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SAIL-ASSISTED FISHING VESSELS WORKSHOP SUMMARY

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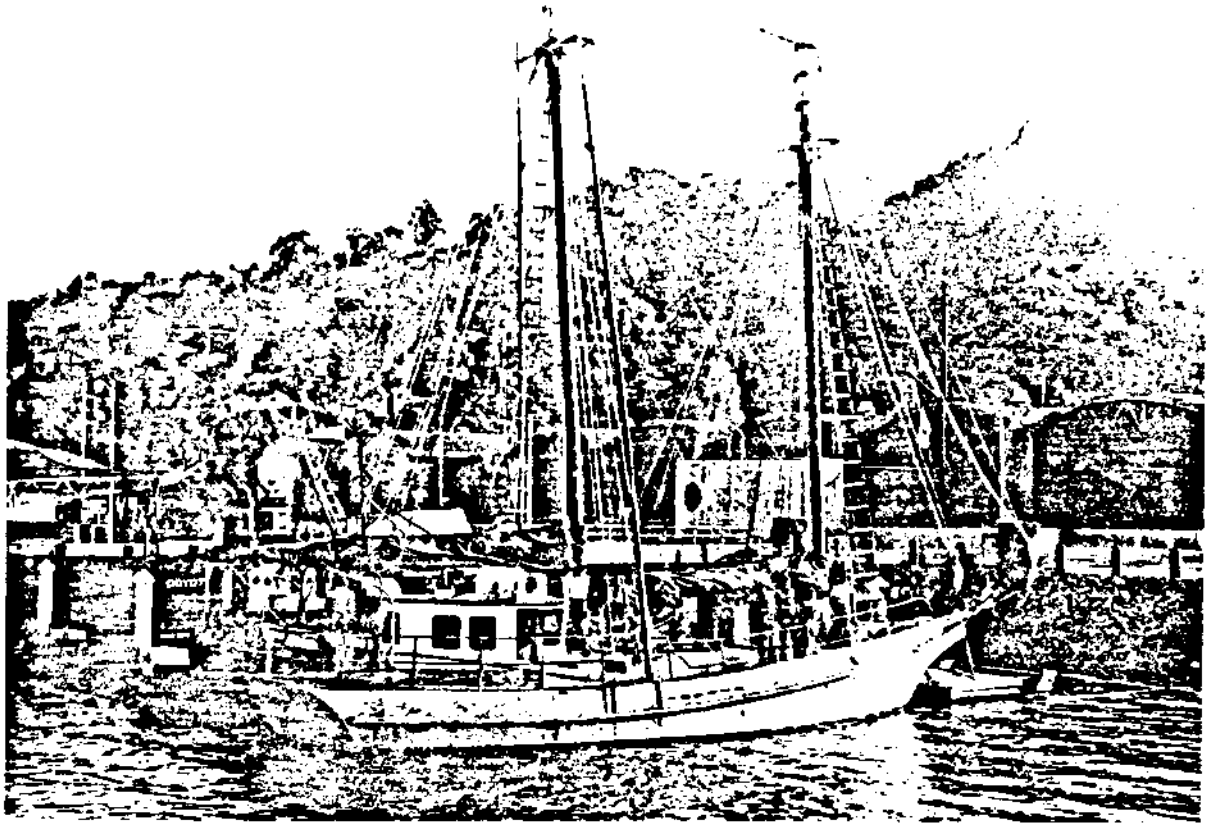

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COOPERATIVE EXTENSION
UNIVERSITY OF CALIFORNIA

MARINE ADVISORY PROGRAM

SAIL-ASSISTED COMMERCIAL FISHING

VESSEL WORKSHOP SUMMARY

On November 3, 1982, a one-day workshop on sail-assisted fishing vessels was held in Sausalito. It was sponsored by the University of California Sea Grant Marine Advisory Program, Ocean Carriers Corporation, University of Florida Sea Grant College Program, University of South Florida College of Engineering and the Pacific Coast Federation of Fishermen's Associations, Inc. Additional support was received from the City of Sausalito and the U. S. Army Corps of Engineers.

The purpose of the workshop was to present and discuss practical information about the use of sails on fishing vessels. This is a concise summary of what took place at the meeting. Also included is a brief bibliography and a list of participants. For further details on each topic contact the individual speakers.

Christopher M. Dewees, Editor

Contents

1. Design and Realities of Sail-Assisted Fishing Vessels
2. Overview of Economic Studies of Sail-Assisted Fishing Vessels
3. Practical Sails for Fishing Vessels
4. Panel Discussion
5. Bibliography
6. List of Participants

I. Design and Realities of Sail-Assisted Fishing Vessels - John Shortall III, N.A., University of South Florida, College of Engineering

In the Gulf of Mexico fisheries fuel costs are shutting down many fishermen, especially shrimpers. Approximately 50 percent of the shrimpers' costs and 30 percent of the Gulf longliners' costs are fuel related. Sea Grant funded research in Florida has been directed towards retrofitting and the snapper-grouper longline fishery. Retrofitting of shrimpers is difficult because of the large amount of complex deck equipment. One can retrofit a vessel for the snapper-grouper fishery for approximately $10,000.

Fuel prices will increase in the long run. Shortall feels that the following are critical needs for successful sail-assist vessels:

1. Retrofit must show economic gains over a 15-year life span.
2. Sail rigs must be simple with no extra crew required.
3. There should be minimum interference of fishing operations by the rigging (consider unstayed masts).
4. Clean, low superstructures are needed.
5. The heel angle should be 10° or less to minimize crew fatigue. (Editor's note: Some audience members felt 20° heel was acceptable.)
6. Consistent winds are needed; a minimum of a 10 knot average.
7. Bridge clearance by masts is important.
8. The fishing grounds must be at least 150 miles away unless the sails are used during fishing operations.
9. Sail and engine must be used at the same time. Turning the prop at several hundred R.P.M. reduces propeller drag.

Some of the problem areas, especially with retrofitting of vessels, include:

1. Ballast tradeoffs.
2. Coping with the variable center of gravity and variable displacement due to changes in fuel loads and filling of the fish hold. Center of gravity needs to be lower.
3. Lateral plane area.
4. Developing good rudders and steering systems.
5. Dealing with the shallow waters found in Florida waters.
6. Developing balanced sailing rigs.
7. Stayed or unstayed masts.
8. Type of rig for use: gaff, bermuda, ketch, schooner.
9. Being able to predict motor-sailing performance.

Some overall issues need to be addressed also. The merchant marine industry currently favors coal over sail-assist. Builders seem to be much more resistant to sail-assist vessels than fishermen. Perhaps they

don't want to change their traditional profitable building methods. Others are negative on sail-assist and they say that other fuel conservation methods (clean bottoms, lower speeds, etc.) should be used instead. Finally, the value of single shot experiments in sail-assist vessels is often criticized.

The choice between retrofitting or using new designs is difficult. At this time the high cost of new designs makes retrofitting more attractive economically. Several builders have tried to adapt yacht designs to fishing situations. It seems better to make sure that the vessel will be a good fishing vessel rather than a yacht. Catamarans need to be considered also. Over 15,000 are used in India. Their wide beam could reduce the need for otter doors on trawls; they have lots of deck space; and they are easily beached for maintenance.

II. Overview of Economic Studies of Sail-Assisted Fishing Vessels - Christopher M. Dewees, Marine Fisheries Specialist, Sea Grant Marine Advisory Program, University of California, Davis

It is difficult to generalize about sail-assisted fishing vessels; the situation is different for each individual and each fishery. This variability is reflected in economic studies. The economic reports often reflect the interests of the authors who range from diesel engine salesmen to romantic sailors.

Since 1967 fuel prices have risen 1,100 percent (1,000 percent since 1973) while fish prices have risen 400 percent. This high price increase has spurred interest in sail-assisted fishing vessels. A University of Hawaii study estimates that there are 50 to 75 sail-assist fishing vessels currently operating in the Pacific. In my review of the economic literature, the following major points become clear:

1. The high cost of technology and high interest rates make sail-assisted fishing vessels difficult to justify economically. Costs range from $10,000 for retrofitting to $400,000 for a new vessel (an equivalent used diesel vessel might cost $200,000).

2. The fuel bill must be a significant portion of the vessel's variable (operating) costs. While Gulf of Mexico shrimpers spend 57 percent of their variable costs on fuel, West Coast fishermen devote 5 to 25 percent of their costs typically to fuel.

3. On the Pacific Coast the most likely to benefit from sail-assist are fishermen with long trips to the grounds. The offshore albacore fleet and Seattle-based vessels traveling to Alaska are the best examples.

4. Fuel savings must be balanced with a loss in hold capacity of up to 50 percent and loss of deck space. If another crew

member has to be added to handle the sails, sail-assist probably won't be economically viable. A loss of speed (time) needs to be considered; this could add up to the loss of one to two trips per year or the fisherman could "miss the bite."

5. One needs to combine sail-assist with other fuel conservation measures such as reduced engine R.P.M., a cleaner bottom, reduced weight, efficient hull design, use of passive fishing methods, variable pitch or feathering propellers, and fuel monitoring devices.

6. In order for sail-assist to become more widely used, a continued rise in fuel costs is needed (this is likely). Also, the cost of the technology for both retrofitting and new vessels must be lower relative to the cost of available used diesel-powered fishing vessels. Tax credits and/or loan subsidies as proposed in S.B. 1356 would encourage adoption of the technology.

7. Careful economic analysis that considers life costs, sensitivity analysis and time to payback is needed. Past economic studies have generally failed to quantify sail-assist's value for coming-home ability, reduced towing insurance, reduced engine wear, comfort (less roll), and the value of the sailing lifestyle. Additional costs that need to be quantified include: loss of time/speed, limiting of fishing alternatives or lack of possible diversification due to vessel design, availability of wind, cost of learning to sail.

III. Practical Sails for Fishing Vessels - Peter Sutter, Sutter Sails, Sausalito

"My knowledge of fishing and its industry is limited and my fishing abilities are even less. My only claim to fame being that I caught six mahimahi and two blue fin tuna on a recent trip home from Hawaii. One of the tuna was so big we threw him back. So I can say at least I saved one for the fishermen to catch.

"I know my talk is supposed to be in the area of sails, however, I do wish to voice my opinions of hulls and rigs as well as sails; and in this talk I am only considering the fishing vessel that has been designed as a sailing fishing vessel with a power plant capable of sustaining hull speed when necessary, and that this vessel will be used by the offshore fisherman.

"A sailing fishing vessel must be capable of moving from one area to another as well as its motor driven competitior; and not always can sails alone supply the power to do this. In this respect the hull shape chosen for the sailing vessel is the most important factor. Very few of the recently built sail-assisted fishing vessel hulls I see are designed

for ease of movement through the water (the real fuel saver). The modern designs are quite beamy with regard to their length, totally losing the cleaner sailing lines provided by narrower hulls.

"There is no denying the fact that toward the end of the Grand Banks Schooner era, the hull design that had evolved was a very fast, easily moved hull (provided you didn't mind getting wet and had a large crew). The hull was narrow and deep with plenty of deadrise through the mid-ship section. Its rig was low and powerful. The maximum length vessels were in the neighborhood of 135 to 140 feet and held about 70 tons of fish. The smaller vessels were about 70 feet and could hold up to 40 tons. All of the vessels enjoyed good sailing capabilities whether empty or loaded primarily because of their hull shapes and their low aspect ratio rigs--most of them were gaff headers.

"Forty or more years have elapsed since these schooners were replaced by fully powered vessels. What I am trying to say is that today's designers of offshore sail-assisted fishing vessels should take a long look at those vessels developed in the past.

"Too often we see the ketch's lower shroud spread so far apart fore and aft that a meaningful sized staysail cannot be built. The jobstay's turnbuckle should be eliminated entirely and that stay be tensioned with the backstay on the ketch and the triatic and main backstay on the schooner. The sailtrack on the spars should be either 7/8 or 1 inch external U.S. standard track because the slides for external track are much stronger than the nylon slides made for the internal track.

"The running rigging should be as simple as possible. Halyards should be of non-stretch braided dacron; lazy jacks to help contain the sails when lowering are very seldom seen on jibheaded rigs but should be employed; boom sheetleads should be placed on the boom to strengthen the boom when the sail is reefed, not at the boom's end; sheeting arrangements that minimize the sheet length when it is being overhauled or slacked should be employed. The list goes on and on, but the K.I.S.S. (Keep it Simple, Stupid) syndrome should always be followed.

"Sails are pretty standard nowadays, but three important aspects of them must be considered: shape, strength and longevity, and ease of handling.

1. Shape. Sails should be cut fuller than those for the average cruising yacht because the fisherman is concerned with power and not with winning races. His vessel is not close winded, so why start out with a flat sail. As the sail is reefed, it automatically flattens itself.

2. Strength and longevity. In the 40 years since those great fishing schooners disappeared, much has happened in sail design, construction and materials. The greatest advance is dacron sail cloth. It first became available in limited amounts 30

years ago and it was about 20 years before the sailmaking industry really understood how to use it. A good part of this time, for the older sailmakers at least, was spent in getting away from the methods used in cotton sails.

One thing that has held true for me, where strength and longevity are considered, is the weight of fabric. The heavier the fabric, the longer it is going to last. Today we are getting sails back in the loft that are 25 years old and have made a couple of trips around the world. After some resewing they are ready for many more years of use. Most of these sails are of 9 ounce or heavier dacron and sun damage has not occurred. Nine ounce should be used in a 40 to 45 foot boat and 10.5 ounce in boats in the 50 to 60 foot range. The sails should be cut without batten pockets or roach which are the real problem areas on most sails. Corners must be stronger and heavier than for the usual cruising sail. If the mainsail and mizzen are expected to be used as trysails, the top third of the sail should be made of heavier weight dacron.

Seams should be broader than normal to provide width for double stitching later. The sails should be triple stitched initially and the two edge rows should be through both thicknesses of cloth. If possible, the dacron should be ordered with its natural woven selvage edge rather than the burned edge which is normal practice for the manufacturers. The natural edge provides a much stronger edge that will not unravel through chaffing as time goes on.

3. Ease of handling. Ease of handling heavier weight sails comes in three ways: knowing how to handle them (which I'll touch on later); the degree of softness of the dacron cloth itself; and the rigging of the boat. For the fisherman's purposes, the softer the fabric the better. Some fabric is woven and finished for the cruising yachtsman that is called soft. It is called Bermuda cloth, but even this fabric could be softer. I think as the fishermen's demands increase, a cloth will be woven that will meet their needs.

"In closing I want to touch on education. We all want the fisherman to use sails to help defray fuel costs. But how can we expect the fisherman to be able to use his sails to their best advantage? Few fishermen have been around sailboats all their lives. There must be a place within Sea Grant or the fishing industry for instruction. Someone is needed who is willing to spend the time on a voyage or two to teach the fisherman a new type of power and a whole new set of gear. Call me anytime."

IV. Panel Discussion - Morgan and David Davies, fishermen, boat builders and boat designers; J. P. Hartog, Naval Architect, Holland Marine; Miklos Kossa, Naval Architect; John Shortall III, Naval Architect; Christopher M. Dewees, Marine Fisheries Specialist

A free-wheeling discussion among panel members and the audience reviewed the earlier talks, answered questions on specific situations

and brought up new issues. The problem of making the non-sailing fisherman skilled enough in sailing to adopt a sail-assisted vessel was an important issue. The trade-off between an easy to move narrow hull shape and the corresponding loss of hold capacity was identified as a key economic and design issue. Problems with retrofitting current fishing vessels with hulls unsuited for efficient sailing was debated. The use of variable pitched propellers was encouraged by several panel members. More information and education in a form usable to the fisherman about sail-assisted fishing vessels is needed.

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