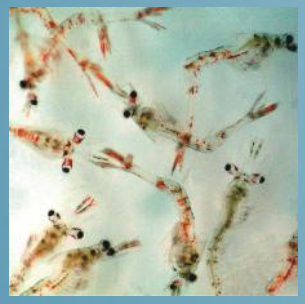
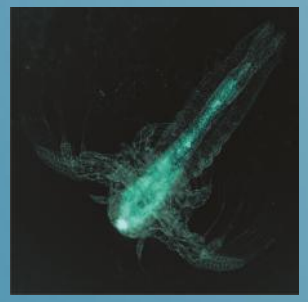
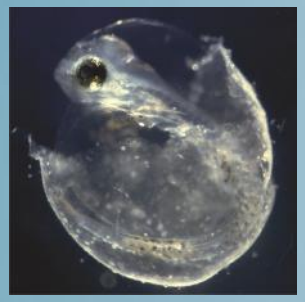
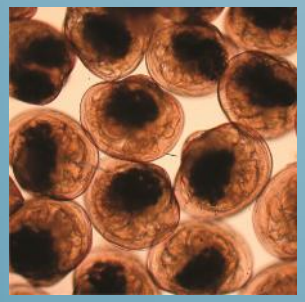




larvi 2013

6th fish & shellfish larviculture symposium

Pubertal development of Atlantic Bluefin tuna (Thunnus thynnus) in captivity

Berkovich Nadia

ghent university, belgium, 2-5 september 2013

The key neuroendocrine regulators of the onset of puberty in the Atlantic bluefin tuna (*Thunnus thynnus*)

Nadia Berkovich, Iris Meiri-Ashkenazi, Vered Zlatnikov, Aldo Corriero, Christopher Bridges, Constantinos Mylonas, Robert Vassallo Aguis, Fernando De La Gándara, Antonio Belmonte, Abigail Elizur, Hillel Gordin and Hanna Rosenfeld

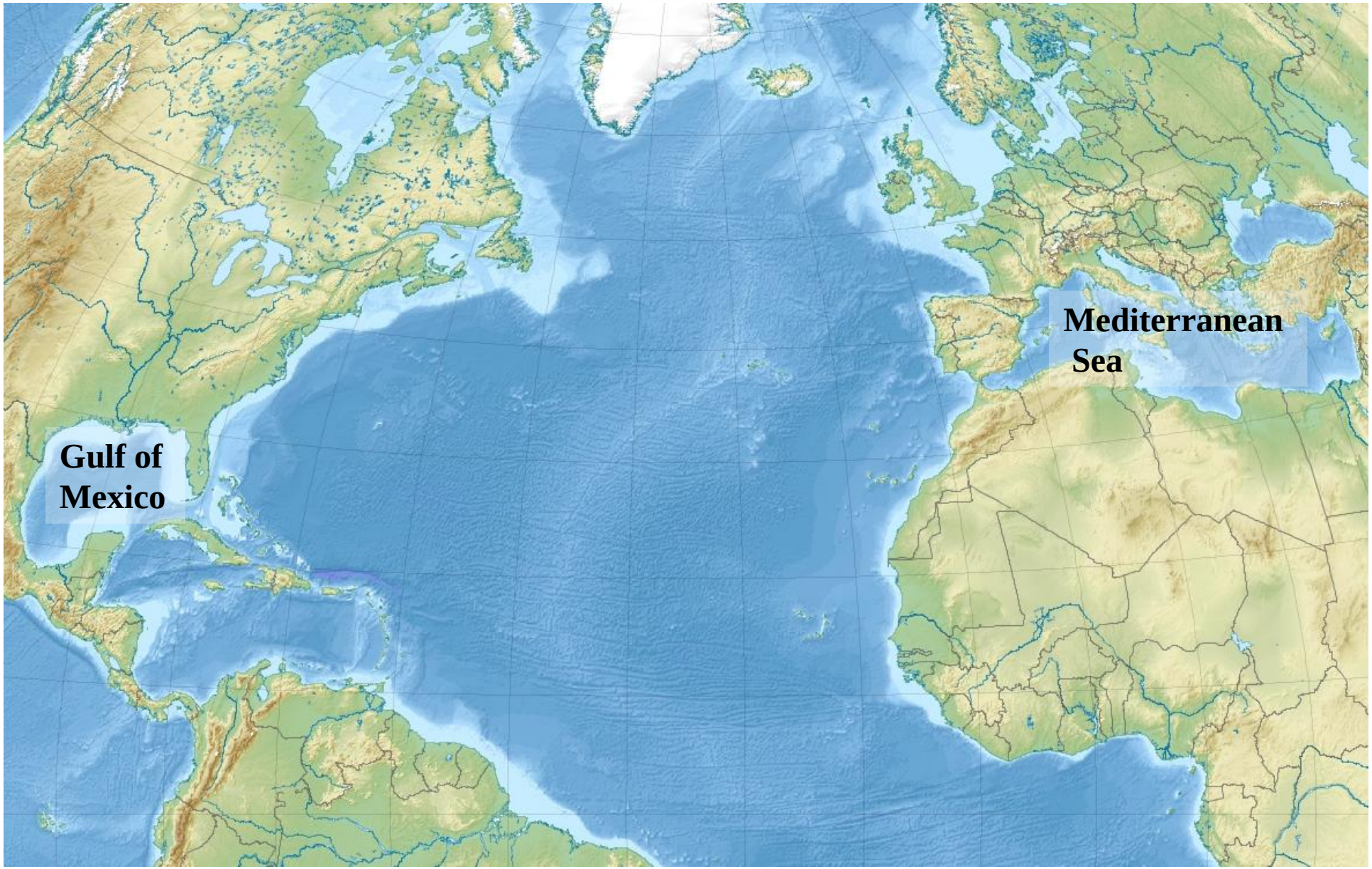
Israel Oceanographic and Limnological Research
Ben-Gurion University of the Negev

Bluefin tuna opens 2013 with record auction price at Tsukiji:

1.78 million dollars

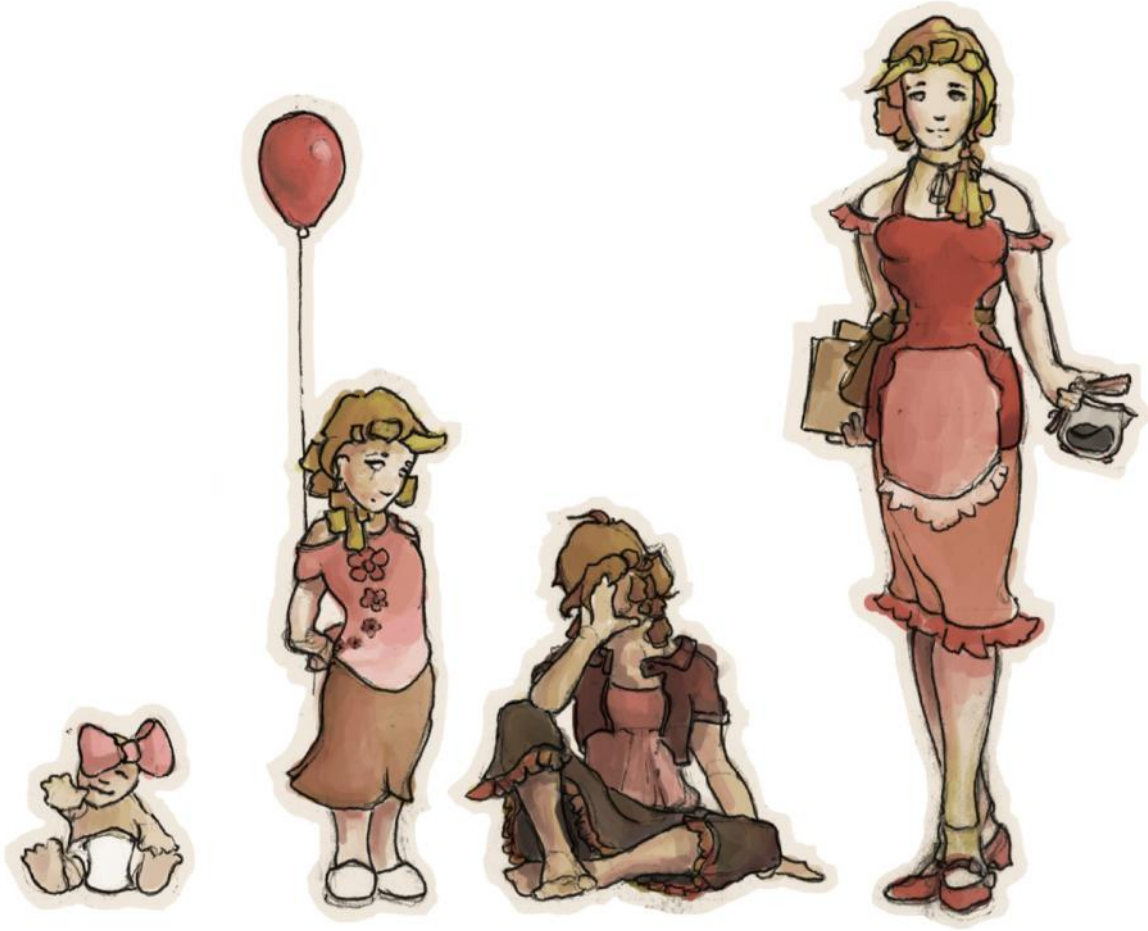
MercoPress, Jan 2013

Distribution

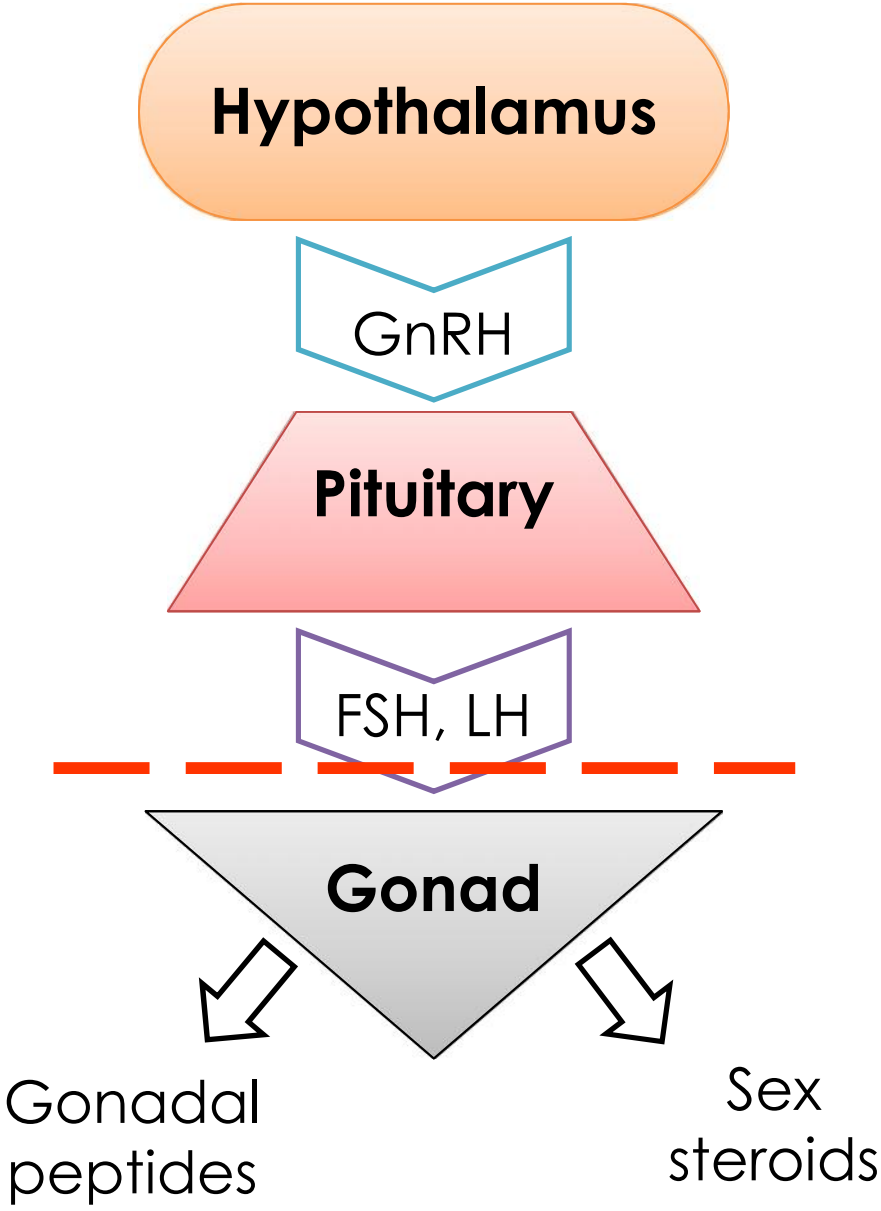


Puberty

The period during which the capability of sexual reproduction is attained



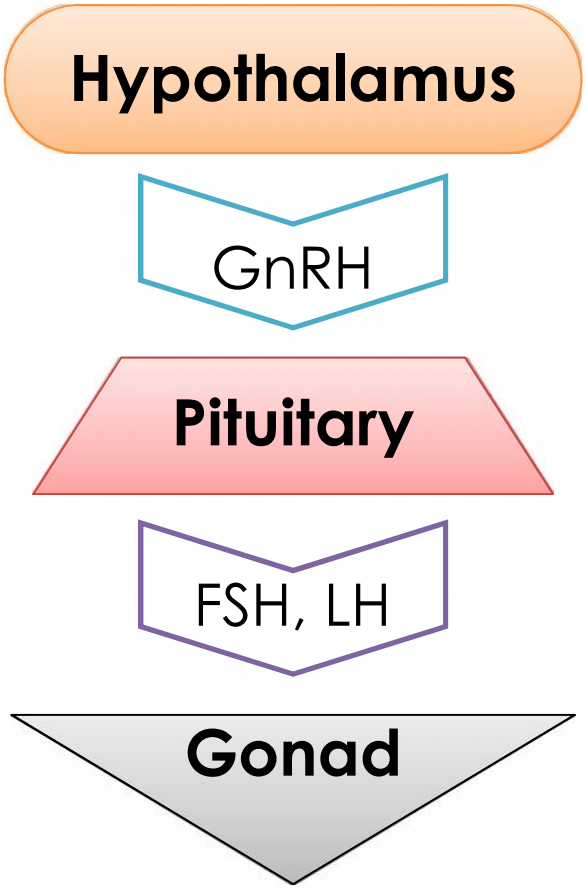
Hypothalamic-Pituitary-Gonadal Axis



Objectives

- To evaluate the maturational competence of the reproductive axis in juvenile tuna reared in captivity (**Experiment I**).

- To assess the competence of the gonads to respond *in vitro* to exogenous hormones (**Experiment II**).



Experiment I

July 2009, Croatia

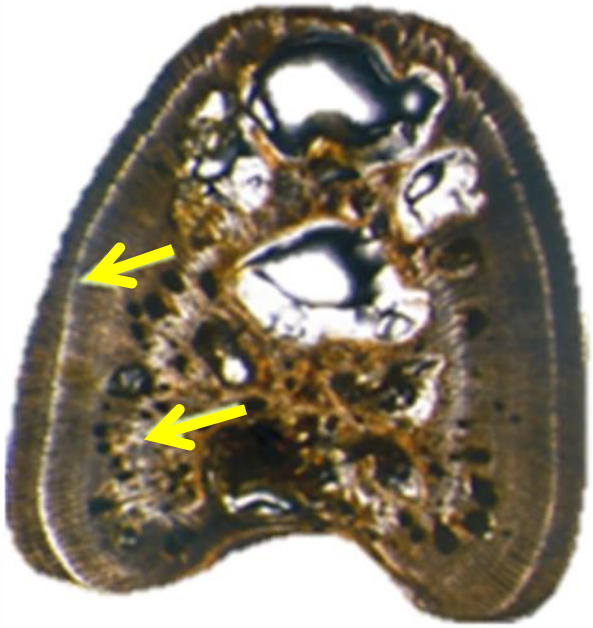
Experiment I: Sampling young tuna

- Biometric data, including: total length, weigh (body & gonads), GSI values

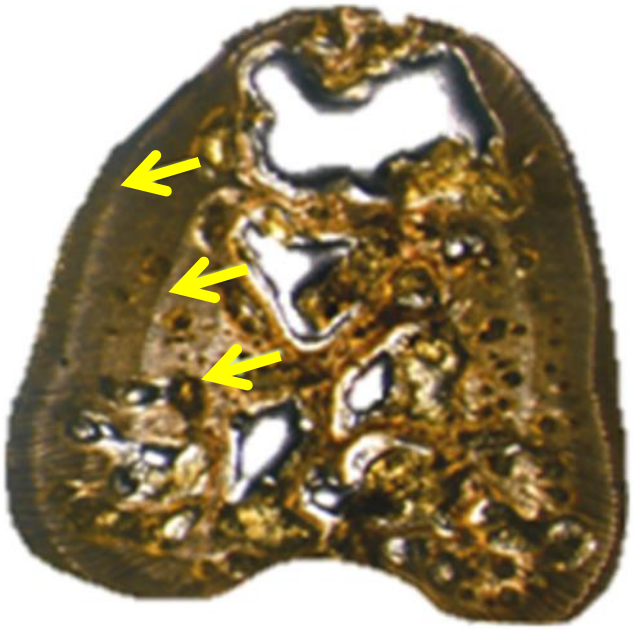
- Tissue sampling, including: brain, pituitary, gonads & first spine

Experiment I: Age determination

- Sections of the first spiniform ray of juvenile tuna



2 years old fish
BW: 8.45±0.41 kg
FL: 82.8±1.03 cm



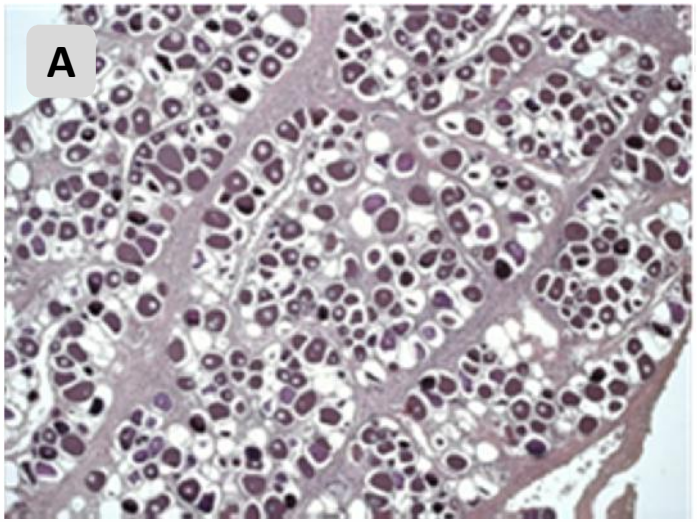
3 years old fish
BW: 19.38±0.75 kg
FL: 102.8±0.98 cm

University of Bari, Italy

Experiment I: Histology

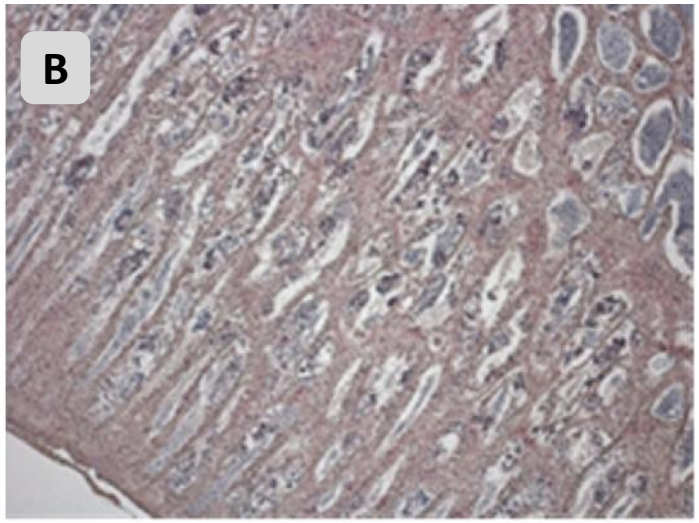
- Sex and reproductive state of juvenile tuna

An ovary section (3Y)



Perinucleolar stage was the most advanced oocyte stage

A testis section (3Y)



All the spermatogenetic stages, as well as spermatozoa

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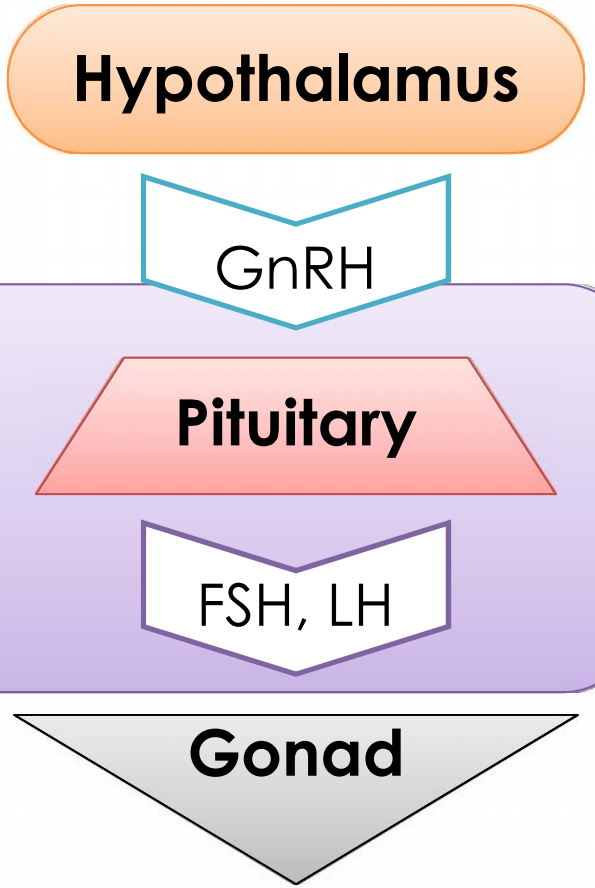
Check points along HPG axis

- Hypothalamus
- Pituitary
  Hormones: FSH, LH
  Gonadotropin subunits: FSHβ, LHβ
- Gonad

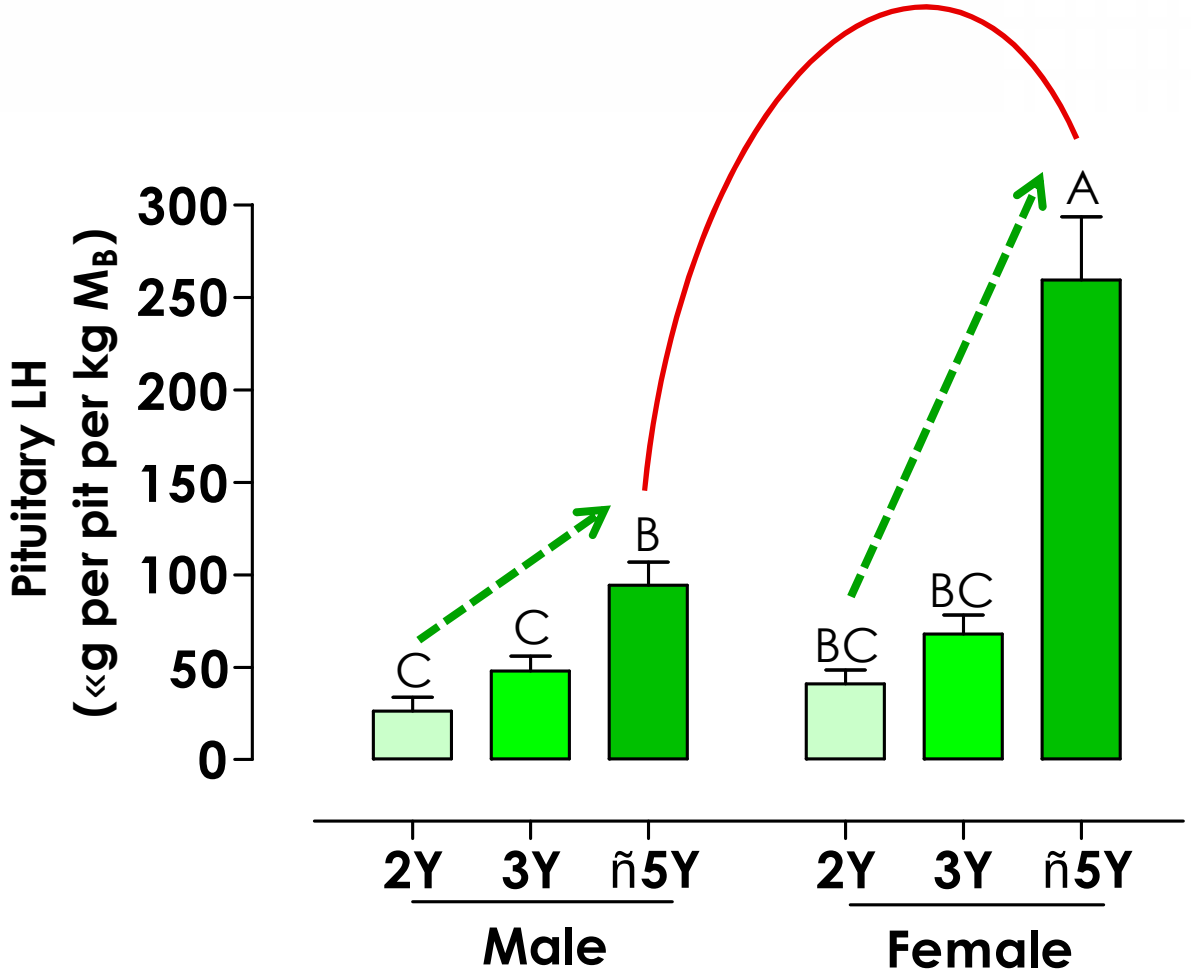


Experiment I

Experiment I: Hormonal analysis

- Pituitary LH

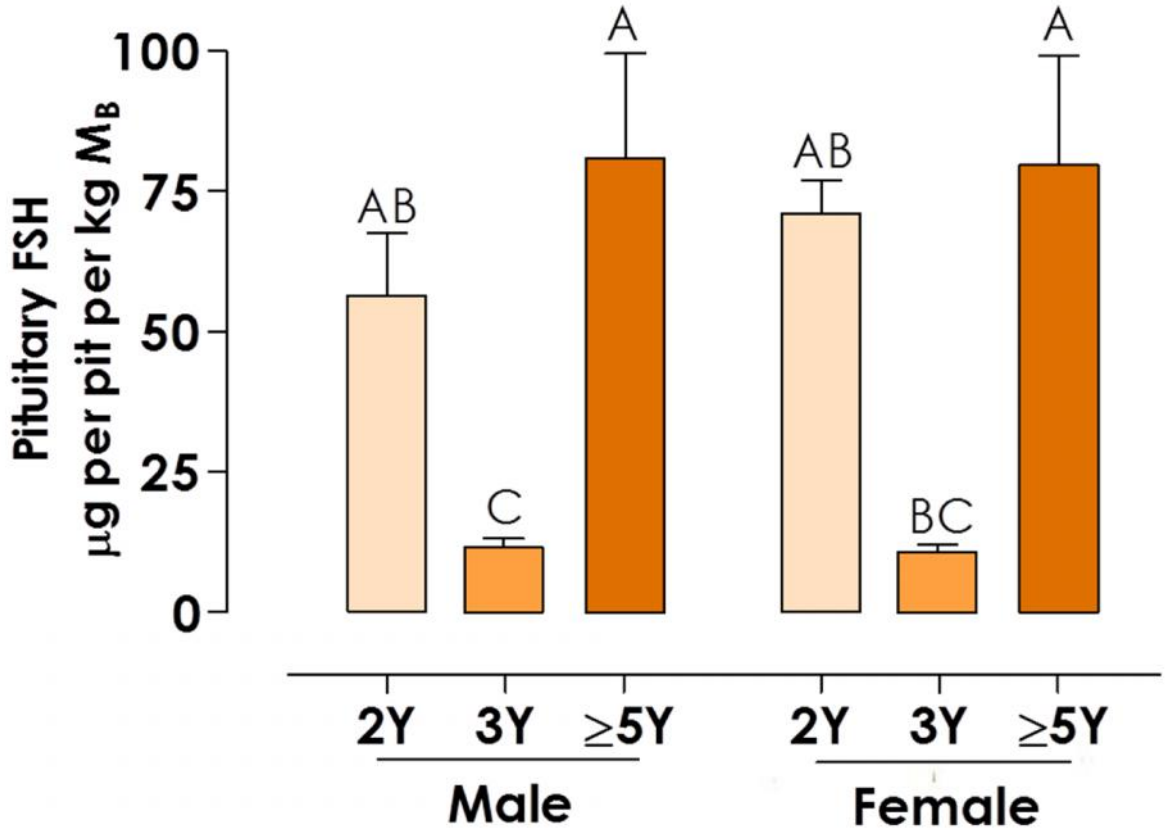
Pituitary



Experiment I: Hormonal analysis

- Pituitary FSH

Pituitary



Experiment I: Hormonal analysis

- Pituitary FSH/LH ratio

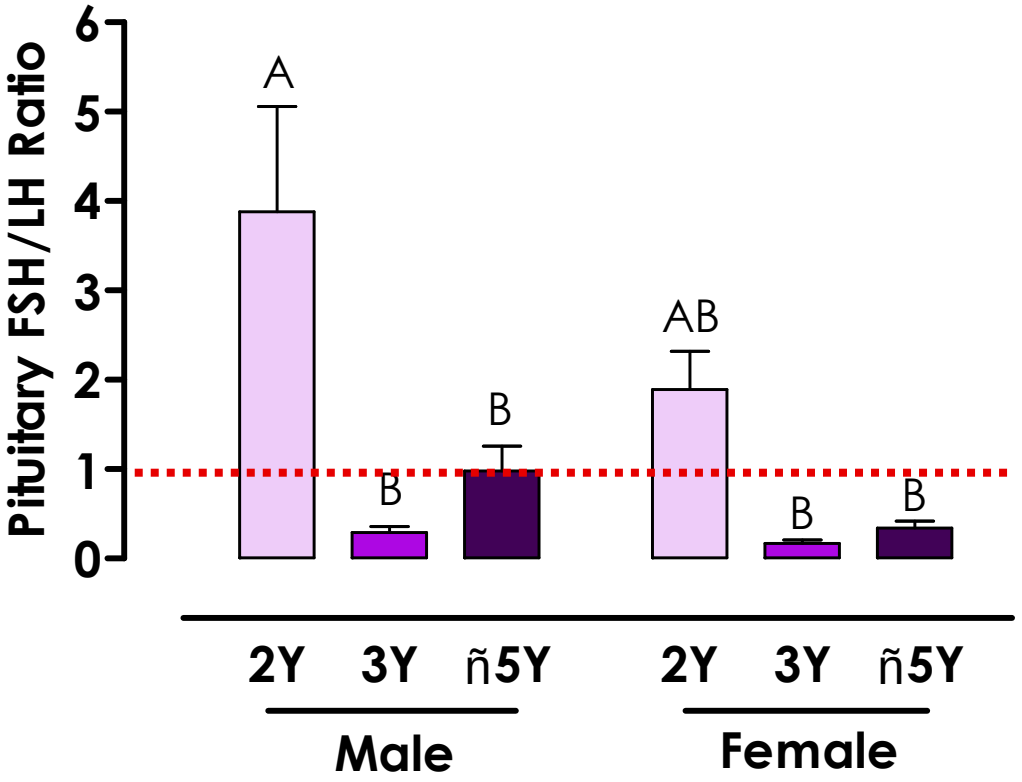
Pituitary

Mature individuals:

FSH/LH ≤ 1

Immature individuals:

FSH/LH > 1



Experiment I: Summary

- The 3-Y males exhibited **advanced puberty** compared to females of the same age class.
- The pituitary LH content increased concomitantly with the age of the fish.
- Sexual **dimorphic** pituitary **LH patterns** were observed in fully mature BFT (3-fold higher in females).
- The intra-pituitary **FSH/LH ratio** in sexually **immature** 2-Y BFT is relatively **higher** (>1) than in maturing or pubertal fish.

Experiment I: Summary

It appears that the onset of puberty in females necessitates also a rise in the pituitary LH storage above a minimum threshold.

Aimed to verify the responsiveness of the HPG axis to exogenous hormones.

KALI TUNA d.o.o.

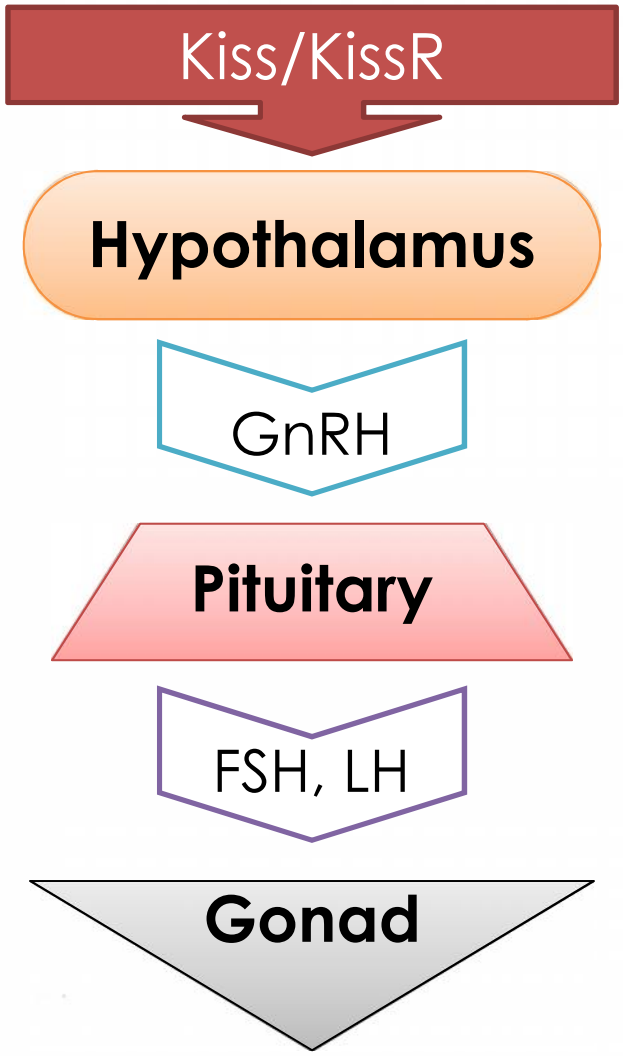
Experiment II

June 2010, Croatia

Experiment II: *In vivo*

In vivo

- Kiss EVAc implants
- GnRHa EVAc implants
- Untreated(control)

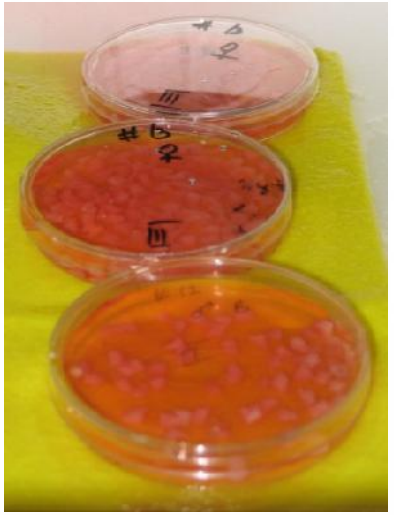


Experiment II: Sampling strategy

Histology → GtHs & Sex steroids → qRT-PCR

Experiment II: *In vitro*

rFSH **rLH**



Tuna juveniles:

1. Untreated (control)
2. GnRHa-implanted
3. Kiss-implanted

} 3 weeks prior to sampling

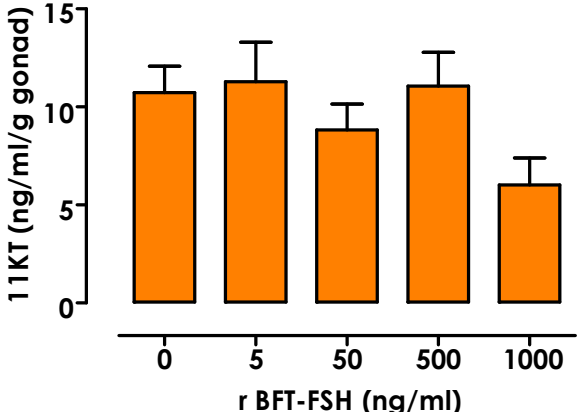
KALI TUNA d.o.o.

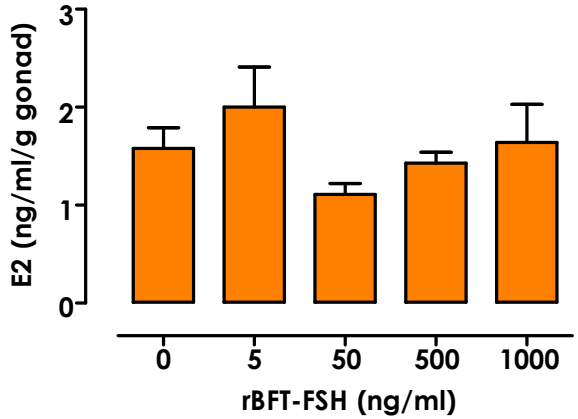
Experiment II: Hormonal analysis

- Effects of rGtHs on sex steroid secretion

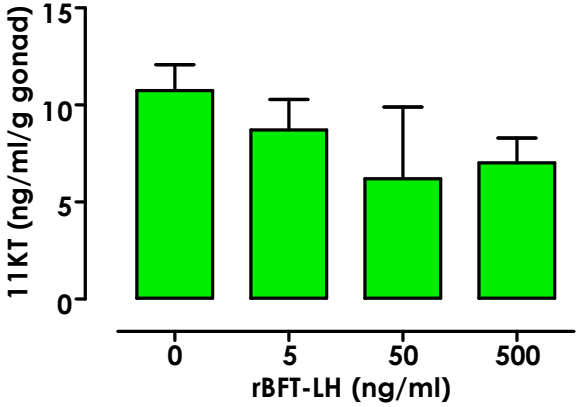
Immature tuna (control)

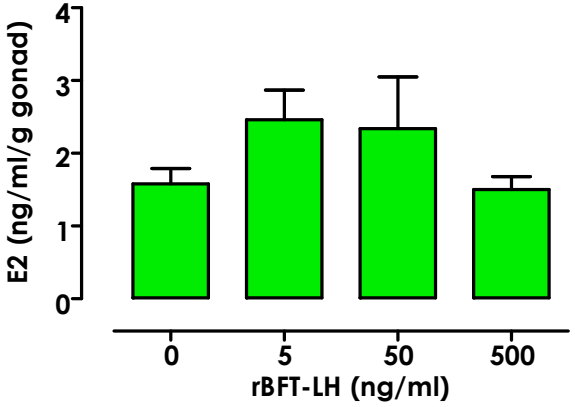
rFSH





rLH



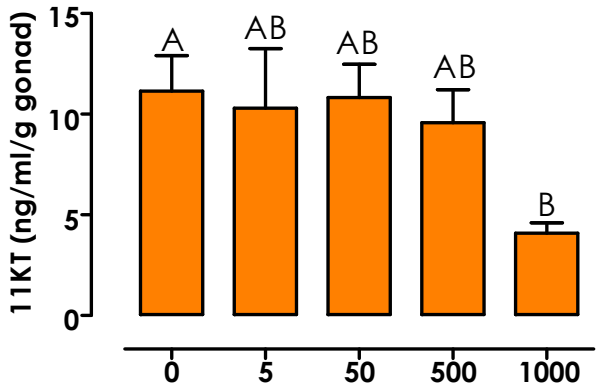


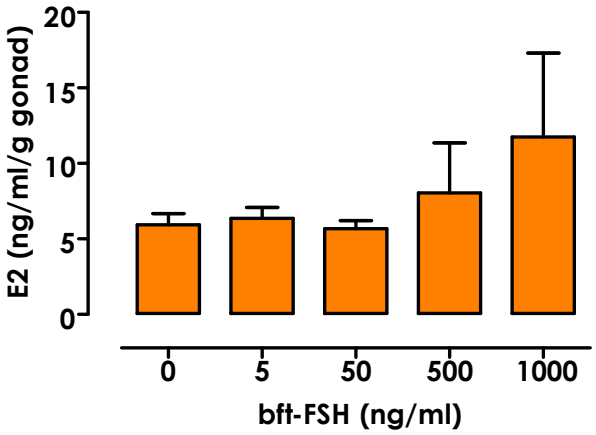
Experiment II: Hormonal analysis

- Effects of rGtHs on sex steroid secretion

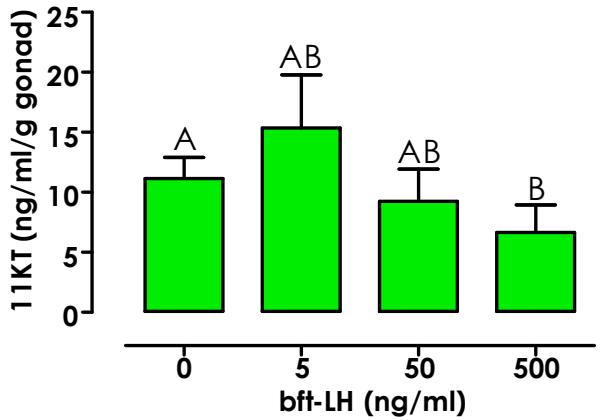
Immature tuna pretreated with GnRH

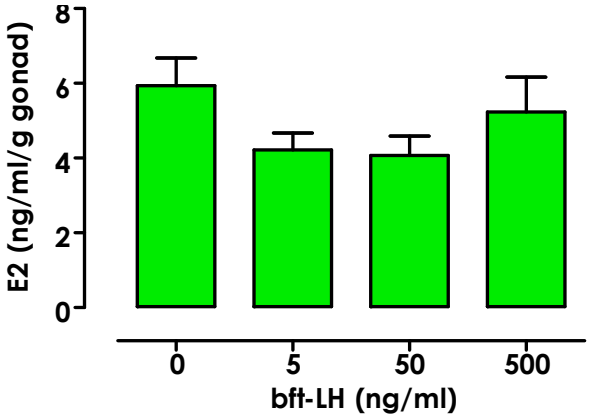
rFSH





rLH



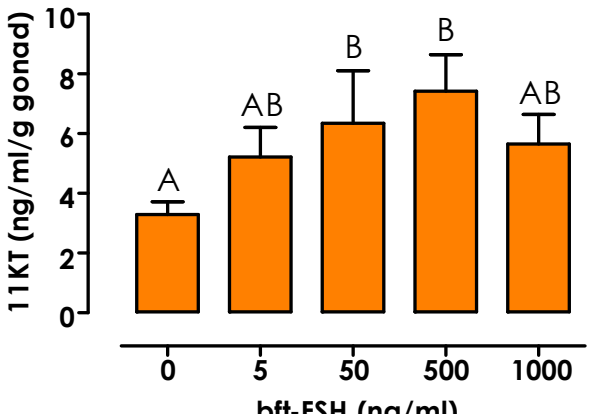


Experiment II: Hormonal analysis

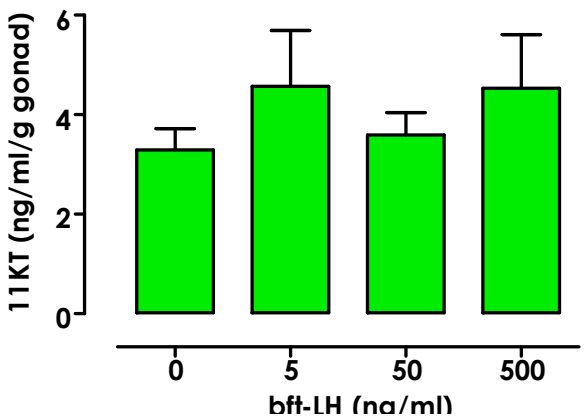
- Effects of rGtHs on sex steroid secretion

Immature tuna pretreated with Kiss

rFSH

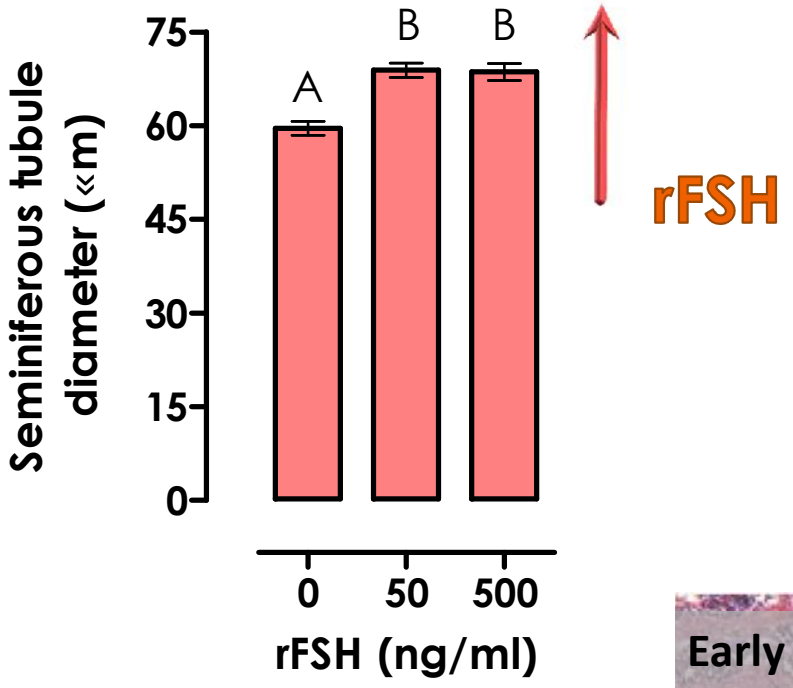


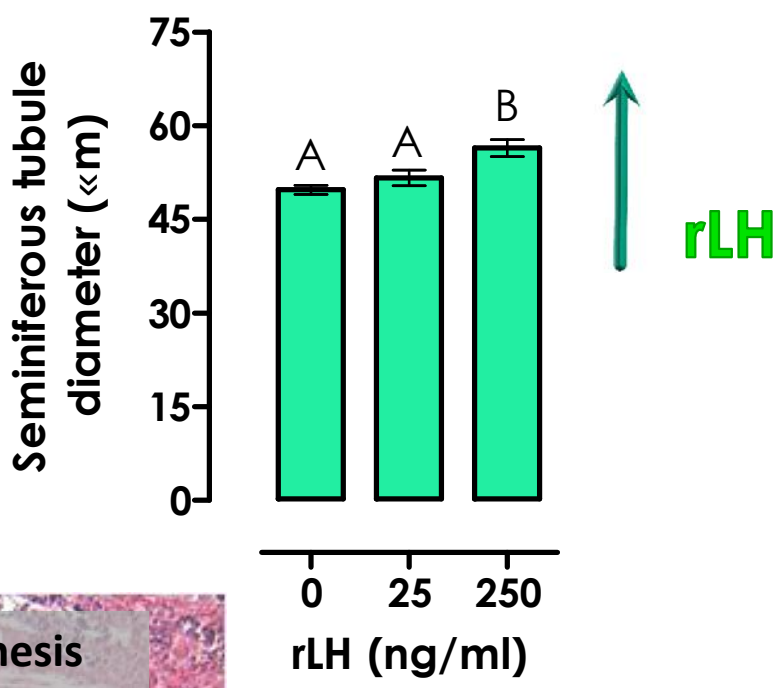
rLH

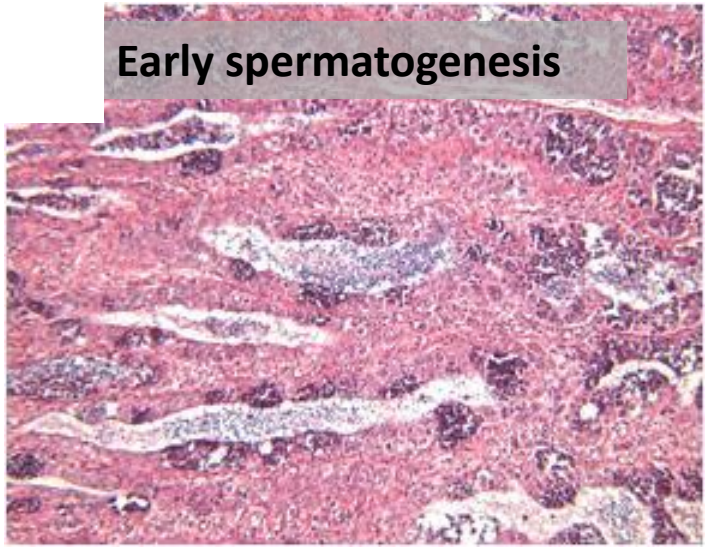


Pretreatment with Kiss seems to potentiate the responsiveness of the testes to FSH

Experiment II: Effects of rGtH on gonadal growth







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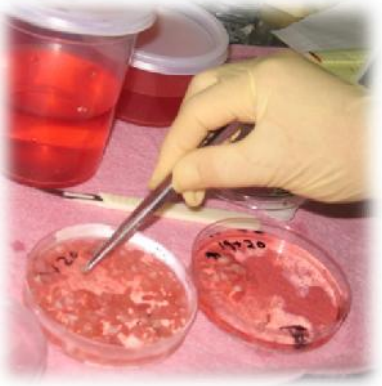
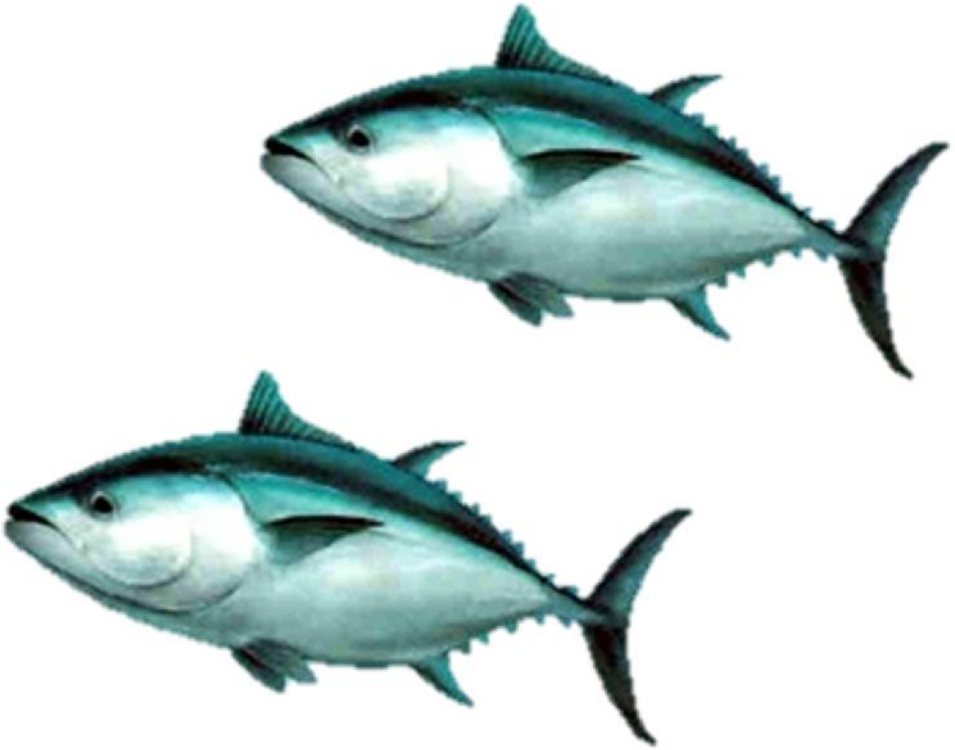
Experiment II: Summary

- Neither bftFSH nor bftLH induced steroidogenesis in control group.
- Nevertheless, bftFSH and bftLH stimulated gonadal growth.



Next challenge:
Advance puberty in captive tuna juveniles



Acknowledgments

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Vered Zlatnikov
Hanit Ben-Ari
Dr. Rachel Armoza-Zvuloni
Hagit Kvitt

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