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Short communication

Catch variation among traps in an American lobster (*Homarus americanus*) trawl

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ABSTRACT

Most population estimates of American lobster (*Homarus americanus*) rely on catch data from the commercial fishery. Therefore, it is important to understand the factors that affect the catchability of lobsters and their behavioural response to traps. Commercial fishermen claim that if lobster traps are fished in linked sets, or trawls, that the trap that is adjacent to the surface buoy generally has a lower catch, presumably because of increased trap movement due to more direct exposure to wind influence. For four consecutive weeks during May and June 2007, we recorded the catch of 944 trap hauls to determine if there are differences in lobster catch rates among the four linked traps on a line, and if these differences are related to wind speed. In addition, on the second and fourth week of the study, every second trawl received a gear modification designed to decrease the effect of the wind on catch rates. The study found that there were no significant differences in catch rate among the four traps in a trawl. Although wind and catch rate were expected to be somehow related, no meaningful linear relationship between these variables was found. These results indicate that common assumptions about the effects of gear design on lobster catch rate may not be supported when examined systematically, and that relationships between wind, temperature and catch rate are not always evident.

1. Introduction

Since most population estimates of American lobsters (*Homarus americanus*) rely on catch data from the commercial fishery, which uses baited traps, understanding the factors that affect catch rate is important for the management of the fishery. Previous research suggests that biotic and abiotic factors can affect lobster catch rates. Biotic factors include sex, size, (Miller, 1989, 1995; Tremblay et al., 2006) and intra- and interspecific interactions (Richards et al., 1983; Jury et al., 2001; Cobb and Castro, 2006). Abiotic factors include wind, water currents, and water temperature (Hudon, 1994; Koeller, 1999; Drinkwater et al., 2006), among others.

While the effects of biotic and abiotic factors have been well documented, little research has examined the effects of fishing strategies on catch rates (Miller and Rodger, 1996; Comeau et al., 2009), particularly trap and trawl design. Trap design can vary by size, material, and location of entrances, while trawl design (a trawl is a group of traps connected on a line to a surface buoy; Comeau et al. (2009)) includes the number and spacing of traps and the presence of extra buoys (Smith and Tremblay, 2003). When relying on catch data from the commercial fishery for population estimates, it is important to understand the variability in catch rates that may occur if different fishing strategies, such as trap and trawl design, are used (Comeau et al., 2009).

Furthermore, in relation to trawl design, commercial fishermen often report that the first trap in the trawl (the one attached to the surface buoy) catches fewer lobsters compared to the other traps. Presumably, this first trap moves more frequently due to its connection to the surface buoy that is affected by wind and current, reducing the entry rate of lobsters into the trap. This study examined whether there were actual differences in lobster catch rates among four linked traps in a trawl, and if observed differences were related to wind speed. We also tested a simple gear modification designed to decrease any possible effect wind has on the catch rate of the first trap.

2. Materials and methods

2.1. Study area

The study was conducted on common lobster fishing grounds (center = 46°36′N, 63°35′W) east of Malpeque Bay, along the north shore of Prince Edward Island, Canada (see Fig. 1). American lobsters (*H. americanus*) were fished for four consecutive weeks from May 21 to June 16, 2007, during the spring commercial lobster fishing season. The fishing depth for the study ranged from approximately 6 to 23 m.

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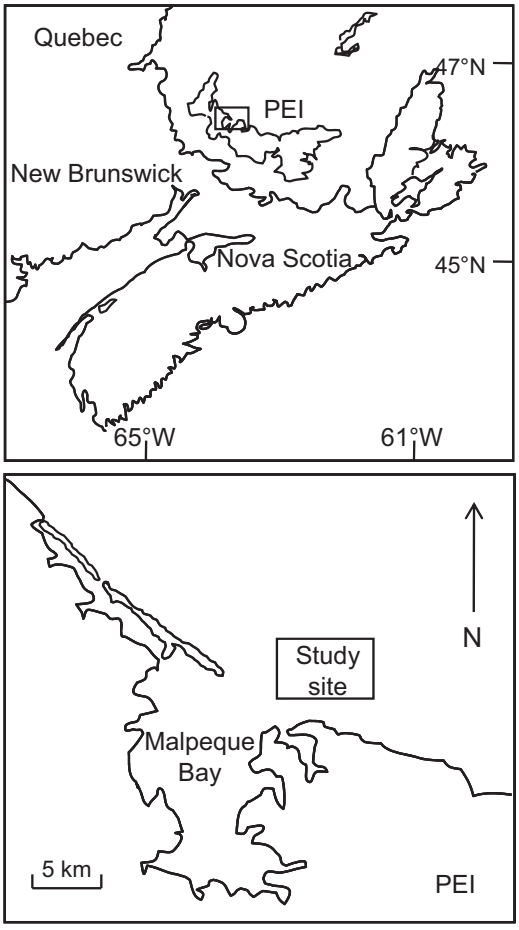

Fig. 1. Location of the study site east of Malpeque Bay, Prince Edward Island, Canada.

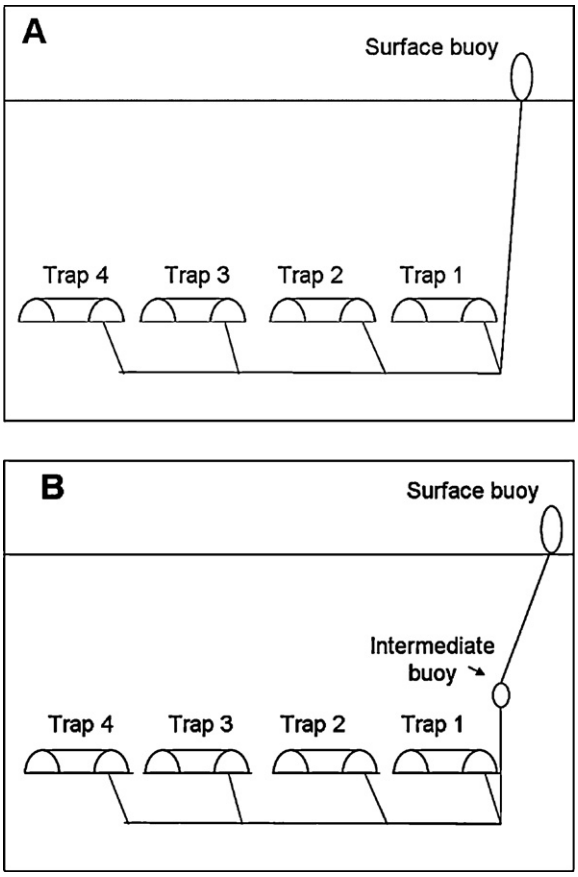

Fig. 2. Original (A) and modified (B) trawl designs with four lobster traps on a line and a surface buoy attached to the first trap. In the modified trawl design, an intermediate buoy is attached 2 m on the line from the 1st trap to the surface buoy.

2.2. Trap and trawl design

The lobster traps were of a wooden design commonly used in the commercial fishery, and similar to those described by Karnofsky and Price (1989). The traps (64 cm × 112 cm of base, 41 cm height) were wood lath framed with nylon mesh sides and contained two compartments, a "kitchen" and a "parlour". Two opposite side, mesh funnel entrances, held open by 14.0 cm diameter wooden rings, led into the "kitchen" compartment containing the bait. The bait was held in place by the use of a metal spike and a large rubber band. In the "kitchen", a mesh funnel entrance led to the second compartment, the "parlour", which retained the lobsters while preventing them from feeding on the bait. The parlours of each trap had escape vents with dimensions of 40 mm × 127 mm, designed to allow lobsters less than 70 mm carapace length (CL) to escape. The traps were weighted with 24 kg of cement ballast and had an overall weight of 35 kg. The traps were set in trawls of four traps with a distance of 14.6 m between traps. The first trap in the trawl was attached to a rope 40 m in length, with a cylindrical polyethylene buoy (36.83 cm × 20.32 cm, buoyancy = 6.71 kg) that floated on the surface (see Fig. 2a). Trawls were set parallel to tidal currents, a common practice in the commercial fishery. Traps were baited with a fairly similar amount of Atlantic mackerel (Scomber scombrus) or Atlantic herring (Clupea harengus) each day they were hauled.

2.3. Catch measurement procedure

Ten trawls were hauled daily for four consecutive weeks, for a total of 944 trap hauls. The numbers of lobsters per trap, along with the position of the trap in the trawl, were recorded. Lobsters were grouped into three categories: "markets" (>81 mm CL), "canners" (70–81 mm CL), and "sub-legals and berried females" (lobsters < 70 mm CL and females carrying eggs). Sub-legals and berried females were arbitrarily pooled together because both groups were returned to the sea after they were removed from the traps. It should be noted that the presence of escape vents (40 mm in height) in the traps allowed some lobsters less than 70 mm CL to escape, which would have otherwise been counted in the "sub-legals and berried females" category. For the analysis, "total caught" (all lobsters caught) and "total landed" (all lobsters > 70 mm CL) categories were also used.

During the second and fourth weeks of the experiment, every second trawl was modified by attaching a smaller, intermediate (subsurface) buoy (see Fig. 2b). The intermediate buoy was attached on the rope linking the first trap to the surface buoy, approximately 2 m from the trap (see Fig. 2b). This intermediate buoy was attached to decrease the movement of the first trap caused by the tension in the line due to the surface buoy being pulled by surface currents and wave action. Such tension is believed to cause a decrease in the catch rate of that first trap compared to other traps in the trawl due to increased movement on the seafloor.

The bottom temperature for the area was recorded using a Vexilar Deptherm underwater thermometer for each day the trawls were hauled. Wind speed and direction were obtained from Environment Canada's marine weather reports issued for the study area each day the trawls were hauled.