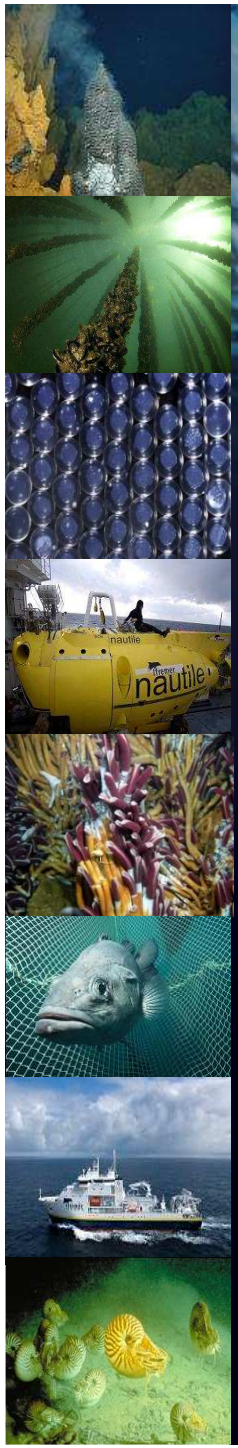

Impact assessment: A new Approach?
the implementation of the notion of animal health

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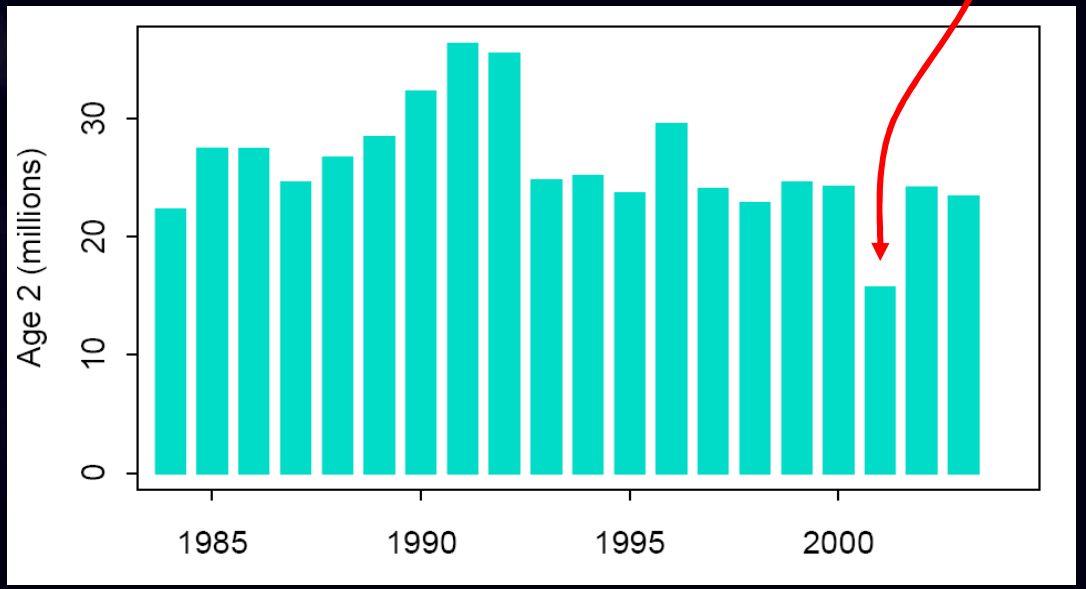
ERIKA (1999): a double failure?

In 2001: -40 %

Biomarkers:

- **Bioaccumulation**
- **Detoxification**
- **Energetics**
- **Physiology**
- **Histology**
- **Survival**
- **Growth**



There is a need to define a new approach

To improve environmental management, policies and remediation strategies

- Assessing the vulnerability of organisms;
- Need a “paradigm”;
- Need metrics;

- Translate the concept of human health to fish?

Human health, a life-course perspective

(Hertzman et al. 2001; Deem et al. 2001)

Health informs about the past (**diagnosis**);

- Integrative outcome of earlier-life environment, exposures and experience.

Health informs about the future (**prognosis**);

- sustainability, vulnerability and resilience to daily challenges and changes.

From human health to fish health

Today's notion of animal health lags behind how health is defined and assessed in human.

- Limited to current time;
- Mostly concerned with proximate causes (mono-factorial) of death or disease;
- Fails to account for cumulative effects;
- Fails to include the notions of resilience and vulnerability of populations *i.e.*, poor projection.

→ **FishHealth project (funded by Itopf)**

FishHealth

Impact assessment: Experimental methodology

CNRS/IRD/UBO
IFREMER
UMR 6539/196
LEMAR

ITOPF

TOTAL

UBC

SCIENCES
DE LA MER
& DU LITTORAL

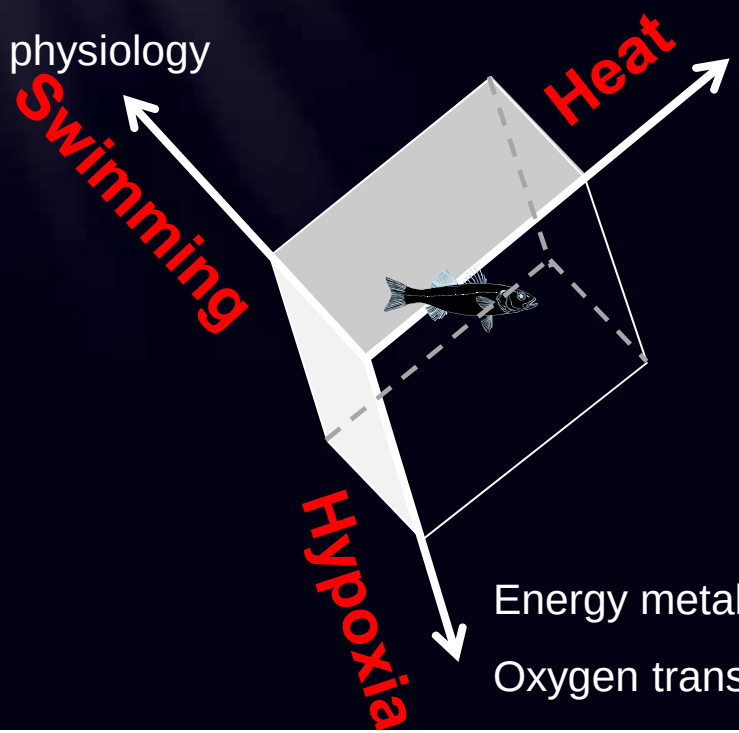
Objectives:

- Assess the effects of **oil exposure** on three performance traits involved in environmental adaptation (Hypoxia tolerance, temperature susceptibility, swimming performance)

Energy metabolism

Oxygen transport and use

Cardio vascular physiology



Respiration

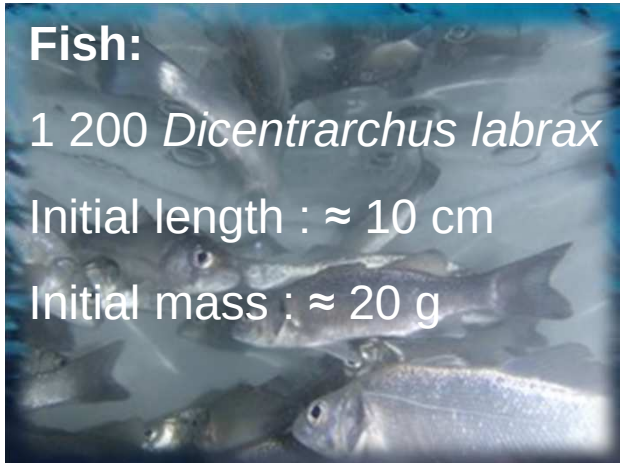
Cardio vascular physiology

Oxygen extraction, transport and use

Energy metabolism

Oxygen transport and use

Methodology



Fish:

1 200 *Dicentrarchus labrax*

Initial length : ≈ 10 cm

Initial mass : ≈ 20 g

Stabulation + Tag

Challenge tests

1. Swimming
2. Hypoxia tolerance
3. Temperature tolerance

OIL exposure

1. OIL
2. Dispersed oil
3. Dispersant alone

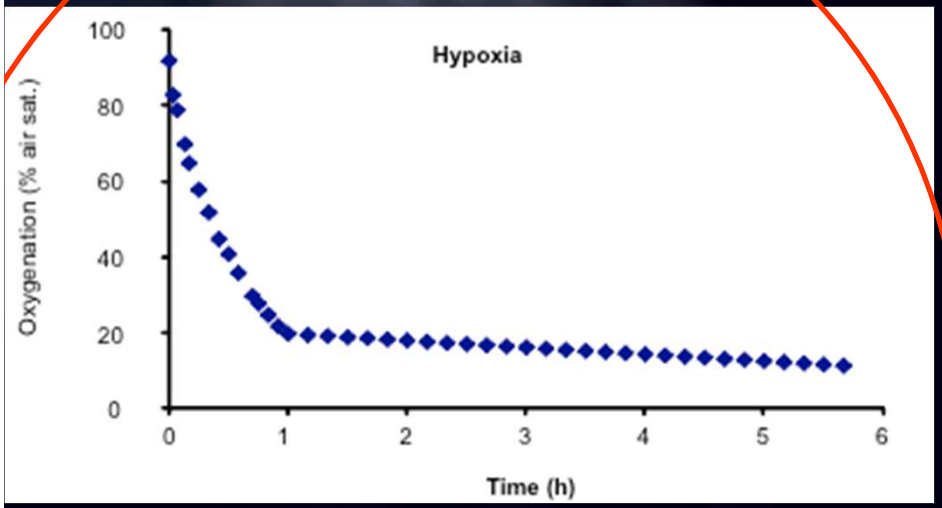
Challenge tests

1. Swimming
2. Hypoxia tolerance
3. Temperature tolerance

6 months later?

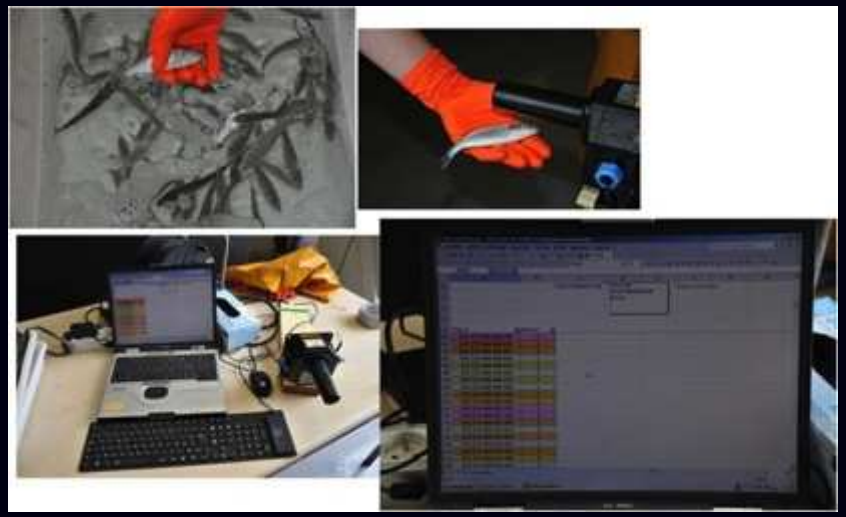
Challenge test: hypoxia tolerance

Water condition



Rapid decrease in water oxygenation (100% -> 20% in 1H)

Followed by a much slower descent (2% air saturation / hour)



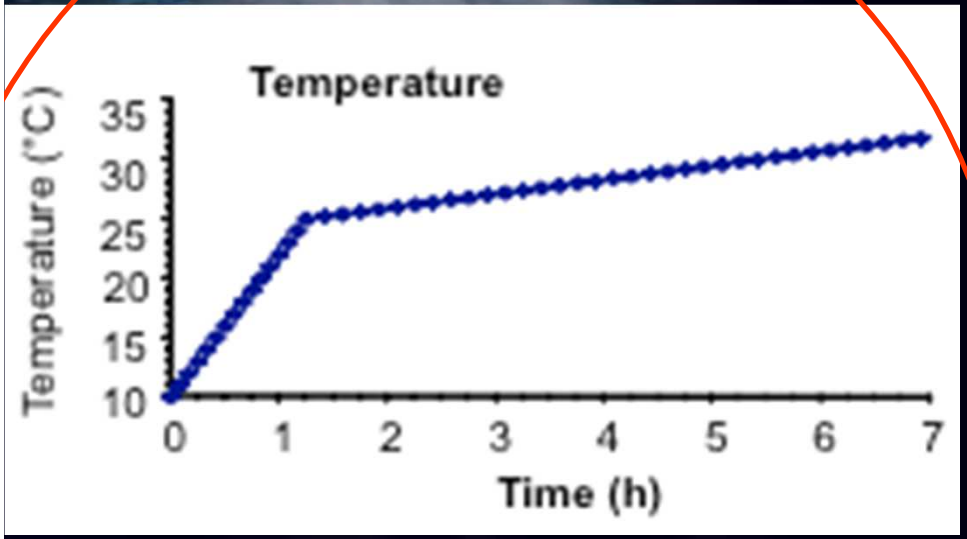
Fish loose their ability to maintain balance

-> quickly removed from the experimental arena, identified (tag reading), placed in a fully aerated tank

Corresponding time and oxygenation level recorded

Challenge test: temperature susceptibility

Water condition



Rapid water T°C increase

(acclimation T°C -> 27°C in 1H)

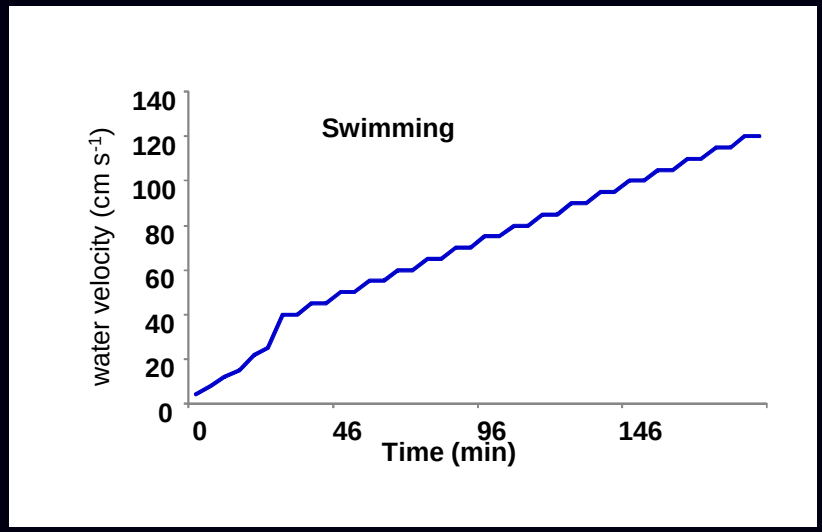
Followed by a much slower increase (0.5°C / hour)

Fish loose their ability to maintain balance

-> quickly removed from the experimental arena, identified, placed in a recovery tank at acclimatation T°C

Corresponding time and T°C recorded

Challenge test: swimming performance



Swimming flume : 2 chambers in which the speed of water is controlled (pump + frequency regulator)

One experimental group (n=60) is exercised while the second group is habituated to the chamber

Water velocity is increased progressively (5 cm/sec every 10 min)

Fish exhausted that can't remove themselves from the grid place downstream from the swim chamber

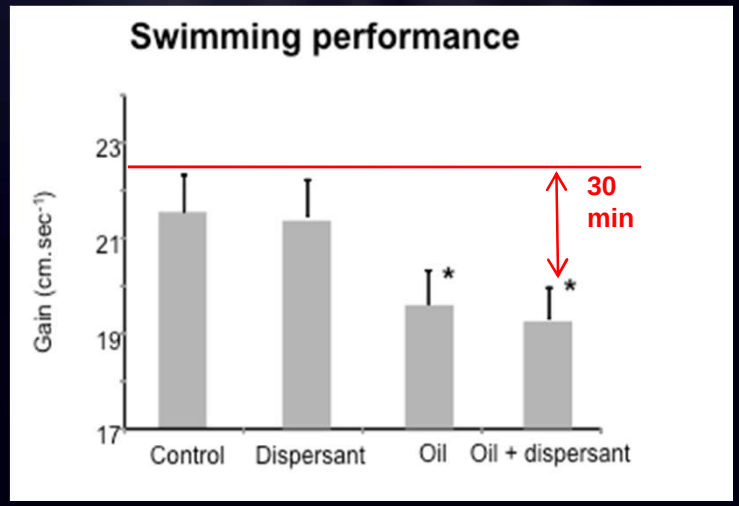
-> taken out of the flume, identified and placed in a recovery tank.

Corresponding time and water speed are recorded

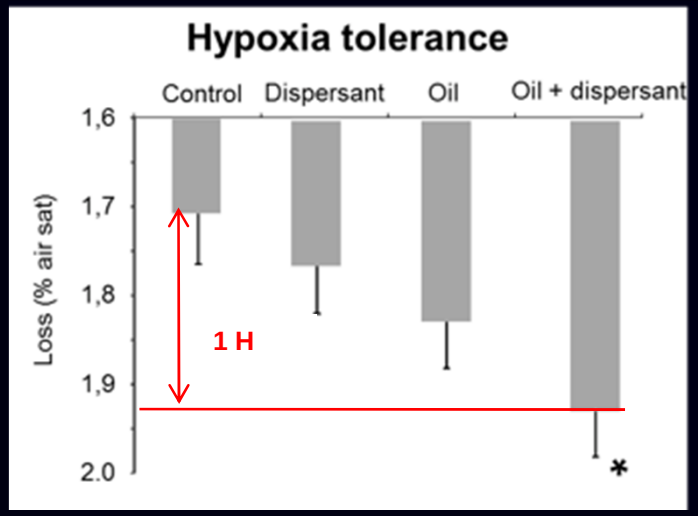
Preliminary conclusions

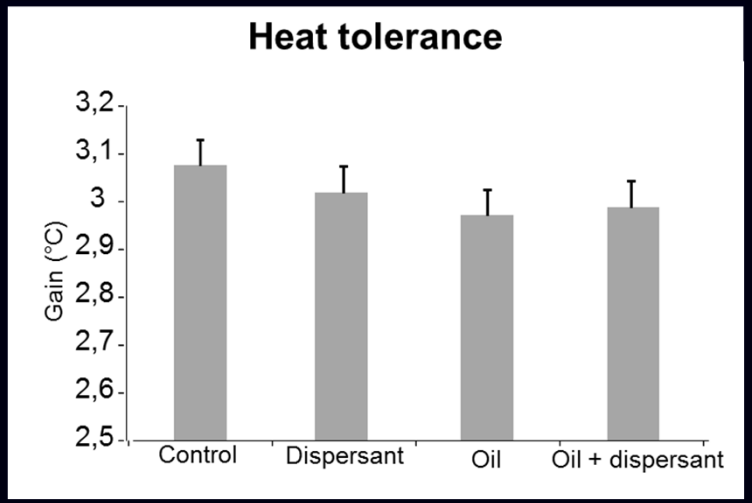
Just after the exposure period

Swam 30min less than the control



Tolerate hypoxia 1 hour less than the control





Preliminary conclusions

- Individuals' performance is influenced by test conditions (temperature, body size) and environmental history (laboratory *versus* wild)
- Experimental treatment (oil and oil + dispersant) affected fish swimming ability and tolerance to hypoxia. On the other hand, thermal sensitivity was not affected.
- Dispersant potentiate the effects of oil, just after the exposure
- These effects are reversible

Work is on going…

- Validate the ecological relevance of challenge tests with higher oil concentrations exposure
- Dose-response assessment