First report on the population of gelatinous zooplankton around the French Caribbean islands (Guadeloupe and Martinique)

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As part of the Prolitensan project, zooplankton gelatinous species composition and distribution pattern along the Atlantic and the Caribbean shores of the Guadeloupe and Martinique Islands was investigated for the first time using snorkeling (September and January/February 2014) and surface net sampling (January-February 2014). Around Martinique, seven stations on the West/South sector of Caribbean shore between Fond Boucher and Le Marin were sampled while the Atlantic shore was sampled only inside the reef due to weather constrain between Baie du Francois and Trou Cochon (7 stations). Guadeloupe waters were also investigated between Pointe Noire and Basse Terre on the West shore and between Rivière Salée and Sainte Rose for the East shore (10 stations). Surface horizontal hauls were rich in zooplankton with large population of decapod larvae (Squille and Lucifer larvae and Pontellidae copepods) and gelatinous zooplankton (siphonophores, hydromedusae, ctenophores, salps and chaetognaths). Large scyphozoans (*Aurelia* sp. and *Cassiopea* spp.) were also observed by mean of scuba diving. Characterization of the relationships between gelatinous zooplankton presence and human activities (professional and recreational uses of the shores of the two islands) was also conducted thru sociological interviews (N=80).

Introduction

Ecological issues dealing with blooms organisms and associated processes are exacerbated or more complex in coastal areas. As pointed out by literature, the coastline as an interface between land and sea is characterized by strong anthropogenic pressure (i.e. urbanization, population growth, economic and humane activities such as tourism) on environement with strong ecological issues (i.e. biodiversity, endemisms, populations and habitats dynamics,...). In addition, the question of relationships between environmental and health issues are particularly strong along the shores. High urban densities significantly affect natural environments and species blooms cause higher health risks when their natural environments are weakened and human populations are increasingly concentrated along the shoreline. These blooms affect temperate as well as tropical areas.

These processes of proliferation require to take into account different temporalities (seasonality, irregularity and plurality of time scales), but also different spatial scales (from micro - to the macro-scale). It's therefore crucial for the researchers to propose to social actors and decision-makers contrasting scenarios in a perspective of decision support. The PROLITENSAN project will focus on the analysis of the proliferation of a terrestrial taxonomic group, mosquitoes and two marine groups gelatinous zooplankton and microalgae along the Mediterranean coast and the French west Indies (Guadeloupe and Martinique).

The gelatinous zooplankton (scyphozoans, siphonophores and ctenophores mainly) form large swarms along the shore of the French Mediterranean shore, with subsequent impacts on tourism, fisheries, fish aquaculture and cooling systems. Very little is known on the gelatinous population found the other side in the Atlantic and Caribbean waters around the French islands of Martinique and Guadeloupe.

Here we present new data on the species composition of the zooplankton with a special emphasis on the gelatinous taxa collected in two contrasting seasons (Sept 2013 and Jan/Feb 2014) as well as the first results of the sociological survey.

Materials and method

Gelatinous zooplankton

- Presence of large conspicuous scyphozoans was done by conducting snorkeling survey in 32 different sites along the Atlantic and Caribbean's coasts of Martinique and Guadeloupe. When jellyfish were present, all or ~10-15 individuals were collected, general conditions, size and weight were reported, and samples (oral arms, bell and palpons) for genetic analysis preserved.
- In January/February 2014, plankton samples were also collected at 24 stations (14 in Martinique and 10 in Guadeloupe) using a small 200µm surface net. Samples were check directly on board for the presence of fragile ctenophore (i.e. *Mnemiopsis leidyi*) before preservation (~4% formalin/sea water solution final concentration).
- Once back at the lab, whole zooplankton communities were identified using a dissecting microscope down to genus or species level.

Sociological survey

- Interview grid was made by the sociologist after coordination with the team of oceanographers and addressed several themes dealing with knowledge, management solution, inconveniences or interests regarding presence of gelatinous zooplankton
- 40 interviews were conducted in Martinique and 41 in Guadeloupe
- Interviews done in creole were then translated
- The whole set of interviews will be then submitted to a thematic analysis using N'Vivo software. Common and specific traits will be then extracted allowing a comparative studies of the different areas.

Results and Discussion

Only two species of large scyphozoans were encountered during the two surveys, *Aurelia* sp. and *Cassiopea andromeda*. While all Cassiopea were found in harbor or protected area in both surveys and in both Martinique and Guadeloupe, Aurelia were only sampled in September in Guadeloupe in the southern sector of Guadeloupe over a large sandy bay. Other large conspicuous jellyfish were mentioned during the sociological survey during different labels ("brulants", "galeres"). The lack of knowledge on the species composition around those two islands is limiting our capacity to recognize the underlying organisms. Nevertheless *Physalia* sp. as well as *Pelagia noctiluca* have been reported by fishermen and sea goers.

Cassiopea andromeda specimen recorded displayed different color morphs (yellow, green, light and dark blue) and grey, with no spatial or temporal differences observed along the two islands. As observed by Lampert et al (2012) colors of the morph and clade distribution of the symbionts do not correspond. Animals ranged from 5.3 to 13 cm in diameter and with a weight wet from 51 to 934g (average 317g) in accordance with Stoner et al (2011). The large numbers of upside-down jellies observed in some harbors (>100 ind per linear meter) might have an impact on the functioning of the coral ecosystem through the release of large quantities of mucus filled with nematocysts as well as organic matter (Niggl et al 2010).

Overall zooplankton composition both in term of crustaceans and gelatinous zooplankton match those previously described by Parra-Flores & Gasca, 2007, Markez et al., 2009, Jacobson & Edmunds, 2010, Maria-Hereu & Suarez-Morales, 2012). Crustaceans were represented by amphipods, isopods, lucifer larvae, alima larvae of squille, and other decapod larvae as well as by large copepods (pontellidae), and cladocerans. Gelatinous components of the net zooplankton encompassed siphonophores species, both polygastric and eudoxides forms (*Chelophyes contorta*, *Diphyes dispar*, *D. bojani*, *Bassia bassensis*, *Eneoganum hyalinum*, *Abylopsis tetragona*, *A. eschschlotzi*), ctenophores (*Mnemiopsis leidyi*), hydromedusae (Bougainvillidae), salps, doliolids and pteropods. No clear pattern of distribution were observed. Fish larvae and fish eggs were also collected,

This first dataset on the zooplankton distribution of zooplankton around the Caribbean islands will set the baseline in a strongly impacted environment and will allowed to follow potential variations of the climatic and anthropogenic forcings on the zooplankton community (Taylor et al. 2012) and its impact on both the functioning of the ecosystem, health issues and human activities

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