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Round Table 2 of the International Conference on *Ostreopsis* Development: Environmental, Health and Economic management, state of the art and perspectives

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The roundtable gathered the following speakers: Katerina Aligizaki, Asmae Bennouna, Raffaele Siano, Nicola Ungaro, Magda Vila and was moderated by Rosella Bertolotto and Hubert Grossel.

The organization of the ICOD meeting provided a list of seven questions to be addressed by the speakers in the roundtable. These questions have been approached sequentially, as reported below.

1) Concerning an environmental monitoring, should we follow planktonic or epibenthic (or both) *Ostreopsis* abundances?

All the participants agree that the optimum would be to sample both planktonic and benthic cells. But if we have to choose, the priority should be given to the benthic abundances, as they represent the stock of planktonic cells. The quantification of benthic cells is generally considered more difficult, as trained personnel is needed for the identification of the macroalga and sometimes it is not easy to find the same macroalgal species in all the sites, in order to have comparable results. Nevertheless, benthic abundances can be quantified very quickly, as they do not need generally to be sedimented in Uthermol's column as in the case of planktonic abundances (which causes a delay of the result of at least 24 hours).

It is suggested to couple the benthic quantification to a visual estimation of the mat and of the mucilaginous aggregates, but these features of blooms are very variable and sometimes also diatoms can produce similar mats. So the visual estimations have to always be coupled to cells abundances quantification.

The use of artificial substrates is suggested, but could pose some problems in sites with high hydrodynamism and/or be removed/damaged by people.

The sites where a monitoring should be implemented in priority are beaches and sea-farms.

2) Which is the best period for monitoring *Ostreopsis*?

All the participants agree that the best period to monitor *Ostreopsis* for the bathing season is from June to October included (based on the synthesis proposed by Mangialajo *et al*., 2011). For the sanitary monitoring (e.g. mussels, urchins, sea-farms) the period may be extended, see roundtable n.1.

3) Which are the sampling strategies used around the Mediterranean Sea?

In France, only the planktonic abundances are monitored by local representatives of Health Ministry (2 beaches per department, twice a week during the summer season), while aquaculture activities are followed by Ifremer (mainly close to oysters and mussels farms, but recently also close to important harvesting sea-urchins areas, with a toxicity survey on the the sea-urchins, during the fishery period: october-may).

In Catalonia at present there is no official phytobenthos monitoring; only the planktonic abundances are quantified on 14 beaches twice a month during the summer season and once a month during the rest of the year. Additional 9 sites are located in harbours (sampled year-round) as an early-warning system of bloom detection. However, this early detection system which has been useful to control plankton blooms is not applicable to benthic ones. The monitoring program is done by ACA-ICM. More sampling on seawater is done near seafarms by DARP-IRTA.

In Greece there is no official monitoring; until now 52 sites have been sampled for epiphytic, planktonic and "sand-welling" abundances in the framework of a research project. Seawater sampling is performed near seafarms in the frame of the routine monitoring for potentially toxic phytoplankton producing marine biotoxins, while an effort is being made in order to expand the routine monitoring to epiphytic samples as well, especially during the summer and autumn periods.

In Italy the monitoring is done by regional agencies, following official guidelines. Local authorities decide the number of sites and the period of monitoring, according to regional needs and available resources; there is also a national coordination by ISPRA (Italian central Institute for Environmental Research). Also in Morocco there is no official monitoring. Samples are collected exclusively near seafarms.

Concerning the strategy, some participants think that it would be good to have an official and standardized monitoring concerning both benthic and planktonic abundances. Others think that the monitoring should be planned on a regional basis and suggest the use of more forecasting. The forecasting would allow to delocalize the alert from a single spot (the sampled one) and to avoid the closure of a beach when neighbor beaches, with similar conditions and potentially similar blooms, are still open. Some examples of delocalized forecasting are pollen monitoring/surveillance and avalanches forecasting.

One of the major problems at present is that we have not enough data and we should couple research and monitoring in order to build time series data to find relations with environmental variables and run forecasting models.

4) Which different *Ostreopsis* abundance thresholds are used around the Mediterranean Sea?

The present *Ostreopsis* abundance thresholds are based exclusively on planktonic abundances. The participants agree that thresholds should be based on benthic abundances.

In Catalonia the thresholds are of 5000 cells/l for a warning and 10000 cells/l for an alert.

In Italy the threshold is of 10000 cells/l for a warning, then the monitoring is increased (this threshold is still based on the observations of Genoa outbreak in 2005; the following researches performed on toxicity levels did not allow to refine the thresholds).

In France, for bathing activities, the thresholds are of 30000 cells/l (warning) and 100000 cells/l (alert). At the beginning the thresholds were lower (respectively 4000 cells/l and 30000 cells/l), but beaches closures were too frequent and thresholds have been increased to the new values (except for the aquaculture zones where the threshold is still of 4000 cells/liter).

In Morocco and Greece there is no official threshold for *Ostreopsis* abundance.

5) How should we react when *Ostreopsis* abundances exceed the thresholds?

At present there is no articulated and fixed strategy in the impacted countries. The most common reaction to exceeded thresholds is closing beaches or limiting recreational activities. The communication is not really structured, although it has been evidenced that a "catastrophic" communication can have negative economic impacts in tourist areas.

The forecasting like avalanches risk or pollen reports may be a good alternative to the real alarm thresholds: authorities could give to the citizens the main periods/zones at risk for *Ostreopsis* development, in a delocalized way. The problem would therefore become a " natural " phenomenon and the habits of beach-goers would simply change in function of the risk level (in the days at high risk it would be counseled, for example, to avoid bathing and to limit the exposure in the very first meters of the beach, especially if the day is windy and there is marine aerosol in the air).

6) Which structure is in charge of *Ostreopsis* monitoring in the different involved countries?

In Italy and Spain the monitoring is managed at the regional level, while in France, Greece, and Morocco at the national level (Ministries of environment, of food and agriculture or of health).

The EU Directive on bathing water (2006) advises to put in place a specific surveillance in sites prone to toxic algal blooms, which justified the adoption by Italian Health Ministry of official guidelines on managing *Ostreopsis* blooms. Also, in the framework of the Marine Strategy Directive, the water masses quality will take into account the presence of introduced and toxic species. When this directive will be applied in the Members states, *Ostreopsis* will probably be taken into account.

7) Do we really have a good estimate of socio-economic impact of *Ostreopsis* development?

No, the first study on this topic was performed in the framework of the MediOs project in France. See Lemée *et al.* (same issue) for a preview of the results.

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