Registration number: 14416829

Perkinsus sp. in the sand clam, *Chionista fluctifraga*, cultivated in the southeast Gulf of California

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INTRODUCTION

Currently, mollusks contribute with 10% of world aquaculture production. The clam, *Chionista fluctifraga*, also known as "sand clam", "black clam", "venus clam", or simply, "Chione", is distributed from Santa Barbara, California, in the United States, to the Gulf of California in Mexico, where it is harvested together with other bivalve mollusks such as mussels, other clams, and oysters. For some of them, there are reports on the occurrence of the protozoa *Perkinsus* sp. within the Gulf of California; therefore, it is assumed that such facultative parasite is been hosted by other bivalve species. So far, the information on the presence of *Perkinsus* sp. in natural populations of *Ch. fluctifraga* is scarce; but under culture conditions is null. Recently, an aquafarm located in the southeastern Gulf of California cultivated the sand clam in a intertidal zone, and for the first time, the health condition of its culture was monitored as part of a sanitary program with emphasis on the prevalence and infection intensity of this protozoa.

OBJETIVE

To determine the presence of *Perkinsus* sp. in the sand clam, *Chionista fluctifraga*, cultivated in the southeast Gulf of California.

METHODOLOGY

A total of 905,000 sand clam seeds (7.7 ± 0.9 mm shell height) were sown in an intertidal zone in El Colorado Bay, Ahome, Sinaloa, Mexico (Figure 1a), where they were kept from April 2018 to September 2019. Monthly, water physicochemical and biological parameters (temperature, dissolved oxygen, salinity, pH, depth, transparency, chlorophyll a, total suspended solids, and particulate organic matter) were obtained (Figure 1b). Besides, 60 sand clams were collected and measured (length, height, and width of shell and total weight, Figure 1c). In the lab, the prevalence and parasite load of *Perkinsus* sp. in *Chionista fluctifraga* were obtained by using the technique of Ray's Thioglycollate Fluid Medium (MFTR) (Figure 1d and 1e) for detecting presumptive hynospores, which were observed under optical microscopy (Figure 1f).

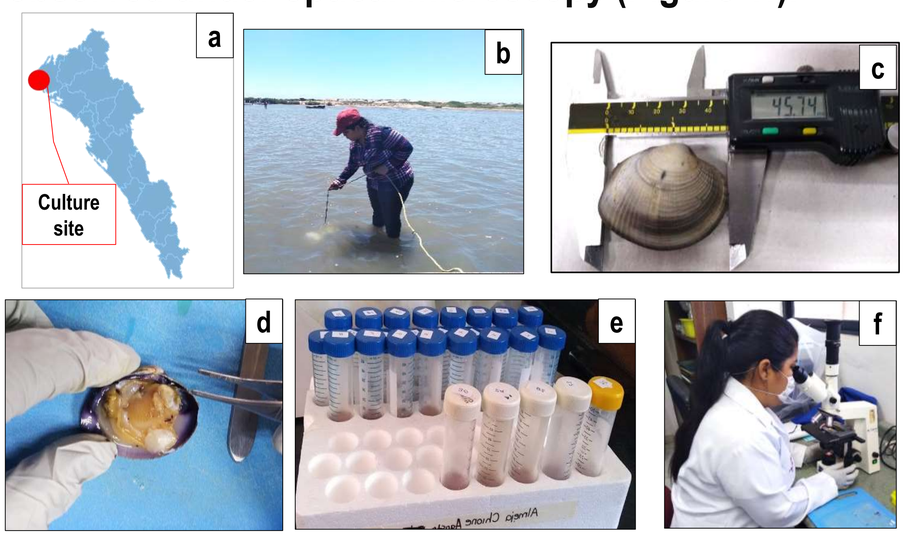

Figure 1. **[a]** Culture site: El Colorado, Ahome, Sinaloa; **[b]** obteining the physicochemical and biological water parameters; **[c]** clam biometrics; **[d]** observation of clam soft tissue; **[e]** incubation of tissues in MFTR; **[f]** Observation of samples under optical microscopy.

RESULTS

Table 1. Water physicochemical and biological parameters from the intertidal zone in El Colorado bay, Ahome, Sinaloa, Mexico.

Temperature (°C)	Salinity (‰)	Dissolved oxygen (mg/L)	pH
15.9 - 32.1	25 – 40	5.14 - 9.63	4.3 - 8.21
Depth (m)	**Transparency (m)**	**Chlorophyll *a* (mg/m³)**	
0.20 - 1.15	0.16 - 0.8	2.2 - 10.5	
Total suspended solids (mg/L)		**Particulate organic matter (mg/L)**	
19.3 - 189.3		4.8 - 26.3	

The clam grew steadily over the course of 18 months (Figure 2), reaching the minimum commercial size (35 mm shell height) after 10 months of cultivation. MFTR staining detected presumptive hypnospores (dark, spherical and smooth corpuscles, with a size between 20 to 70 microns) in eight months of culture (Figure 3). The prevalence of the protozoan ranged from 0 to 13.3%, the average parasite load varied from 2 to 1,286 hypnospores/g of tissue. The intensity of infection (Bushek scale) was from negative to slight.

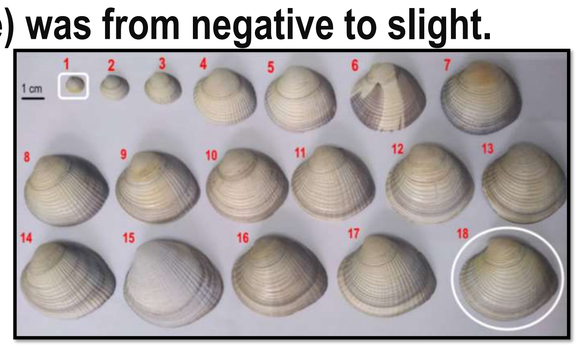

Figure 2. Monthly growth of *Chionista fluctifraga* (1 = April 2018, 18 = September 2019) cultivated in the intertidal zone of El Colorado bay, Ahome, Sinaloa, Mexico.

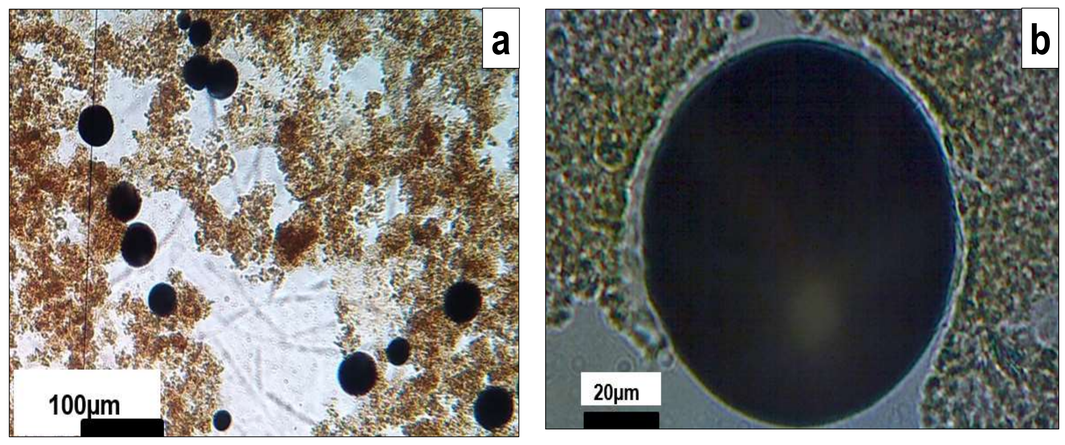

Figure 3. Presumptive hypnospores of *Perkinsus* sp. in the soft tissue of *Chionista fluctifraga*. **[a]** Optical microscopy (10X); **[b]** Digital Microscope Suite 2.0 (40X).

CONCLUSIONS

- There were no correlation (P > 0.05) between the prevalence and parasite load of the protozoa with the sand clam biometrics or with water parameters.
- Presumptive hypnospores of *Perkinsus* sp. were detected in *Chionista fluctifraga* cultivated in the north coast of Sinaloa, Mexico, without clear indications of infection that compromise the health of the clam in culture.
- • The results suggest that the protozoan found a new host in the Gulf of California, Mexico

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