Recommendations for evaluation of the health status in cultured and wild shellfish: *Perkinsus olseni* infestation in clams as an example

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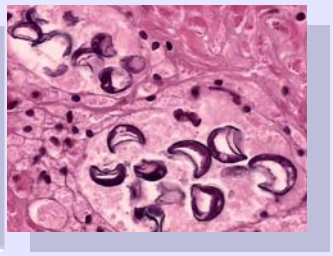
Enhancement and sustainability of shellfish resources

Aquatic animal diseases are an important constraint to sustainable aquaculture development. Shellfish pathogens can be introduced from farmed shellfish by restocking practices or could be present in the wild populations acting as carriers or reservoirs. Possible exchange of pathogens between wild and farmed shellfish is of great concern because both populations are sharing the same marine environment. Outbreaks could consequently impair the economical value of aquaculture activity and reduce the biodiversity of the marine environment.

An up-to-date knowledge of the epidemiological status of diseases is becoming increasingly essential in health policy decision making. These data must to be adequately collected to give accurate information on presence or prevalence of a pathogen or a disease by avoiding bias. After reviewing epidemiological methods currently used in field studies to evaluate occurrence of *Perkinsus olseni* in clams, we propose recommendations for a basic methodological design to conduct an epidemiological survey.



Perkinsus olseni is a Protozoan responsible for perkinsosis, **notifiable disease to the OIE and EU.** The host species are Clams (*Ruditapes philippinarum*, *R. pullastra*, *R. decussatus*, *Venerupis aurea*, *V. pullastra*) and Abalones (*Haliotis laevigata*, *H. cyclobates*, *H. scalaris*, *H. ruber*).

Methods

The epidemiological methodology of 12 surveys conducted worldwide and published between 1992 and 2005, including two unpublished studies realized in 2004, were analyzed using a framework of criteria:

Objective of the survey: **Detect pathogen** / **Estimate pathogen prevalence** — both including evaluation of the **infection intensity**

Targeted population

Sampling methodology

Sample size

Diagnostic accuracy

Pathogen characterization

We focused only on epidemiological methodology developed to evaluate the occurrence of Perkinsus olseni.

Other objectives (i.e improvement in methodological tools, histological description of the parasite,….) were not investigated. For published references, the quality of the documents was already evaluated by peer review.

Results and Recommendations

Results

Recommendations

Targeted population

Population about which information is required and from which a sample is drawn

Studied populations are inaccurately defined and rarely estimated

Define the population on shellfish density and adjust accordingly the sampling methodology

Sampling methodology

- **Non Probabilistic:** well adapted for detection of pathogen/disease. Then focus on the weak animals (but when nothing is known about the health status of a shellfish population, it is better to choose a probabilistic method)
- **Probabilistic:** necessary to estimate a prevalence:
  - Simple
  - Systematic
  - Stratified: simple or systematic
  - Cluster: simple, systematic or stratified
  - Multistage = systematic, then cluster

Including "when" and "where": number of days, tidal situation, season

Never or insufficiently described

As probabilistic as possible. Except for detection of pathogen: could be non probabilistic

Characterisation of the pathogen

Additional tool to demonstrate the pathogen species (related with Specificity)

Not still systematically included in epidemiological studies, cost and time consuming methodology

Powerful methodology to demonstrate evidence of pathogen exchanges between wild and cultured aquatic animals

Surveys	Objectives of the survey	Targeted population	Sampling methodology	Sampling size	Diagnostic accuracy	Pathogen characterization
1	P I	W C				ND
2	P I	W C				ND
3	P I	W				ND
4	P I	W				ND
5	P I	C				ND
6	D	C				ND
7	P I	C				ND
8	D	W				
9	D	W C				ND
10	P I	W				ND
11	D I	W C				ND
12	P I	W				ND

D: Detection P: Prevalence I: Infection intensity
W: wild C: cultured ND: Not done

Not accurate
Not enough precision
Accurate

Sample size

- **To detect disease:** based on a minimum expected prevalence with a 95% level of confidence
- **To estimate the prevalence:** based on an expected prevalence (previous data) or if you know nothing of 50%, with a acceptable precision of ± 5 or 10%
- **To estimate an average level of infection,** based on an expected standard deviation or accepted error

Generally inaccurately calculated

Sample size must be calculated according to the survey objective (if more than an objective, retain the most important value)

Diagnostic of test

To estimate the prevalence, you need to adjust the apparent prevalence (= clam+) with the **sensitivity** and **specificity** values of the analytical method to get the real prevalence.

Quantitative values of sensitivity and specificity of current analytical methodologies are unknown

Specific studies must be developed to calculate these values. If no information is available, be prudent with the conclusion and the terminology you use : it is an apparent prevalence

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