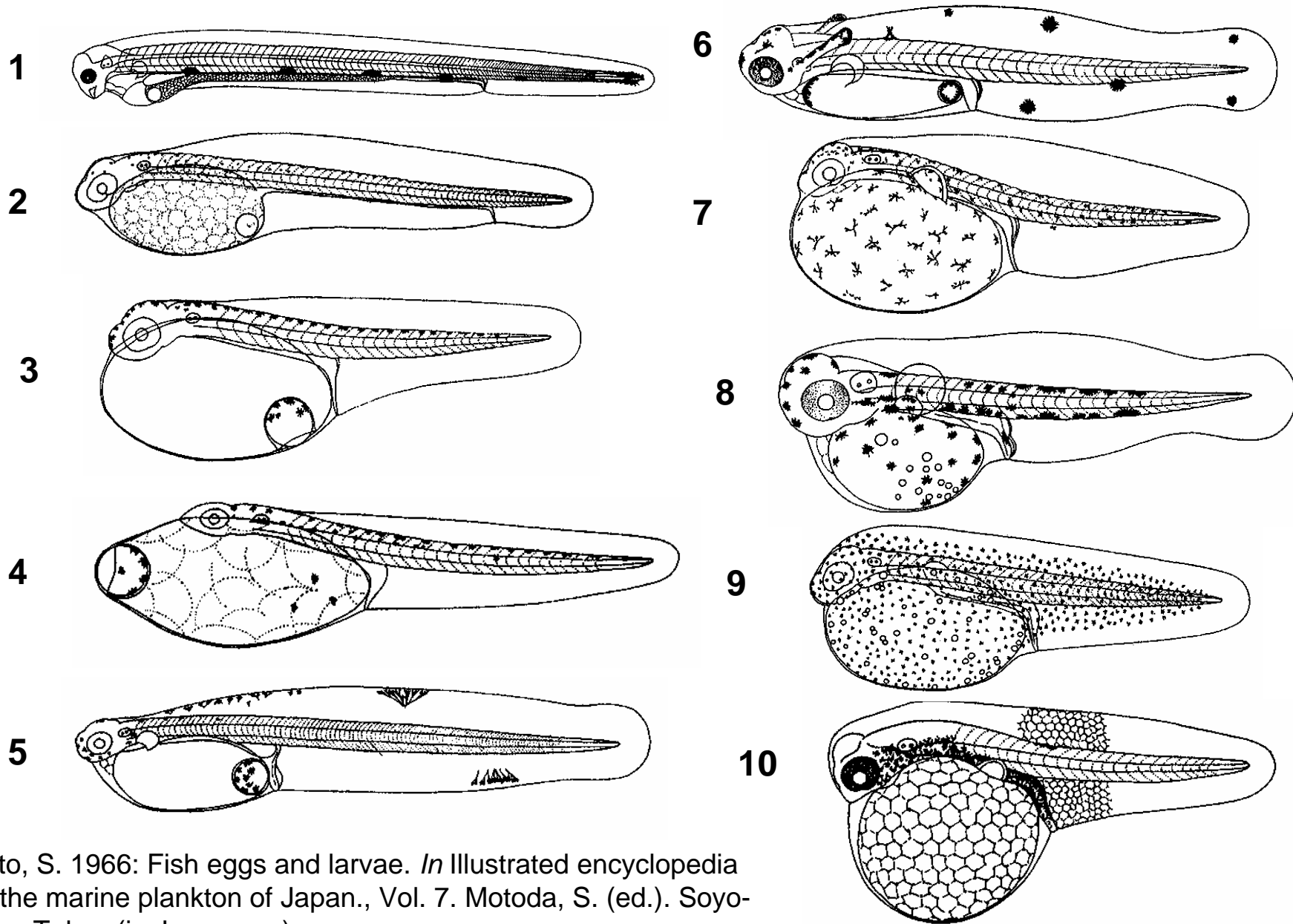
- Characters used for the identification -

Mito (1960a)

1. **Yolk shape** (oval, elliptical)
2. **Position of oil globule(s)** (single OG: anterior or posterior in yolk; many OGs: scattered or concentrated in yolk)
3. **Number of myomeres** (color, thickness, sculpture, appendage)
4. **Position of anus** (anterior, half body or posterior)
5. **Fin fold** (origin of position, wide or narrow, sculpture)
6. **Melanophores** (location, form)

# Various types of **yolk-sack larvae**

from Mito (1966)



Mito, S. 1966: Fish eggs and larvae. *In* Illustrated encyclopedia of the marine plankton of Japan., Vol. 7. Motoda, S. (ed.). Soyo-Sha, Tokyo.(in Japanese.)