

Low Energy Fishing Vessels

The Use of Sail Power

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Introduction

Vessels using sail as a method of propulsion can be arbitrarily divided into five categories:

- 1) light flat bottom forms designed to skim over the water surface (e.g., light sailing dinghies used for racing);
- 2) heavy displacement hull forms (which include most, if not all of the traditional working craft using sail);
- 3) multihulls (catamarans, trimarans and other craft using multiple hulls or outriggers);
- 4) sailing hydrofoils;
- 5) miscellaneous craft using sail, such as sailboards, land and ice yachts, etc.

Given the nature of fishing vessels as load carrying craft categories two and three are the ones which most concern us in work boats in general and fishing vessels in particular, although some of the principles evolved by other forms of craft could have application in fishing vessels (e.g., the rig of the sailboard).

Before proceeding too far with the design of sailing fishing craft, thought must be given to a marriage of the sail system to be adopted with the operational conditions under which the vessel will be working.

Even a superficial examination of the evolution of a working sail powered fishing boat in any part of the world will show that the rig, while partly owing its form to traditions, has always evolved in a manner to suit the climatic conditions and the fishing

methods practiced in the area. A change in fishing method or extension to new areas has frequently resulted in the modification or abandonment of an older rig where the operational conditions favor change.

Traditional Working Sail Rigs

There are four main types of sailing rigs—the spritsail, lateen rig, Chinese lug sail and gaff sail. Each has its own advantage for the particular purpose of the vessels.

Thanks to the rapid growth of pleasure boat sailing and the experimentation in materials, rig and hull form which has taken place in recent years there is a considerable body of experience on which a designer can draw when proposing new rigs and sail systems for fishing vessels. Even if a decision is taken to revive a traditional rig the use of modern synthetic sails and running rigging, aluminum mast and boom extrusions, etc. can increase efficiency, decrease weight aloft and reduce the maintenance required.

The conventional Bermudian rig of pleasure craft while more efficient to windward is at a disadvantage compared to some traditional working rigs off the wind. This is overcome by the use of large, light weight spinakers,

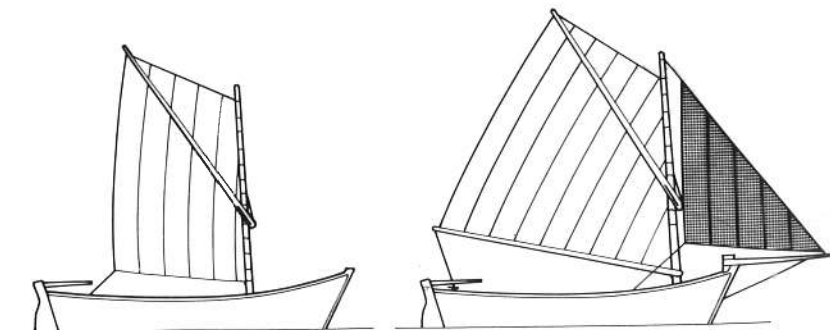
which, while suitable to the pleasure craft racing fraternity, are unlikely to meet with much approval in working fishing craft due to the additional complexity of rig and handling requirements.

Experimental Sail Systems

Of the various experimental rigs for wind powered propulsion there are four which could be of interest in fishing vessels large or small, namely:

- 1) Fixed aerofoils—which include both rigid and fabric aerofoils, amongst which are also included conventional square and fore and aft sails. Aerofoils of this nature convert wind power into a thrust which can be directly applied to moving the vessel through the water;
- 2) Magnus effect devices—of which the best known is the Flettner rotor which uses power rotated cylinders to produce an aerodynamic thrust;
- 3) Wind turbines—in which wind power is converted into mechanical power by a wind driven rotor either on a horizontal axis similar to land based windmills or a vertical axis turbine either of which can be used to drive a shaft and conventional propeller;
- 4) Airborne kites—which can be set and retrieved from the deck of the vessel and produce traction forces which can be used to propel the ship.

Spritsail rig and use of temporary bowsprit to increase sail area.



Design Criteria

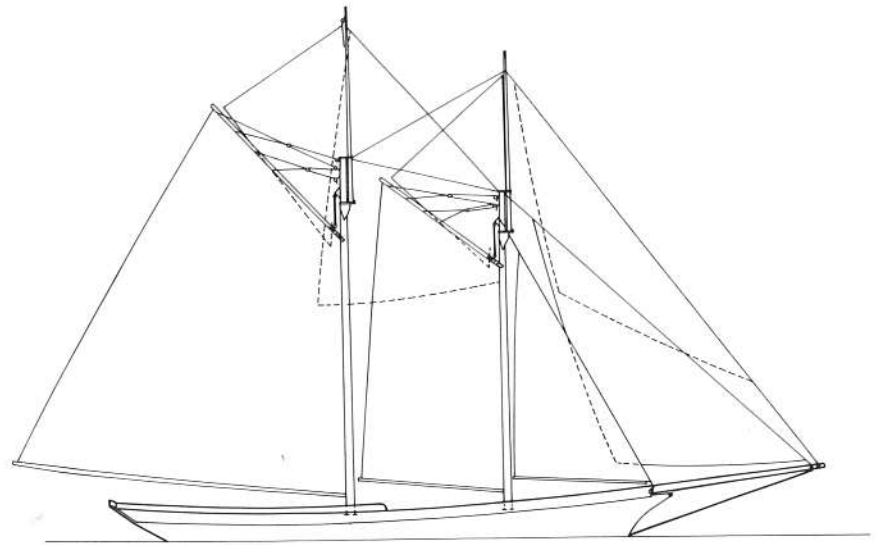
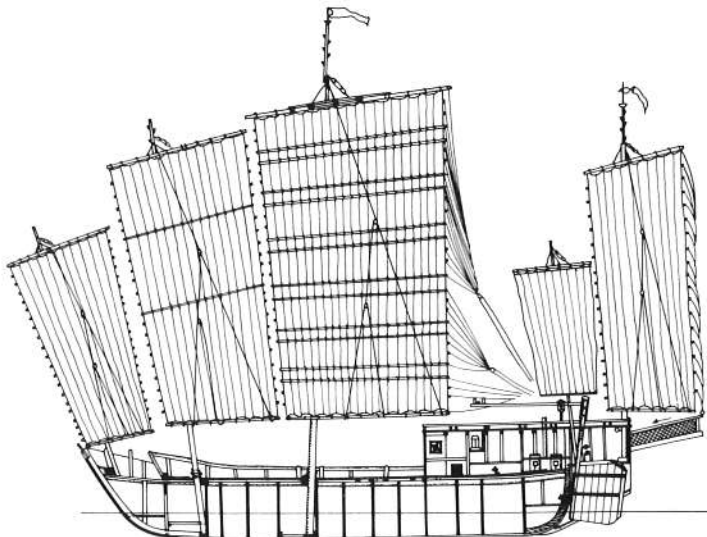
The following list, while perhaps not exhaustive, shows factors which require consideration during the preliminary design stage:

- (i) Fishing method (or methods) to be used;
- (ii) Working deck space required and the location of the principal operating areas;
- (iii) amount of time spent travelling to the fishing grounds;
- (iv) climatic conditions likely to be encountered and their probably variation through the yearly cycle;
- (v) power requirements for propulsion during the fishing operation;
- (vi) expected catch and the method of bringing it aboard;
- (vii) auxiliary sources of power necessary to:
 - a) the fishing operation, e.g., winches, net and line haulers, etc.
 - b) navigation and detection of fish, e.g., radar, echo sounders, sonar, etc.
 - c) conservation of catch, e.g., power requirement for refrigeration in one of its several forms
 - d) life on board, e.g., cooking, lighting, heating or cooling of living spaces, etc.

Obviously certain fishing methods—those requiring long periods of free running at less than full speed, with minimum use of auxiliary power for the operation of gear—will lend themselves most readily to an investment in the gear and skill needed to operate a sailing fishing boat. The advantages to be derived decreasing in proportion as the power output for gear operation and/or speed requirements for fish capture increase.

A few examples should be sufficient

The Chinese lug sail. Typical northern Chinese work boat.



The gaff sail, here on an American fishing schooner.

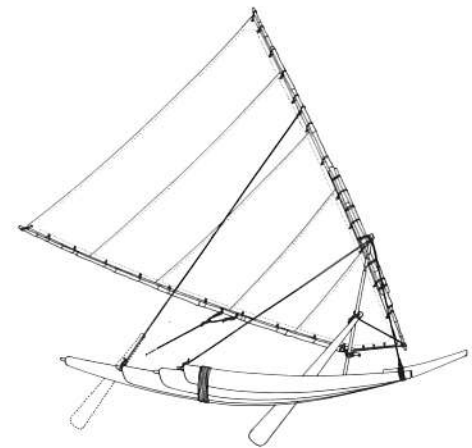
to emphasize the point. In descending order of advantage we might list:

- (i) trolling for surface and near surface pelagics (with the exception of certain species, such as skipjack tuna, which travel fast and require a speed and maneuverability for maximum catches which is beyond that to be expected from a working sail boat
- (ii) long lining
- (iii) pot and trap fishing
- (iv) gillnetting
- (v) seining and lift netting with lights

At the other end of the scale, we would expect to find modern day purse seining and deep bottom and mid-water trawling. In these cases any advantages to be derived from sail power would be exclusively in free running between port and fishing grounds.

Conclusions

For fishing vessels the traditional



Small lateen rig on an Indian log kattamuran. Courtesy of FAO.

working sail rigs still have much to offer. In many cases the simplicity of the gear, the ease of sail reduction in increasing wind strength, the possibility of readily clearing the working deck for fishing operations and good off wind performance make their use attractive in developing countries. The use of new materials developed for pleasure craft can increase efficiency and/or decrease weight aloft.

None of the experimental rigs have yet provided outstanding advantages which would warrant their immediate adoption for sailing fishing vessels. However, continued experimentation may well produce a rig with advantages in drive, simplicity and ease of operation either for use as the principal power source or in combination with engine power.