Insights on the Reproduction and Embryonic Development of *Garra rufa* (Cyprinidae)

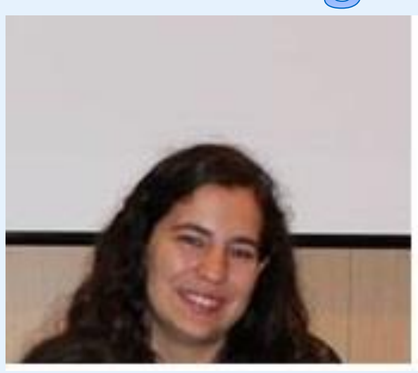

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Fig.1 – *Garra rufa*

Introduction

Garra rufa are subtropical, benthopelagic and non migratory Cyprinids (Özcelik &Akyol 2000), which can be found in rivers and watersheds of the Middle East (Turkey, Iraq, Syria, Israel) (Sherman 2012).
It is a species resistant to environmental changes that can be found at temperatures between 15ºC and 35ºC.
They feed on phyto and zooplankton (Grassberger & Hoch 2006).
Garra rufa is a sexually isomorphic species. Males and females are very similar to each other. They are oviparous fish. The eggs are released by the female and are fertilized by the male's sperm externally (Coad 2010).

Objectives

It was made an attempt to reproduce *Garra rufa* in captivity, in order to respond to an increasing marketing demand for this fish, plus to get an insight on its reproductive biology and embryonic development.

Materials and Methods

Groups of 5 *Garra rufa* were inserted in twelve aquaria of 20 l, in a controlled temperature room at 26ºC.
Each aquarium had an internal filter and aeration.
A net was placed 1.5 cm above the bottom.
The fish were fed three times per day and checked for the presence of eggs.
The eggs were removed, placed on separate aquaria and photographed hourly, with a Leica DM2000 LED compound microscope, equipped with a Leica DMC2900 camera and processed with the Leica Application Suite (LAS).

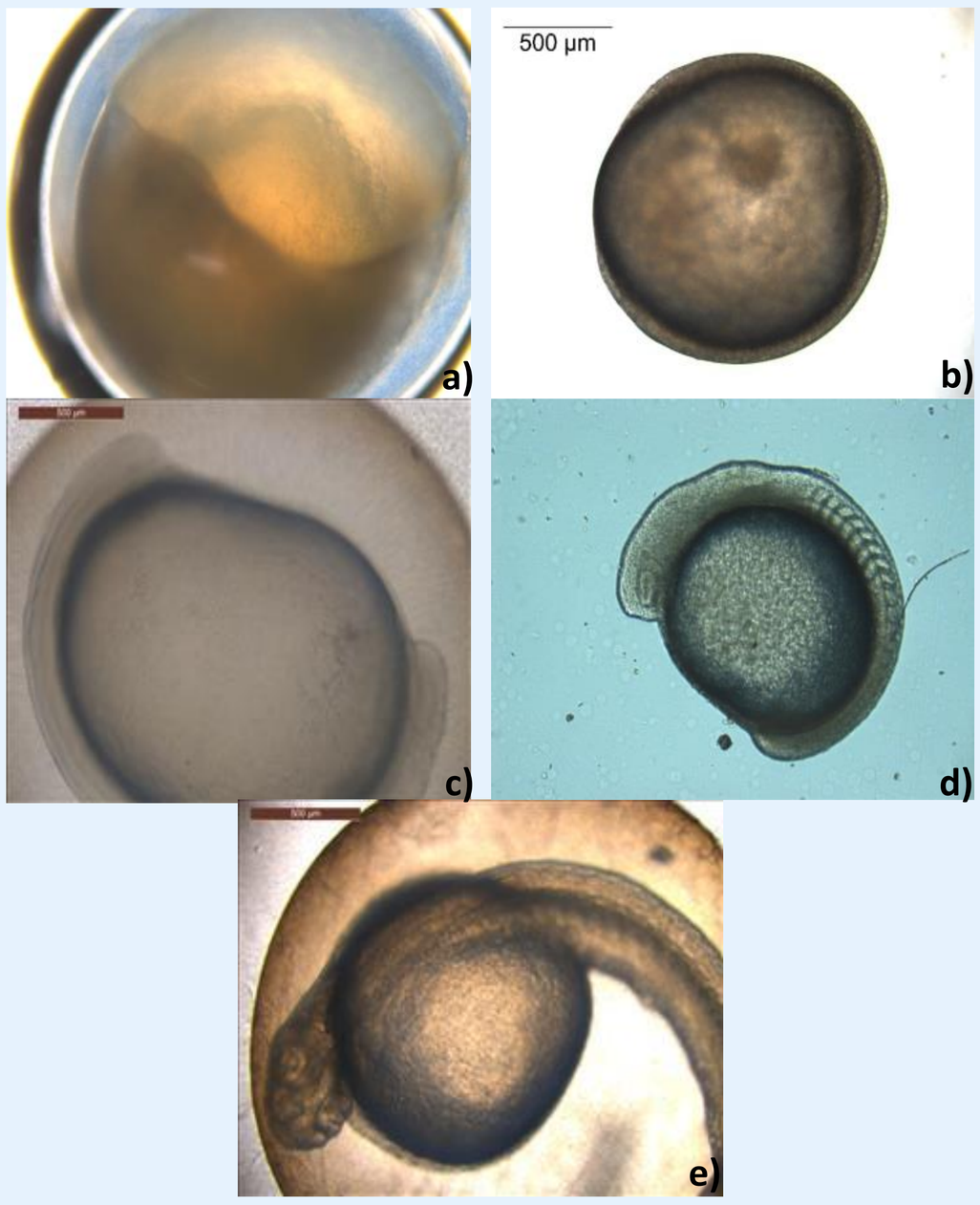

Fig.4 – Embryos inside the eggs (a,b,c,d,e)

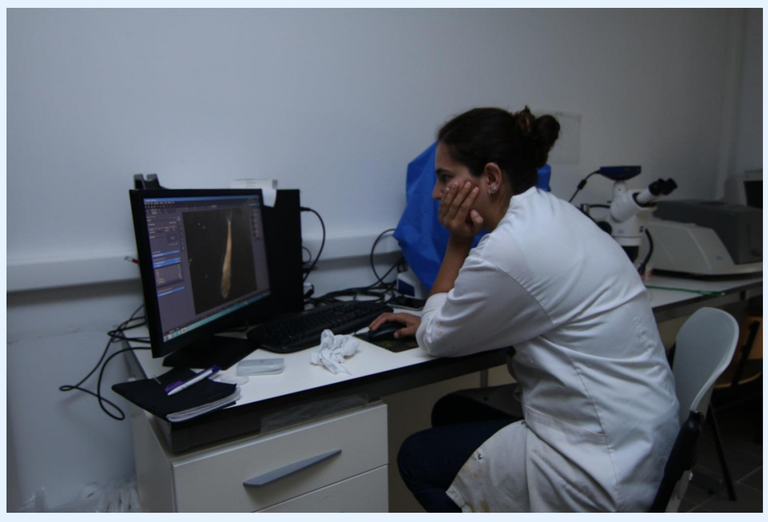

Fig.2 – Leica Application Suite.

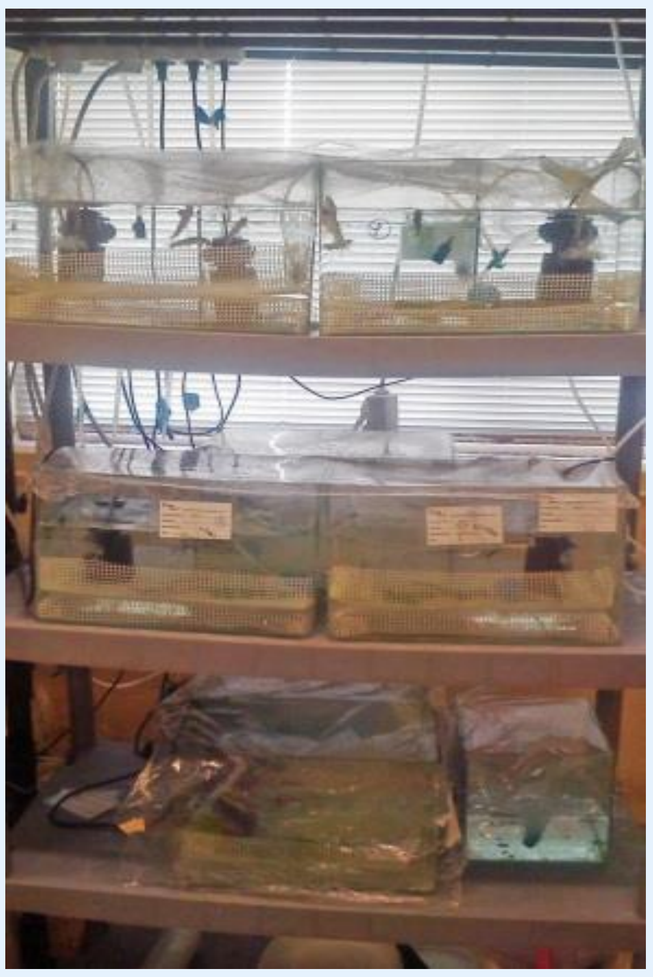

Fig. 3- Life Support System to breed *Garra rufa*.

Conclusions

Garra rufa showed almost no sexual dimorphism, except for the presence of tubercles on the snout of males, which appeared only when they were willing to reproduce. Males displayed sexual courtship, engaging in high velocity persecutions after the females.
Several spawning batches of demersal eggs were obtained, showing no adhesive properties.
The telolecithal eggs presented discoidal meroblastic cleavage (Fig.4a).
The gastrulation happened 3 hours after the fertilization (Fig.4b).
Afterwards, the embryo begun to extend and the tail formed on the side of the blastopore, which later will originate the anus of the fish (deuterostomes; Fig.4c).
The neurulation proceeded, with the formation of the neural tube from the ectoderme and notochord from the mesoderme (Fig.4d).
Next, the somits begun to individualize and optical vesicles started to be noticed 6 hours after fertilization (Fig. 4d)
The heart started beating and the blood circulated through the body after 10 hours (Fig.4e) .
Between 24 to 48 hour after fertilization, the larvae hatched (Fig.5) and consumed the yolk sac within 48 hours.

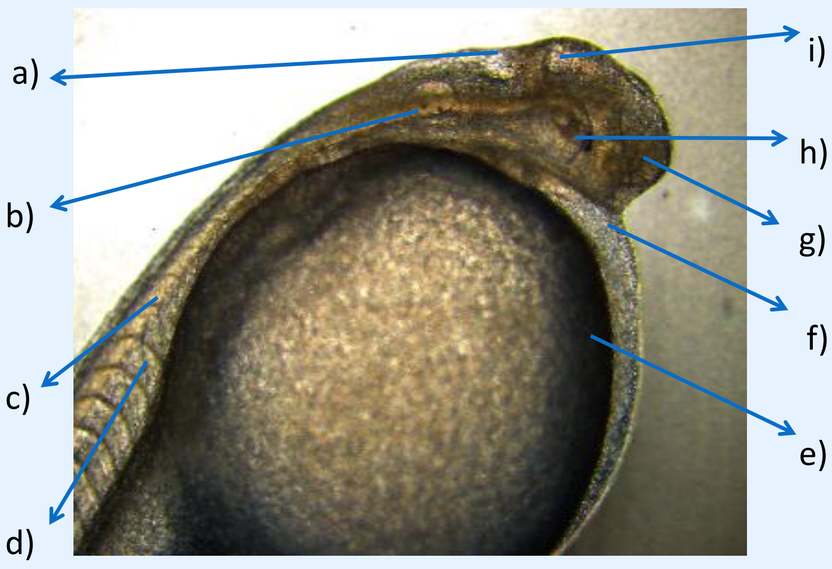

Fig.5 – Larvae newly hatched from the egg: a) Posterior brain ; b) Optical Vesicles; c) Notochord; d) Somits ; e) Yolk; f) Heart; g) Nostrils; h) Eye ; i) Midbrain.

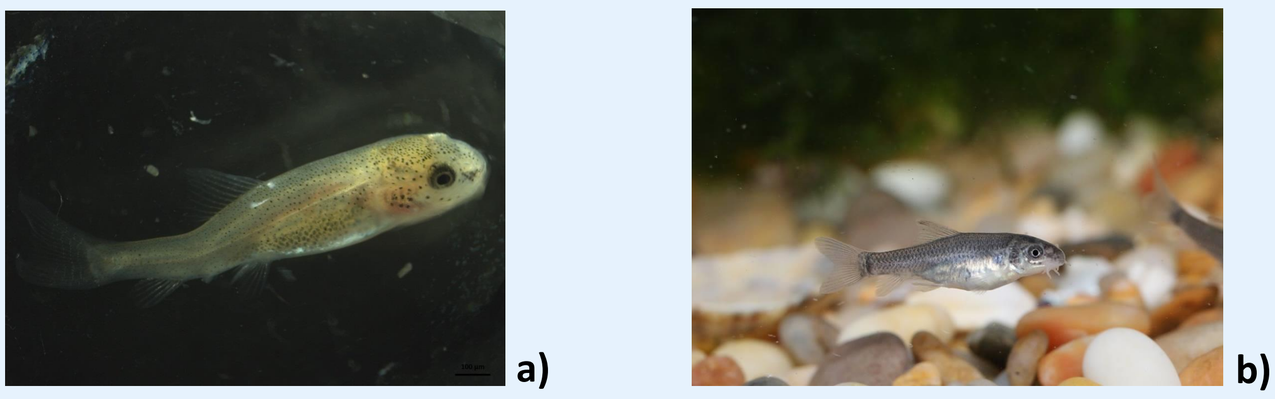

Fig 6 – Juveniles with 2 weeks (a) and 1 month old (b)

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