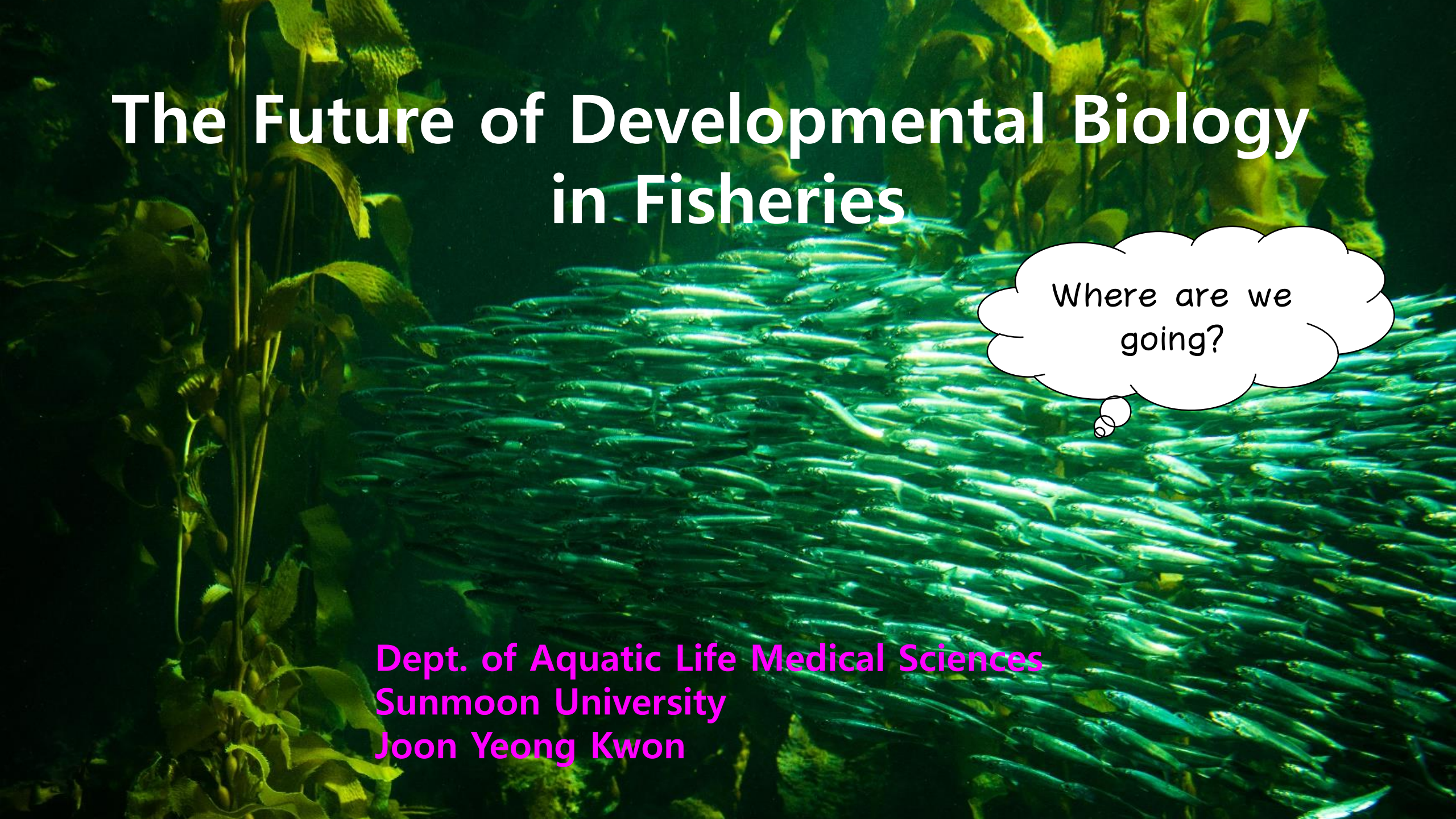
The Future of Developmental Biology in Fisheries



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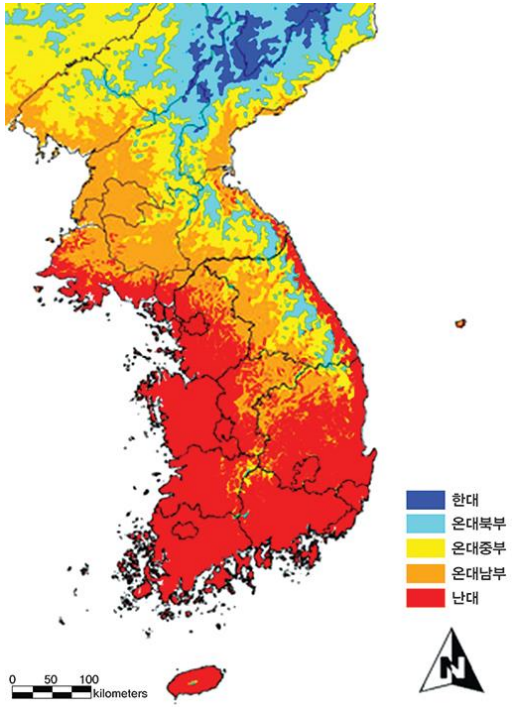
Domestication of indigenous species in the past 20 years

: Flounder, Rockfish, Seabreams, Pufferfish, etc.

: Success of artificial reproduction in these species
(Use of GTH, GnRH, Sex steroids / Sperm cryopreservation)



Climate change forces to study new species

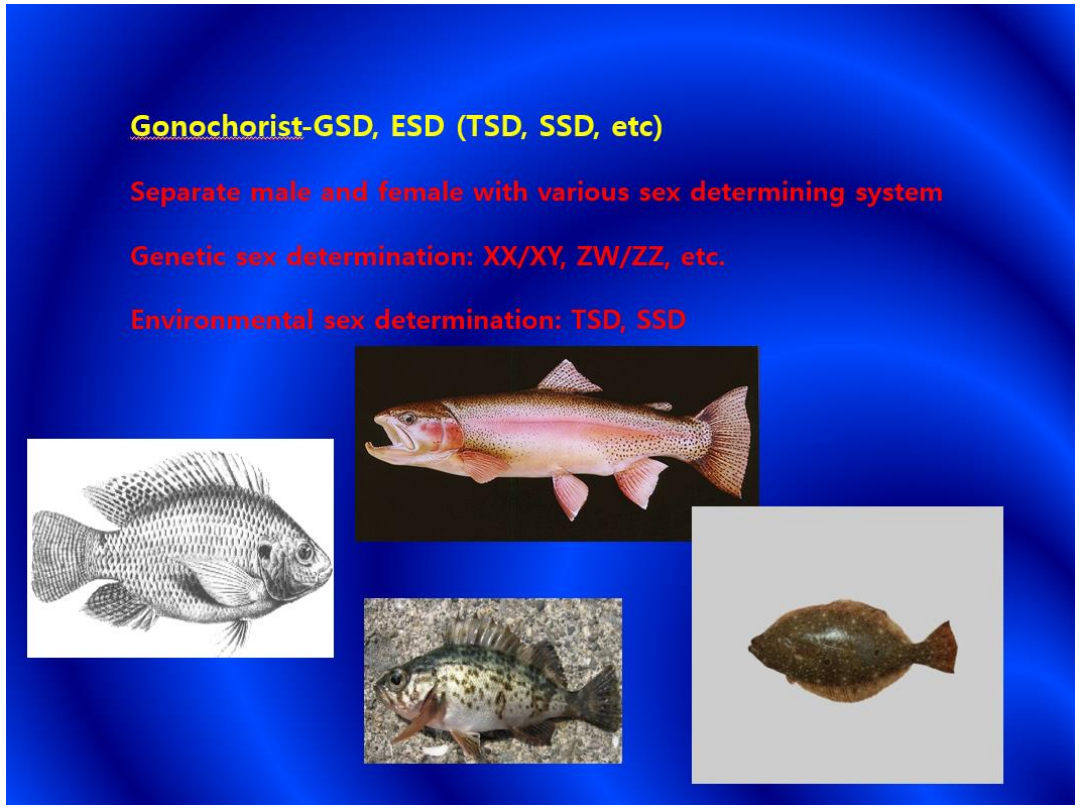
: Temperate zone → Subtropic zone

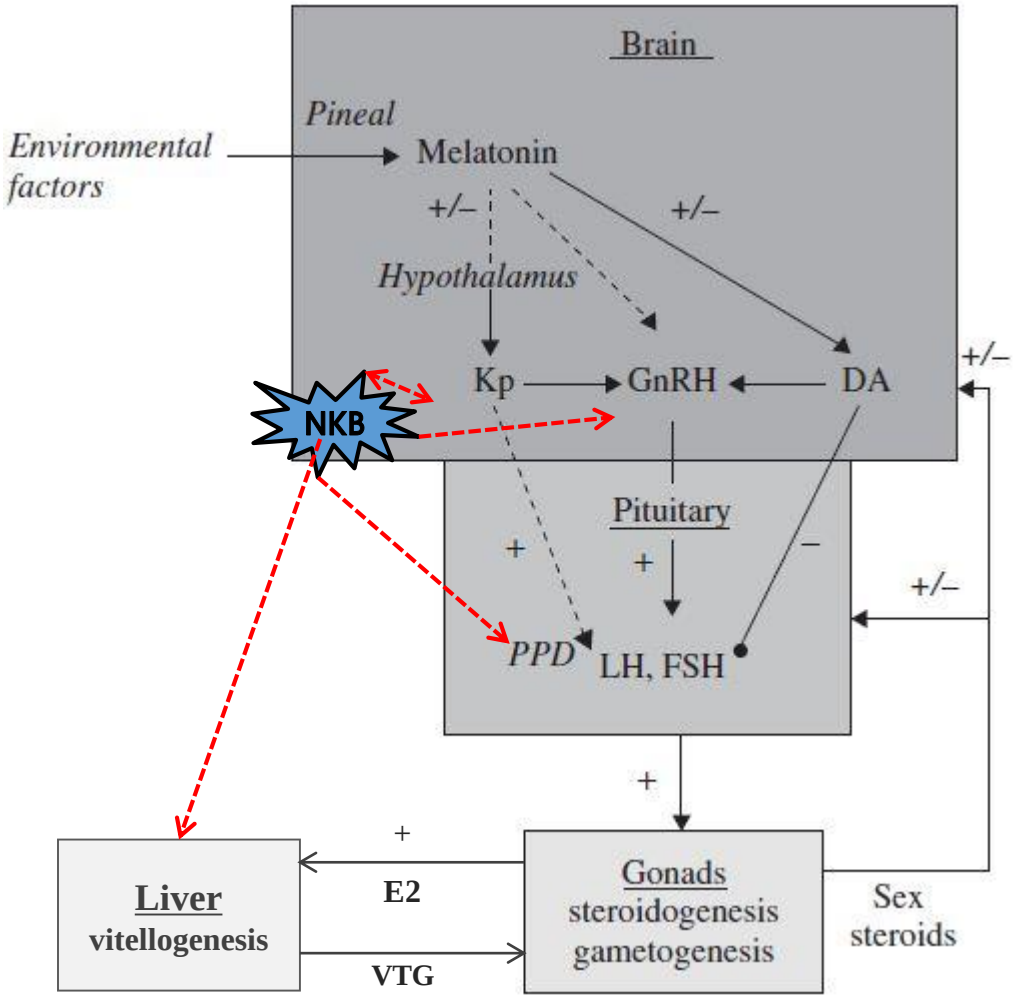
: Cod, Tuna, Groupers, etc.

: New challanges

Problems Unsolved

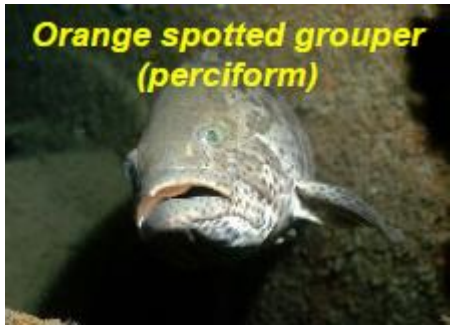
: Precocious sexual maturation
: Understanding neurohormones
: Sex determination / differentiation





Hermaphrodites – both sexes in an individual fish?

Protogynous hermaphrodite:
From female to male



Protandrous hermaphrodite:
From male to female

Simultaneous hermaphrodite:
Functional male and female
at the same time

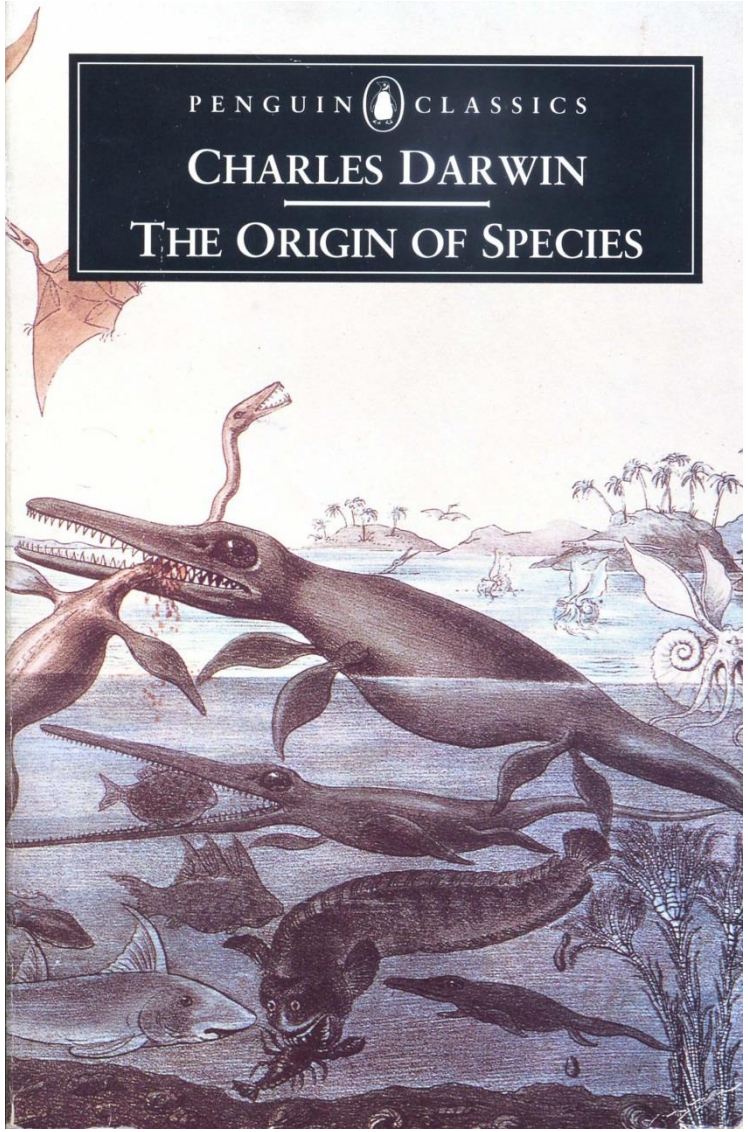
Pathenogenesis – Asexual reproduction in fish?

The Amazon molly

All female species

No male exist in this species. How to fertilize eggs?

Sperm from closely related species is used just to activate the oocyte without contribution of any genetic materials



"I formerly thought that when a tendency to produce the two sexes in equal numbers was advantageous to the species it would follow from natural selection, but I now see that the whole problem is so intricate that it is safer to leave its solution to the future" (Darwin, C.,1871. The Descent of Man and Selection in Relation to Sex)

New Challenge 1

: Getting harder to fish in the sea

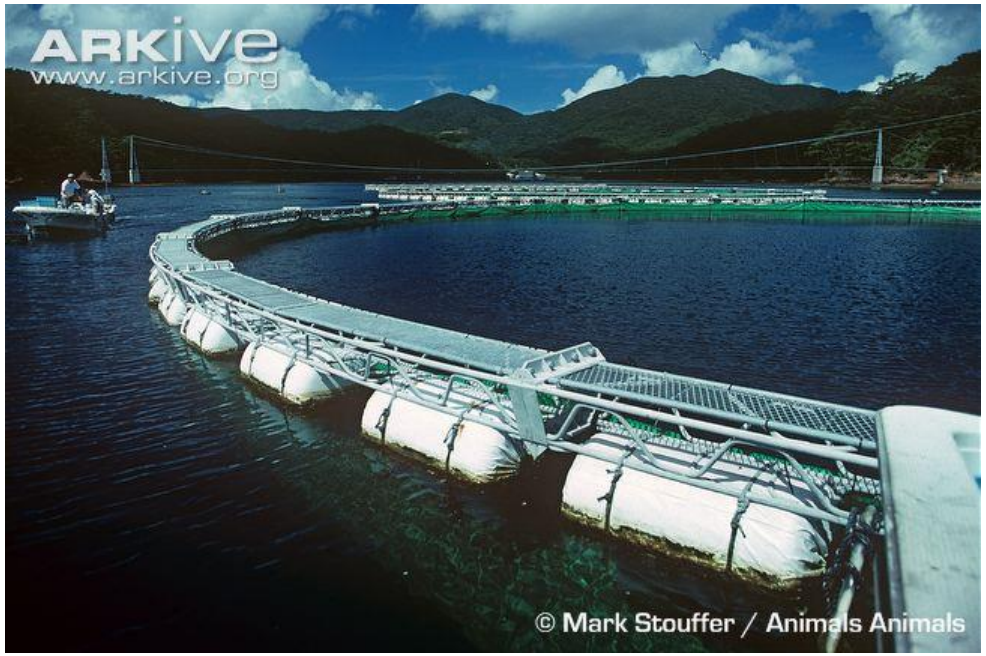
: Understanding chemical language

- How to attract fish

New Challenge 2

: Need to breed giant fish in the cage

: Understanding chemical language



Perfume
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!

Come and Do Reproduce !

Pheromone


ALFA MASCHIO
FOR MEN

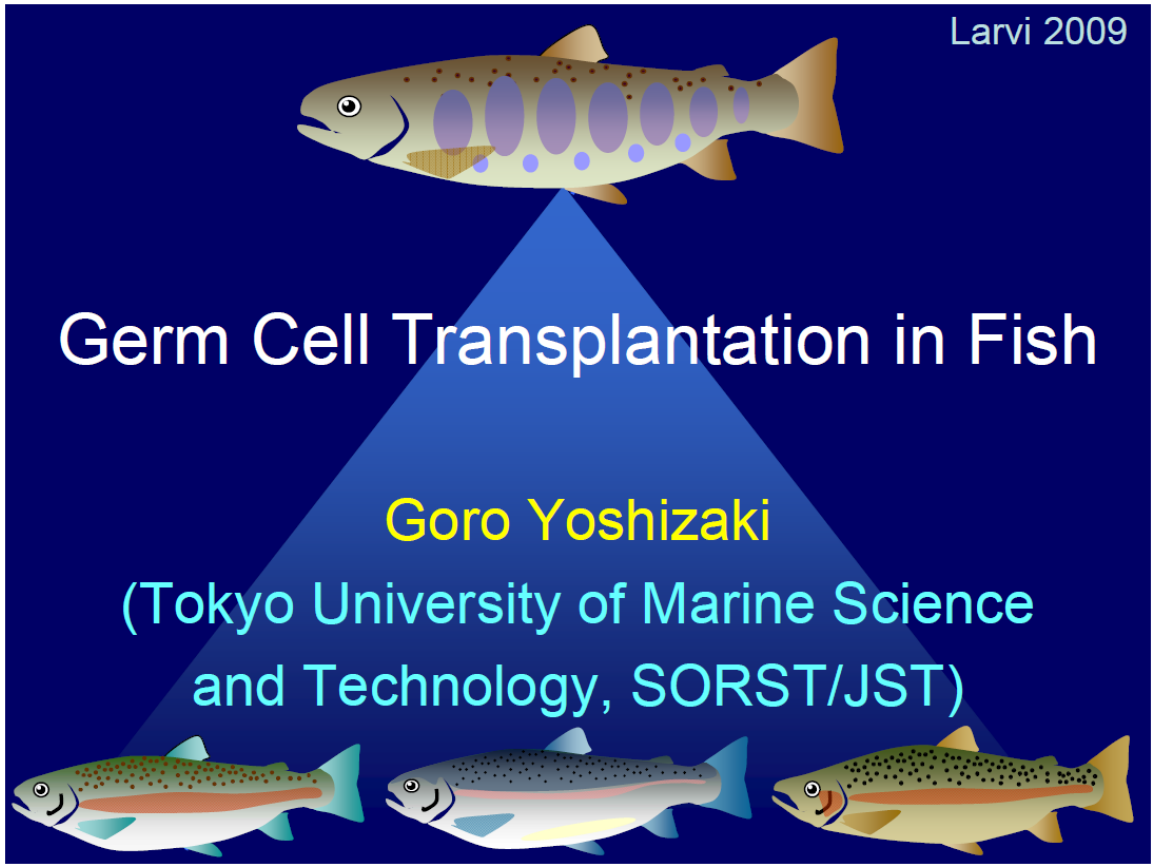

AMOUAGE

New Challenge 3

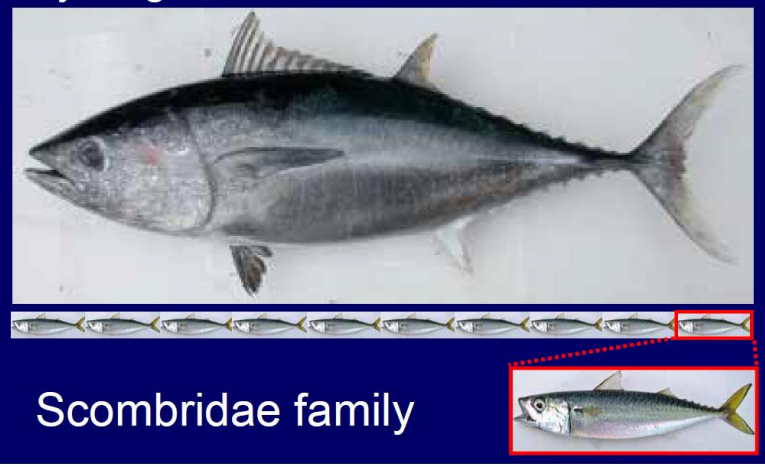
: Develop surrogate fish?

: Germ cell transplantation

- Trout → Salmon (app. to tuna, grouper)



	Tuna	Mackerel
Body weight;	300 kg	300 g
Body length;	3 m	30 cm



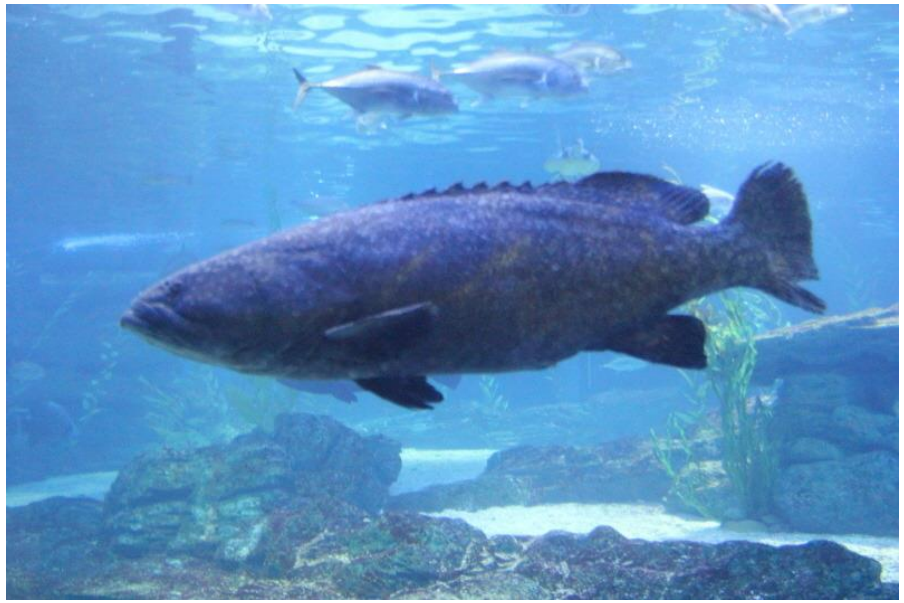
Maintenance of adult tuna requires a lot of space, cost, and labor

Mackerel can spawn in a small fish tank

If we can obtain mackerel that produce tuna gametes

With the Help from modern science and technology

: Genetics
: Computer sciences
: Recombinant DNA tech
: Nanotechnology
: Aptamer
: Molecular endocrinology
: Advanced cell culture tech
: Accumulated information
from model fish species



Nothing is impossible in 20 years time !