VESSEL TECHNOLOGY

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I am going to talk about technological innovations for the San Pedro wetfish purse seine operation that can perhaps increase the efficiency and reduce the cost of the operation. I would like to begin by going into the general problem of making money with a fishing boat or for that matter with any production business. In order to remain competitive, that is stay in business, one has to, if it is in an expanding economy, manage to increase productivity in line with the increase in cost of operation in order to cover the increase in labor costs that have to go up in an expanding economy. This increase in labor cost has to be offset either by reducing the operating costs of the business, by increasing the dollar value for its product per man hour, or by raising the prices.

Before we look at the fishery, let's look in general to what has happened in the American economy over the past decade. In general, the indices of the agricultural product have gone up some 15%. The wholesale price indices have risen similarly; these are, I believe, something on the order of 20%. In general the cost of living has gone up some 30–35%. Now if we look at a fishery, it is obvious that the vessel operator is going to have to keep his unit producing fish at a price in keeping with the levels of the wholesale price indices. The fishermen, however, have to increase their wages someplace in keeping with the cost of living index.

The high seas tuna fleet has in general followed this type of tendency. Productivity in fish/man hour and boat year has risen in the last decade allowing an increase in the crewmen's wages and owner's profit. However, if you look at Bill Perrin's data on the San Pedro wetfish fleet, you will see productivity in this fleet has stayed essentially level over the last decade.

If the position of the San Pedro wetfish fleet is to improve, somehow or other, the productivity of this fleet is going to have to go up. Jack Baxter showed that it is possible to pull about $5 million worth of fish out of the southern California ocean without any major changes in the fleet. Right now it is only about 2½ million. We have a pretty good chance to increase the landings if we can overcome some of the obstacles that, in the past, have kept the production down to about half of what it could be.

Increasing the productivity of the fishing fleet can be done in two ways, or a combination of these two ways. You can increase the value of the catch or you can cut cost. Some of the problems that must be overcome in these two areas are legal problems: some deal with management in an economic sense—as in operating a fishing boat—and some with economics in the marketing sense—that is developing markets for these products. But also, some of these problems are technological in nature, that is, they require the application of engineering and science. It is these latter problems that I am going to discuss, but since there is some interaction between these categories, I will probably touch on all of these problems.

To start with, let's look at those actions that will affect the value of the catch. The most obvious way to increase the value of the catch is to raise the price of fish. This is, however, a marketing problem and one that technology cannot do very much about.

Another approach, you might use, would be to increase the volume of the catch; here we run into a number of subproblems. A portion of the cost of operating a vessel is "fixed" cost. Regardless of whether the vessel goes to sea or not you have to pay interest on your loan, you have to pay moorage, and insurance, etc. It is obvious that the more fish you catch the less the fixed costs will affect the production cost; but to catch more fish means that some existing obstacles must be overcome. For example, our San Pedro fleet has a list of, I believe, some 90 port rules that are mostly holdovers from the sardine days which say you cannot fish on certain holiday days, weekends, and during the full moon periods as well as other restrictions. The boats also are faced with certain periods of bad weather when they cannot fish. The overall result is that they are only fishing on an average of about 100 days a year. It would be desirable, when you are operating a vessel, generally to have it operate for 200 to 250 days a year. Unfortunately, technology cannot do anything about port rules or about labor problems, and at present we cannot do anything about the weather. There are however some things technology can do about increasing the volume of the catch by increasing the days of fishing per year. Part of the problem is that some of the fish are available at only certain times of the day. For example, there is a tendency for the fish to come up at night, disperse, go down deep during the day. They are only available to the fishing gear for a short portion of the evening and a short portion in the morning. If it were possible, for example, to fish during the daytime when the fish are still deep, this would essentially increase your time on the fishing ground and fishing time by probably twofold. It is possible in other parts of the world to fish deep schools using sonar and deep nets. Both sonar and net technology are well developed and there is no reason why they could not be applied here.

We have a third problem which restricts the volume of the catch and this is the legal barriers, the institutional barriers, that control seasons, fishing areas, the size limit of the fish, and in some instances the

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type of gear. Institutional barriers, in general, are not open to technological solution.

A fourth problem affecting the value of the landings is, what you might call, the dockside bottleneck. Generally in a fishery there is an optimum vessel size which makes the most money. This is not true, as you have just heard from Bill Perrin, in the San Pedro fleet. In a large part, I believe it is due to the limited capacity of the processing plants. In the tuna industry when fishing is good and you have a lot of vessels coming into port, you may have to wait several weeks to unload; since the high seas tuna vessels are refrigerated they can tie up at the docks and act as freezer plants for the canners. In the wetfish fleet, however, the vessels are mostly unrefrigerated and therefore, you cannot have them setting around more than a couple of days or someone will complain. So the processors are forced to put limits on what the boats can bring in; this is so they will not bring in more than the plant can handle. This often means that the vessel is allowed less than a full load and probably tends to hurt the bigger boats more than the smaller boats. This problem of limits may be a matter of marketing in that the processor can sell only so much of that species and that he wants no more. This may be a matter of economics; it may not be worth the money for the processor to increase his processing capacity or to meet some of the new standards of pollution control that have been put into effect in the San Pedro area. But I think it is also likely that partially it is just a matter of poor plant utilization—that there is a bottleneck at dockside. This is open to analysis and technological solution. For example, it is possible to hold fish in refrigerated sea water for periods of up to 10 days without appreciable loss in quality. It might be feasible to prepare several large refrigerated sea water barges that could act as accumulators for fish so that when fishing is good the vessels could unload at the barges and the plant could then spread out its capacity over a period of time. That might cover weekends when the vessels are not allowed to fish and it might cover bad weather periods. This type of accumulator system might have some additional benefits. It might be that these barges could also be used to transport some plant effluents offshore and dump them instead of the plant now being required to run a pipeline out past the Long Beach breakwater. It also might be that by providing this type of storage for the fish it would allow a continuous monitoring of the catch, for example, for some of these pollutants, pesticides, residues, and the processor could have time to decide whether or not a load of fish went into the can or whether it had to go to the reduction line. I don't know who would pay for this or how effective it would be, but it is a problem that can be studied and one can come up with some answers.

Finally, we can get into this concept of managing the vessels themselves, that I hoped Mr. Douglass would talk about. If the processors only want so much of each species and it costs so much to catch a pound of this fish at a certain time of year, and a pound of that fish at some other time of year, or if there is only a little bit of one species available and a lot of any other, it might be interesting to see if you could change the strategy of fleet operation. For example, you could assign different vessels to different species to meet the market demands. During the times when there is a small run of tuna, instead of allowing the entire fleet to go out and waste their time searching for these tuna you could assign the majority of the fleet to mackerel and let only a few boats fish for tuna. Then perhaps you could develop a management system whereby you could pool profit in part so that the boats that are fishing for the low value species would not necessarily have to suffer. Such an approach is open to modeling; it is part of the Lenarz/Perrin economic model and I think it will prove very interesting. I don't think, however, that it is a solution that is very easy to implement.

Besides increasing the value of the landings the second obvious way to improve the vessel productivity is by reducing the operating costs. Although this cannot be potentially as profitable as increasing the volume of the catch, I think it is a little easier to obtain at this point. It is certainly very important in a business sense. I can think of three ways to cut down costs: you can cut manpower, you can speed up the fishing operation, or you can reduce the overhead. With a fishing boat all of these are open to technological solutions.

To cut manpower you can mechanize the operation. Right now we have a subcommittee of the Marine Research Committee which is evaluating the cost effectiveness of mechanizing wetfish purse seining using a fish pump rather than the mechanical brail, operating the vessel without using a power skiff by using a side thruster or bow thruster instead of the seine skiff and by using a storage drum for the net rather than stacking the net in the net pile by hand. We hope that by using these three innovations these boats will be able to operate with a five-man crew rather than the nine or 10 men that are used now. We also hope that the capital cost of this mechanization can be recovered from the labor cost saving realized by reducing the number of men in the crew and taking some of the increased crew earnings, and applying it to the vessel share.

Speeding up the operation is in part a matter of technology and in part an institutional barrier problem. If the drum seine and the fish pump are successful, a considerable savings in the actual operating time in making the set should result. However, the biggest waste of time, in this and about any other fishery, is in finding fish. It should be possible to reduce search time by using sonar and by improving the forecasting and fish spotting services but I don't want to develop this theme any further.

Now we come again to the institutional barriers. In our area we have a problem in that the vessels are denied the right to fish inside the 3-mile limit and they are not allowed to fish in some other restricted areas. At present this results in considerable increase in running time. We have to live within these restrictions right now but in the future if they were somehow modified or changed I think it would prob-

ably do more to increase the profit to the wetfish vessels than any of the technological innovations.

The last item I want to develop is the reduction of overhead. One overhead item in the San Pedro fleet or in any fishing fleet is the cost of paying off your vessel. For the modeling purposes, we have used cost construction estimates in the quarter to half million dollar range from some of the new vessels that are being constructed. However, I recently talked to a couple of fishermen who felt that they could build a boat for our local conditions for less than $100,000. This would be essentially a flat bottom power barge which would pack 200–300 tons of fish. I think that this idea has some merit. The question is, is it economically sound and is it legally possible to build a vessel for wetfish that might not be sea worthy or readily adaptable to another fishery? But again, the question is open to study.

Well we have looked at most of the major problems that are holding back the productivity of the San Pedro wetfish fleet.

In summary, we want to accomplish two things: we want to increase the value and volume of the landings and we want to reduce the cost of catching fish. Increased value and volume through technology might be achieved by increasing the time a vessel can spend at sea, by using sonar and deeper nets, by increasing the plant capacity using this refrigerated sea water accumulation system and by developing a vessel operations strategy for a multi-species fishery.

I have left out institutional barriers since this is a people problem, and I left out prices because that is a marketing problem.

We also have three ways we can apply technology to reduce operating costs. We can do this by cutting the crew size by mechanization; by cutting the search time with sonar, and forecasting and fish scouting services; and by developing low-cost vessels designed specifically for this fishery and the weather conditions we have off the California coast.

I have not tried to put any dollar values on these proposals mainly because to do so would require more data than I have available. I think you will agree that each and every proposal is open to analysis and it should not take too long to establish an order of priorities for implementation.