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Chairman — R. T. WHITELEATHER, *Deputy Regional Director, Bureau of Commercial Fisheries, St. Petersburg Beach, Florida*

Trends in Shrimp Trawler Design and Construction over the Past Five Decades

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Abstract

Advances in the shrimp trawler fleet for the most part have been confined to an increase in vessel numbers and size—the number of vessels increasing in far greater proportion than in any other segment of the U. S. fishing industry. With but few exceptions, these vessels have remained basically the same in design, equipment, and construction.

The move by American flag vessels into more distant grounds requiring increased facility for independence at sea has resulted in the recent design and construction of large seagoing self-sufficient refrigerated shrimp trawlers capable of working any of the shrimp grounds of the Western hemisphere.

Although wooden vessel construction still predominates, the all-welded steel trawler is making its appearance in increasing numbers. The primary reasons for this trend lie in the inherent ability of steel vessels to carry more fuel and water since the tanks can be combined into the hull, the added strength-to-weight factor, and the availability of new anti-corrosive coating compounds such as the inorganic zinc silicates.

A recent innovation has been the design of an all-aluminum extended range multi-purpose trawler. Due to aluminum's inherent advantages over other structural materials and the vessel's long-range and all-purpose capabilities, this vessel could be a breakthrough needed to put the U. S. shrimp industry on an equal basis with its foreign competitors.

The design and development of shrimp trawlers and shrimp fishing methods is one of the few fishing methods having its origin in the United States, practically all other U. S. fishing methods having originated in the Eastern hemisphere. Shrimping is now pursued in most of the waters of the world where shrimp exist, and the methods used (from the vessels to the trawls) are, at least in their inception, copied from the U. S. shrimp industry. The slide presentation illustrates how some European countries, in the short span of three years, have taken our basic shrimping technology and successfully applied it to large mothership operations capable of fishing and processing their shrimp catch anywhere in the world ocean.

OTTER TRAWLING for shrimp is one of the few fishing methods that originated in the United States. Although shrimp trawling is now conducted in most waters of the world, the methods used, from vessels to gear, have been copied from the U. S. shrimp industry.

As practiced today, shrimp trawling had its beginning in 1913 when a group of Portuguese immigrants tried to catch shrimp with otter trawls in the waters off Florida's northeast coast. The attempts were highly successful and by 1917 the otter trawl had displaced the traditional haul seine as the standard commercial gear.

The early shrimp trawlers were open skiffs ranging from 15 to 25 feet long, powered by small gasoline engines. By the early 1920's the trawlers were decked over, the engine placed forward, and a pilothouse added to the fore part of the vessel. This arrangement remains the standard for today's shrimp trawlers (Fig. 1).

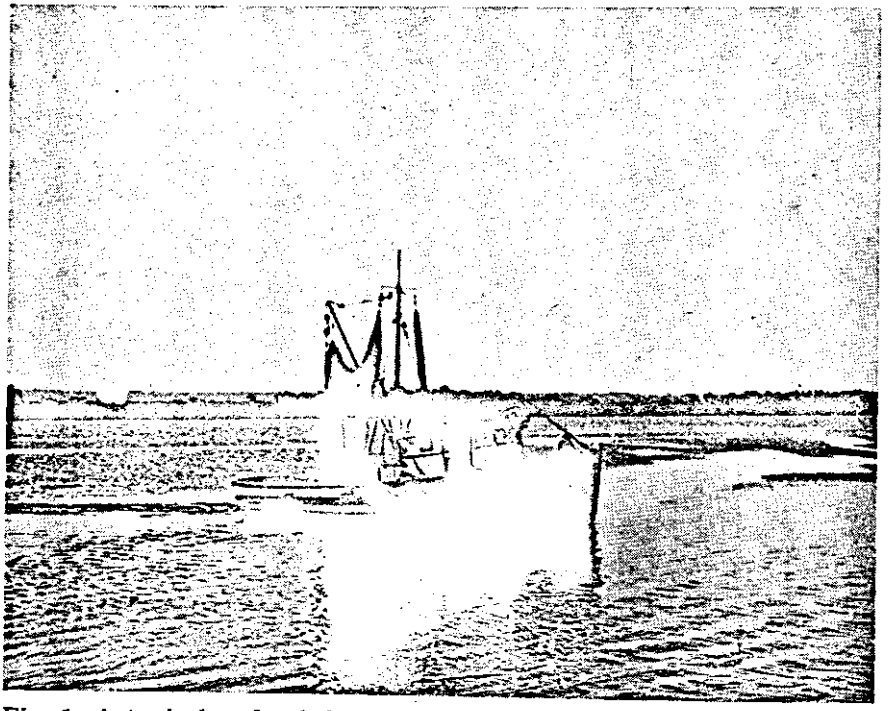

Fig. 1. A typical early shrimp trawler, the 35-foot GEORGE K, was constructed in Brunswick, Ga., in 1923. Many of these early vessels are still operating in the coastal and inshore shrimp fisheries.

The major trend in the 1930's was the introduction of the diesel engine and a slight increase in vessel size.

The 1940's marked a major transitional period for the shrimp trawler fleet. The need for large, powerful, and more versatile vessels to exploit the Louisiana and Texas offshore grounds and the newly discovered Campeche and Tortugas grounds resulted in many innovations in shrimp vessel design and construction. The first all-steel shrimp trawlers and the first freezer trawlers made their appearance at this time. Average vessel length increased to about 60 feet and many vessels were constructed in the 70- to 90-foot range with a corresponding increase in horsepower rating.

The construction boom of the 1940's continued into the mid-1950's. Although the same basic design prevailed, average vessel size and power again increased. Although wooden construction continued to be dominant, one of the developments of the 1950's was an increase in the number of steel vessels. Another trend was the increased use of freezer vessels, particularly in the Tampa, Fla., area. Mass design and production methods for shrimp trawler construction were initiated by Diesel Engine Sales Inc. of St. Augustine, Fla., resulting in a standard vessel at minimum cost (Ringhaver, 1960) (Fig. 2). The construction boom ended in 1955

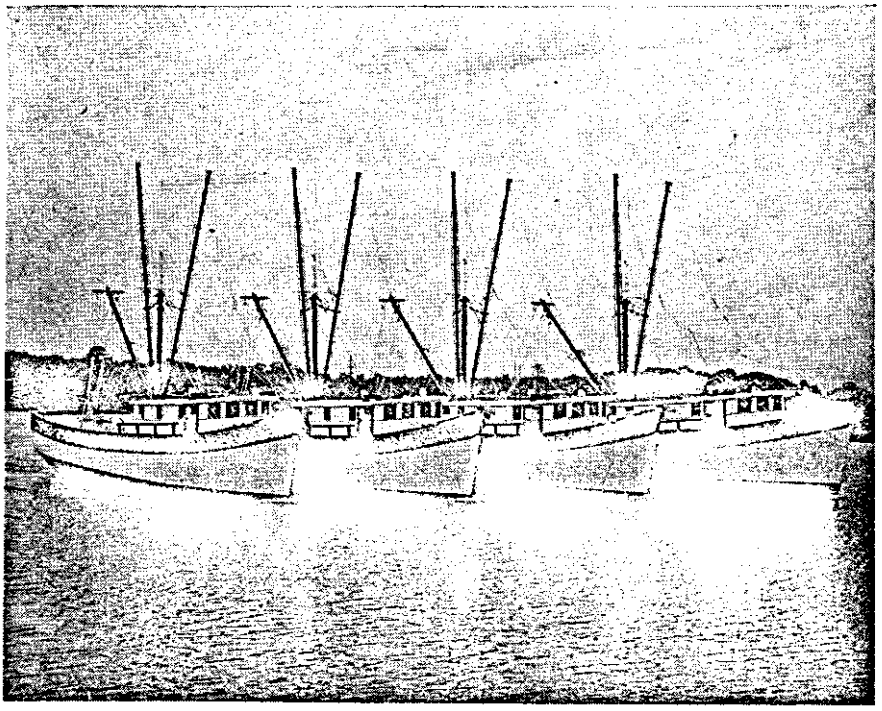

Fig. 2. A 72-foot shrimp trawler class produced by mass design and construction methods at Diesel Engine Sales Inc. shipyard at St. Augustine, Florida.

when only 168 new vessels were documented in the South Atlantic and Gulf States as compared to 432 in 1954 and an average of 325 vessels per year for the 1949-53 period (Fishing Gazette, 1956).

In 1958 the overall length of new vessels decreased to the 53- to 67-foot range with most being 53 to 62 footers. Horsepower ratings, however, remained at the previous levels.

The general profits decline of the late 1950's and early 1960's placed a damper on new shrimp vessel construction. The nadir was reached in 1961 when interest in new construction was reported as "almost zero." In late 1963, however, encouraged by good catches, new grounds, and increasing market demand, the shipbuilders experienced a building up-

surge comparable to the building boom of the late 1940's. The resulting competition for orders and the widespread recognition of the value of improving efficiency, effectiveness, dependability, and the durability of vessels and gear resulted in the introduction of many innovations in vessel design and construction that were more in line with the general technological advancements of this day and age.

In addition to the recognition that advanced technology must be utilized if the shrimping industry were to survive in the face of increasing competition and rising costs, the move by American flag vessels into more distant fishing grounds is perhaps the prime motivating source behind the present trend to construct large, modern, deep-sea shrimp vessels (July, 1966) (Fig. 3).

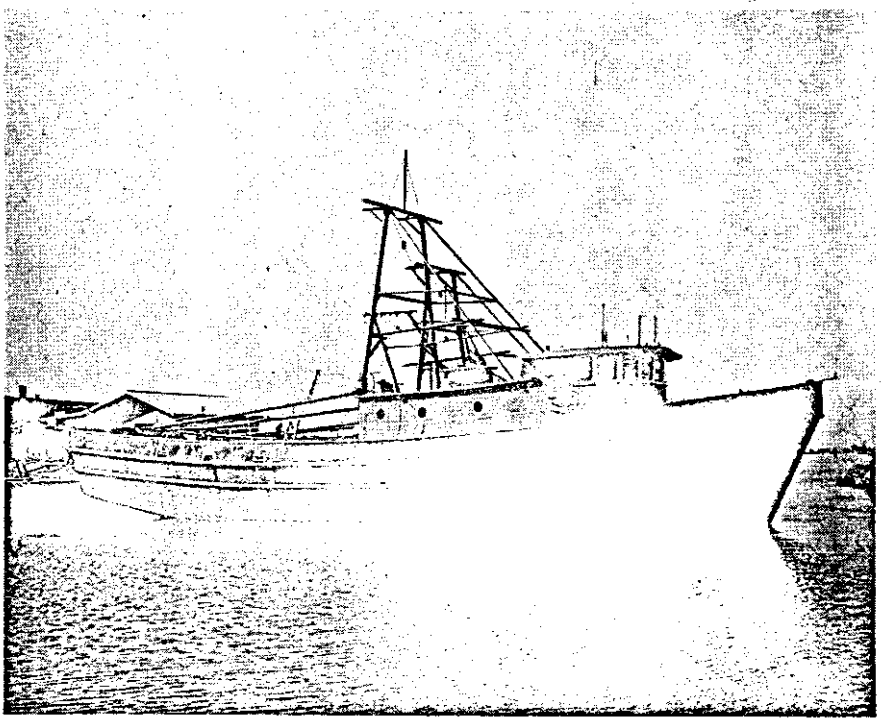

Fig. 3. Ultramodern steel shrimp trawler typical of the 1966 trend to larger and more powerful vessels. Principal dimensions are length overall 95 feet, beam 22 feet, draft 9 feet. Main propulsion consists of two 365-horsepower diesel engines driving twin screws. Living quarters are air-conditioned and attractively furnished. Complete shrimp processing and freezing equipment and the extended all-weather operating range enable these vessels to fish any of the shrimping grounds of the western hemisphere.

Although wooden construction has predominated in the past at the ratio of about 8:1, the all-welded steel vessel is now reported to constitute 50% of new construction. The primary reason for this development lies

in the inherent ability of steel vessels to carry more fuel and water because the tanks can be combined into the hull. Other reasons are the added strength-to-weight factor and the availability of new anti-corrosive coating compounds such as the inorganic zinc silicates and the epoxy and vinyl resins.

Other notable trends are (1) more powerful engines, with 300 horsepower being minimum; (2) better crew accommodations such as attractive air-conditioned quarters and modern sanitary facilities; (3) development of multi-purpose vessels adaptable for shrimp or industrial fishing, snapper fishing, or oil survey work; (4) installation of sorting, packaging, and quickfreezing equipment; (5) installation of hydraulically powered winches and steering systems, and alternating current for ship's service; (6) increasing use of integrated control systems and electronic aids; and (7) development of such innovations in design and construction as an all-aluminum, multi-purpose vessel, fiberglass reinforced hulls, and catamarans (Figs. 4 and 5).

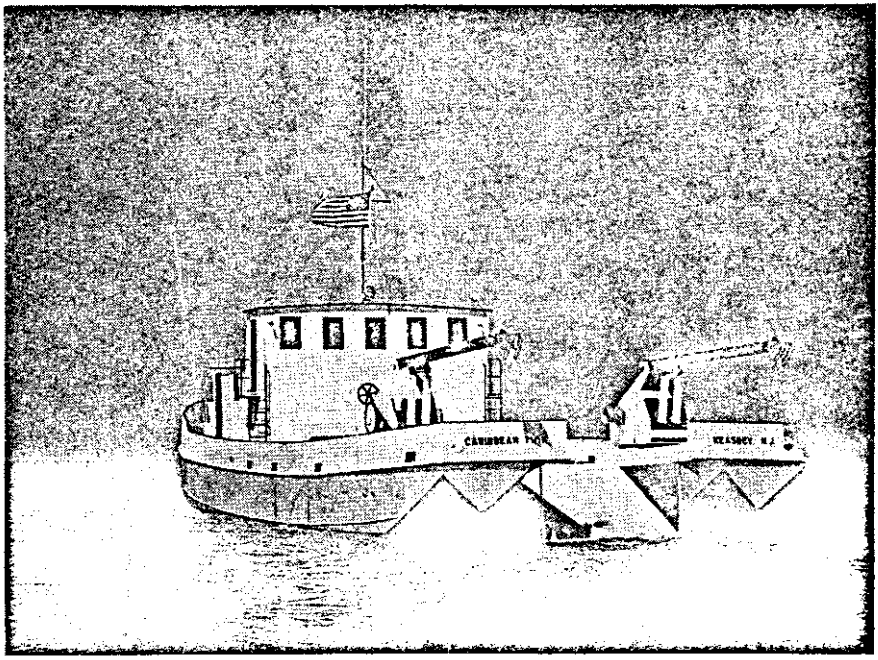

Fig. 4. The 71-foot catamaran hulled shrimp trawler CARIBBEAN TWIN now operating in the Gulf of Mexico shrimp fishery.

In reviewing the history of the development of the shrimp trawler over the past 5 decades, it is obvious that new construction and innovations in design are strongly influenced by immediate economic factors rather than by long-range economics. For example, when fishing earnings are down in any one year, new construction falls off significantly and there is little talk of the need for bigger and better vessels. Conversely, following one profitable year a significant increase in vessel construction

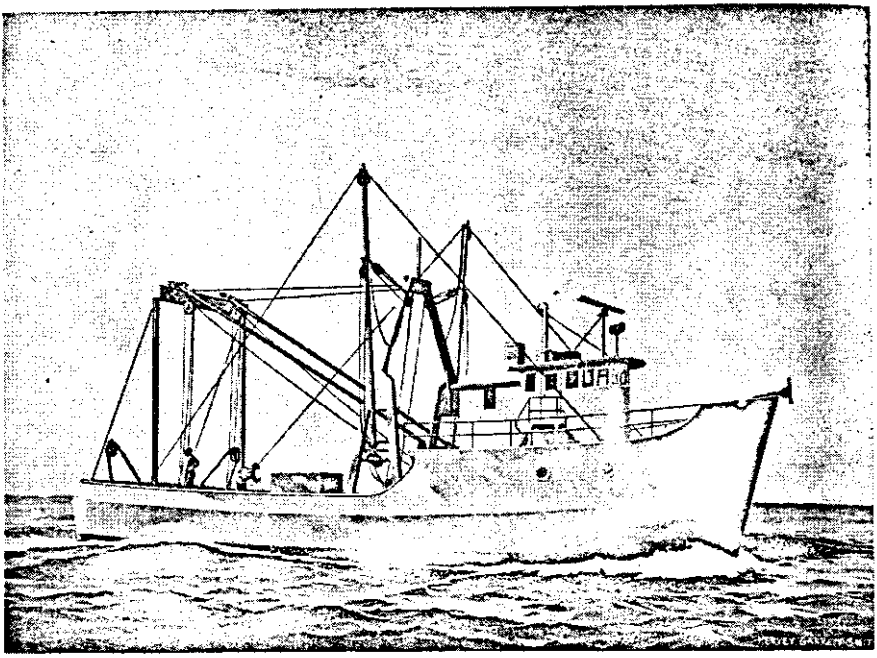

Fig. 5. An 86-foot all-aluminum shrimp trawler of advanced design. Special features include extended range and capability to function with a variety of fishing gear without further structural modification or alteration.

takes place, most of which are of conventional design. Although much talk is heard about advanced design, only a few vessels ever incorporate any measurable departure from the standard.

Two additional factors were noted: (1) the shrimp industry has, with few exceptions, purchased vessels that must be termed economy models—the emphasis is placed upon initial cost rather than upon increased production potential, sustained low-cost operation and maintenance, and economical long life; and (2) the major investments by U. S. shrimp operators have been in shore plant installations rather than in floating equipment.

In the past, most new and improved vessel designs have come from foreign countries where marine design creativity is encouraged and financed largely by their governments (Chapman, 1964) (Fig. 6).

Although it is doubtful that the U. S. will take the lead in design creativity, it is apparent that, with the aid of U. S. Government loan and subsidy programs, measurable change in the shrimp industry's outlook is evident. As a result there is every reason to believe that the U. S. shrimp fleet is approaching a level of modernization which, if continued, will in the near future make it one of the most modern deep-sea fishing fleets in the world.

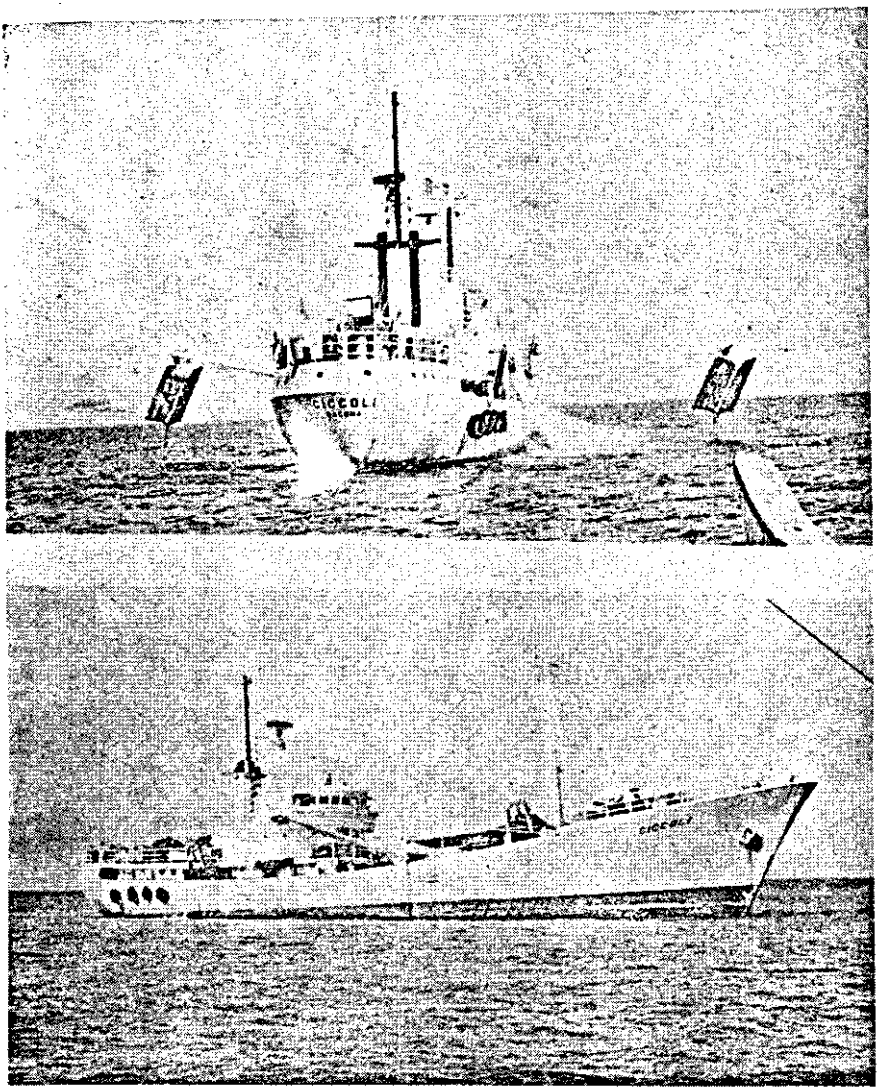

Fig. 6. The 188-foot refrigerated Italian side trawler CICCOLI, converted to double-rig shrimp trawling. The vessel also serves as a mothership to a fleet of catcher vessels. Note the simplicity of the outrigger installation, which is mounted in the bulwark railcap, and the side trawling equipment in place for instant conversion to fish trawling.

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Design and Economics of a New 86-foot Aluminum Multi-purpose Fishing Vessel

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TO REMAIN COMPETITIVE with foreign fishermen, U.S. operators are becoming keenly aware that their vessels must be highly efficient for maximum utilization of both equipment and personnel, inexpensive to operate and maintain, fast and with sufficient range to reach distant fishing grounds, big enough to carry a profitable load safely, capable of remaining at sea for prolonged periods of time, and capable of operation with a degree of flexibility impossible with existing fishing vessels.

The Aluminum Association, representing the industry, and with a background of successful marine applications of the light metal, recognizes the importance of the needs of the U.S. commercial fishing industry. The association commissioned Robert H. Macy, naval architect, Pascagoula, Mississippi, to design an all-aluminum fishing vessel with the most modern features for economical operation, and to conduct an economic study of its costs in comparison with a similar vessel in other materials. Mr. Macy was told that his design criteria must meet all the requirements of the Fishing Vessel Construction Differential Subsidy Act, and also that it should incorporate features as recommended by personnel at the Pascagoula Base of the U.S. Bureau of Commercial Fisheries, as well as recommendations by experienced commercial fishermen. The final design complies with requirements of the Subsidy Act.