INDUSTRIAL FISHERY

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New England's industrial fishery continues to grow apace. At the present rate, it will soon exceed landings of 200 million pounds a year, probably in 1959. The project's research emphasis is still on the problems concerned with such a fishery that operates on a community of fishes, and on the structure of these communities. Now that an adequate system exists for the collection and processing of data, our principal concern is with the analysis of this information. Toward this end, the effect of vessel size and power on the catch per unit of effort has been studied.

It is, of course, impossible to evaluate all of the factors involved that affect the ability of a vessel to catch fish. These include the capabilities of the skipper and his use of modern fish finding gear (if he has it). The net itself may markedly affect the vessel's efficiency, and further these vessels are hardly standard models that may be easily compared, one with another, from a hydrodynamic standpoint.

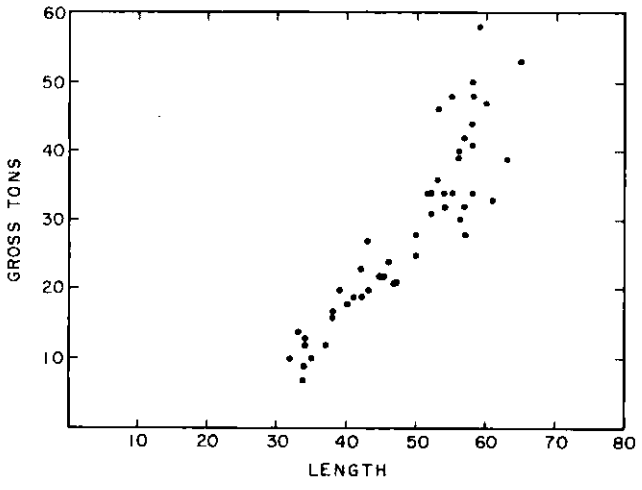

Figure 10. Gross tonnage plotted against total length in feet, Pt. Judith vessels.

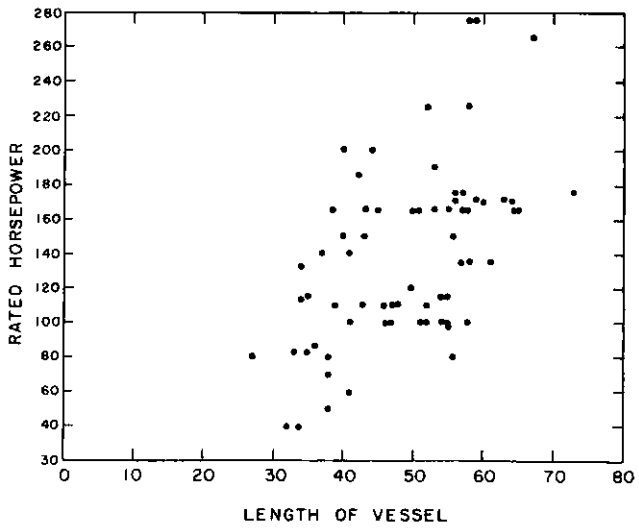

Figure 11. Rated horsepower plotted against total length in feet, Pt. Judith vessels. Data for diesels only.

In figures 10 and 11, gross tonnage and horsepower are plotted against total length of the Pt. Judith vessels engaged in the industrial fishery. Gross tonnage is a computed value and may accordingly be regarded with some reservations. It is apparent that tonnage is exponentially related to vessel length and that some of the vessels deviate considerably from the mean values. Horsepower increases approximately linearly (as far as the range of vessel sizes is concerned) with increases in length. Certain standard and popular makes of engines are used in a fairly wide range of sizes of vessels. No vessel normally uses the full rated horsepower of its engine, particularly if the skipper wishes to have his engine last any length of time. If we can reasonably assume that the suggested relationship represents the correct rated horsepower for any length, some of these vessels are distinctly underpowered while others are overpowered.

Figures 12-15 present the data used in evaluating the effect of gross tonnage, horsepower per ton, length, and horsepower per unit of length on the catch per unit of effort. The information is based on a large and varied series of vessels that operated for a period of one month on a single, relatively exclusive fishing ground off Pt. Judith.

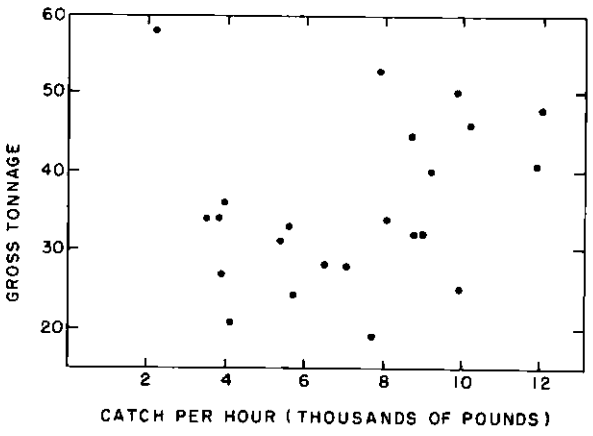

Figure 12. Gross tonnage plotted against catch per hour in thousands of pounds.

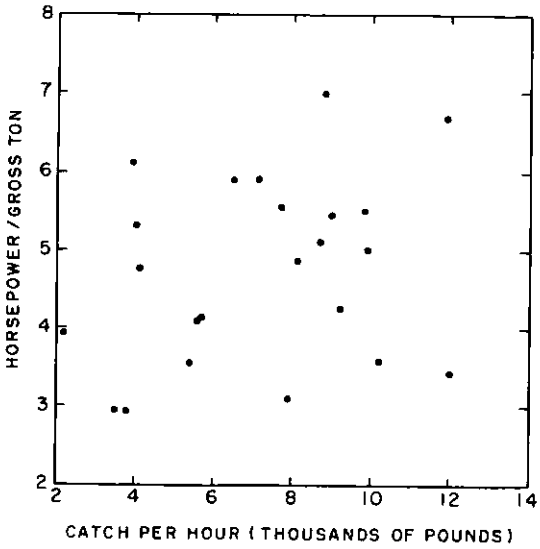

Figure 13. Horsepower - gross tonnage factor plotted against the catch per hour in thousands of pounds.

All of the trips were fully interviewed. It is immediately apparent that both horsepower and length have some effect on the catch per unit of effort, with by far the most correlation demonstrated in the plot of horsepower per unit of length.

However, since each of these vessels did not always fish on the same days as the others and since considerable changes in abundance could have occurred, the relation of horsepower per unit of length and length itself were investigated for one small fishing area for a five-day-period. Figure 16 is the plot of the horsepower length ratio against catch per unit of effort. No greatly improved picture results although in figure 16 three of the four vessels that show up as being excessively inefficient relative to the other vessels are powered with high horsepower engines for their length. This gives them an exaggerated horsepower per unit of length ratio. Otherwise the fit is fairly good. It seems reasonable to assume that excessive horsepower would have little effect, whereas an underpowered vessel would be at a distinct disadvantage. Unfortunately, none of the other points represents an obviously underpowered vessel, so a comparison is not possible.

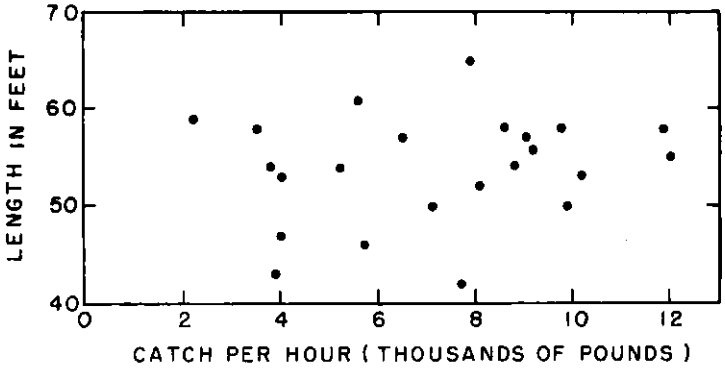

Figure 14. Length in feet plotted against the catch per hour in thousands of pounds.

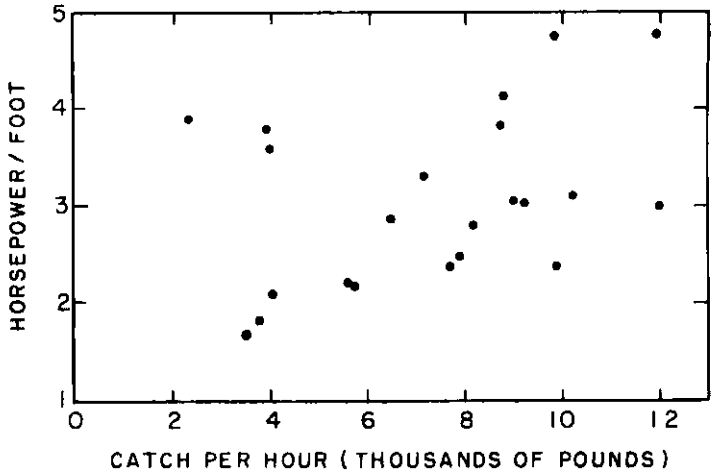

Figure 15. Horsepower - length in feet factor plotted against catch per hour in thousands of pounds.

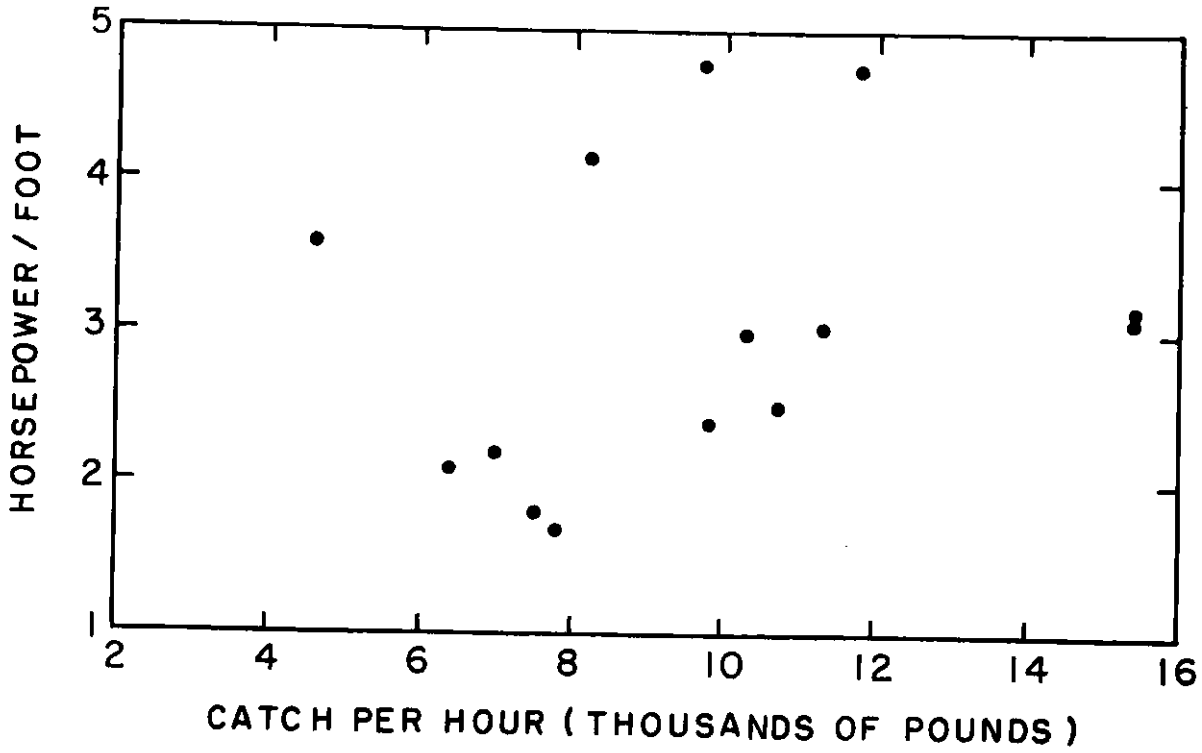

Figure 16. The horsepower length ratio plotted against the catch per hour in thousands of pounds.

Although many of these above mentioned factors affect the catch per unit of effort and are statistically significant, none of the empirical measurements of these vessels show sufficient relationship to enable us to satisfactorily adjust catches of individual vessels to a "standard" boat. The effectiveness of many of these vessels appears to be profoundly determined by the skipper's ability to fish certain grounds, and his persistence. It is quite possible to explain why certain vessels are more or less efficient than the majority on the basis of personal knowledge of the skipper but such information cannot be statistically analyzed.

Similar studies have shown much better fits than we have shown here. In every case, however, the studies were not based on individual fishing grounds such as those referred to here. Larger vessels have a marked tendency to fish further offshore where the fishing is better for them. Obviously, the larger the vessel, the greater the freedom of movement; and in turn, a better size-catch per unit of effort fit is observed.