aquaculture europe 17 COOPERATION for GROWTH October 17-20, 2017 Dubrovnik, Croatia

Description of the endocrine reproductive cycle of the wreckfish *Polyprion americanus* in captivity

Maria Papadaki[1], Jose Benito Peleteiro[2], Blanca Alvarez-Blázquez[2], J.L. Rodríguez Villanueva[3], Fatima Linares[3], Antonio Vilar[4], Evaristo Pérez Rial[2], Nuria Lluch[2], Ioannis Fakriadis[1], Constantinos C. Mylonas[1]

[1]Hellenic Center for Marine Research, Crete, Greece
[2]Instituto Español de Oceanografia, Spain
[3]Xunta de Galicia, Spain
[4]Aquarium Finisterrae, A Coruña, Spain

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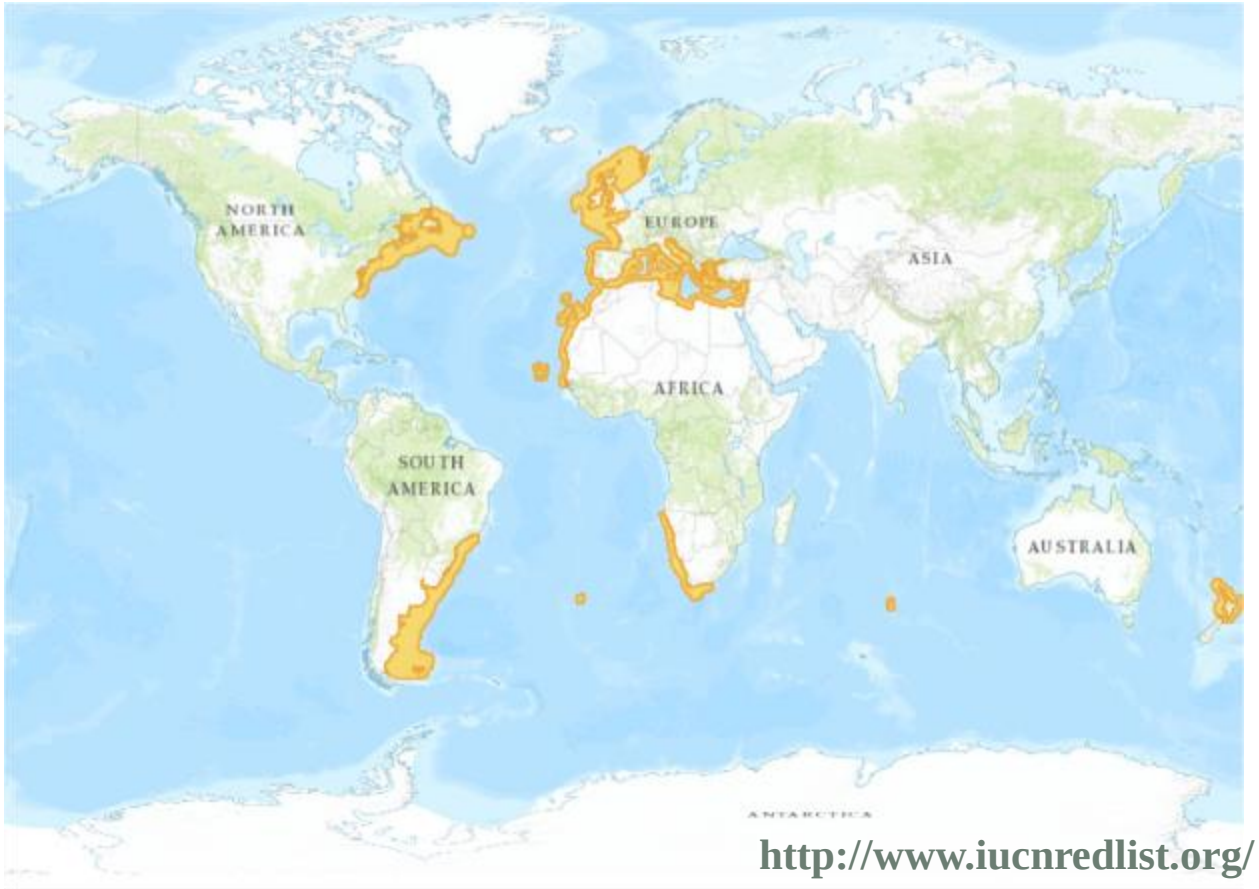
Wreckfish

- **Demersal fish (100-1000 m)**
- **Worldwide distribution**



http://www.iucnredlist.org/

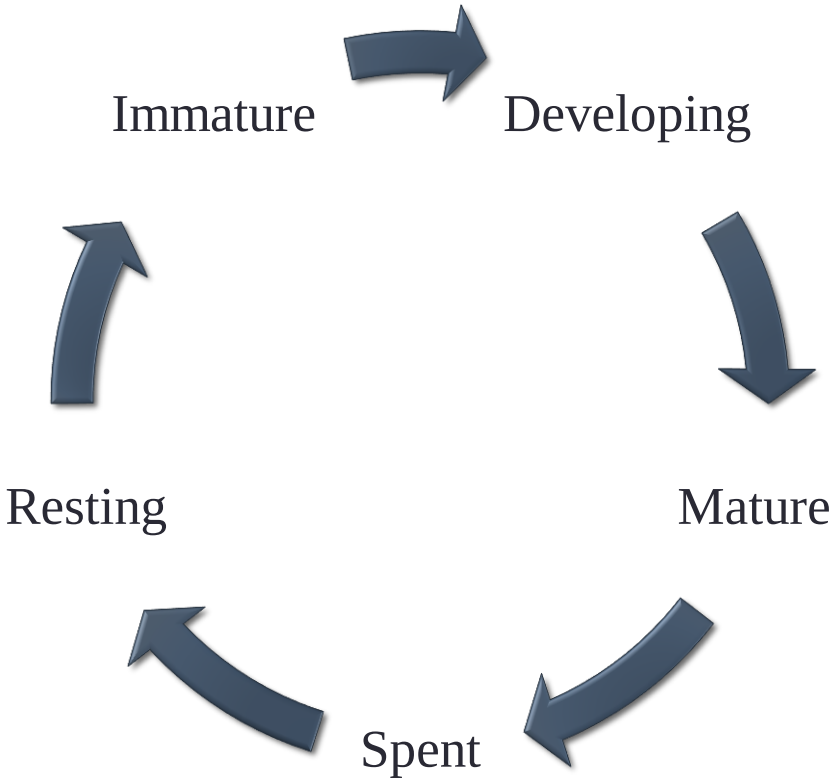
Good for aquaculture

- Fast-growing (5 kg in 2 years)
- Late maturing (>7 years old)
- Adapts to captivity
- High flesh quality
- High market price

However…

- Not easy to collect wild wreckfish for broodstock formation
- Oogenesis and spawning is rare in captivity
- Egg quality is variable and generally low

Description of the reproductive cycle



- ✓ **recognition of possible reproductive dysfunctions**
- ✓ **creation of spawning induction protocols**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Wreckfish broodstocks

Broodstocks	IEO	CMRM	MC2	HCMR
Number of fish	13	21	11	3
Females	10	12	8	1
Males	3	9	3	2
Tank	110 m^3	35 m^3	180 m^3	15 m^3
Photoperiod	Natural	Simulated natural	Natural	Simulated natural
Temperature	Natural	Natural	Natural	16° C

Biopsy collection

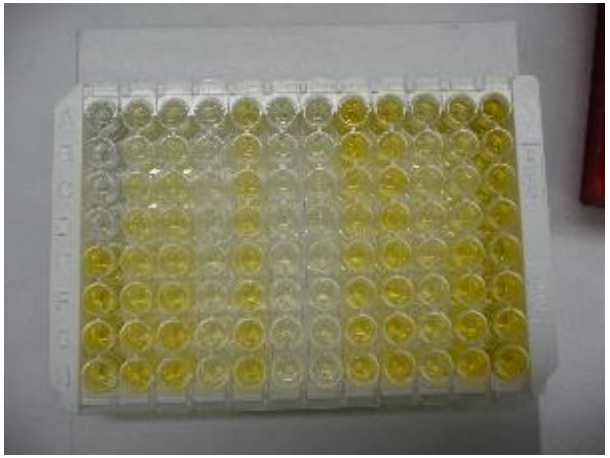
Sperm collection

Blood collection

- **Monthly from February until July**
- **Bimonthly from August until January**

Histological analysis

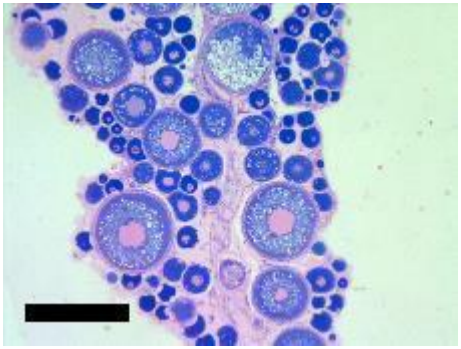
Sperm evaluation



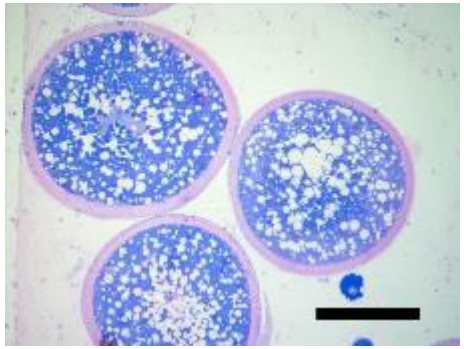
ELISA

Oocyte development

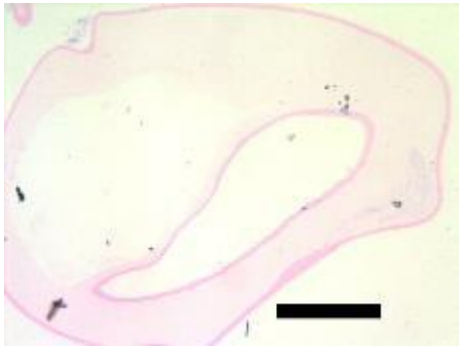
Bar: 500 µm



Cortical alveoli



Vitellogenesis

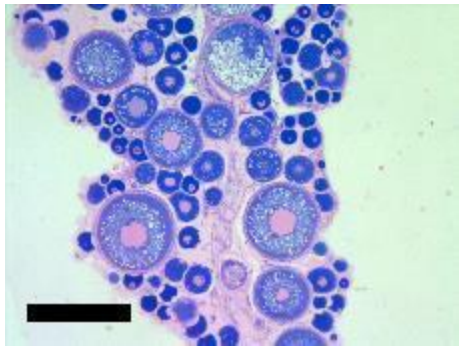


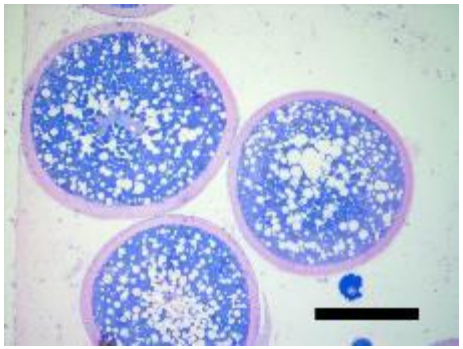
Maturation

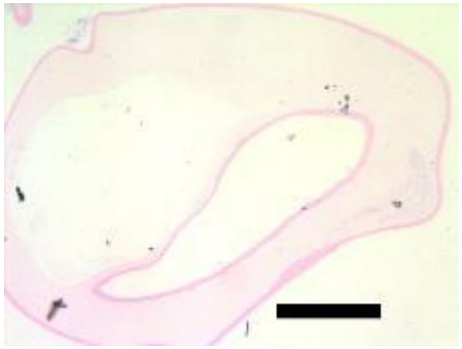
Developing → Maturing → Mature

Vitellogenesis in the winter (December – February)
Maturation and spawning between March and July

Mean oocyte diameter of post-vitellogenic oocytes is 1400 µm and mean egg diameter is 2000 µm

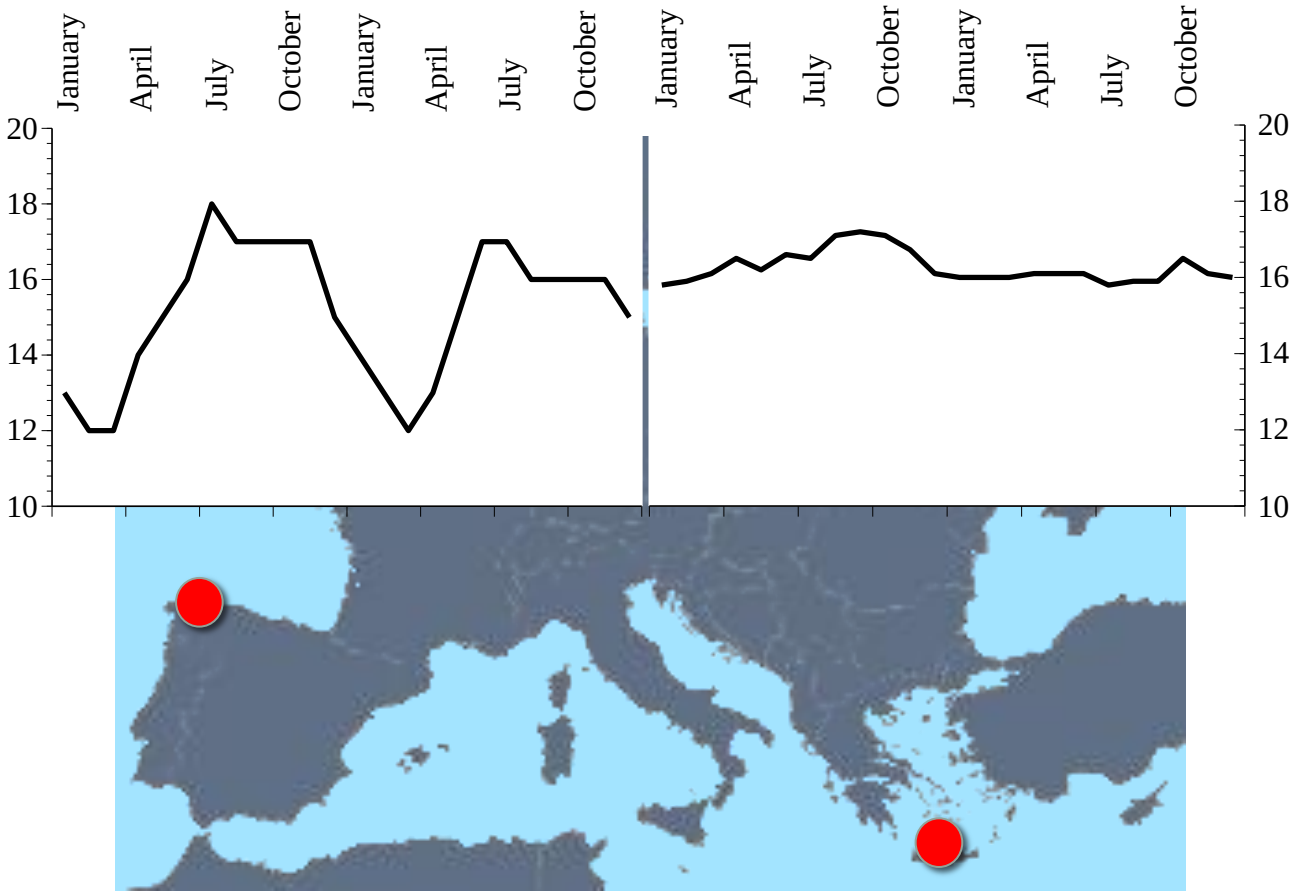




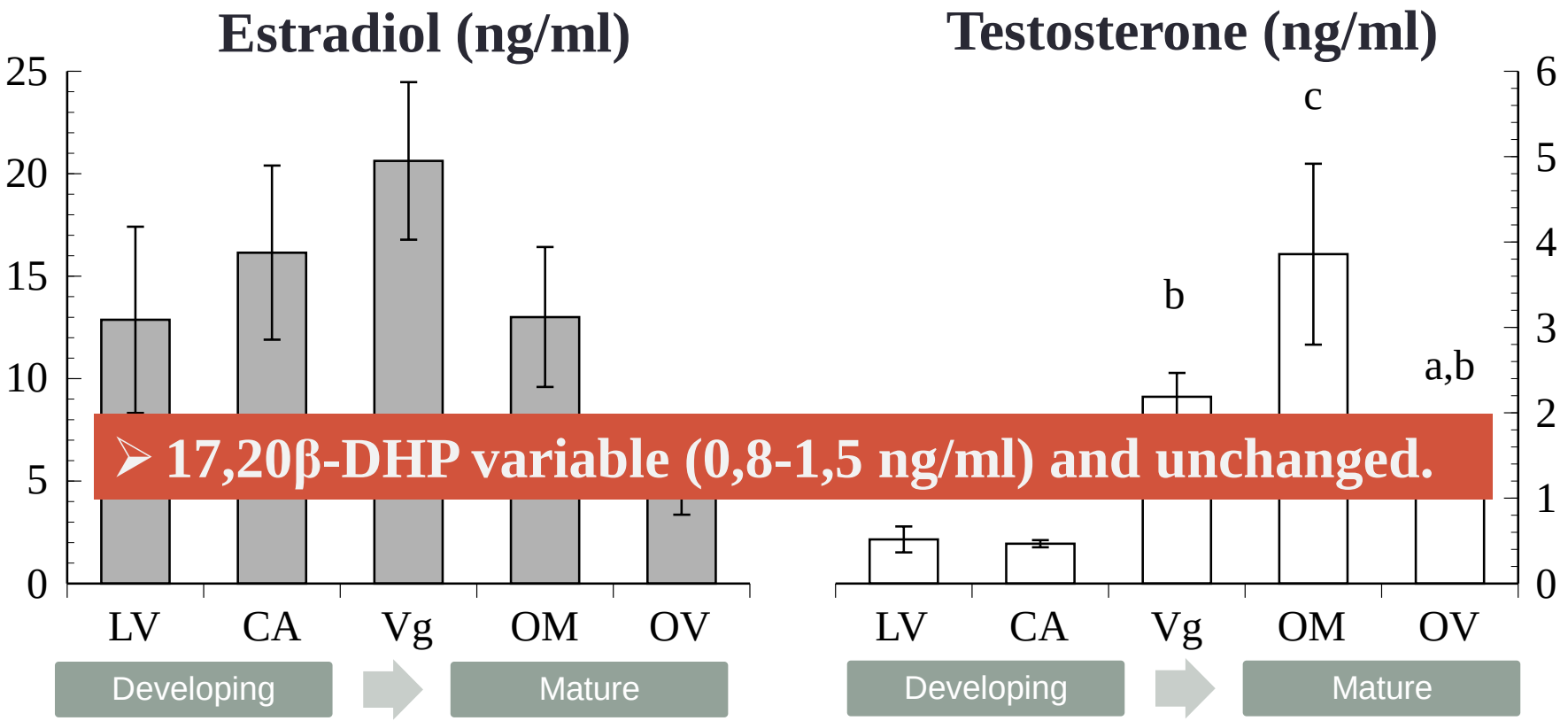


Bar: 500 µm

- **19% of the females with arrested oocyte development at the cortical alveoli stage (350 µm)**



Females

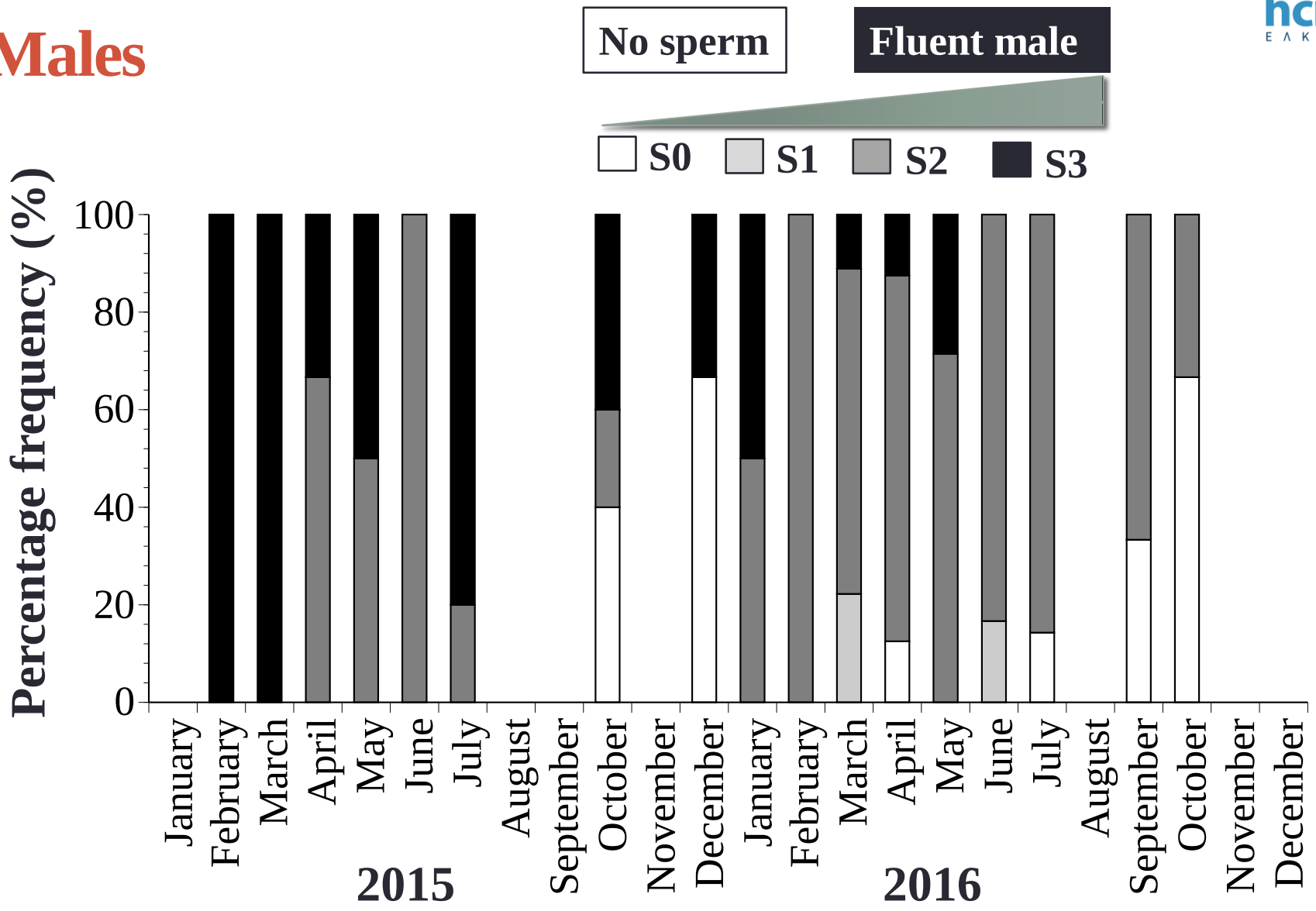


➢ 17,20β-DHP variable (0,8-1,5 ng/ml) and unchanged.

➢ Estradiol showed an increasing trend until vitellogenesis and a decreasing trend thereafter.

➢ Testosterone was highest at maturation.

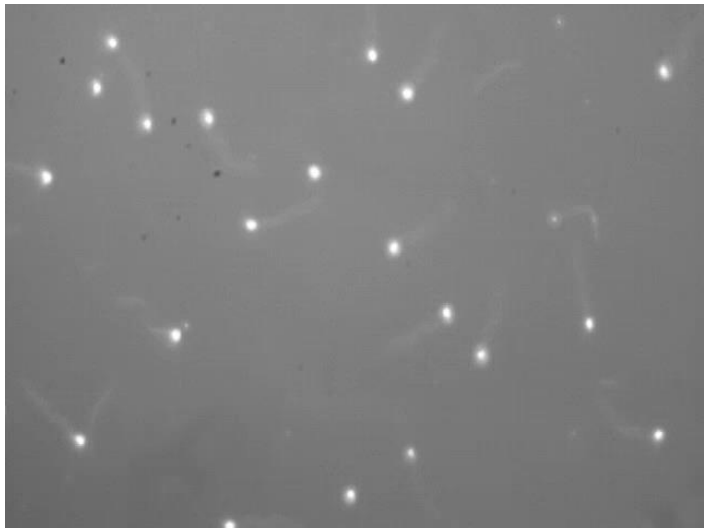
Males



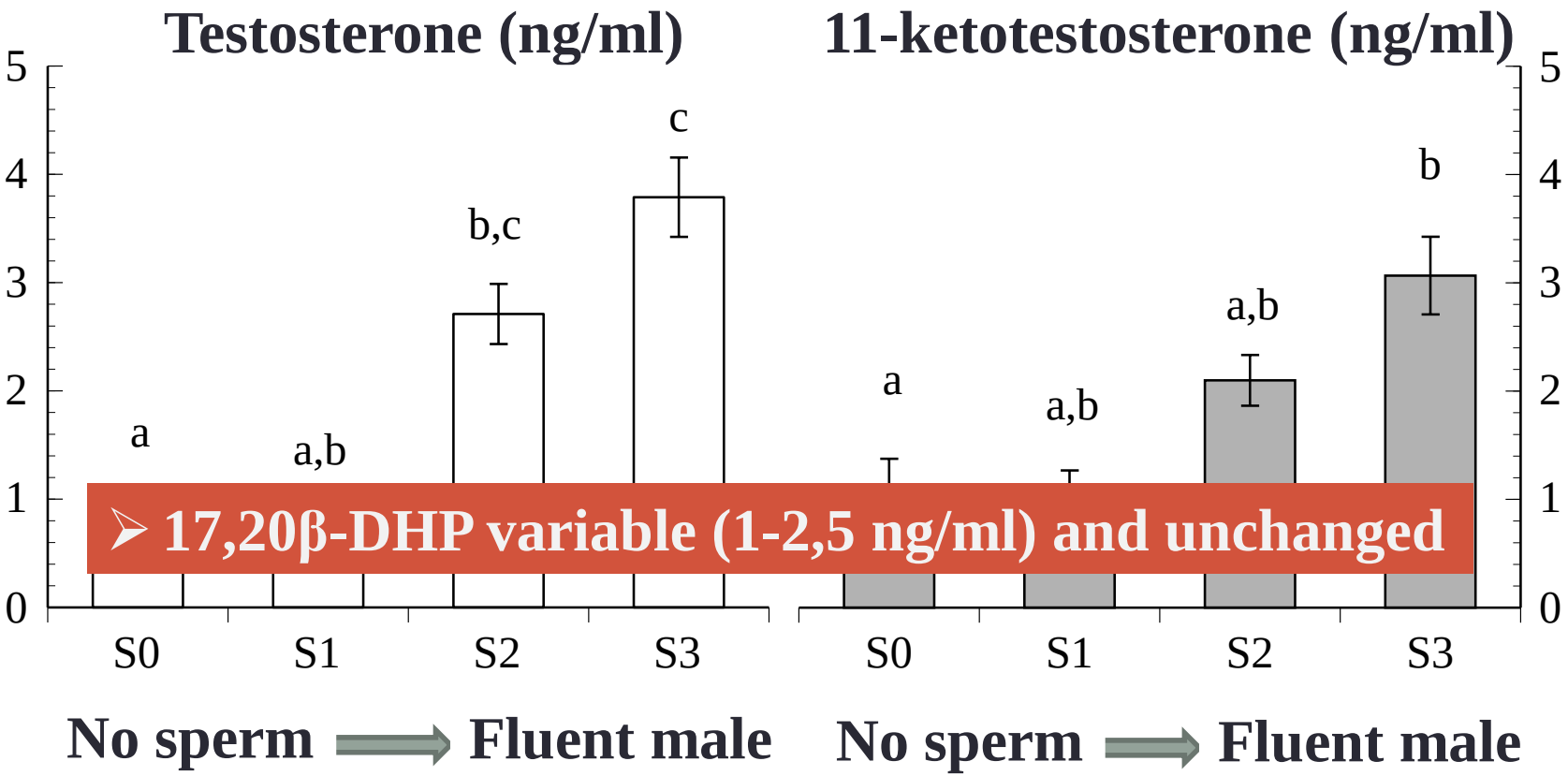
- Sperm was produced almost all year.

Sperm quality

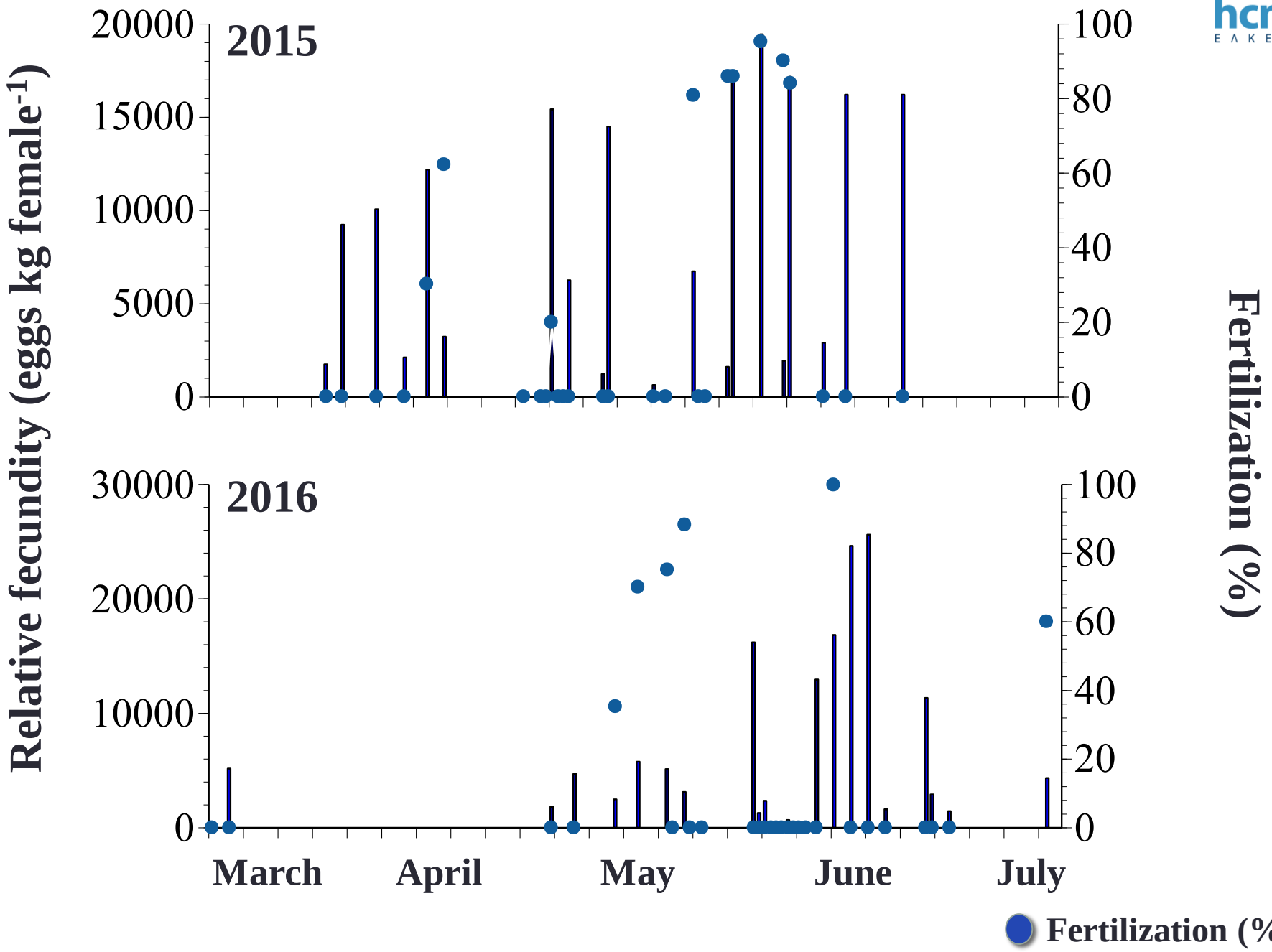
- **mean sperm density ranged between 4.5-11.5 x 10^9 spermatozoa ml^{-1}**
- **sperm motility was always higher than 60%**
- **motility duration ranged between 1.5 and 6 min**
- **survival of sperm at 4°C ranged between 3 and 10 days.**



Males



➢ **Testosterone and 11-ketotestosterone increased with increased sperm production.**


2015
2016
Relative fecundity (eggs kg female-1)
Fertilization (%)
20000
15000
10000
5000
0
30000
100
80
60
40
20
March
April
May
June
July
Fertilization (%)

Females

1. **Undergo gametogenesis and occasionally mature and produce eggs both under fluctuating natural and under constant low temperature**
2. **Plasma sex steroid hormones followed the already described pattern of change during oogenesis, though 17,20β-DHP was not correlated to reproductive stage of fish**

New efforts must focus on the environmental conditions under which fish are held, in order to ensure that more fish complete gametogenesis and hopefully mature and spawn.

Males

1. **Produce sperm all-year round (natural or captivity-induced?)**
2. **Plasma sex steroid hormones followed the already described pattern of change during spermatogenesis, but with varying17,20β-DHP levels**
3. **Sperm was of good quantity and quality**

New spawning induction and in vitro fertilization methods could improve fertilization percentage.

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