Levels of the parasite *Perkinsus marinus* in populations of oysters from the Louisiana Public Seed Grounds: Summer 2012

by

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Among the most significant causes of oyster mortality is the parasite *Perkinsus marinus,* responsible for annual mortality rates that exceed 50% in many populations of adult eastern oysters, *Crassostrea virginica*. *Perkinsus marinus* was described in 1950 by John Mackin, Malcolm Owen and Albert Collier as *Dermocystidium marinum* – hence the common name "Dermo" which is still in use (Mackin et al. 1950).

The discovery of the parasite was the result of investigations (funded by a consortium of oil companies and directed by Texas A&M University) of the impact of oil and gas activities on the Louisiana oyster industry (Mackin and Hopkins, 1962). Extensive studies were conducted on the effects of crude oil, bleed water, natural gas, drilling mud and seismographic surveys. It was ultimately realized that none of these pollutants or activities explained the widespread mortalities of oysters that were observed. It is now known that the parasite is a major cause of oyster mortality from Maine to Mexico (Soniat, 1996).

The critical environmental factors which favor the proliferation of the parasite are high water temperatures and high salinities. Thus infections are more intense in the late summer, on the seaward side of estuaries and during droughts. Drought conditions on the Gulf Coast are associated with the La Niña phase of El Niño Southern Oscillation; however, increases in prevalence (percent infection, PI) precede sharp increases in intensity (weighted prevalence, WP) and epizootics of Dermo in Louisiana can lag La Niña events by about 6 months (Soniat et al., 2005). Management techniques to minimize disease and increase oyster harvest include moving infected oysters to lower salinity, early harvest of infected populations, and even freshwater diversion into high-salinity estuaries. Because of the key role of Dermo as a cause of oyster mortality, the success of oyster farming depends on the ability to manage oyster populations in the presence of high levels of disease (Soniat and Kortright, 1998).

The standard assay for determining the level of parasitism is the fluid thioglycollate method (Ray, 1966). A small piece tissue is removed and assayed for disease after incubation in fluid thioglycollate and antibiotics for one week. *P. marinus* intensity is scored using a 0-to-5 scale developed by Mackin (1962), where 0 is no infection and 5 is an infection in which the

oyster tissue is almost entirely obscured by the parasite. Calculations are made of percent infection (PI) and weighted prevalence (WP), which is the sum of the disease code numbers divided by the total number of oysters in the sample. A WP of 1.5 could be considered a level at which disease-related mortalities are occurring. For example, Mackin (1962) claims: a population of live oyster with a weighted prevalence of 2.0 "contains an intense epidemic, and more than half of the population may be in advanced stages of the disease, with all of the individuals infected."

Oysters for the summer 2012 study were collected from 20 sites across coastal Louisiana. Samples were taken from Three Mile Pass (TM) in Mississippi Sound; Lonesome Island (LI), North Black Bay (NB), South Black Bay (SB), Telegraph Point (TP), Bay Crabe (BC), Horseshoe Reef (HR), and Bay Gardene (BG) in the Breton Sound area; mid Hackberry Bay (HB) in the Barataria system; Lake Felicity (LF) and Lake Chien (LC) in the Terrebonne Bay region; Grand Pass (GP) and Old Camp (OC) in Sister Lake; Bayou DeWest (DW) and Buckskin Bayou (BB) in Bay Junop; South Point (SP) and Indian Point (IP) in Vermilion Bay; Northeast Rabbit Island (NE) and Commissary Point (CP) in Lake Calcasieu; and a single Sabine Lake (SL) site.

An attempt was made to assay 10 market-sized (≥ 75 mm) oysters and 10 seed (25-74 mm) oysters from each site. However, in some cases insufficient oysters were available to satisfy that standard. With the exception of Three Mile Pass (Mississippi Sound area), insufficient numbers of seed oysters were available from stations east of the Mississippi River. No market-sized oysters were available from South Point in the Vermilion Bay area (Table 1). The length of oysters was measured to the nearest mm; mantle tissue was removed from each oyster, incubated at room temperature in fluid thioglycollate for about a week, and assayed according to the standard Ray (1966) technique. The level of infection (disease code) was scored from 0 to 5, where 0 is no infection and 5 is near total coverage of the oyster tissue by the parasite. Weighted prevalence (WP) was calculated by summing the disease code values and dividing by the number of oysters in the sample.

Weighed prevalence (WP) and percent infection (PI) results are shown in Table 1. This year's results show low levels of disease across the State. This was particularly evident in stations east of the Mississippi River; samples from six of eight stations there (LI, NB, SB, BC, HR) showed no evidence of Dermo, and at TM and TP disease levels were low (20% infection and low WPs). Seed oysters from the lone Barataria Bay site (HB) showed a 30% PI and a 0.13 WP; 20% of market oysters were infected with a WP of 0.07. Terrebonne Bay stations (LF, LC) showed slightly higher Dermo levels than those from last year, but are still at low levels. Sister Lake stations (GP, OC) showed disease levels lower or equivalent to those from last year, and Bay Junop (DW, BB) stations showed slightly higher levels. Oysters from the Vermilion Bay area stations (SP. IP) were uninfected. Oysters from the Northeast Rabbit Island station had the highest levels of infection in the 2012 survey, but not significantly differently than levels from last year. A new station was sampled from eastern Lake Calcasieu, Commissary Point (CP). None of the previously established stations in eastern Lake Calcasieu (Big Washout, Little Washout, Mid Lake) yielded enough seed or market oysters to support a Dermo assay. Oysters in the Big Washout, Little Washout, and Mid Lake areas have experienced excessive mortalities from oyster drills (Harbison, personal communication) which necessitated sampling from the lower salinity CP site. Seed oysters at CP had a PI of 40%, whereas market oysters showed a 60% PI. Last year the Sabine Lake sample showed 100% infection of market oysters with a WP of 1.13; this year's survey shows a 40% PI and a WP of 0.20.

Disease levels are low across the State. This is especially evident in areas east of the Mississippi River and around the Atchafalaya River. There is some uncertainty in the evaluation of the disease dynamics of oysters in the lower eastern portion of Lake Calcasieu, since oysters from there were unavailable this year. Disease levels from oysters in Sabine Lake, a cause for concern in last year's survey, have diminished. Records of disease levels from this year and previous years are available from Oyster Sentinel (www.oystersentinel.org).

Table 1. Percent Infection (PI) and Weighted Prevalence (WP) of seed and market-size oysters from Louisiana Public Seed Grounds: Summer 2012. Date is collection date, S = salinity, T = water temperature.

Station	Date	T (^{o}C)	S (ppt)	Seed PI	Seed WP	Market PI	Market WP
Three Mile Pass	7/15/12	30.2	14.8	0	0	20	0.07
Lonesome Island	7/12/12	28.7	15.1	--	--	0	0
North Black Bay	7/12/12	28.7	19.4	--	--	0	0
South Black Bay	7/12/12	29.4	19.0	--	--	0	0
Telegraph Point	7/12/12	30.2	21.6	--	--	20	0.10
Bay Crabe	7/12/12	28.6	14.2	--	--	0	0
Horseshoe Reef	7/11/12	28.5	21.6	--	--	0	0
Bay Gardene	7/12/12	28.6	11.1	--	--	0	0
Hackberry Bay	7/2/12	31.2	21.9	30	0.13	20	0.07
Lake Felicity	7/11/12	28.5	23.1	20	0.13	10	0.07
Lake Chien	7/11/12	28.3	22.6	33	0.41	30	0.27
Grand Pass	7/11/12	28.9	20.1	10	0.03	10	0.03
Old Camp	7/11/12	28.9	22.2	10	0.03	0	0
Bayou DeWest	7/12/12	28.7	20.3	0	0	10	0.03
Buckskin Bayou	7/12/12	29.0	18.4	0	0	10	0.10
South Point	7/16/12	29.1	7.7	0	0	--	--
Indian Point	7/16/12	29.3	15.7	0	0	0	0
Northeast Rabbit	7/11/12	26.2	19.9	56	0.59	60	0.97
Commissary Point	7/11/12	26.6	18.3	40	0.27	60	0.30
Sabine Lake	7/11/12	27.4	15.8	30	0.13	40	0.20

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