Can reduced environmental impact increase fishing profits?
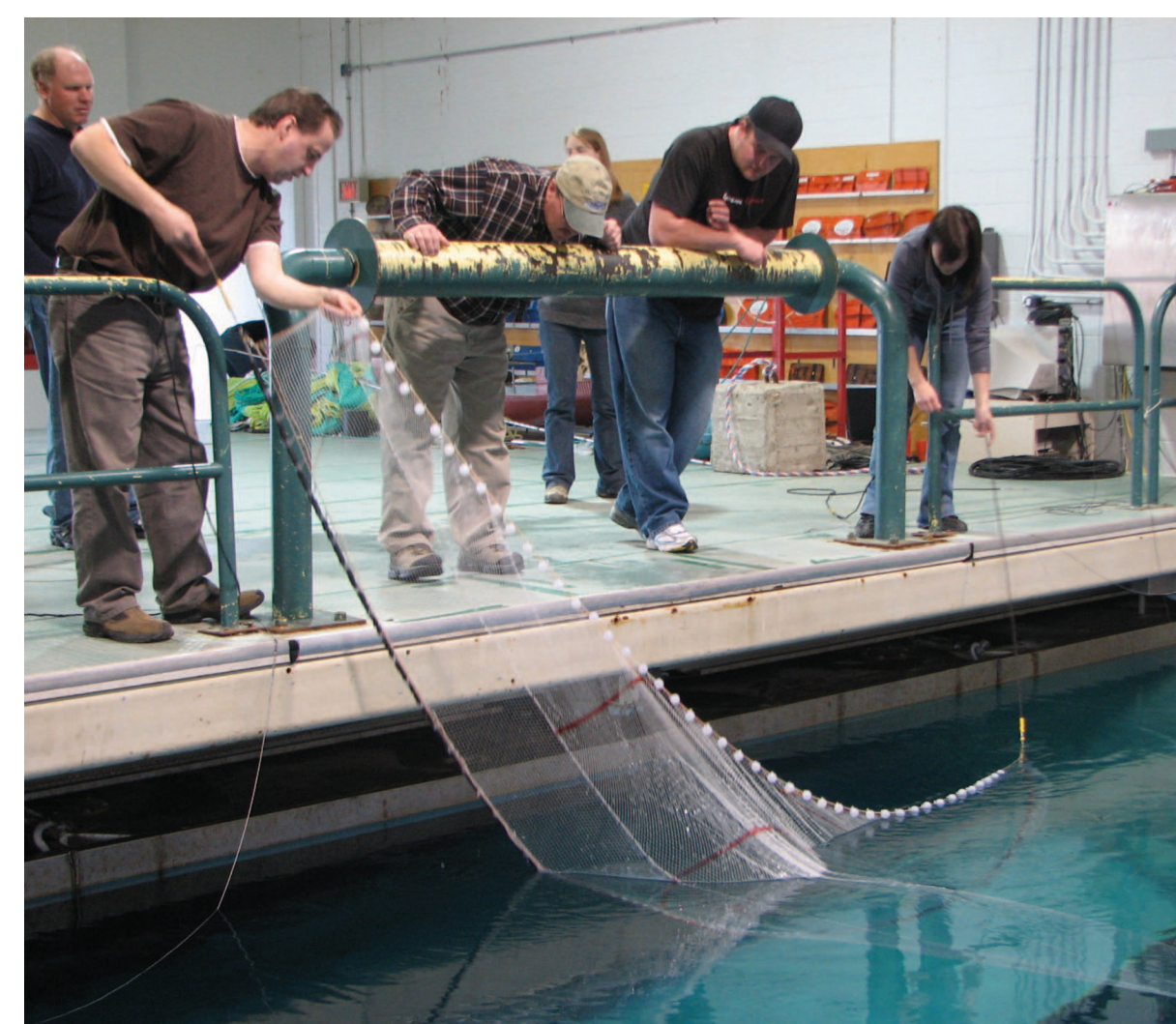
A collaboration to reduce environmental impact and enhance the profitability of fishing

Gulf of Maine Research Institute
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Codend selectivity

In 2009 we compared the selectivity of four codends on the F/V Lauren Dorothy over a 13-day period. The codends tested were constructed from:

- 6.5″ diamond mesh
- 6.5″ square mesh
- 7.0″ square mesh
- 6.5″ composite codend

A 2″ diamond mesh cover net was placed around each codend to retain fish that escaped through codend meshes. We completed 79 tows in total (19 or 20 one-hour tows for each codend) and sampled the codend and cover net catch from each tow.

We found that:

- Between 69% - 89% of non-commercial species and 37% - 52% of commercial species escaped through the codend meshes
- The commercial catch was dominated by American plaice (dabs), grey sole, skate, and monkfish
- The 6.5″ square mesh codend retained the highest proportion of legal and sub-legal dabs and grey sole (Fig. 1)
- The 7.0″ square mesh codend retained more legal dabs and grey sole than the 6.5″ diamond mesh codend, but similarly low proportions of sub-legal sized dabs and grey sole
- At least 94% of legal sized monkfish were retained in each codend, and at least 83% of sub-legal monkfish
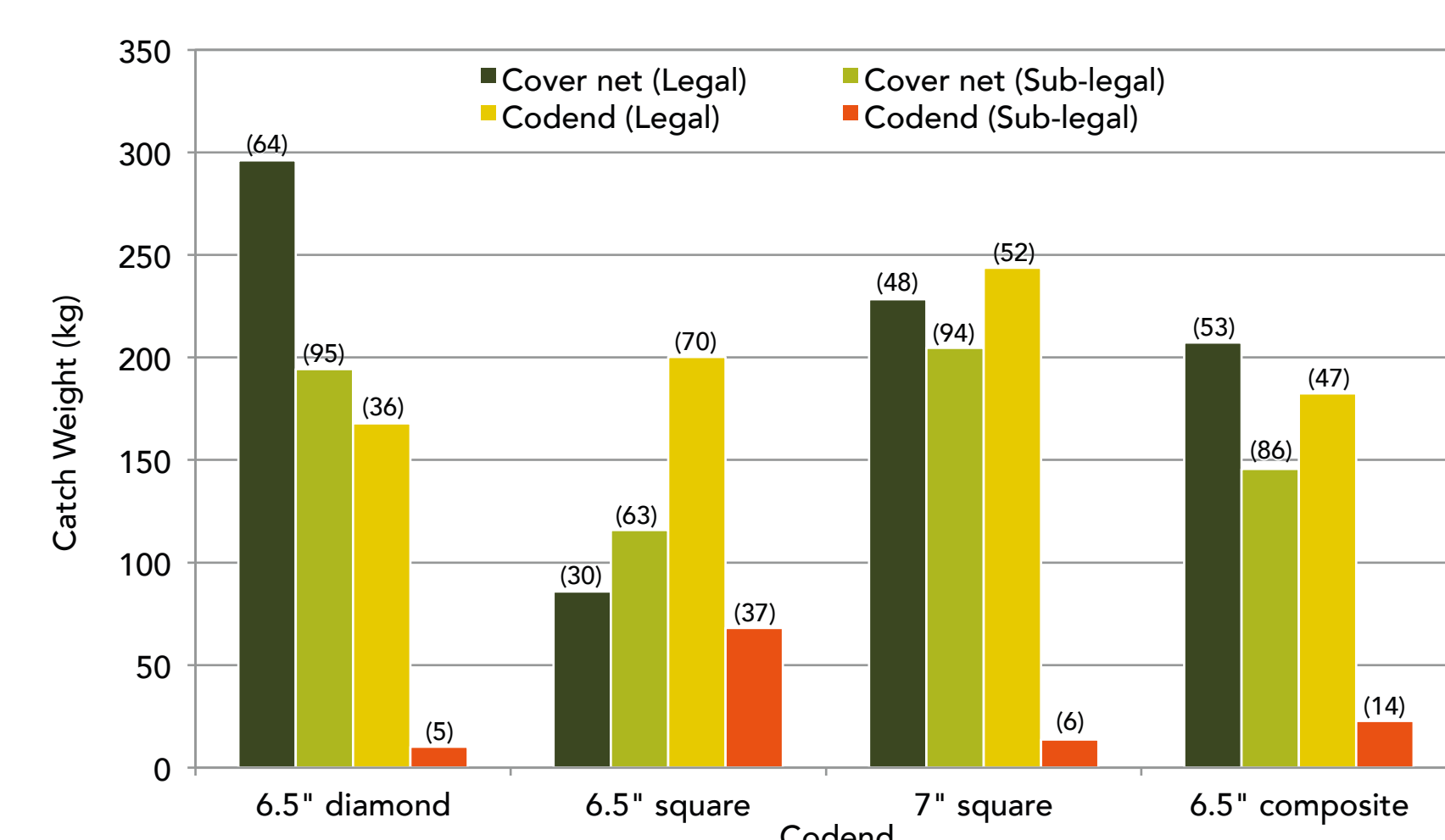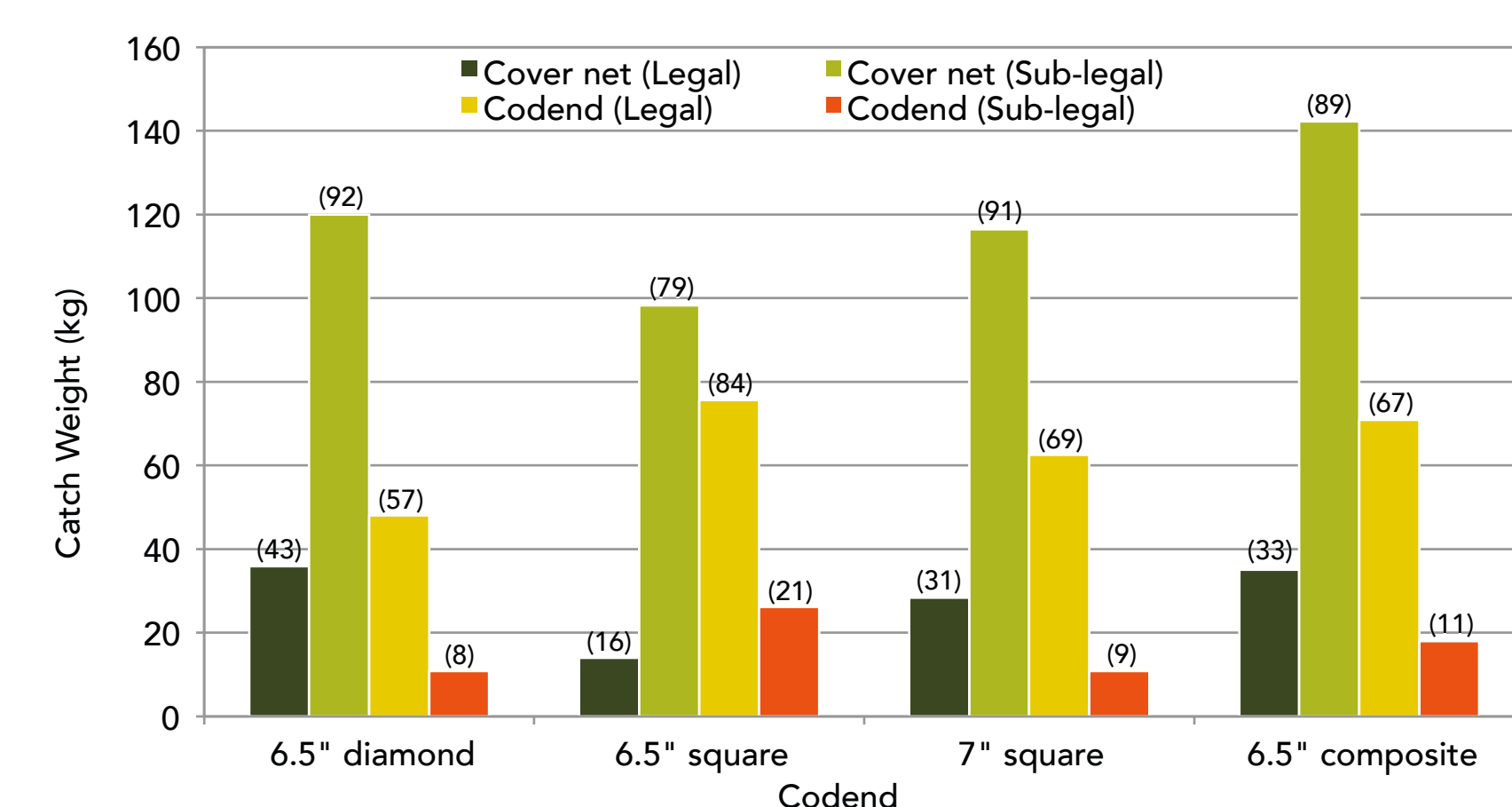

Figure 1: *Catch weight and proportions (in brackets) of dabs (top) and grey sole (bottom).*

Fuel consumption

In 2010 we compared the performance of the locally designed Cushman trawl constructed from 3.0 mm diameter, 6.0″ polyethylene mesh with the same trawl constructed from 2.1 mm diameter, 7.0″ sapphire mesh. A model of each trawl was constructed and tested in a flume tank to provide useful information about the expected performance of each trawl and important rigging detail.

Next, we compared the full-scale performance of both trawl designs over several days on the F/V Lauren Dorothy. After some initial difficulties we replaced the No 7 Bison doors with No 6 Bison doors and collected trawl performance and catch data from 10 one-hour tows.

We found that:

- Using the large-mesh experimental trawl, wingend spread and headline height were on average 13% and 26% larger than the traditional Cushman net respectively (Fig. 2)
- The mean rate of fuel consumption per square meter of trawl-mouth area was 29% less than that for the traditional net (Fig. 3)
- Catches were modest in the test location, however, with the exception of dabs there was little difference in catch between trawls
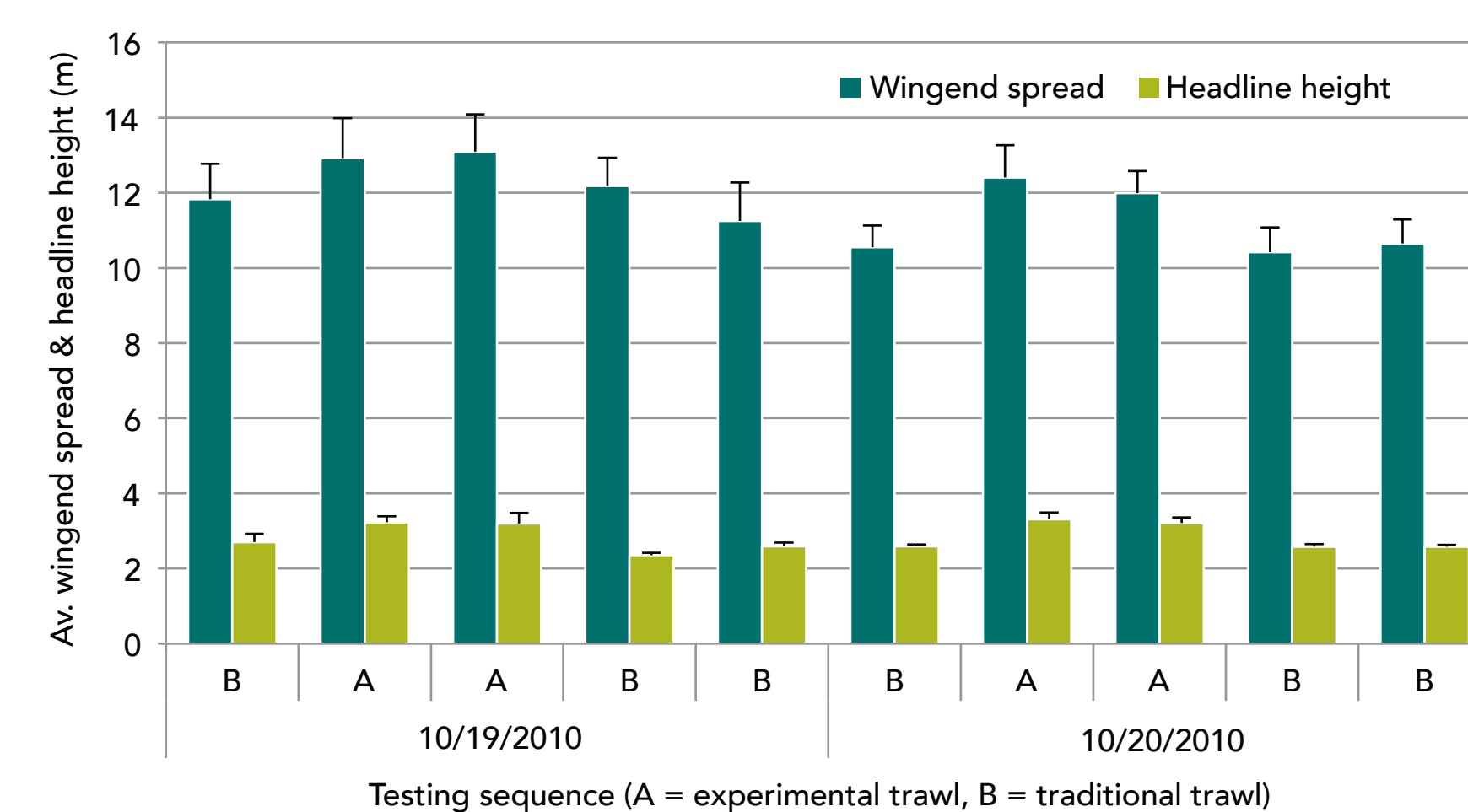- A loss of dabs in the experimental trawl may be due to excessive spread

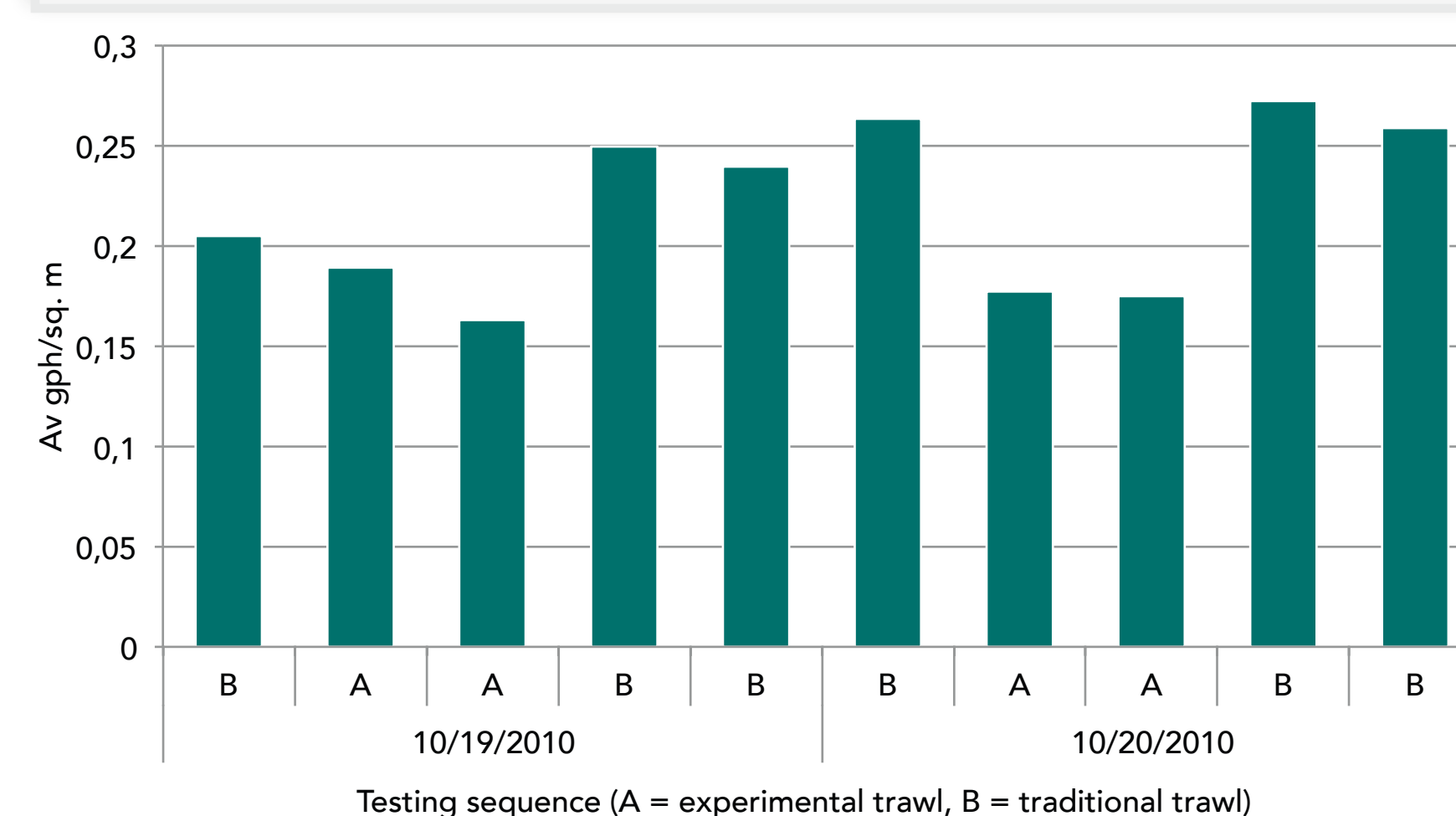**Figure 2:** *Average trawl geometry for each tow.*

Figure 3: *Average fuel use (gph) per square meter of trawl-mouth area.*

Background

In recent years a multi-institutional collaboration with fishermen based in Port Clyde, Maine, has tested several options to simultaneously increase vessel profitability and reduce environmental impact. This has included efforts to improve codend selectivity and reduce fuel consumption.

Conclusion

These results are an excellent start and demonstrate potential opportunities to link boat profitability with reduced environmental impact.

As a result of this work, fishermen are already realizing substantial benefit:

"With a 7 inch square-mesh codend I lost fish but got a better fish price and offset my loss"

"The fuel flow meter is making me think harder about fuel consumption"

"I used the new trawl and reduced my fuel cost by around 17%"

Future work includes:

- Testing the large-mesh trawl in other regions of the fishery
- Taking steps to reduce catch loss
- Testing semi-pelagic otterboards to reduce fuel consumption and seabed impact
- An energy audit of several boats to explore further opportunities for energy savings

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