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UNIVERSIDAD DE LA REPÚBLICA
URUGUAY

Cell Biology of Reproduction and Development In Fishes

Cell Biology Section

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Gabriela Casanova**

Facing harsh environment through developmental plasticity:

annual fish embryo

ANNUAL FISH

Cyprinodontiformes

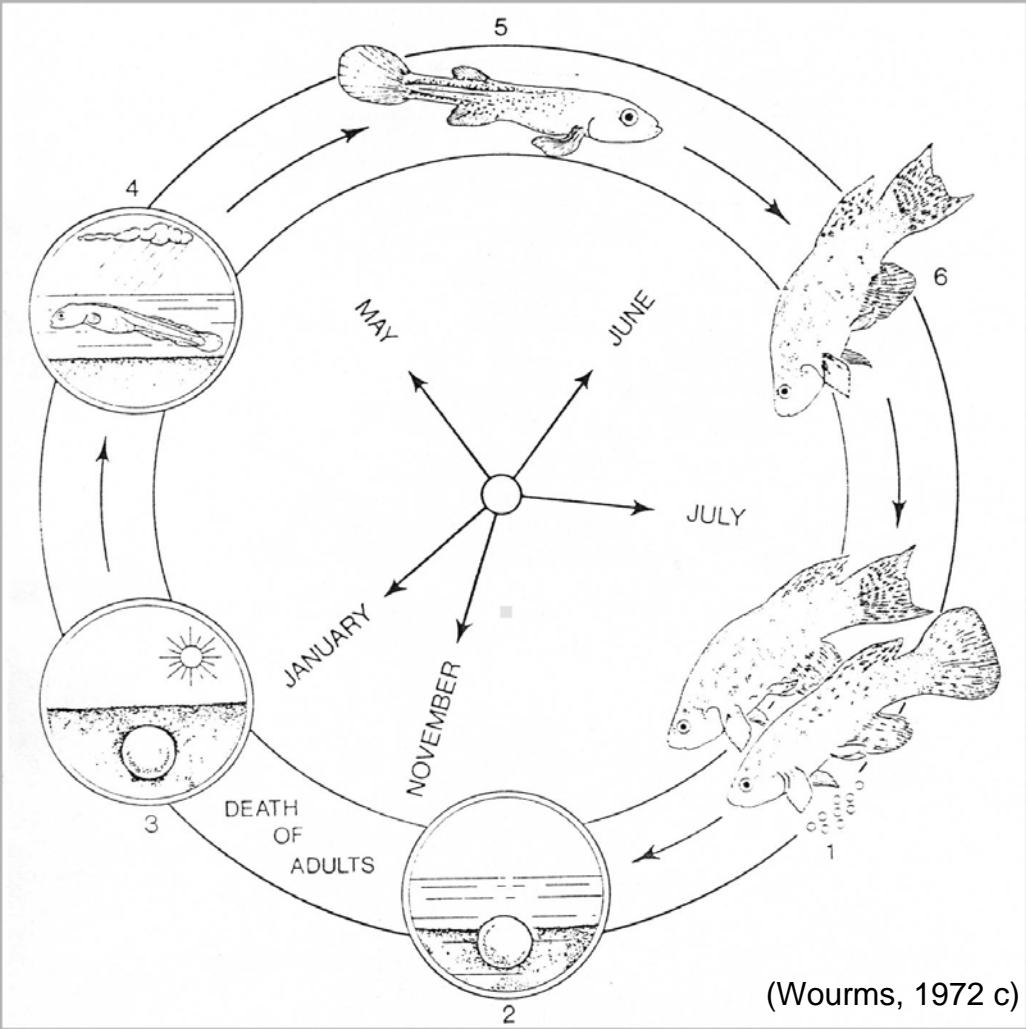
Austrofundulus, ***Austrolebias***, *Rachovia* and *Pterolebias* (**South-America**)
Aphyosemion , *Nothobranchius* (**Africa**)

- Habit temporary ponds that dry in summer
 - Plasticity facing very variable environment
 - Unique strategies in reproduction and development
- Embryos resist desiccation
➤ Hatch in the following rainy season

Austrolebias is one of the most specious genus



Annual cycle



Austrolebias, from habitat to the lab

- Biogeography of the species
- aquaria infrastructure
- maintenance
- reproduction
- embryo and fry culture
- development: stages and timing



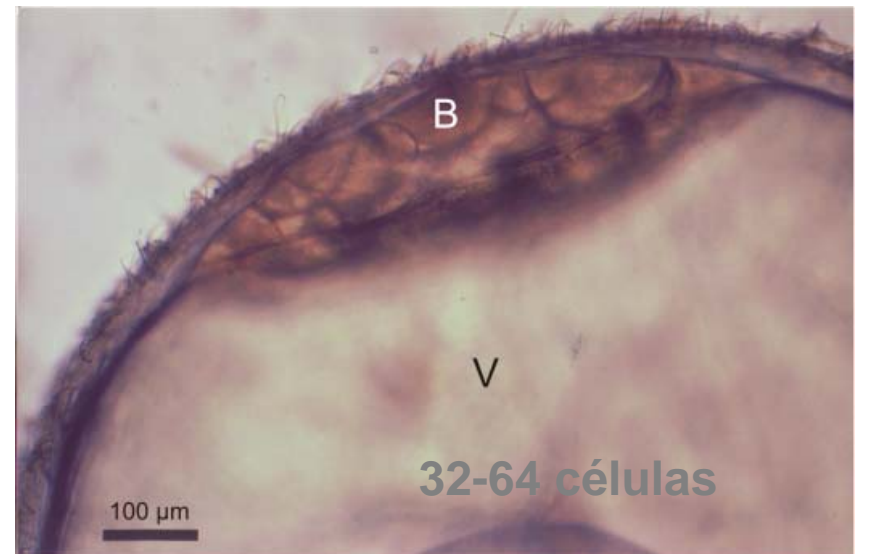
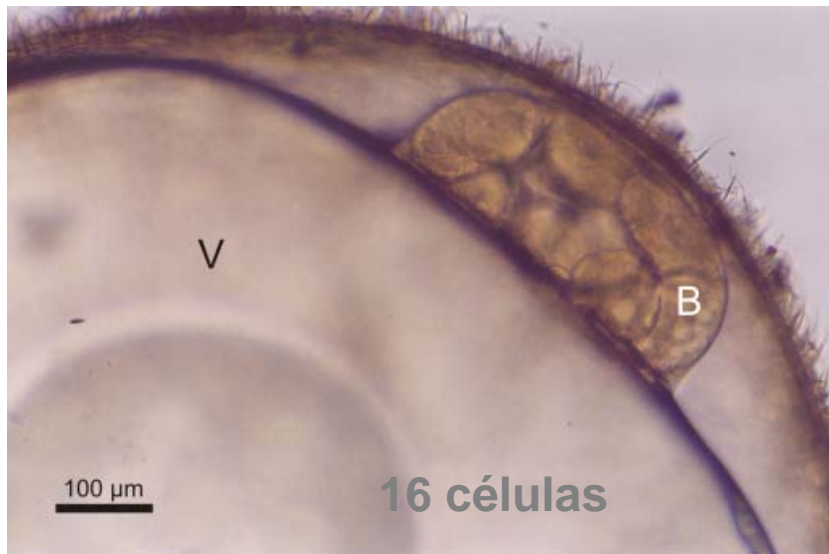
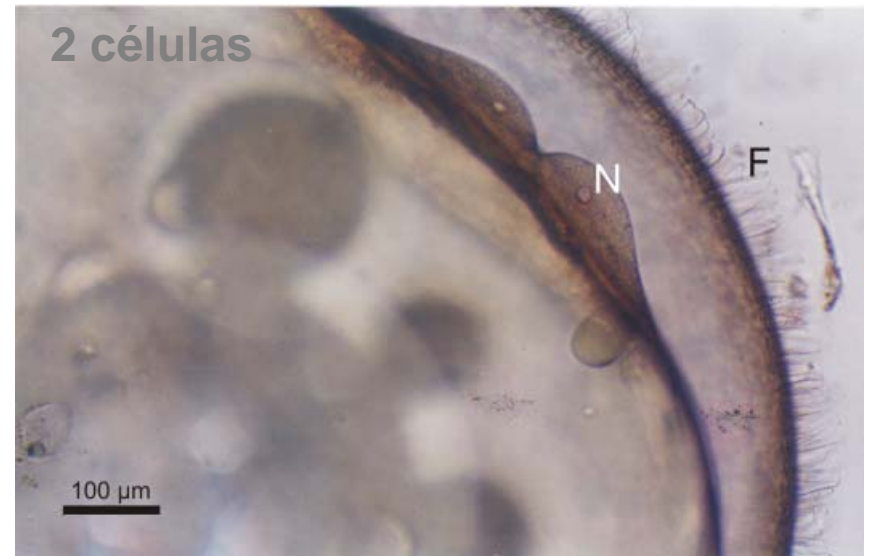
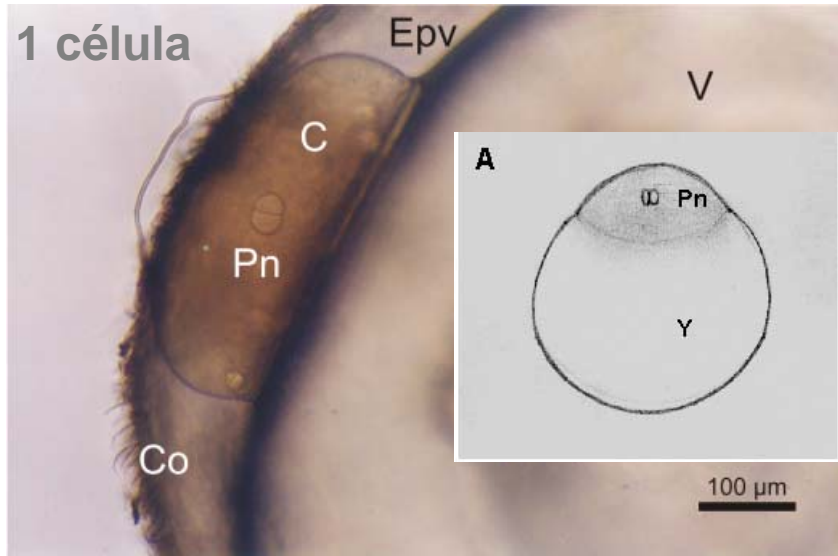




Induced hatch and fry breeding



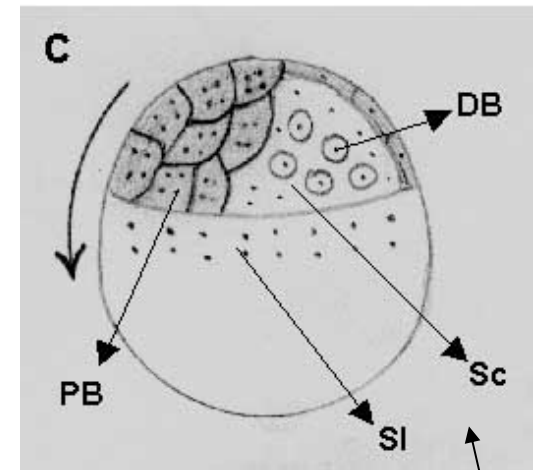
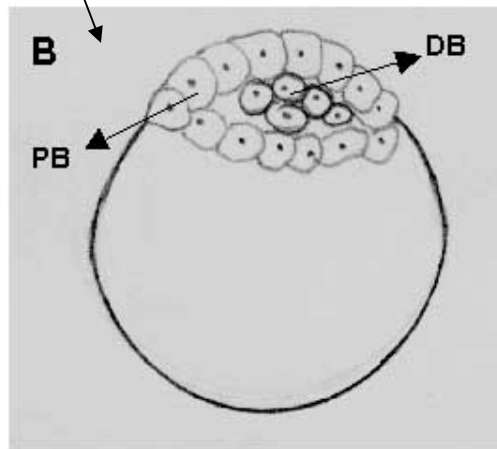
Early development stages



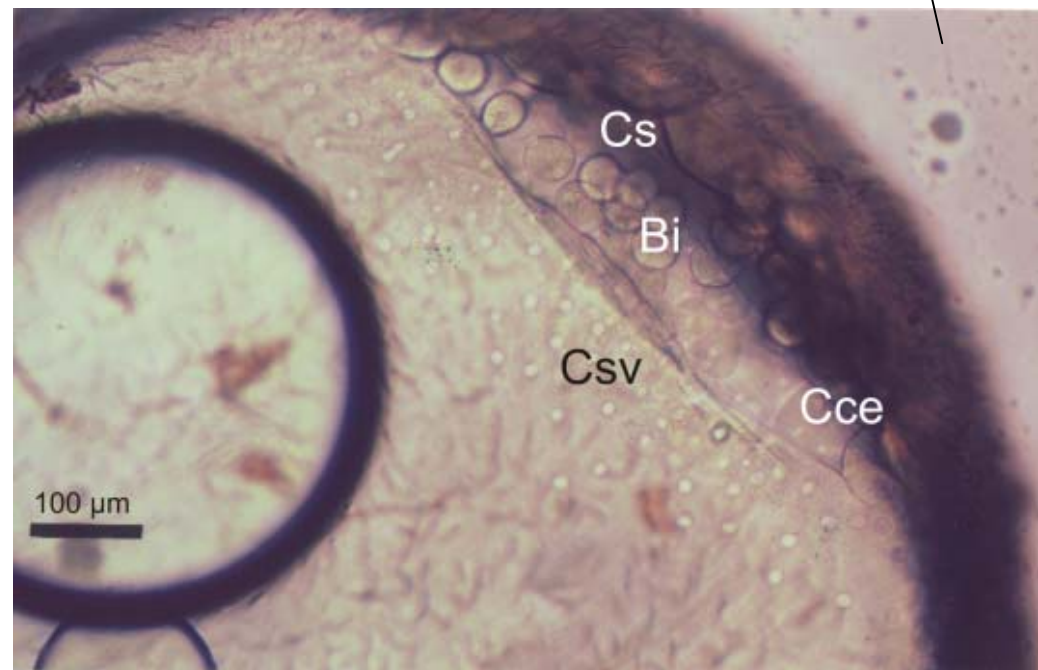
Blastula

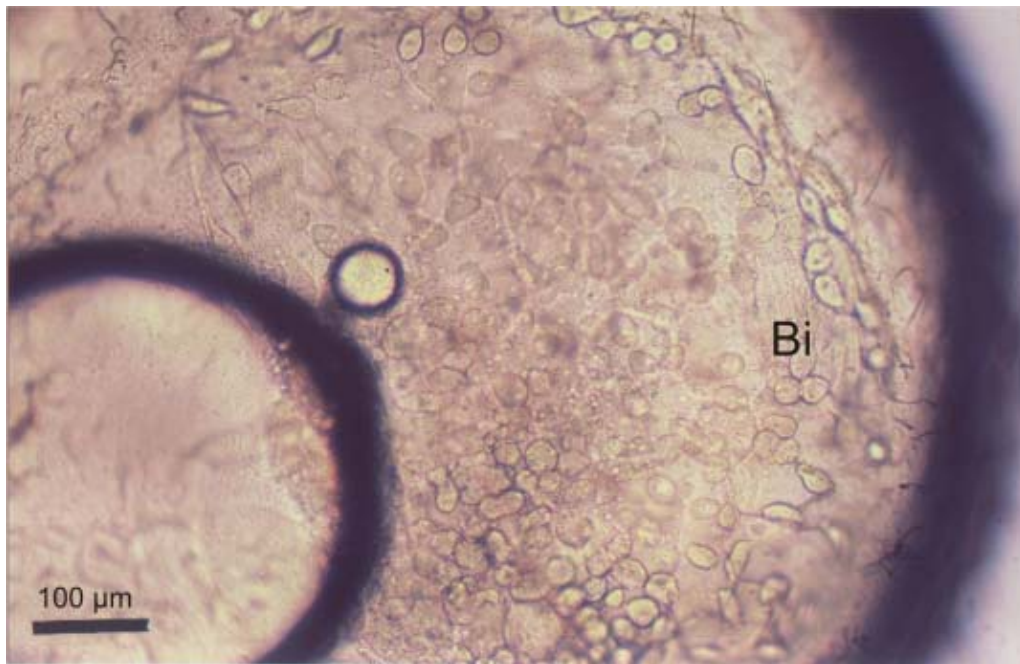


Early blastula



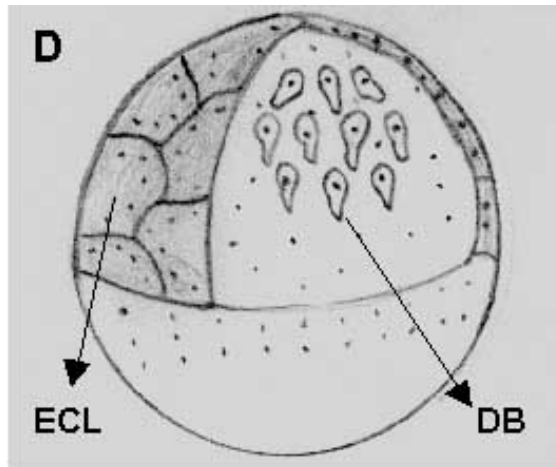
Late blastula





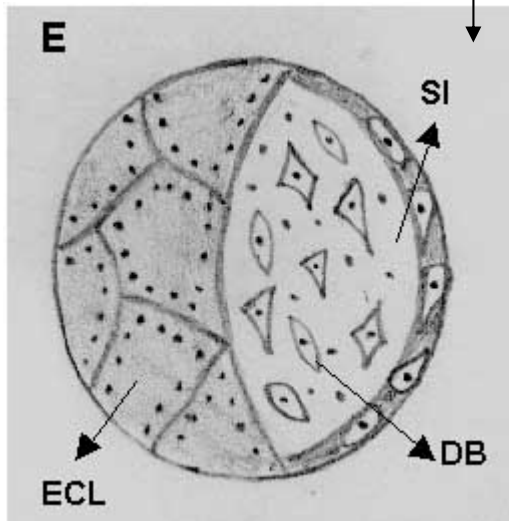
Epiboly

Early epiboly

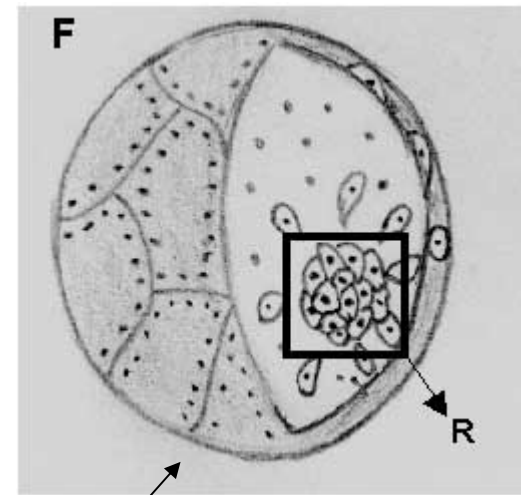




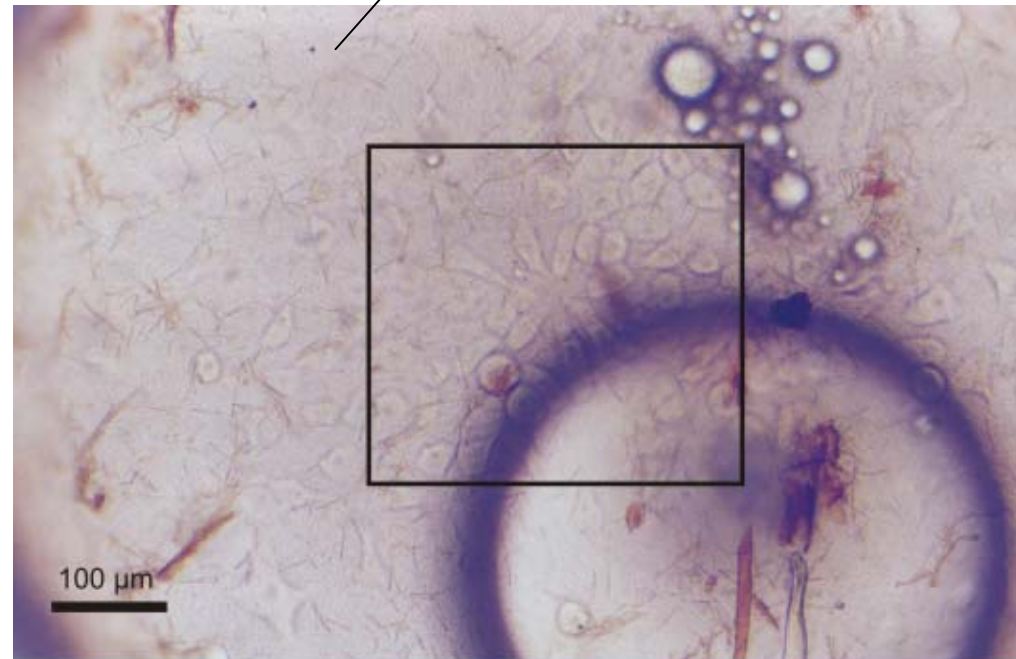
Dispersion

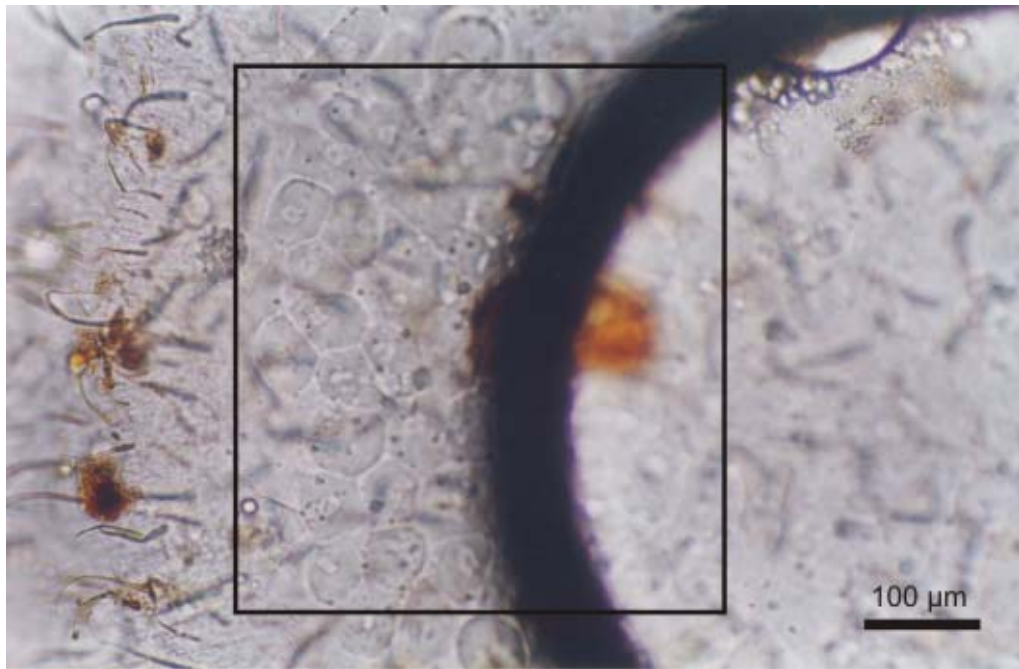


Total epiboly

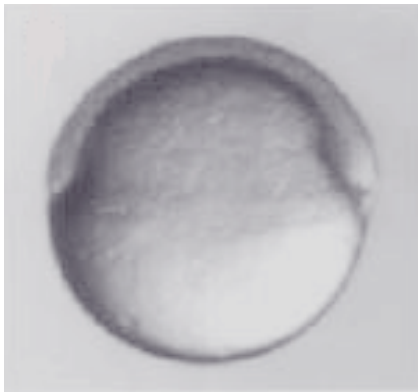


Aggregation
Early

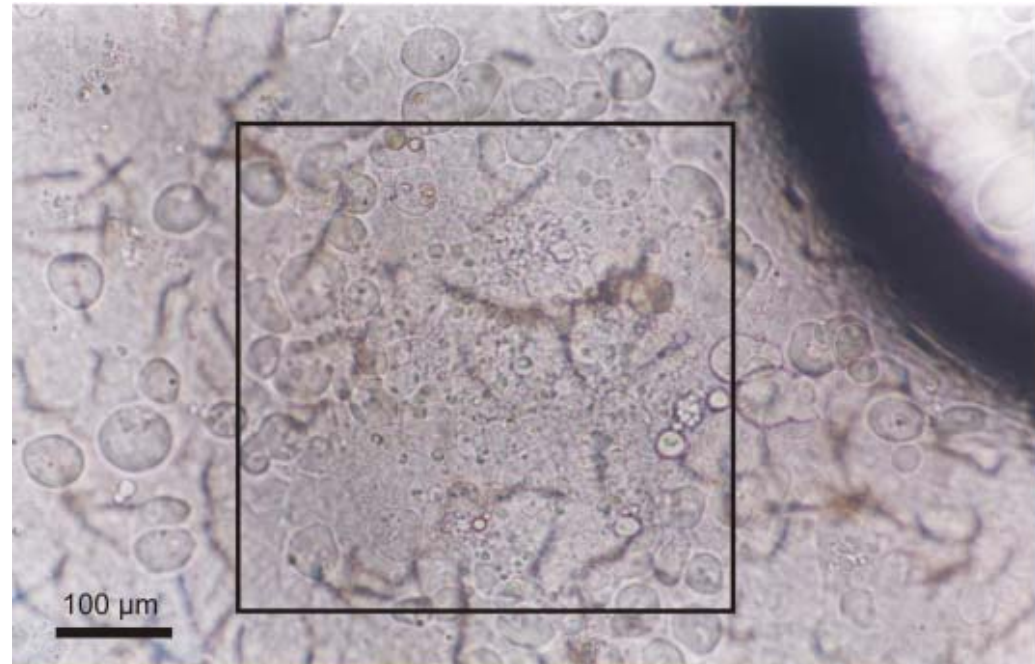


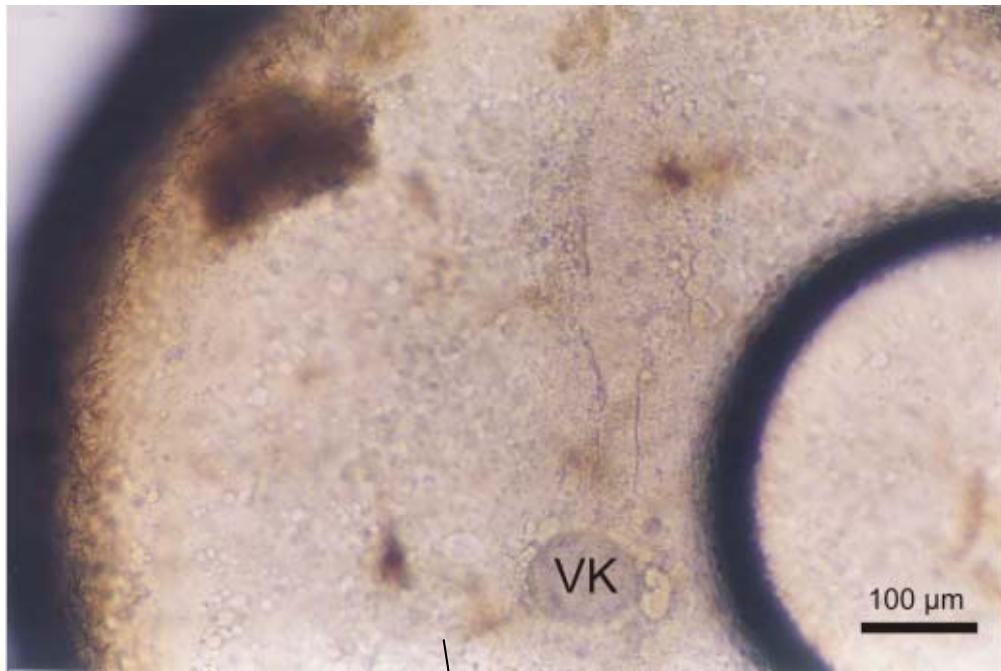


Late aggregation

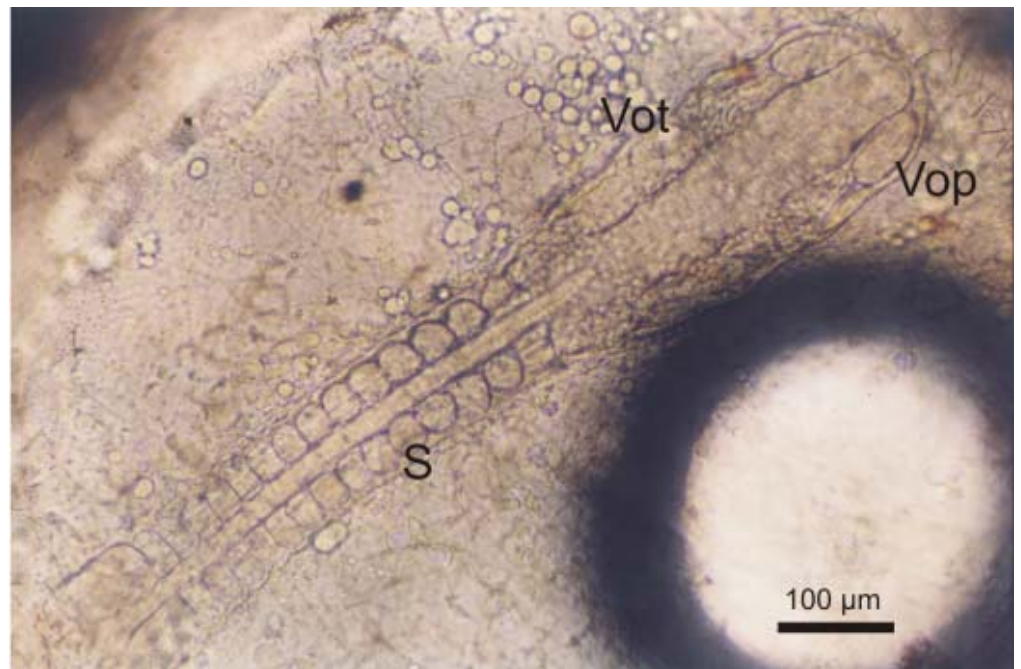
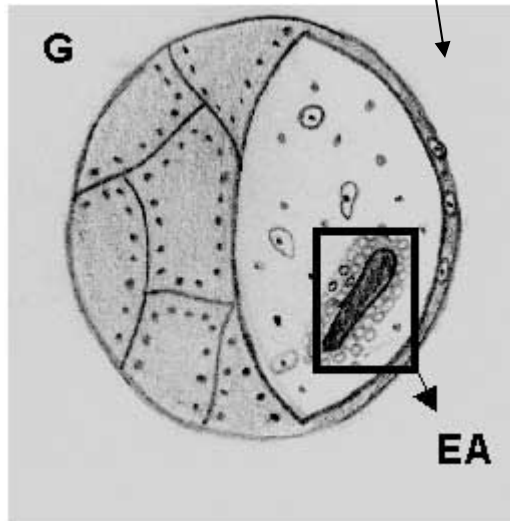


Gastrula *Danio rerio*





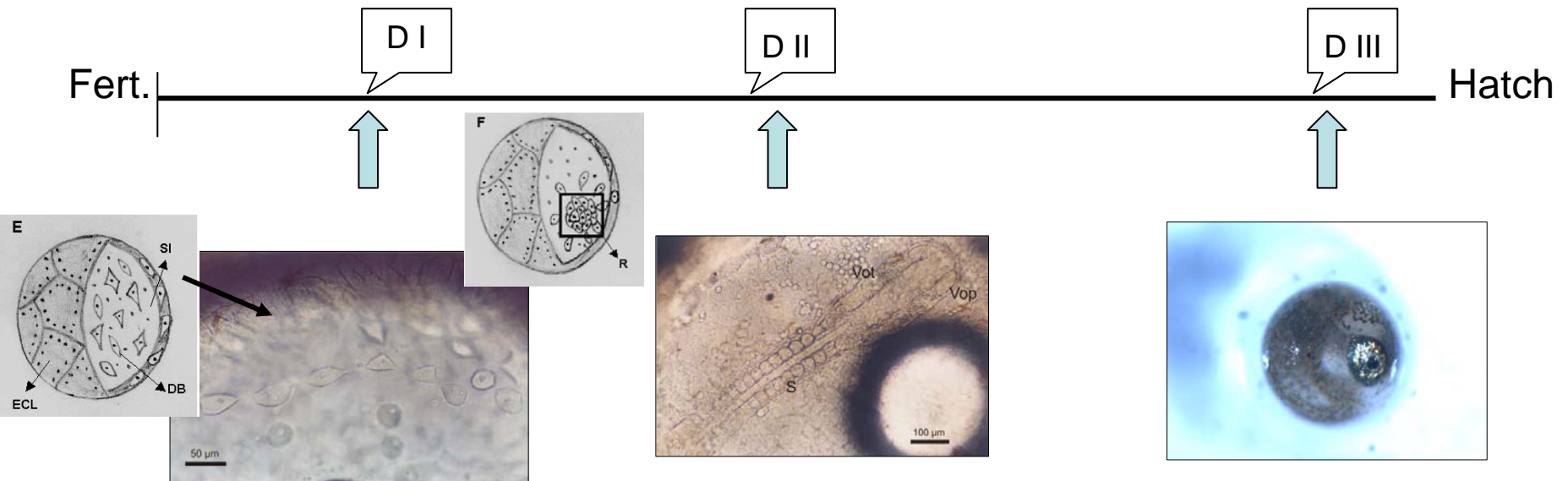
Somite embryo



Special developmental features

Between cleavage and embryogenesis: dispersion-aggregation

Diapauses



Some advantages and disadvantages

Advantages: resistant and easy to maintain in lab

continuous production of eggs during life (ovipars)

sex maturity in few weeks from hatch

transparent, large, strong embryos

easy to analyze superficial cell movements

Disadvantages: adults die (or age) at summer

long embryo development

weak embryos at dechoriation

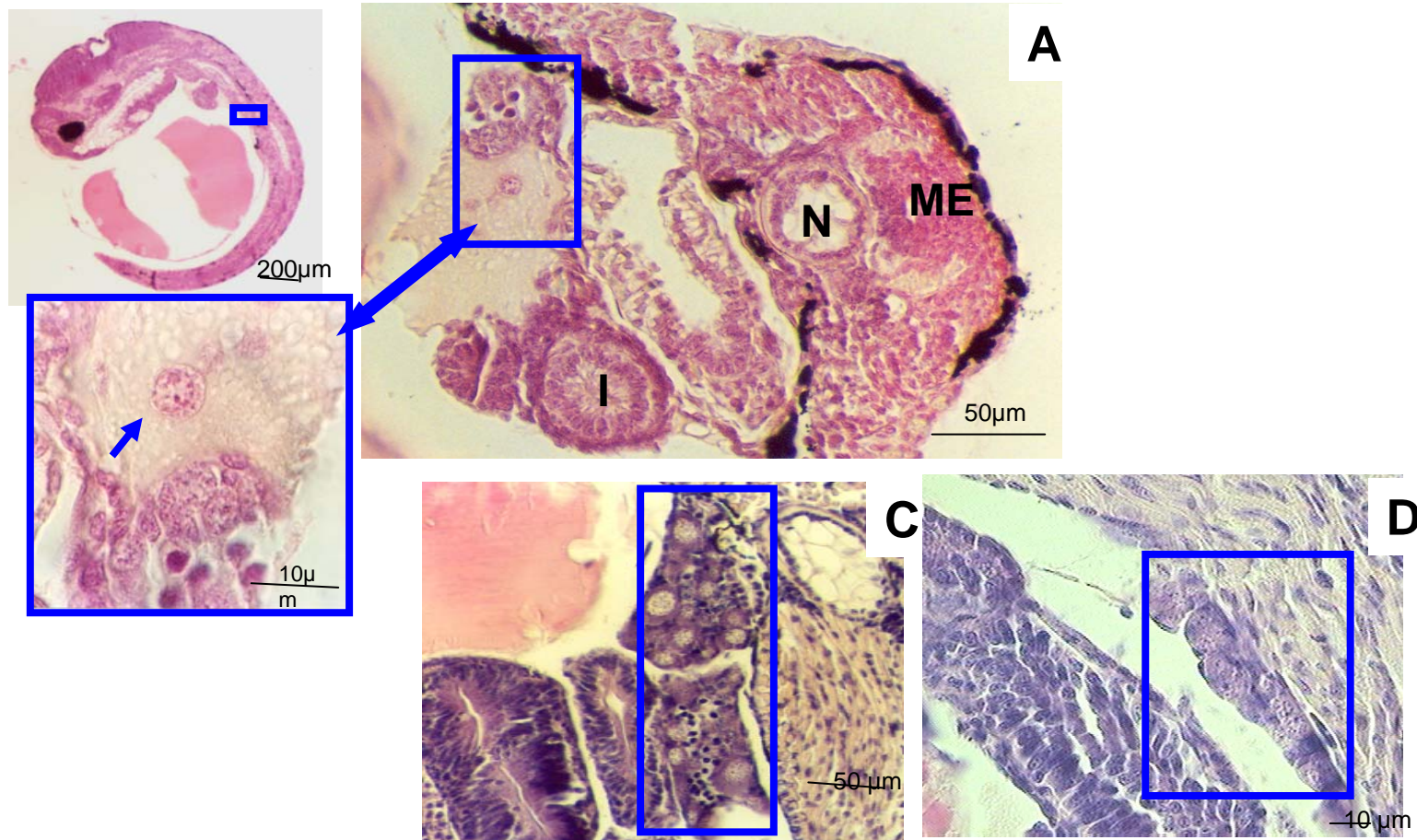
many gaps in information

few sequences at GB

Arezo, M.J., Pereiro, L., Berois, N. (2005) Early development in the annual fish *Cynolebias viarius*. *J. Fish Biol.* 66, 1357-1370 .

Arezo, M.J., D'Alessandro, S., Papa, N., de Sá, R., Berois, N.(2007) Sex differentiation pattern in the annual fish *Austrolebias charrua* (Cyprinodontiformes: Rivulidae). *Tissue & Cell* 39, 89-98.

Gonocoric differentiated type



Current works:

Exploring sex determination mechanism in annual fish

- To identify PGCs and to analyze their migration through development

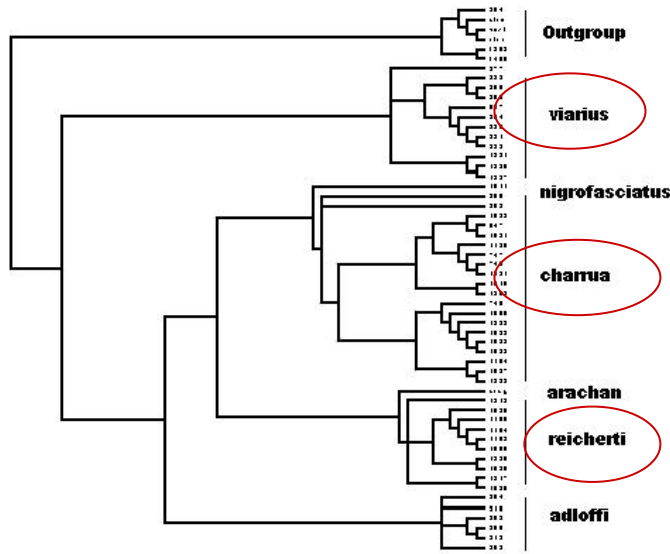
Markers: Vasa (immunodetection)
ARNm vasa-GFP injection

Germ plasm (ultrastructure, TEM)

Gametes and phylogeny

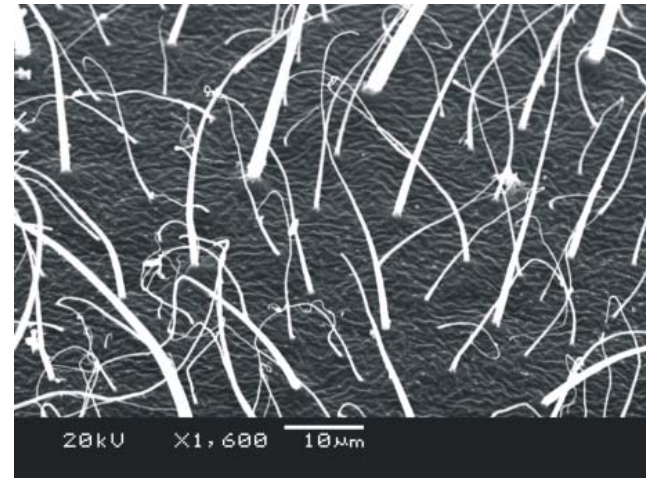
G. García, M. Loureiro, N. Berois, M.J. Arezo, G. Casanova, G. Clivio and A. Olivera. Pattern of differentiation in the annual killifish genus *Austrolebias* (Cyprinodontiformes; Rivulidae) from a biosphere reserve site in South America: a multidisciplinary approach. J. Zool. Syst. Res

Citocromo C mitochondrial

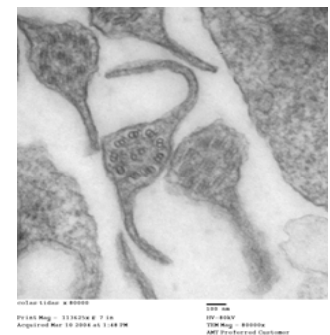


(García et al. 2003)

Oocyte envelope



Sperm



We are also interested in other topic:

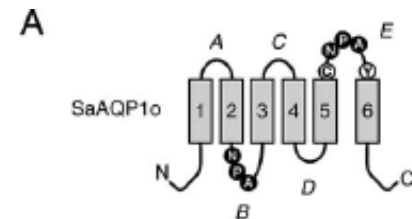
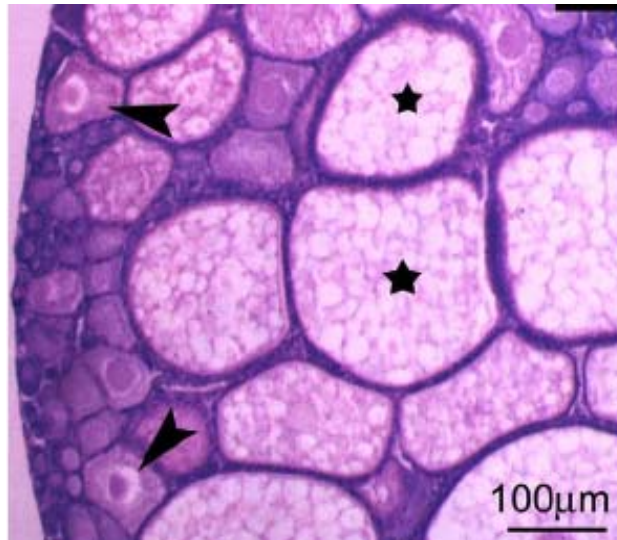
Oocyte

Benthophil species: benthonic oocytes

Maturation and involved mechanisms

Hydration?

Aquaporins involved?



In association with a Spanish lab we are looking for:

- AQP's expression in annual fish
- pattern expression (from egg to fry)
- relation with diapauses (up/down regulation)

A final reflection:

Considering that we are joined in a Course of the LASDB, annual fish is one more example that biodiversity of our region can supply unusual suitable organisms to analyze special issues in DB

