The effect of contrasting feeding environments on anchoveta egg quality during the spawning season off central Chile (S2-7182)

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Fish population variations

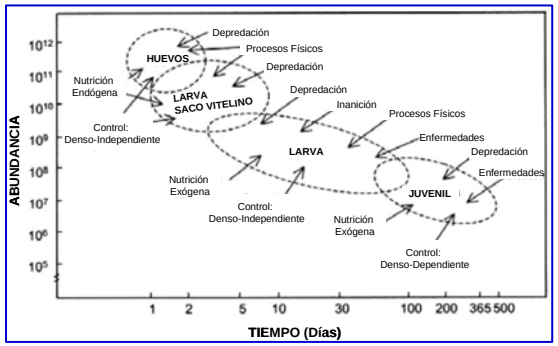
For small pelagic fish .. environment play an important role

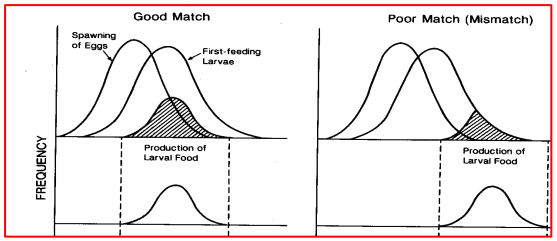
… changes in recruitment resulting from processes that ***affect directly*** survival of early life stages survival

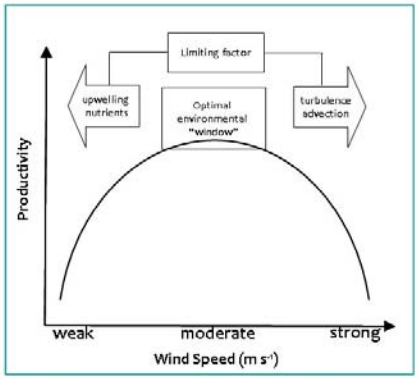
* predation on eggs and larvae

* trasport of early life stages to unsuitable areas for survival

* larval food limitation







However:

Scarce information exists on *indirect environmental effects* on egg and the earliest larvae survival..

Environment → spawning females → early life stages

variations in the quality of the eggs spawned

Objective :

Describe a mechanism through which the feeding environment may modulate the chances survival of the early life stages but *through its influence over the spawning female fish during the reproductive season (indirect effect)*

Approach… variations in the quality of the eggs spawned

Case of study:

Anchoveta (*Engraulis ringens*)

Changes in egg quality

in *years of contrasting environmental conditions*

in central Chile

Egg quality

Fatty acid content :

* important in neurone development in embryos

* Hatch success

* Eye (sight) development

Fatty acids

Fatty acids may give information on the environment:

SAFA y MUFA… fishes in warmer waters

PUFA…… fishes in colder waters

Fatty acids (essential) may also be traced down through the trophic web (bioindicators)

C 22: 6 n-3 (DHA)… dynoflagellates

C 20: 5 n-3 (EPA)… diatoms

DHA/EPA <1 …… + diatoms

For the Talcahuano area, Vargas et al. 2008

In natural fish populations, fatty acids connection between adult food and their body tissues had been reported … but not to their offspring

Hypothesis: Fatty acids may be an appropriate tool to connect the trophic environment for the spawning females with the quality of their egg and the subsequent offspring survival …

METHODS

Talcahuano spawning area:

1.- Cruises to 3 coastal stations (<5nm offshore) at the beginning of the winter spawning seasons (July- September), 2005 and 2007

* Hydrographic data: CTD casts, SST and color images, winds
* Microplankton sampling:
  - diatoms, microzooplankton (ciliates, dynoflagelates. flagelates)
* Mesozooplankton sampling:
  - icthyoplankton: eggs (staging), egg volume, fatty acids
  - mesozooplancton:
    - major groups (copepods*, euphausiids, chaetognaths, medusae, ctenophores, etc.)
    - Copepods (cyclopoids, harpacticoids, calanoids)

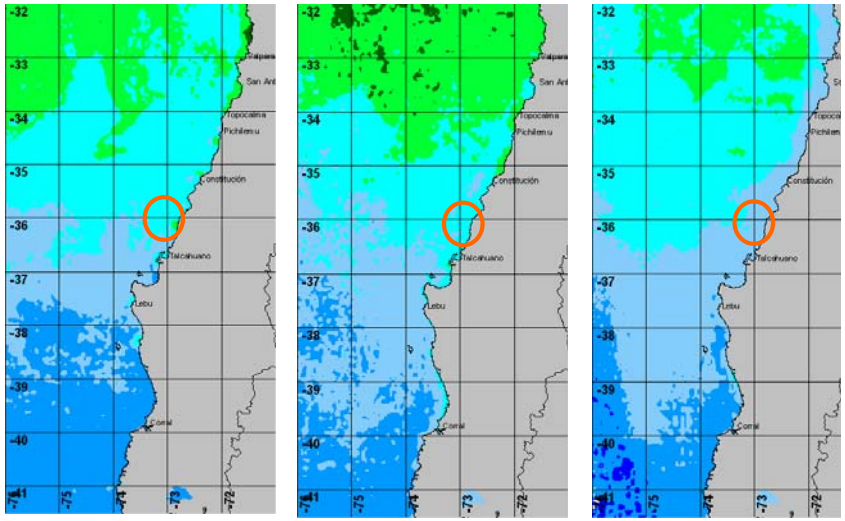
2.- Monthly cruises to an additional coastal station where COPAS Center has maintained a time series since 2003

* Hydrographic data + microplankton

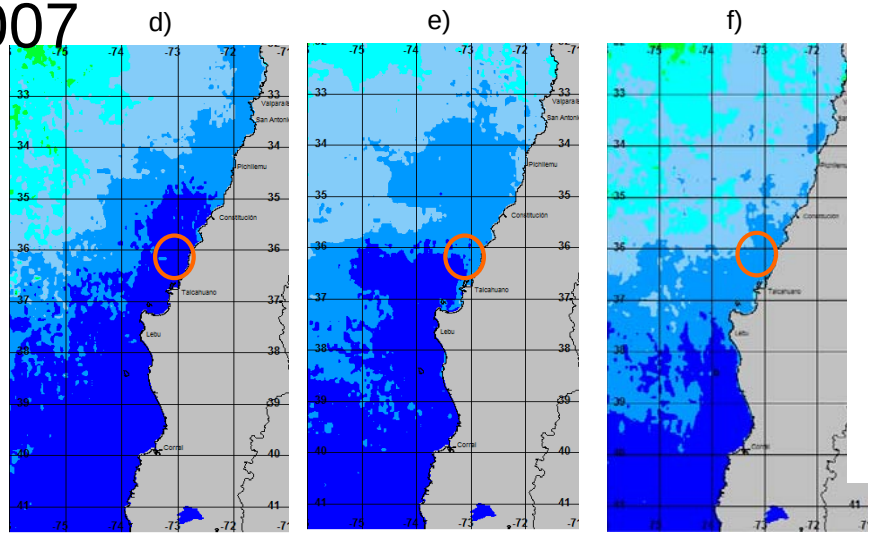
RESULTS

SST

2005



2007

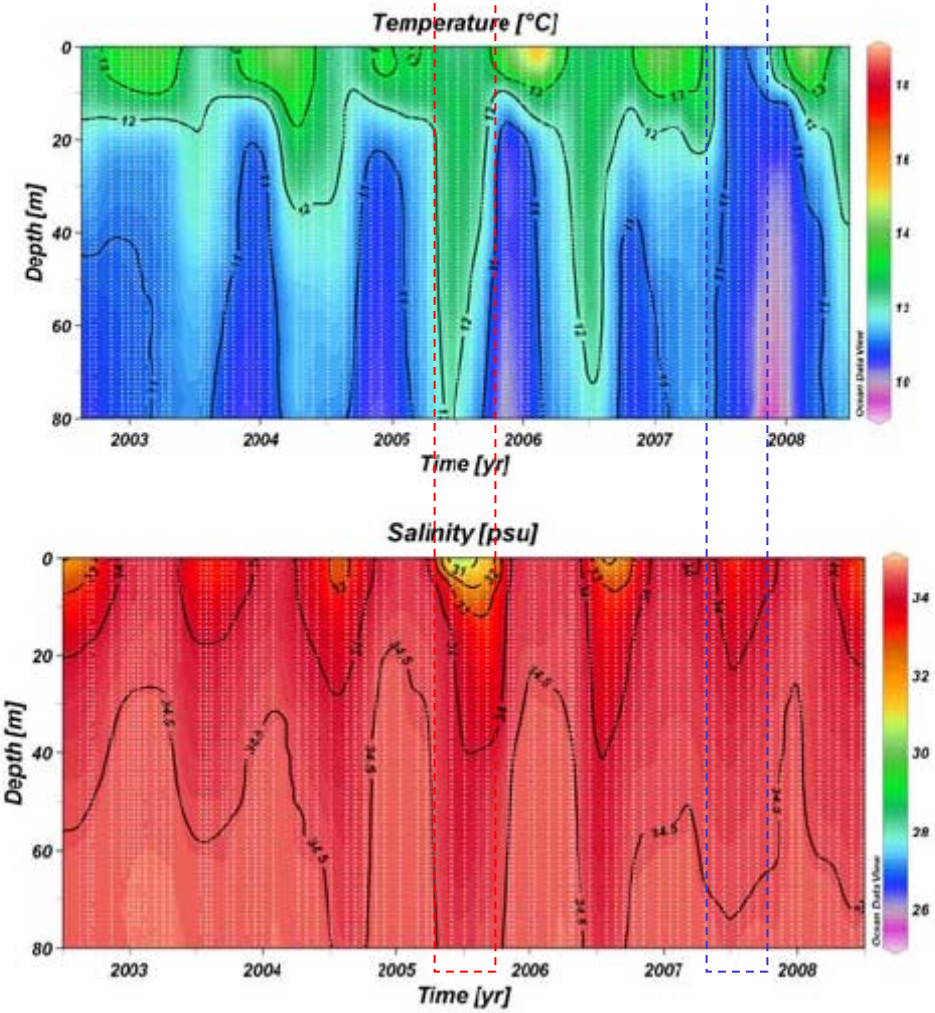


SEA SURFACE TEMPERATURE

10 12 14 16 18 20°C

STATION 18

2005 2007



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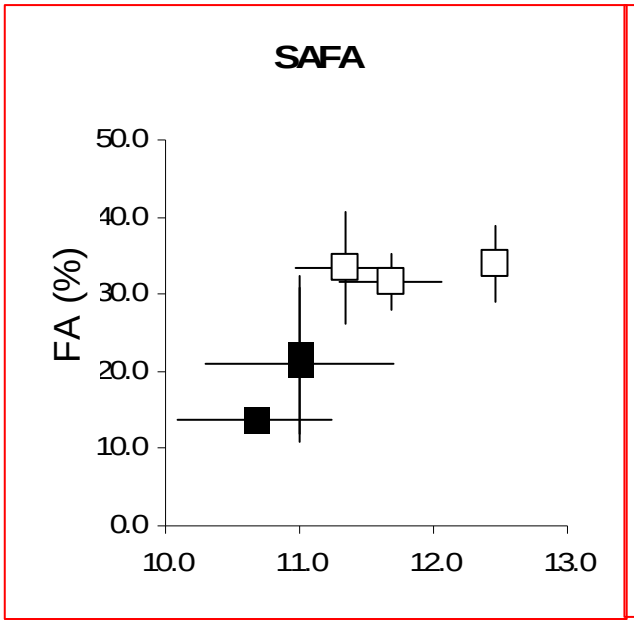
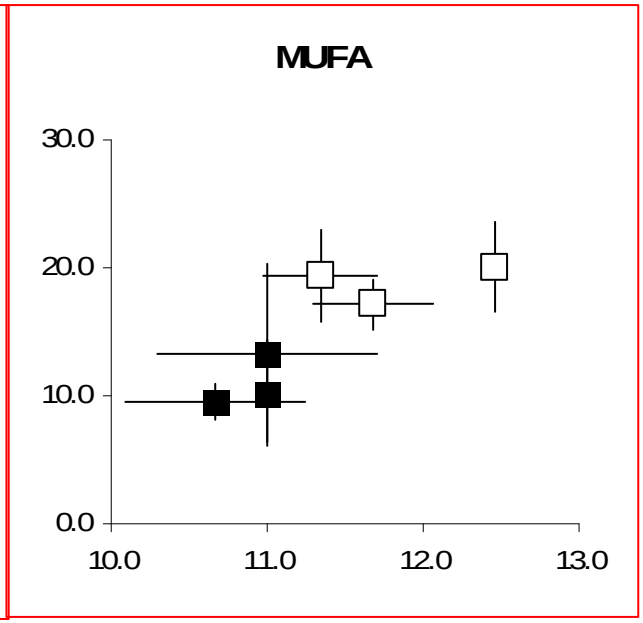
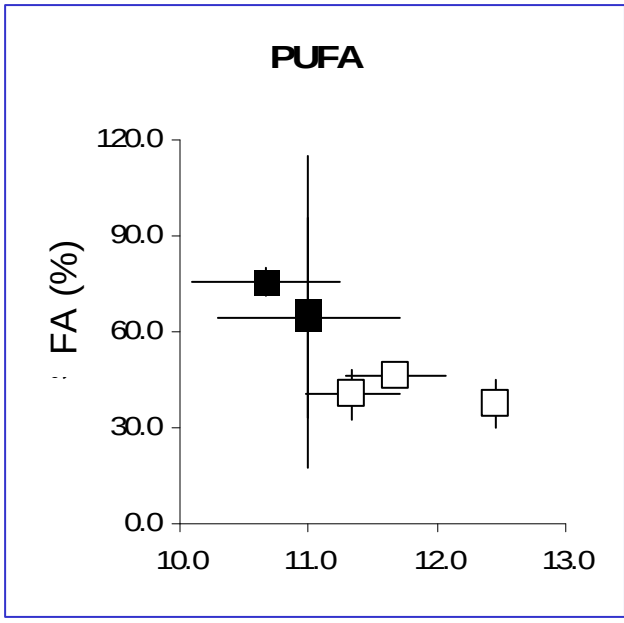
FATTY ACIDS

IN ANCHOVY EGGS

2005 - 2007







SST

□ 2005 ■ 2007

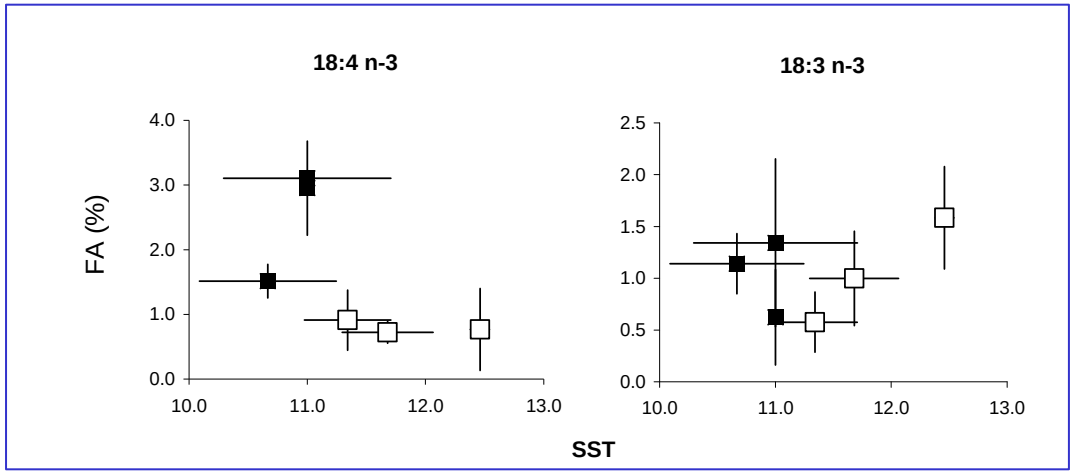
Cambios en calidad de huevos en la zona central de Chile

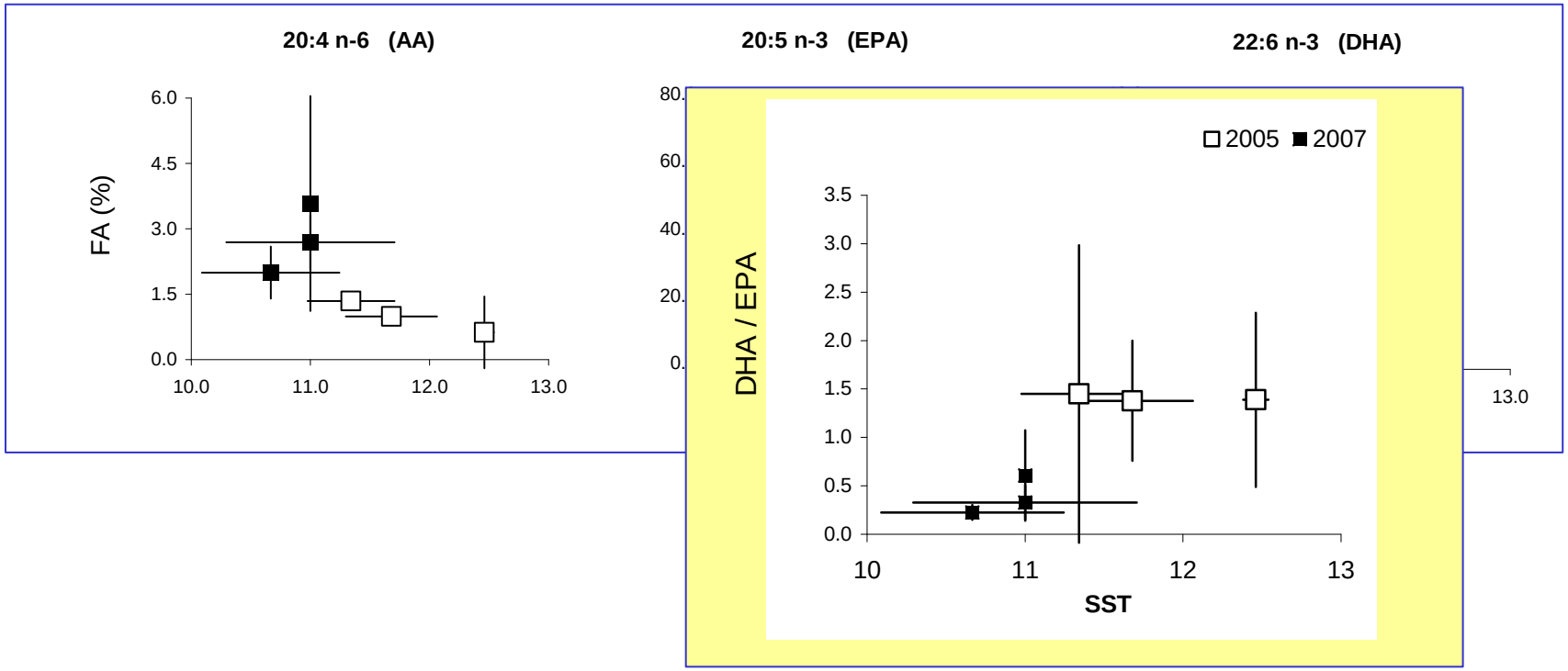
en años con condiciones ambientales contrastantes

PUFA

IN ANCHOVY EGGS

2005 - 2007



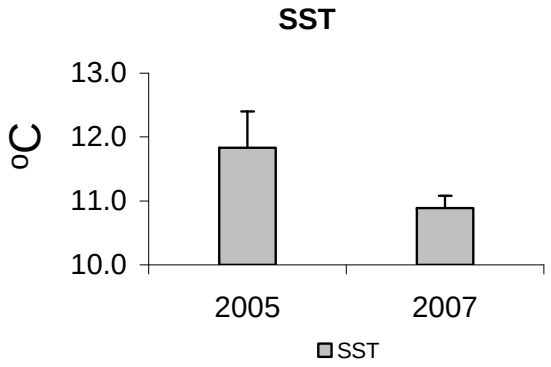


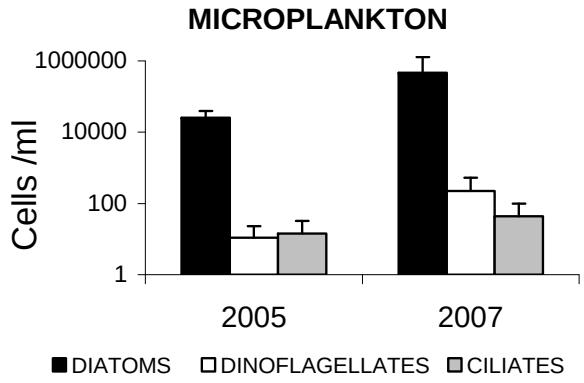
REPRODUCTIVE TRAIT DIFFERENCES BETWEEN SPAWNING SEASONS

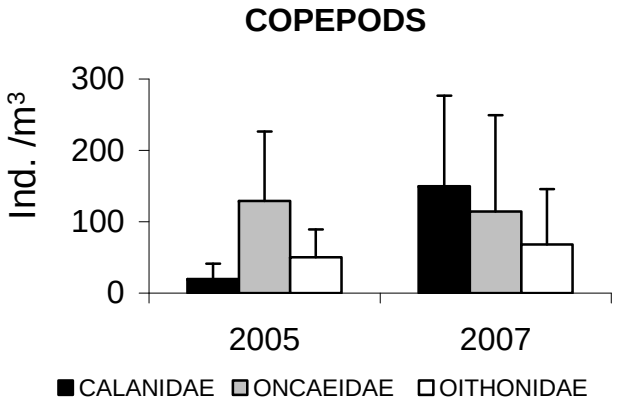
2005 - 2007

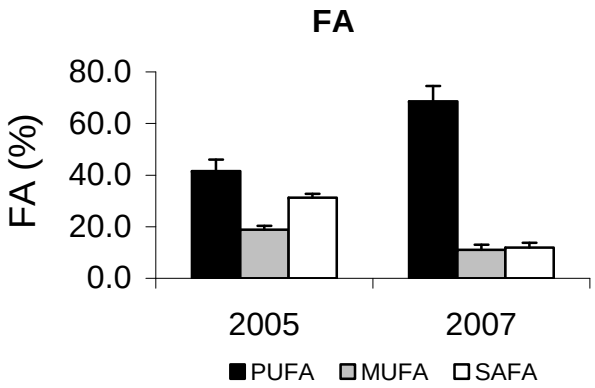
	Ovoc/g ovary (Nº ovoc/g ovary)	Gonad weight (g ovary)	Batch fecund. (Nº ovoc)	Relative fecund.. (Nº ovoc/g fem)	Egg vol (mm3)
2005	3210.0 ± 510.3	1.56 ± 0.786	4921 ± 2288.2	306 ± 78.1	0.336 ± 0.009
2007	2988.7 ± 478.1	3.03 ± 1.12	8903 ± 3102.6	416 ± 90.6	0.377 ± 0.012

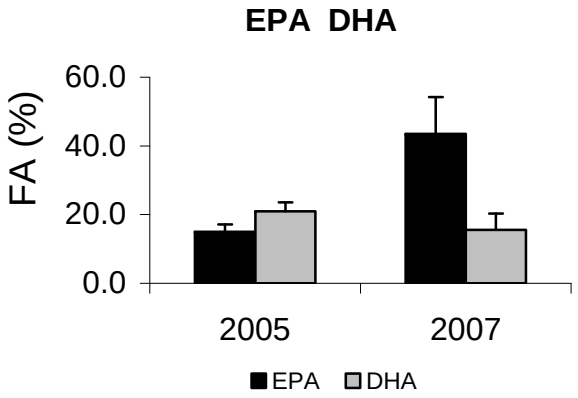
FEEDING ENVIRONMENT

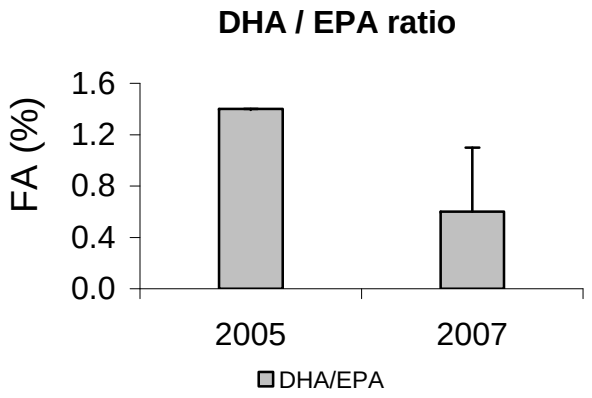












Castro et al. 2010. MEPS 420: 193–205

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2007

TEMPERATURE DECREASE → **DIATOMS** INCREASE → **LARGE COPEPODS** INCREASE (Calanidae) (herbívors) → **SPAWNING ANCHOVIES** GONAD W INCREASE RELAT FEC INCREASE → **ANCHOVY EGGS** PUFA INCREASE DHA / EPA < 1 EGG VOL INCREASE

2005

TEMPERATURE INCREASE → **DYNOFLAGELLATES AND CILIATES** INCREASE → **SMALL COPEPODS** INCREASE (Oithonidae) (Oncaeidae) (carnívoros) (detritivoros) → **SPAWNING ANCHOVIES** GONAD W DECREASE RELAT FEC DECREASE → **ANCHOVY EGGS** SAFA INCREASE MUFA INCREASE DHA / EPA > 1 EGG VOL DECREASE

ENVIRONMENTAL CHANGES THAT AFFECT SPAWNINIG FEMALES MODIFY THE QUALITY OF THE OFFSPRING

VARIATIONS IN LOWER TROPHIC LEVELS AFFECT HIGHER TROPIC LEVELS