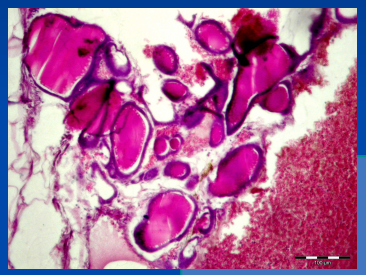
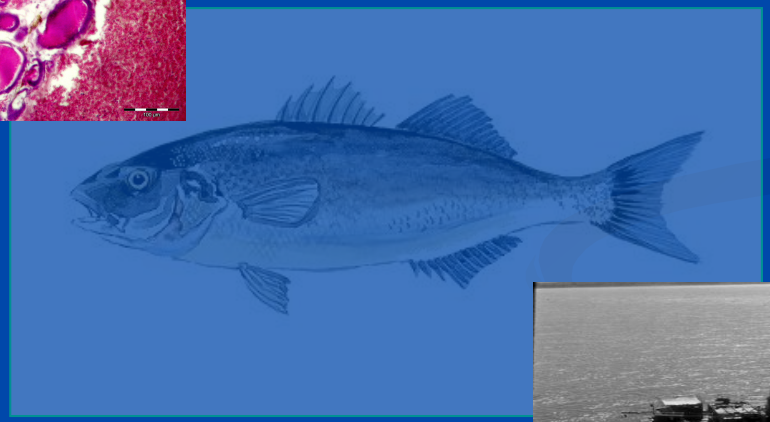
Effects of persistent organic pollutants on the thyroid function of the seabass (*Dicentrarchus labrax*) : An endocrine disruption ?





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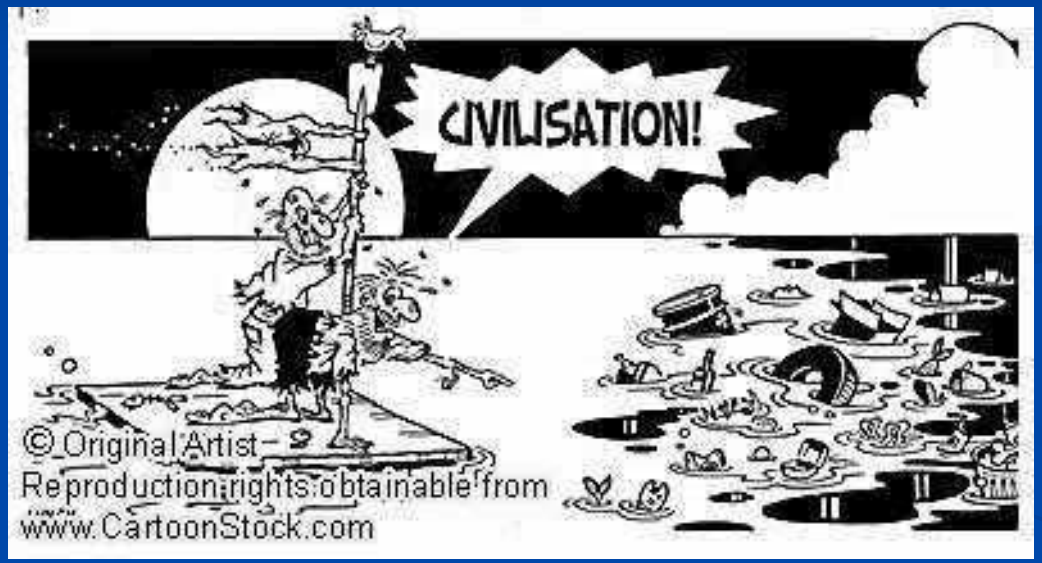
UNIVERSITÉ de Liège

Endocrine disruptors:

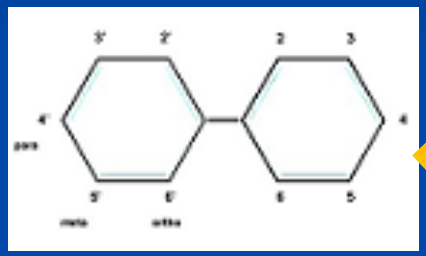
- Synthetic chemicals
- Mimic or block hormones
- Disrupt hormone function



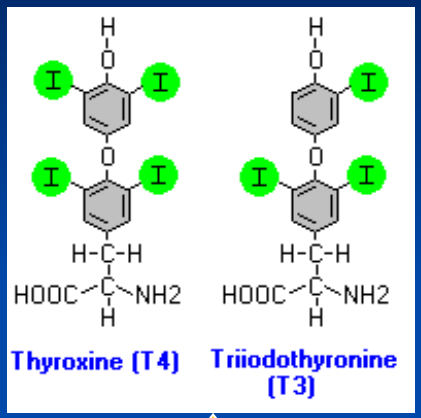
→ Sea as "final sink" for pollution contains high concentrations of endocrine disruption chemicals

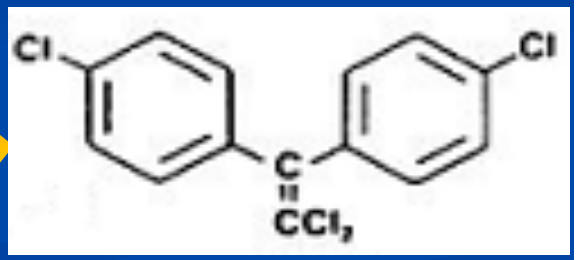
Organochlorinated compounds:

Similar structure as thyroid hormones → may generate an endocrine disruption

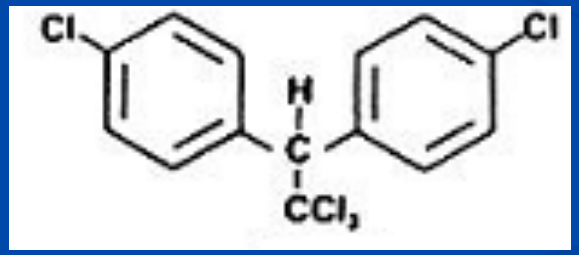


Polychlorobiphenyls (PCBs)





Dichloro-diphenyl-dichloroethylen (DDE)



Dichloro- diphenyl-trichlorethane (DDT)

Thyroid hormones:

Assist in control of

- Osmoregulation,
- Metabolism,
- Somatic growth,
- Development and
- Post hatching metamorphosis

→ Potential source of economic loss in aquaculture and fishery

Target species:

Seabass (*Dicentrarchus labrax*)

- Teleost fish
- High economic value, readily available and easy cultured
- Well known sentinel species
- Implication with human health

Sampling area:

North East of Greece, Prefecture of Kavala

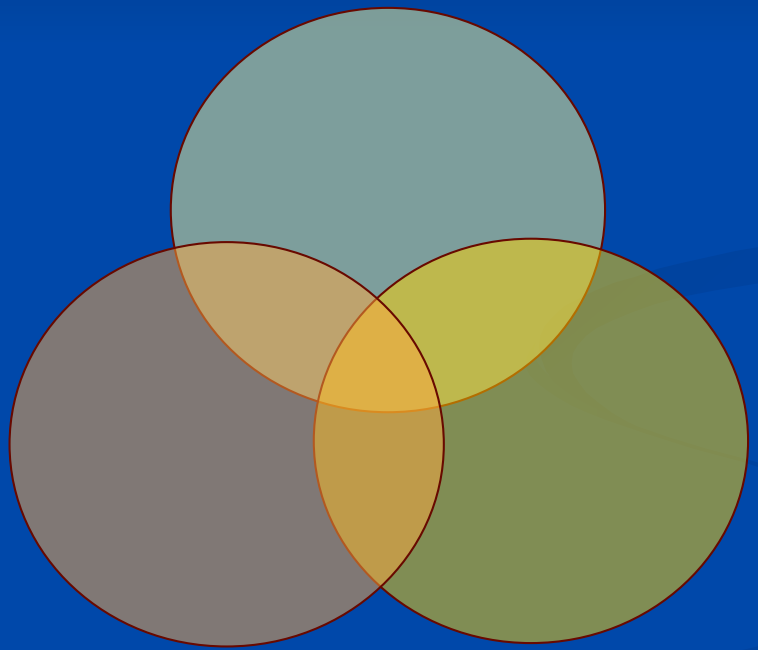
- 15 wild individuals

- 31 individuals from aquaculture

The aim of this study was:

to evaluate the concentrations of organochlorinated compounds and to assess their effects on the thyroid function

Concentration of PCBs and DDTs



Histomorphometry of thyroid tissue

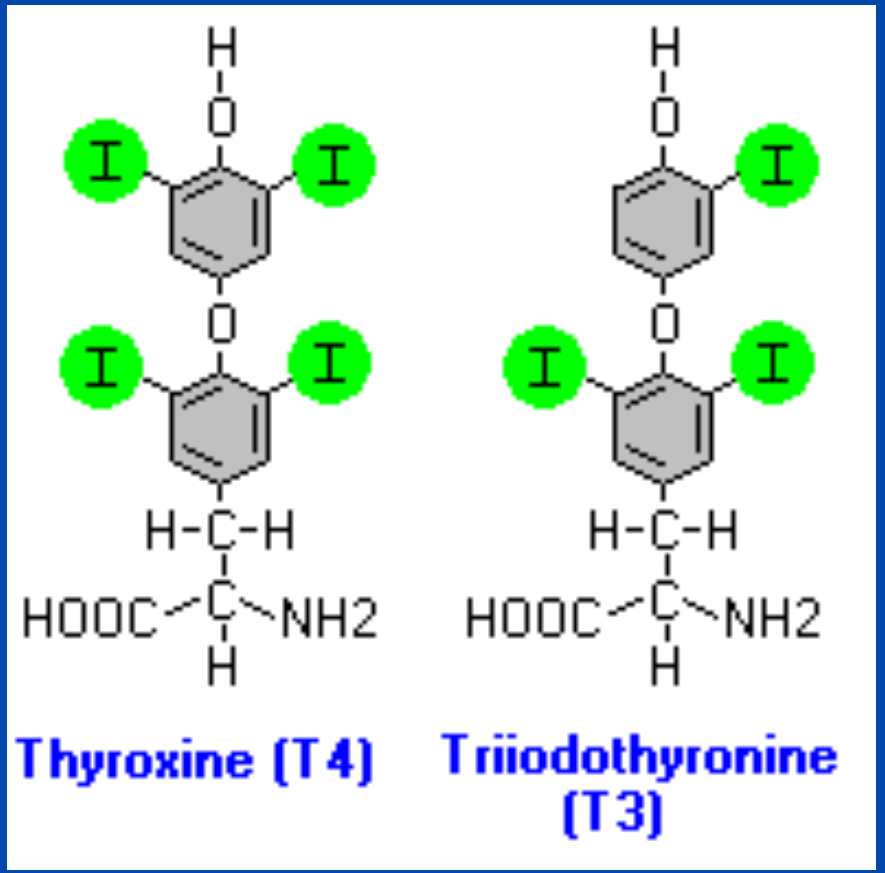
Muscular TH concentration

Thyroid parameters:

Muscular thyroid hormone concentration and follicle histomorphometry

- Muscular thyroid hormone concentration via RIA → secretion activity of the thyroid

- Histomorphometry: Follicle diameter and epithelial cell height → production activity of the thyroid



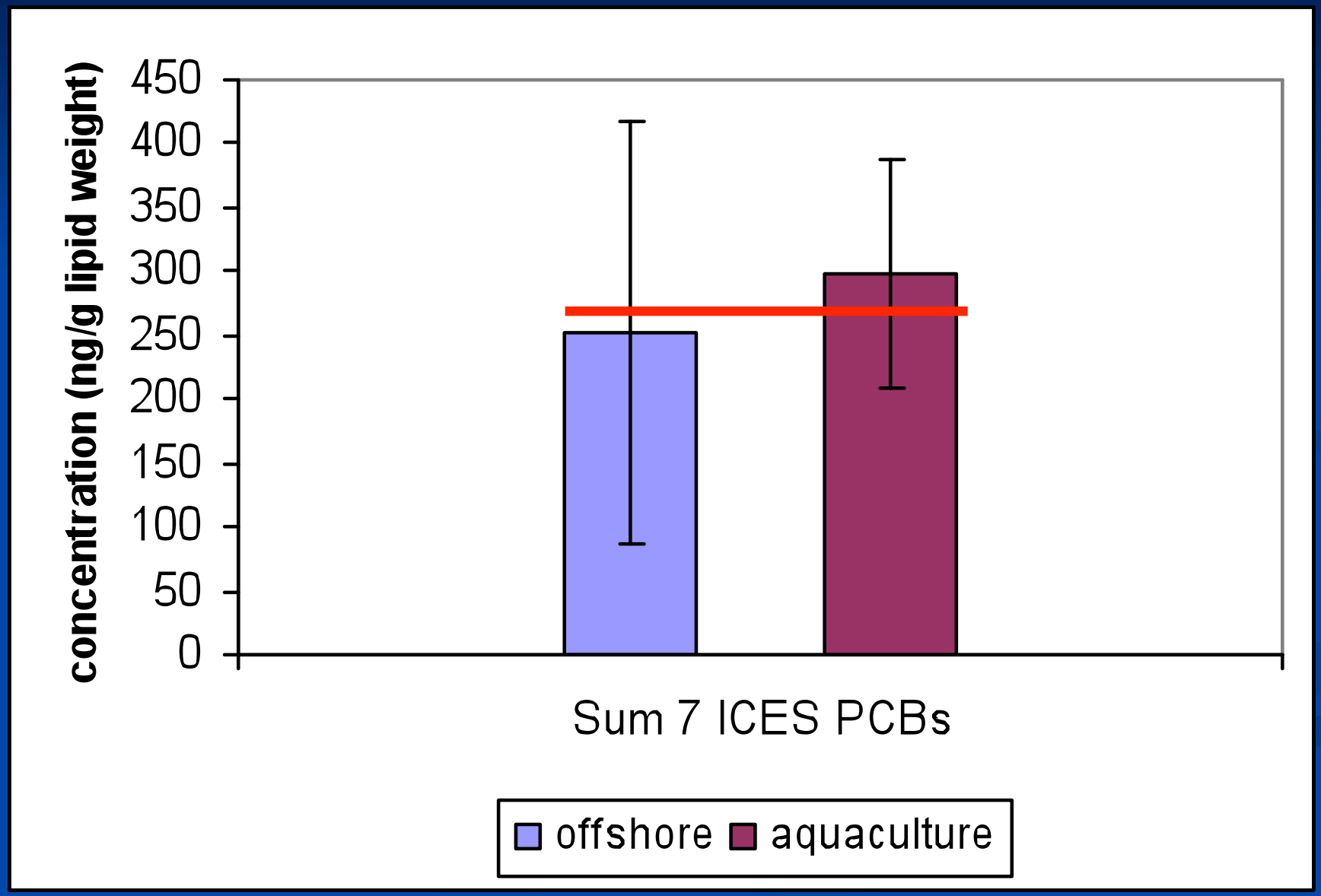
Results and discussion

A. Toxicological analysis

B. Relation with the thyroid parameters

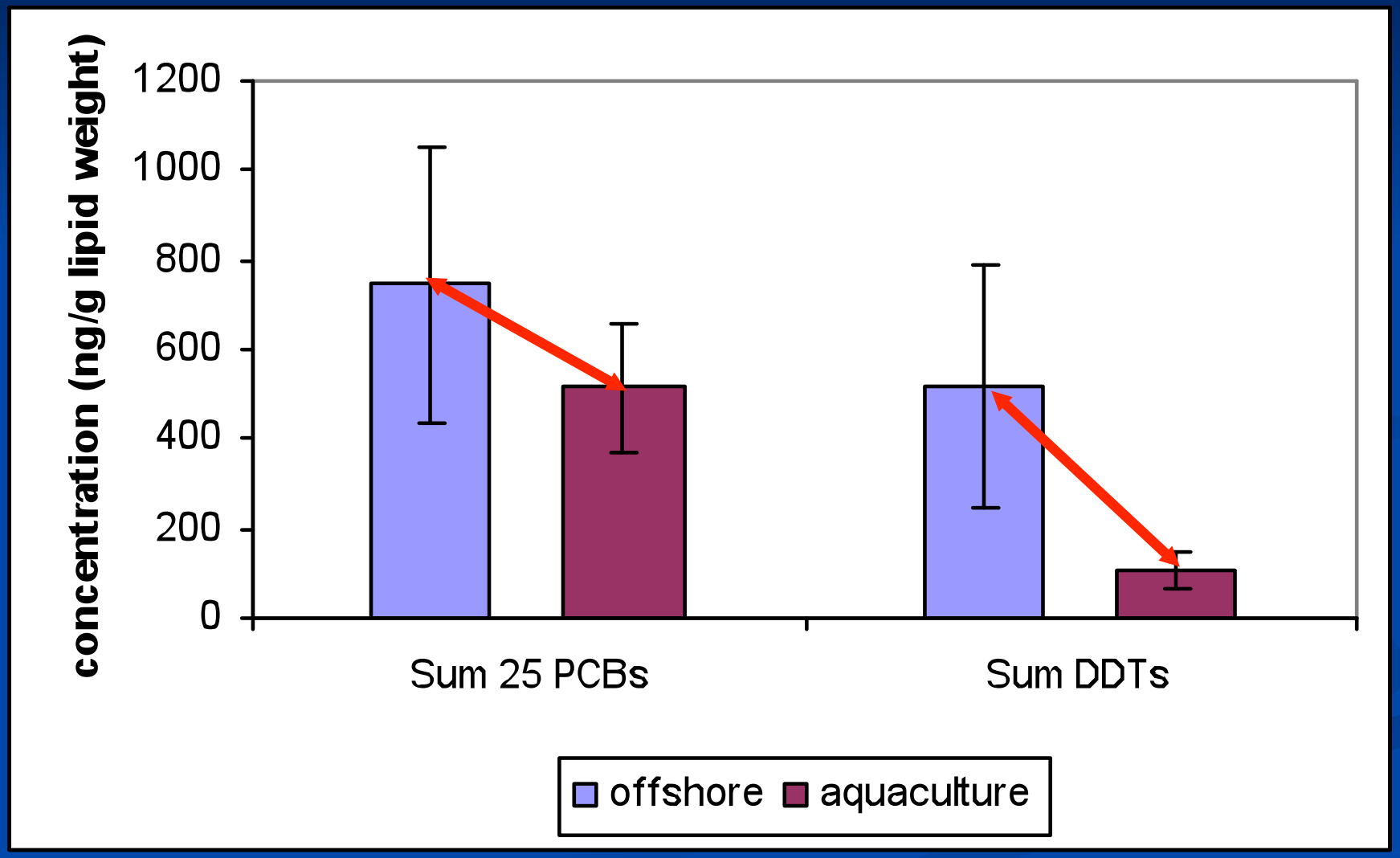
Comparison between sampling sites:

No significant differences in 7 track PCBs concentrations



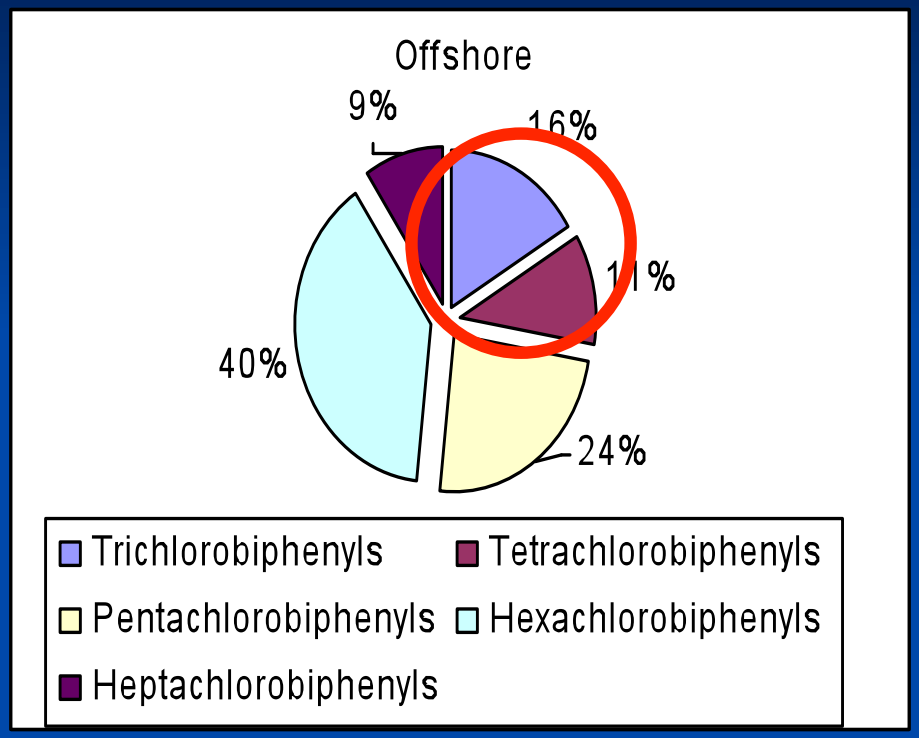
Comparison between sampling sites:

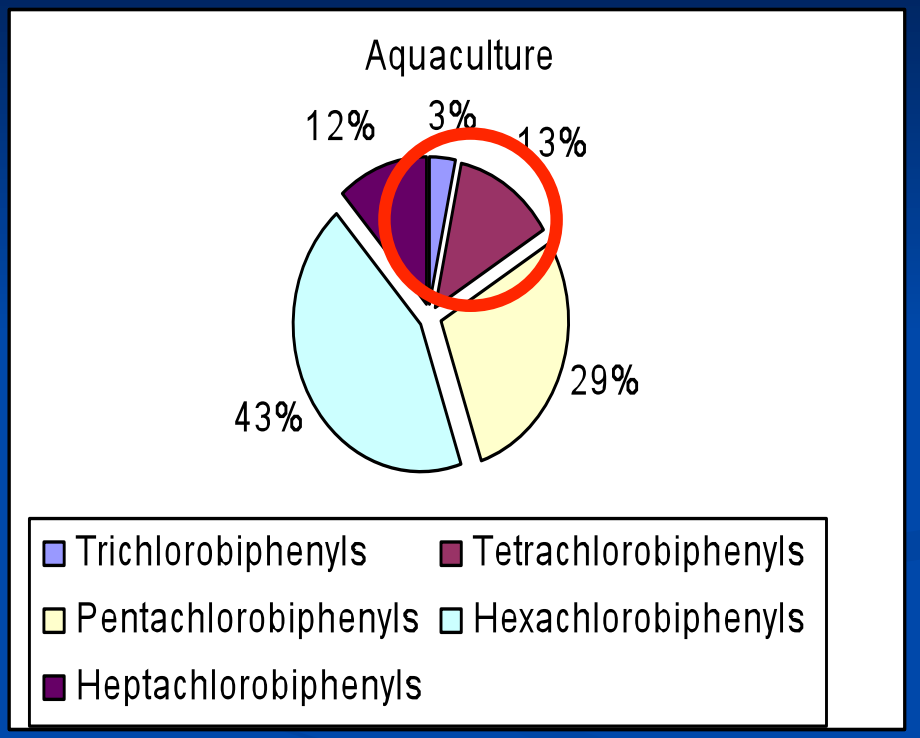
General higher contamination in wild seabass



Comparison between sampling sites:

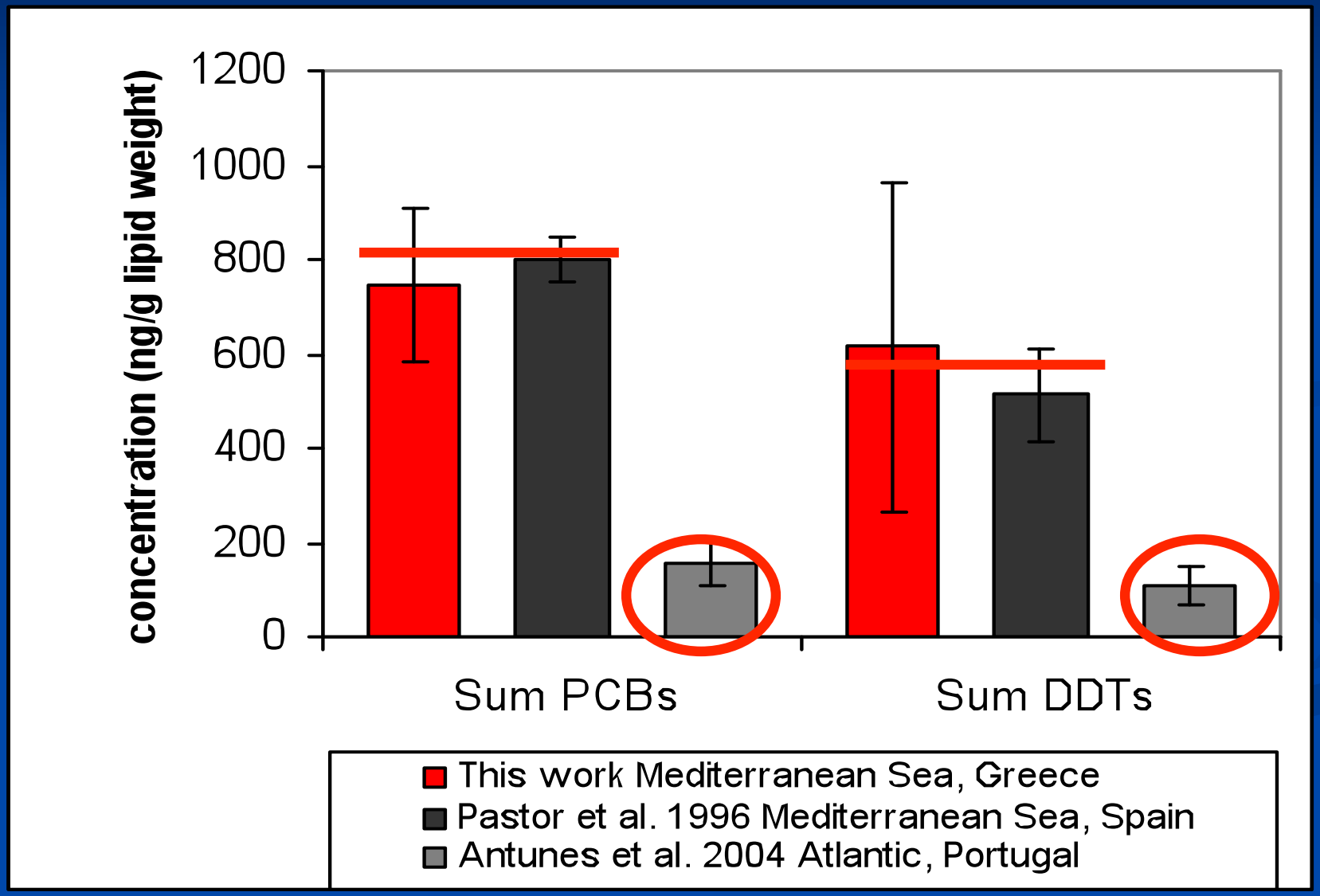
Differences in PCB contamination pattern





Comparison to results in literature:

High levels in the Mediterranean Sea, no reduction the last 10 years



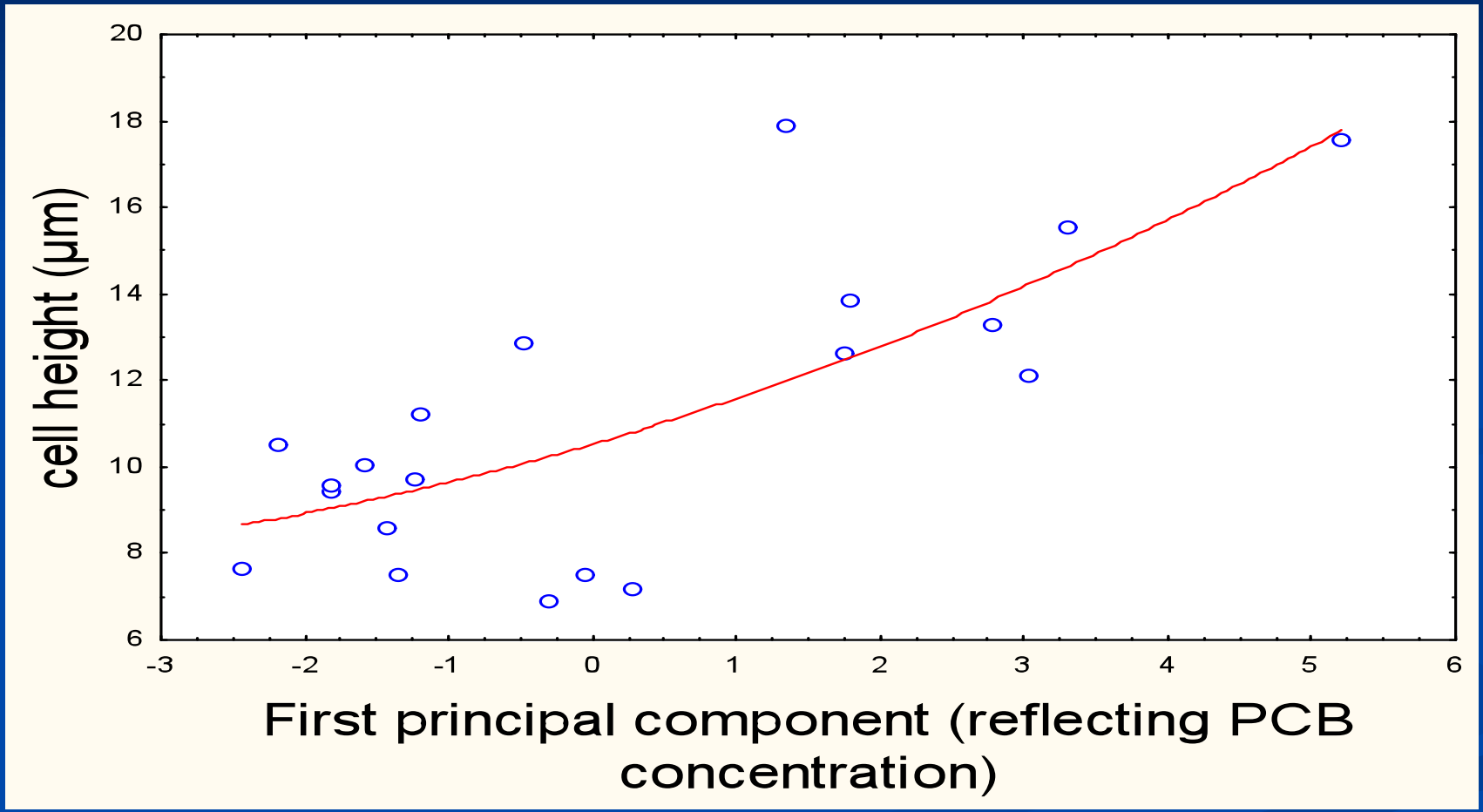
Results and discussion

A. Toxicological analysis

B. Relation with the thyroid parameters

Relation with the thyroid histomorphometry:

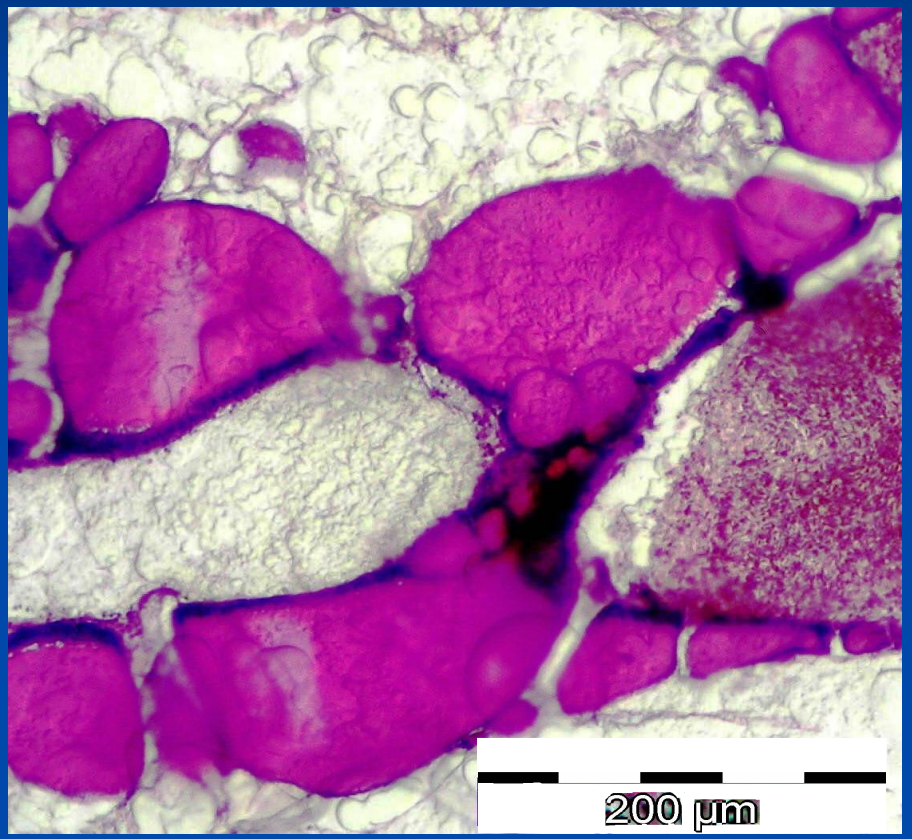
The epithelial cell height increases with the organochlorinated pollutant concentration



→ Thyroid hyperactivity

Relation with the thyroid histomorphometry:

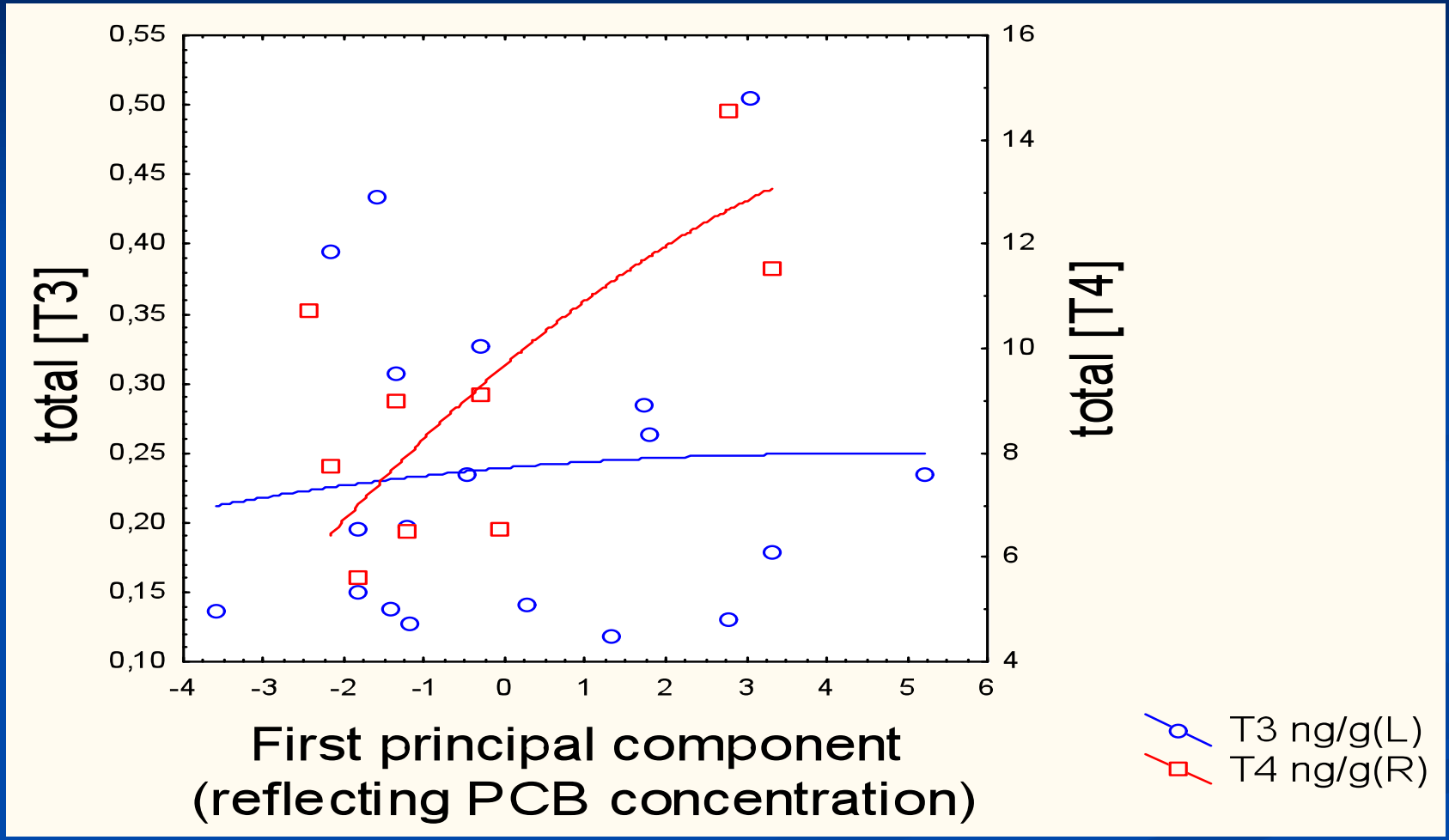
Large follicles surrounded by flattened cells



Small follicles surrounded by high, cuboidal cells

Relation with the thyroid hormones:

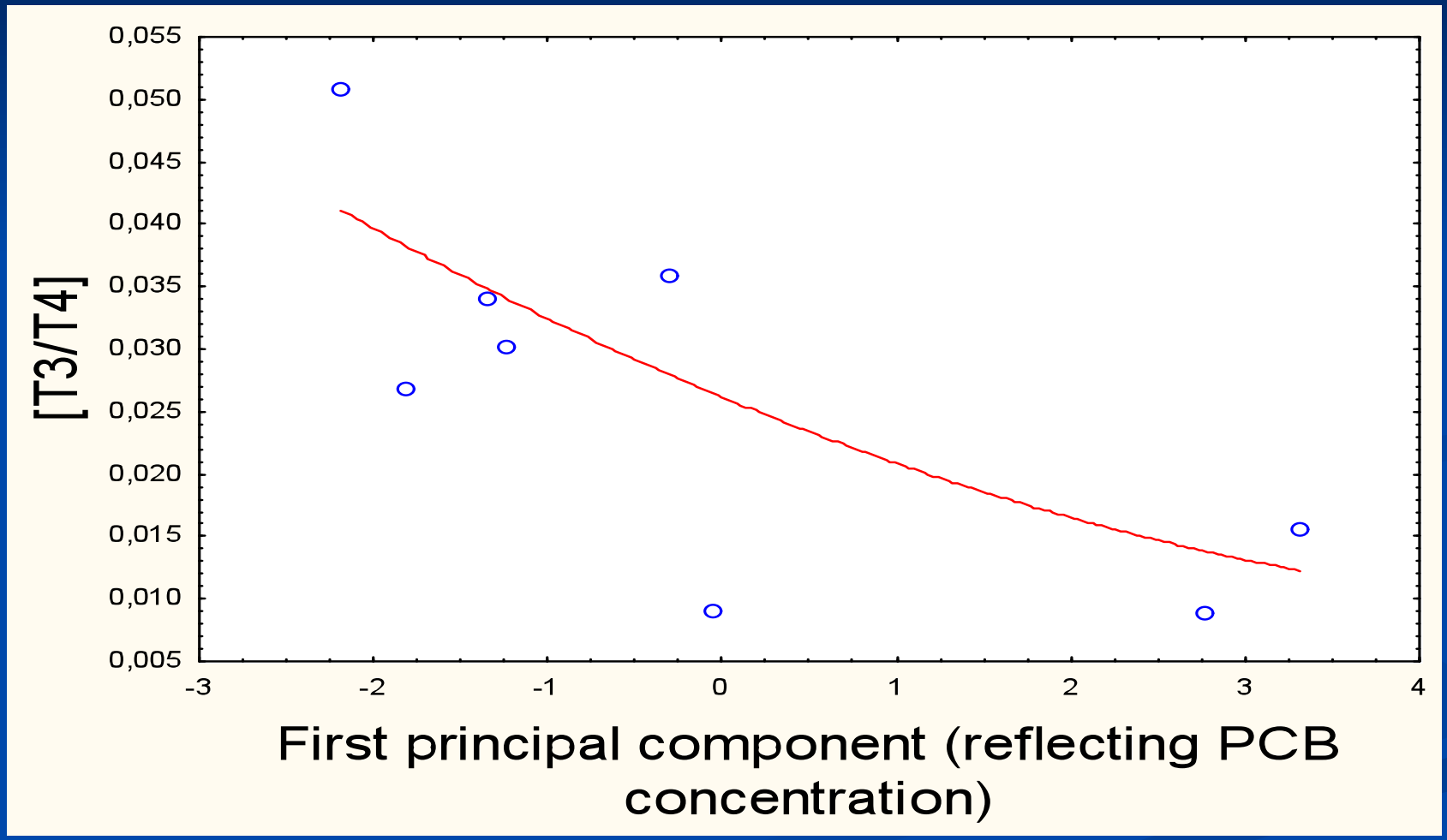
The stimulation of the thyroid follicles result in an increase of the T4 concentration while the T3 concentration is not affected



T4 regulated by brain-pituitary-thyroid axis,
T3 by deiodination in peripheral tissues

Relation with the thyroid hormones:

Disorder of T3/T4 ratio → indicator of thyroid dysfunction



Conclusions

- Considerable levels of organochlorinated pollutants
- Wild seabass more contaminated
- High levels in the Mediterranean
- No signs that the levels sunk during the last 10 years
- Significant correlation between the pollutant concentration and the thyroid parameters
- Hyperactivity maybe induced by pollutants

Endocrine disruption ?

Acknowledgements

I wish to thank all persons who contributed to this work:

- Fisheries Research Institute, Kavalla, Greece
- Forschungs- und Technologiezentrum Westküste (CAU), Germany
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- Laboratoire d'Océanologie (ULg), Belgium