Do Silent Ships See More Fish?

Alex De Robertis, Midwater Assessment and Conservation Engineering Program, Alaska Fisheries Science Center

NOAA has built four new fisheries research vessels that have a specialized design intended to minimize low-frequency underwater radiated noise that fish can hear. Since fish are known to avoid approaching vessels, reducing this noise may increase the accuracy of stock assessment surveys. Accurate survey estimates are essential for appropriate management of commercial fisheries.

To test this new technology, NOAA's Alaska Fisheries Science Center (AFSC) compared surveys conducted by the first of these new vessels, the NOAA ship *Oscar Dyson*, to surveys conducted by a previous-generation ship, the NOAA ship *Miller Freeman*. The two ships simultaneously surveyed walleye pollock (*Theragra chalcogramma*) in Alaska, in order to discover whether the pollock avoided the two ships differently. Alaskan pollock is the largest commercial fishery in the United States. AFSC conducts regular acoustic surveys of pollock in four areas to support management of the fishery. These survey areas differ markedly in pollock depth distribution, age-structure, reproductive state, and environmental conditions, all of which may influence vessel avoidance responses.

These experiments compared acoustic estimates of abundance observed by *Oscar Dyson* and *Miller Freeman* during pollock assessment surveys in 2006-2008. In two experiments in the eastern Bering Sea where pollock were at depths less than 120 meters, the vessels observed statistically equivalent pollock densities. This was also the case for pollock at depths of 400-700 meters during a survey in the Bogoslof Island area. However, statistically significant differences were observed in surveys in the Shumagin Islands and Shelikof Strait. In the Shumagin Islands area, where pollock are found at depths of 100-200 meters, abundances observed by *Dyson* averaged 31% higher than those observed by *Freeman*. In Shelikof, where pollock are found at depths of 200-300 meters, estimates from *Dyson* were 13% higher than those from *Freeman*.

In both areas where differences were observed, the discrepancies were greater for fish in shallower water, which is consistent with a stronger response by fish closer to the vessels. In addition, the observed depth of walleye pollock differed consistently between vessels. To verify these results, AFSC used an instrumented buoy to take measurements during vessel approach. When *Freeman* passed the buoy, a larger decrease in pollock abundance and a stronger diving response were observed compared to the more modest avoidance reaction associated with *Dyson*.

This study is the first explicit demonstration that noise-reduction can lessen vessel avoidance by fish. This indicates that investing in quieter fisheries survey vessels coupled with maintenance of low radiated noise—can improve fish survey estimates by reducing vessel avoidance. ■

Photo courtesy of: Alex De Robertis

▲ NOAA ships *Miller Freeman* (left) and *Oscar Dyson* (right) in Dutch Harbor, Alaska. Although the ships are of similar length, the *Dyson* has approximately 30% more displacement and approximately 40% more horsepower.