

adaptable for use in shrimp and industrial fish trawling, as well as snapper fishing. Their simplicity of design tends to reduce the cost and enables them to be built by even the smallest shipyards in the Gulf of Mexico area. This type of vessel has considerable application in other areas of the world where oil explorations as well as fishing operations are carried out.

### RECENT DEVELOPMENTS OF FISHING VESSELS

Many of the recent developments were discussed but the main item discussed under this topic was the trend toward smaller stern trawlers. It was indicated that designing a small stern trawler is often more difficult than designing a large one, because the problems are greater, often more controversial, and the requirements are contradictory. For example, a small boat skipper wants the biggest boat with the lowest tonnage and price. He wants the ease of remote-control of operations, but he wants mechanical simplicity. He also wants a multi-purpose vessel on which he can change operations while at sea. It was the general consensus that compromises will be effected and the future importance of small stern trawlers should not be underestimated.

### CONCLUSIONS

Probably the most significant developments on a worldwide basis brought out at the meeting were:

1. Increased mechanization and increased efficiency of the fishing fleet of most countries will be necessary to offset the decreasing labor supply.
2. A more steady platform would provide seakindliness and permit more mechanization.
3. The use of computers in designing vessels is on a threshold of possibly great development and will provide significant savings in time and money.
4. Plastics (FRP) will be used more and more on a worldwide basis.
5. The use of wrap-around hull surface method may be significant in saving time and money.
6. The use of combination vessels will spread to many countries.
7. The use of drums for trawl fishing will spread to other areas.

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## Treasure Those Estuaries!<sup>1</sup>

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### Abstract

Till now, we have harvested the rich fisheries of our coasts with little thought as to how these fisheries came to be where they are, or what permits such abundance of valuable fish in such small areas of the total ocean surface. The answer lies, to a great degree, in the fact that food of one sort or another is most abundant there. The reason food is so abundant is that estuaries, lagoons,

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and marshes are natural food traps. Not only do these areas trap food, they dispense it regularly and in abundance during the changing cycles of temperature, runoff, and sunlight intensity. If sea farming ever becomes a reality, it will be because man will have become able to duplicate the productivity of estuaries, not the open sea. Modern fishery management must take into account the role of the estuaries in production since conditions in estuaries as well as in the spawning grounds appear to govern abundance of a majority of fish and shellfish.

NEARLY EVERYONE has read or heard that the estuarine environment is important to fisheries, and that we are losing such areas to the dredge, the bulkhead, or through pollution. In 1961 Seton Thompson described the wanton abuse of Boca Ciega Bay near St. Petersburg, Florida, by unregulated dredging and filling. Such changes as he described are obvious and dramatic, so much so that the general public has at last begun to watch for such developments and to protest vigorously when additional projects of that sort are announced.

But in addition to obvious alterations of the estuarine environment, there are more subtle, but often more serious changes taking place in many areas. Altogether, there is enormous danger that valuable areas will forever be destroyed. From the point of view of the commercial fishing industry, this is a matter of heavy financial loss.

However, when I attend public hearings around the country on problems related to conservation of estuaries and marshes, I am disturbed by the absence of comment and opinion from the commercial fishing industry. Could it be that you in the fishing industry do not care if your fisheries disappear? Could this absence of opinion and comment be because we biologists have not gotten the message across? Don't we talk the same language? What do you think about stewardship of our God-given resources? Are you so convinced that the estuaries will be destroyed that you feel it is no use trying to keep them clean and productive?

The destruction of all estuaries is not inevitable; some of them can be saved. They can be protected if the fishing industry considers it important enough and is willing to put its organizational and private voices into the fight.

How can the truly critical role which estuaries and marshes play in maintaining coastal fishery production best be illustrated?

The Gulf of Mexico is bounded by five states which produce fishery products worth about 86.4 million dollars a year. These landings, weighing about 7.5 billion pounds a year, come from a narrow coastal zone of water generally in depths of less than 25 fathoms; much of the production is taken inside 10 fathoms. This is the real money belt, the savings bank of the fisheries. Although there are fishery resources in water deeper than 25 fathoms, these have not yet shown sufficient promise to cause industry to give up their traditional fishing grounds. It is not entirely a matter of boat size or gear limitation that has caused the fishery to stay in shallow water—the *great fishery resources are in shallow water*.

To feed fish populations that yearly provide in excess of 7 billion pounds of food for humans, it takes hundreds of billions of pounds of plant food at the bottom of the food chain. This food is produced in marshes and estuaries, and to a lesser extent in shallow sunlit off-shore waters. Food supply, therefore, is the key to the question of the value of marshes and estuaries to our fisheries, past and future.

At the 14th Session of this Institute Dr. Eugene P. Odum of the University

of Georgia read an important paper on the role of marshes in estuarine productivity (Schelske and Odum, 1962). He showed how marshes re-cycle phosphorus and nitrogen continuously, and how the vital plant food is produced throughout the year. He showed how marshes, often foul smelling, often slimy with algae, normally teeming with sandflies and mosquitos, are nearly 7 times as productive as the average wheat field, 20 times as productive as the open sea, nearly twice as productive as the best corn land, and about equal in basic production of organic material to the annual production of sugar cane or rice land.

The astonishing thing about all this is that man does not have to turn a hand to make this great crop ready for harvest. There is no fertilizer bill to pay; the food is produced free for the taking. But it can be taken away by destruction of the factory—the factory which relies upon abundant light and a dependable supply of nutrient material. Production depends upon the rise and fall of the tides to transport the raw product to the waiting consumers.

This particular factory uses unique sorting methods to put nutrients into the water and to remove them. One of these is the seasonal clock which causes plants to produce and store food in their tissues at one season and then to release them by death and decay of leaves at another. Another is the process of flocculation, whereby food particles are prevented from washing out to sea. Where sea and fresh-waters meet, flocculation or precipitation causes the tiny particles of soil, decayed plant material and masses of bacteria floating seaward to fall to the bottom of the estuary, thus adding to the savings bank of food.

Estuaries are the home of hordes of animals which are suited to the changing conditions of salinity and temperature that occur there. These animals are grazers, corresponding to the cattle, sheep, deer and rabbits of the land. They eat the basic plant material and convert it to protein. Some of these grazing animals we harvest directly, for example mullet, crabs, oysters and menhaden. Others are eaten, as they move seaward, by fishes valuable to man, such as mackerel, bluefish, seatrout and snappers.

The incredibly high natural production of food in marshes and estuaries has shaped the evolution of species and of their life histories. The annual migration of pink and brown shrimp from the offshore spawning grounds to the estuaries and marshes, and then back to deep water for completion of the cycle is well known. Over eons of time shrimp have capitalized on the advantage offered by such a life history. The very severity of conditions of salinity and temperature in marshes and estuaries excludes all but the hardiest species or the most tolerant stages in the life history. When a small shrimp enters the estuary or marsh it can feed on the abundant food available, and gain protection from the less tough predators which can live only in the stable environment of the open sea. For a time at least, the shrimp has sanctuary where it can grow to near-adult size before it runs for the spawning grounds. The same is true for a host of other crustaceans and of fishes whose young stages occupy the estuary but whose adults are almost never found there.

The importance of estuaries in the production of off-shore landings is thus immense. It is doubtful that there would be any white, pink or brown shrimp fisheries were it not for the estuarine environment. It is entirely possible that the mullet and menhaden populations would disappear if estuaries were filled or otherwise destroyed.

Certainly, there would be no spotted seatrout if the estuaries were destroyed. Moffett (1961) showed conclusively that this fish which is the number one

sport fish of Florida's coastal waters and supports a valuable commercial fishery, is truly an estuarine species, and that living conditions in the estuary are critical to its production.

Consider the oyster fishery of the Gulf area. This fishery which has shown a phenomenal increase in harvest from 18.8 million pounds in 1962 to 24.1 million pounds in 1963, is absolutely dependent upon the preservation of optimum feeding and salinity conditions found only in the unpolluted brackish estuaries. How many acres of prime oyster bottoms are already ruined by pollution, and how many more acres are threatened?

At the 1962 session of the Gulf and Caribbean Fisheries Institute Dr. Saul Sailsa presented a paper on winter flounders of Rhode Island which indicated the following interesting data on the ability of small estuaries to support large fisheries: Two small lagoons on the coast of Rhode Island, having a surface area of only 3.18 square miles and an average depth of less than 3 meters, produced 25 per cent of the annual total of recruits to the offshore catchable adult population of 6,870,000 flounders. He said, "the importance of estuaries is sufficiently high to virtually eliminate the offshore fishery if these breeding grounds were to be destroyed." The fishing industry should not be willing to stand by and let such destruction take place in the Gulf and South Atlantic states.

The sea is *not* inexhaustible. You cannot depend upon some mystical, as yet un-discovered fishery resource to be found in the open sea once your coastal fisheries have been despoiled. Treasure that resource which is already at hand. In the Caribbean, where despoliation of estuaries is not yet a severe problem, protect your fishery sources by protecting your estuaries and do it with all possible speed.

What can you do about these problems? Get the facts from the biologists along your coast and air your views through your trade organizations. Let yourselves be heard: Write to your elected representatives and put your lobbies to work. Treasure those estuaries!

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