"I Spy at the Lighthouse Inn"

- ☐ I spy the Bass River
- ☐ I spy a light house cupola
- ☐ I spy a modern day fish weir
- ☐ I spy a large sand bar
- ☐ I spy a widow's walk
- ☐ I spy the Lighthouse Keeper's original house
- ☐ I spy a Fresnel lens
- ☐ I spy three new parts added to the Lighthouse Keeper's original house
- ☐ I spy the rooms where the Lighthouse Keeper's family slept



Extra Credit

Study this photograph. Draw a sketch of the new parts added to the original Lighthouse Keeper's house.

Lighthouse Inn 2001

Bass River Light

Bass River Light was built in 1855 and became an official lighthouse just to the east of Bass River in West Dennis. A light keeper's house was built, and the lantern was placed on top. Its fixed white light at a mean of 41 feet above mean high water could be seen for 11 ½ miles. Bass River Light continued in operation until 1914 when its use was discontinued by the government. A skeleton tower was constructed as a replacement, but this time it was across the river in South Yarmouth. Shortly after that the old building became a guest house and in 1930 it became what it is today, the Lighthouse Inn. In the late 1980'S the Stone family, which owns the Lighthouse Inn, re-lighted the lighthouse beacon and it serves once again as a private aide to navigation each year from May 1st through October 31st.

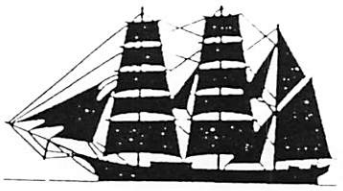
Three Sisters of Nauset Lights & Nauset Light

The original "Three Sisters" were three 15-foot tall, white and black brick lighthouses set 150 feet apart. They were built in 1838 between Highland Light (one light) and Chatham Light (2 lights). Sitting on a bluff 97 feet above mean high water, they were called "The Three Sisters" because they looked like three ladies in white dresses with black hats. Each tower had a fixed white light that could be seen for a distance of 15 ½ miles. The current three 22-foot tall wooden towers replaced the brick ones in 1892 and the brick ones went over the cliff later that year. Eventually in 1911, finding three separate lighthouses to be too expensive to maintain, two of the small towers were retired. The center tower, however, was retained and connected to the keeper's house. It became known as "The Beacon." By 1923, the Lighthouse Service was finding it too expensive to maintain a set of twin lights at nearby Chatham, and the service decided to replace "The Beacon" with one of Chatham's better built towers. The "new" tower was painted a distinctive red and white color to distinguish Nauset Light from Highland (Cape Cod) Light to the north in Truro and Chatham Light to the south. In 1996 this tower was moved again to keep it safe from the eroding shoreline. Two years later the keeper's house was also moved back from the cliff.

Sources: www.capecod.net/~gbenoit/
www.lighthouse.cc/
aristotle.ipl.org/exhibit/light/ATL/ThreeSisters.html



Learn How To Identify Different Types of Vessels



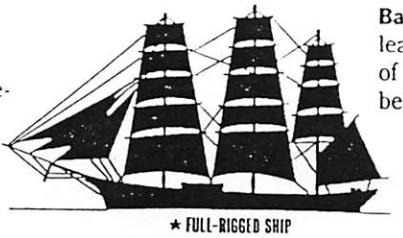
★ BARK

Bark: A ship with at least three masts, all square-rigged, except the aftermost one, which is fore-and-aft-rigged.



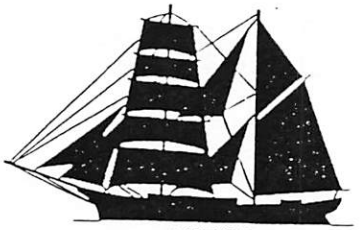
★ BARKENTINE

Barkentine: A sailing vessel of at least three masts, only the forward of which is square-rigged, the rest being fore-and-aft-rigged.



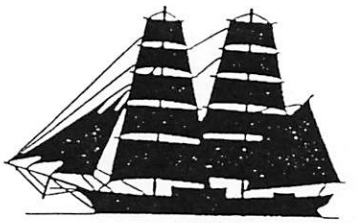
★ FULL-RIGGED SHIP

Full-rigged ship: A vessel with at least three masts, square-rigged, each having a topmast, a topgallant mast and a royal mast.



★ BRIGANTINE

Brig: Also called a Brigantine, a two-masted sailing ship, square-rigged on the foremast and fore-and-aft-rigged on the mainmast.



★ BRIG



★ THREE-MASTED SCHOONER



★ TWO-MASTED SCHOONER



★ TOPSAIL SCHOONER



★ STAYSAIL SCHOONER

Schooner: A vessel with fore-and-aft sails on two masts only, the foremast shorter than the main mast.



★ KETCH

ketch: A two-masted boat that is fore-and-aft-rigged with the mizzen mast always stepped forward



★ YAWL

Yawl: A small sailing boat with two masts, the after one being much smaller. and a mizzen mast, which is always behind the steering gear.



★ CUTTER

Cutter A sailing yacht with a mainsail and two foresails.

Sloop: A sailing vessel with a single mast, fore-and-aft rigged, and carrying a single headsail.



★ MARCONI-RIGGED SLOOP

Marconi-rigged sloop: A sloop with a Marconi (Bermuda-type) sail.



★ GAFF-RIGGED SLOOP

Gaff: A boat with four-and-aft sails laced to gaffs.

Identify the front (bow) and back (stern) of the vessel

Count the number of masts

Observe the height of each mast

Identify the type of sail (square rigged, fore and aft rigged)

"Learn About Lighthouses"

Lighthouse Signals

Bass River Light
Fl (1) 6s = one white flash
every 6 seconds

Nauset Light
Al (2) W R 10s = one white flash,
one red flash, 10 seconds and repeat

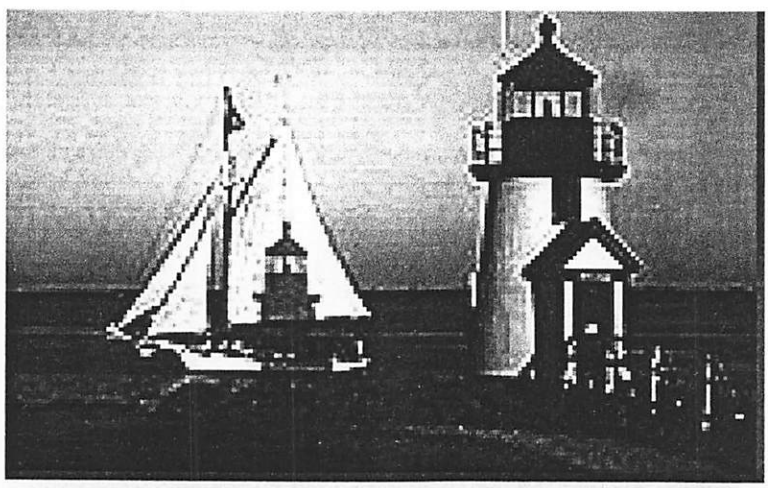
Chatham Light
Fl (2) 10s = 2 white flashes
every 10 seconds

The Passing Vessels Log

One of the duties of a lighthouse keeper was to keep a tally of passing ships and vessels. The keeper had to be able to identify each of the vessels from a distance. In order to do so, the keeper would:

- Look at the bow (front) and stern (back) of the vessel.
- Count the number of masts.
- Observe the height of each mast.
- Identify the type of sail (*square rigged* and *fore and aft rigged).*

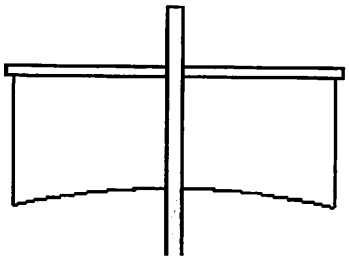
On the following pages we will learn about some of the vessels they would have likely seen in the 1800's and how they identified them.



Ships and vessels were built with two types of sails: square-rigged and fore-and-aft (fore'n'aft).

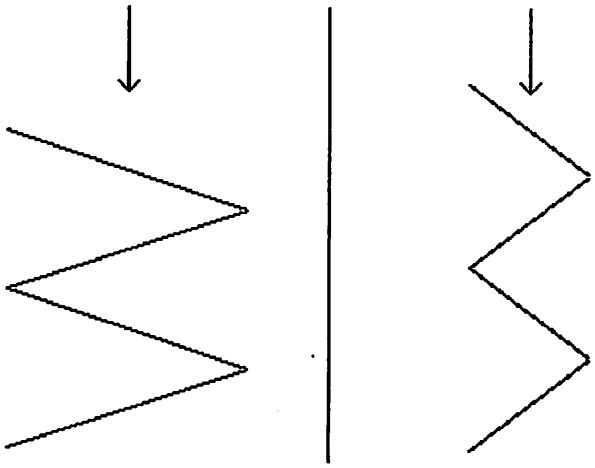
The Square Rigging

The *square sail* is the oldest type of sail. It is rectangular and is held up by a horizontal spar called the *yard*, that is attached to the mast in a fashion that allows the yard to be turned both in the vertical and the horizontal plane.



A mast, a yard, and a square sail.

As opposed to the fore-and-aft sail, the square sail always takes the wind from the same side of the sail. The square sail is at its best when sailing before the wind, and is not good when beating against the wind, as shown on the figure below.



The arrows show the direction of the wind, and the left figure shows the path of a square rigger; the angle between the wind and the course you're able to keep is about 70 degrees. The right picture shows the path of a vessel with fore-and-aft sails; the angle here is only 40 degrees.

The square sail was mainly used on deep-water sailers, because it is a very effective and safe sail when sailing before the wind, and on long voyages you would always choose a route with as little tacking as possible.

Different kinds of riggings

Sailing ships are rated based on how they are rigged, and the most important aspect is where they are rigged with square sails and where they carry fore-and-aft sails. The following are the most important square rigged ship types:

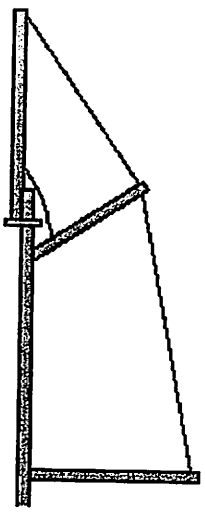
- The full-rigged ship or simply the *ship* has three or more masts and carries square sails on all of them.
- The barque has three or more masts and carries square sails on all but the aftermast, which is fore-and-aft rigged.
- The barquentine has three or more masts and carries square sails only on the foremast, and fore-and-aft sails on the rest.
- The brig is a two-masted vessel with both masts square rigged.

Fore-and-aft rigging

A fore-and-aft sail is a sail that can take the wind from either side of the sail, depending on the direction of the wind, as opposed to the square sail that is always turned so that it takes the wind on the same side of the sail.

A vessel can be rigged with only fore-and-aft sails, for example fore-and-aft schooners and ketches, but also square rigged vessels carry fore-and-aft sails in the form of staysails.

Gaff sail

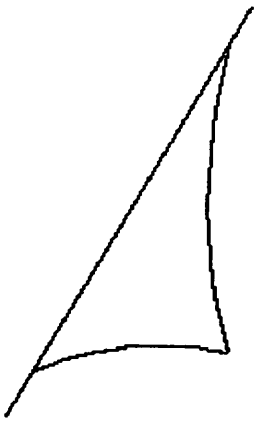


A gaff sail is a fore-and-aft sail with four corners and four edges. The lowest edge is called the *foot* and is attached to a horizontal spar called a *boom*. The vertical edge that is attached to the mast is called the *luff*, the upper edge is called the *head* and is attached to a spar called a *gaff*. The remaining edge is the *leech*. The corner between the luff and the head is called the *throat*, between the head and the leech is the *peak*, between the leech and the foot is the *clew*, and the remaining corner is called the *tack*.

Schooners are usually rigged with gaff sails, and most square rigged vessels have a gaff sail on their aft mast called the *spanker*.

Above the gaff is often rigged a triangular sail called a *gaff topsail*.

Staysail



A *stay* is a piece of rope or wire that supports the mast forward, to prevent it from falling backwards. In the 16th century it was discovered that you could set a triangular sail on such a stay, and this turned out to be an important breakthrough in the development of sailing ships. Soon every sailing ship carried staysails on every possible stay, and still today staysails are in use on every kind of sailing vessel, from small sloops to full-rigged ships.

A staysail has three corners; the highest one is called the *head*, the lowest one is the *tack*, and the remaining one is the *clew*. The edge that is bent to the stay is called the *luff*, the bottom edge is called the *foot*, and the remaining edge is the *leech*.

The sail is set by hoisting it up along the stay by hauling the *halyard* that is fastened to the head. The sail is then trimmed for the current winds by adjusting the *sheet* that is attached to the clew.

To take in the sail you haul the *downhaul*, that is usually fastened in the clew and runs through the head and down to the deck along the stay. This way the clew is pulled up to the head and they are then pulled down together.

A staysail is a fore-and-aft sail since it can take the wind from both sides of the sail, as opposed to the square sail.

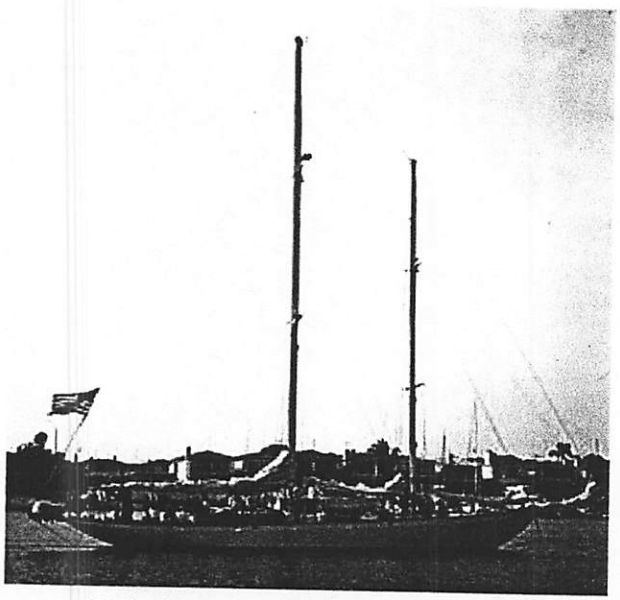
Masts

The tallest mast of the vessel is called the *main mast*. The mast before the main mast (if any) is called the *fore mast*. The masts after the main mast (if any) are called *mizzen mast*, *jigger mast*, *driver mast* *pusher mast*; although the last two names have probably never been in common use. However, on five-masted barques and ships the masts are called fore mast, main mast, *middle mast*, mizzen mast, jigger mast. On the only five-masted full-rigged ship that was ever built, the Preussen, the middle mast was sometimes called the *Laeisz mast*, after the ship's owner F. Laeisz.

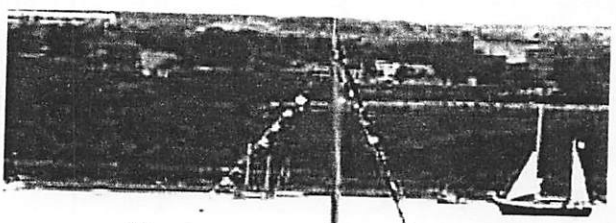
Also, in America the term *spanker mast* was commonly used in reference to the aftermast of schooners. According to a letter from Captain Crowley of the seven-masted schooner Thomas W. Lawson they called the seven masts fore-, main-, mizzen-, number 4, number 5, number 6, and spanker-.

A fully square rigged mast consists of three spars - the *lower mast*, the *topmast*, and the *topgallant mast*. The rig has at least three square sails: the *course* on the lower mast, the *topsail* on the topmast and the *topgallant sail* on the topgallant mast.

Often, the topsail would get so big that is divided into two separate sails to be easier to handle - the lower topsail and the upper topsail; on large vessels the topgallant sail is also split in two for the same reason. Most big square riggers also have a *royal* above the topgallant sail, rigged on the *royal mast*, that is usually not a separate spar but just a lengthened topgallant mast.

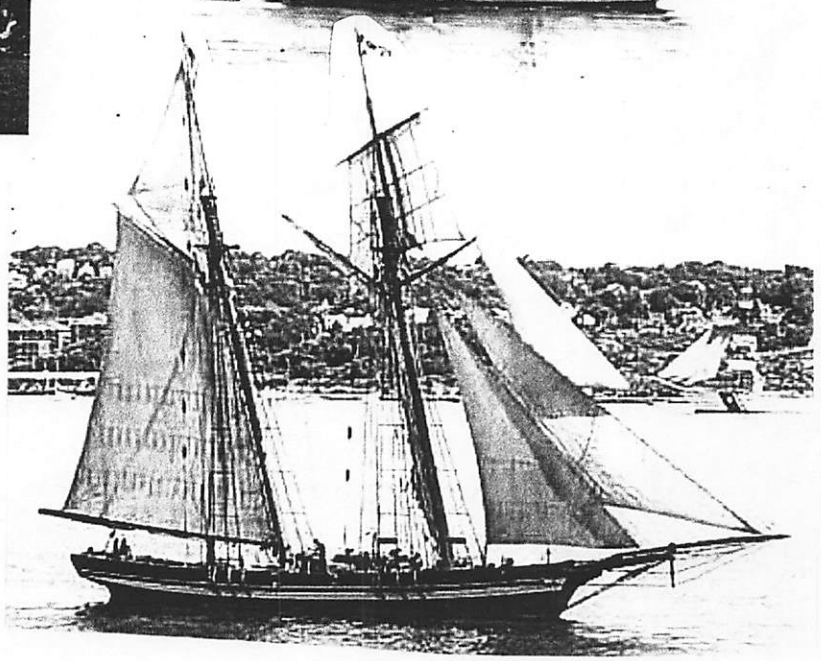


J.G. Alden 63 Staysail Schooner









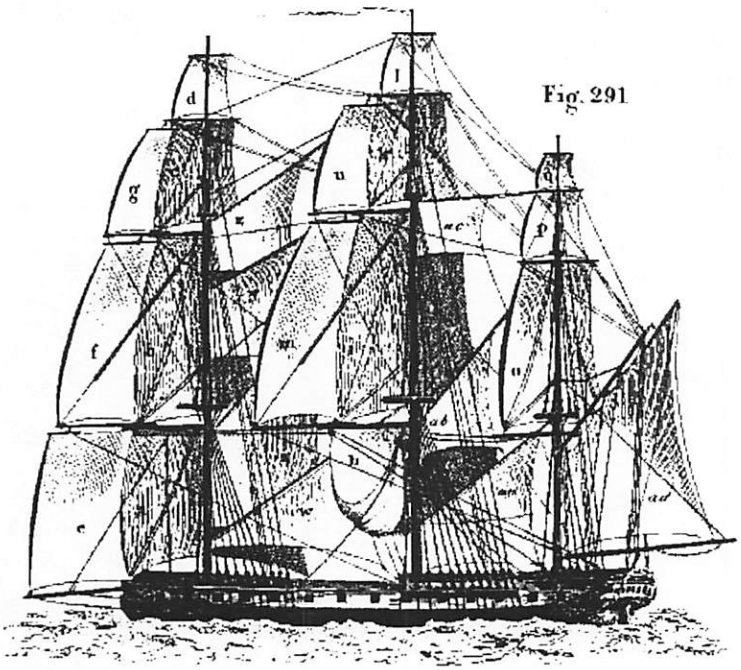


Illustration and text from *The Young Sea Officer's Sheet Anchor: Or a Key to the Leading of Rigging and to Practical Seamanship*, Darcy Lever, Dover Press, 1998.

"The Names of the Sails are derived from the Masts to which they are attached; thus the Foresail is named from the Foremast, the Mainsail from the Main Mast, the Main Topsail from the Main Top Mast, &c."

THE SQUARE SAILS	
(a) The Fore Sail	(k) The Main Top-gallant Sail
(b) The Fore Topsail	(l) The Main Top-gallant Royal
(c) The Fore Top-gallant Sail	(m) The Main Topmast Studding Sail
(d) The Fore Top-gallant Royal	(n) The Main Top-gallant Studding Sail
(e) The Fore Studding Sail	(o) The Mizen Topsail
(f) The Fore Topmast Studding Sail	(p) The Mizen Top-gallant Sail
(g) The Fore Top-gallant Studding Sail	(q) The Mizen Top-gallant Royal
(h) The Mainsail	(r) The Spritsail
(i) The Main Topsail	(s) The Spritsail Topsail
THE FORE AND AFT SAILS	
The Jib	The Main Top-gallant Staysail
The Fore Topmast Staysail	The Mizen Staysail
The Fore Staysail	The Mizen Topmast Sail
The Main Staysail	The Mizen Top-gallant Staysail
The Main Topmast Staysail	The Driver or Spanker and the Mizen brailed up
The Middle Staysail	

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LESSON

1

How does it sail, anyway?

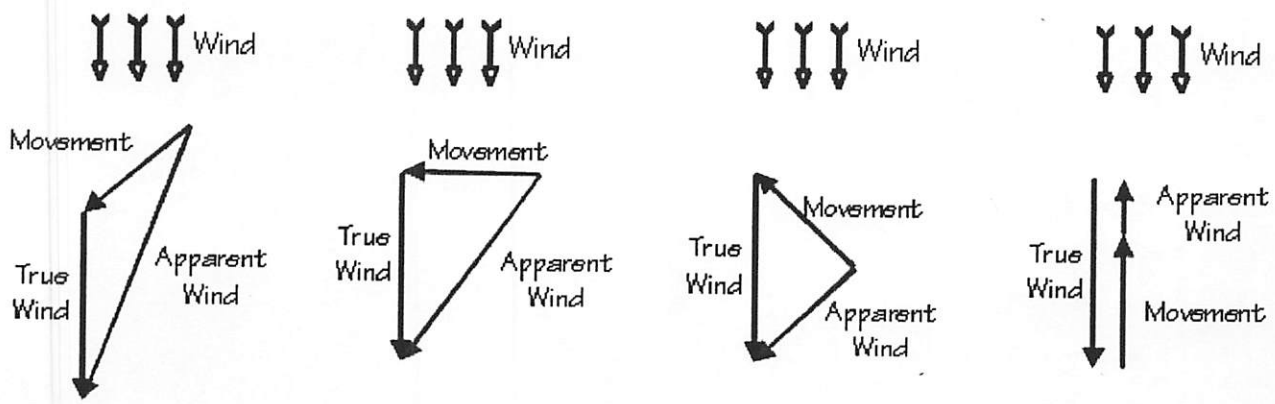
The wind blows on the sails, and makes the boat move. This is pretty basic stuff, and it's very clear when you think of the wind blowing from behind (i.e. when you sail "before the wind").



Early vessels used only this method, using the sails more for steering than for anything else. As the time progressed, people realized that it is possible to arrange the rigging in a way that will enable the boat to sail at different angles to the wind – thus making longer trips possible without having to rely on the direction of the wind. Now it is possible to sail at an angle of up to 38 degrees. In order to understand how it is done, we have to discuss the notion of apparent wind.

When a boat is stationary (when it is anchored, for example) then we only feel the "true wind". It is coming from its true direction. When a motor boat is moving fast, the wind felt while on it is "the wind of its own speed". A sailboat uses a combination of both, and this is called the "apparent wind". The telltales will only show the direction of the apparent wind – *this is a very important point*. It's important, because the direction of the apparent wind will change if the strength of the true wind changes.

Have a look at the following vectors (remember that the "movement" is in fact the wind created by the boat's movement):

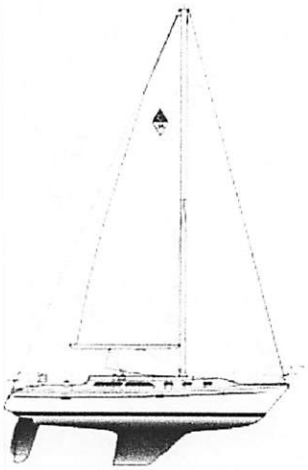


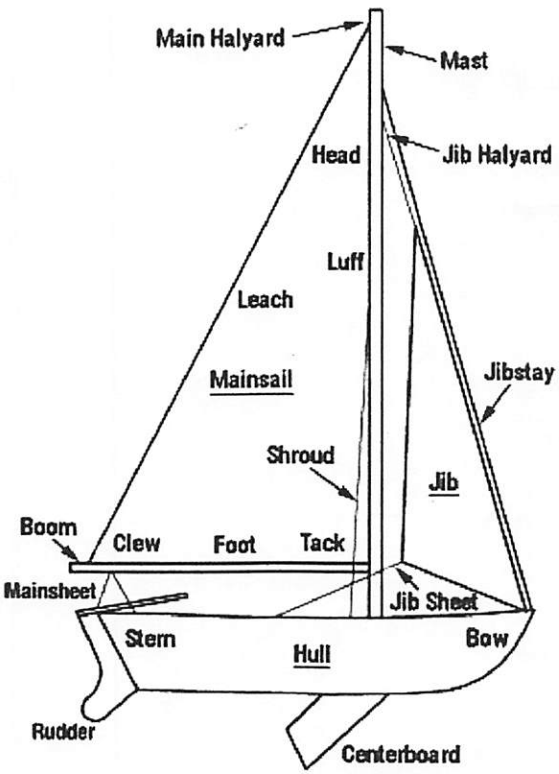
BOATTALK®

What is a hero?

Sailboat Parts

Our diagrams and information below will help sailors to become acquainted with the various equipment located upon their vessel.





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Sailboat Identifier

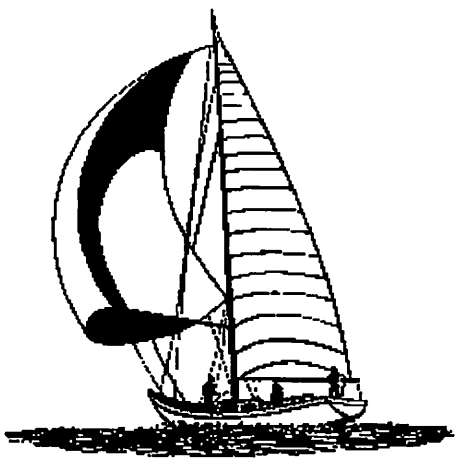
Boating Bookstore

Boat Buying Tips

If you have any further questions visit our sailboat maintenance and repair or sailboat forum and post a message.

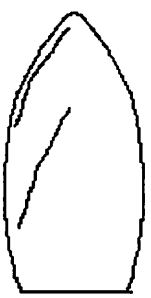
While the true wind stays the same, the movement remains stable, too. But once the strength of the true wind increases (let's say because of a gust), the wind of the boat's own speed remains the same, and the apparent wind will change direction. It will blow more astern (from behind). In this situation the boat will increase its speed, and the apparent wind will change direction again. When the true wind's strength will go back to its previous state, the apparent wind will change again (will blow more from the front, because once again the wind of the boat's own speed remains the same). If you don't realize these mechanics, it's easy to become annoyed at the wind changing the direction constantly. Once you remember that the telltales show only the apparent wind, and that this wind's direction may change with the strength of the true wind changing, you'll then be able to steer your boat in the most advantageous way. In other words, you'll use your wind and your sails more efficiently.

Why do you have to know this to understand why we now can sail against the wind?

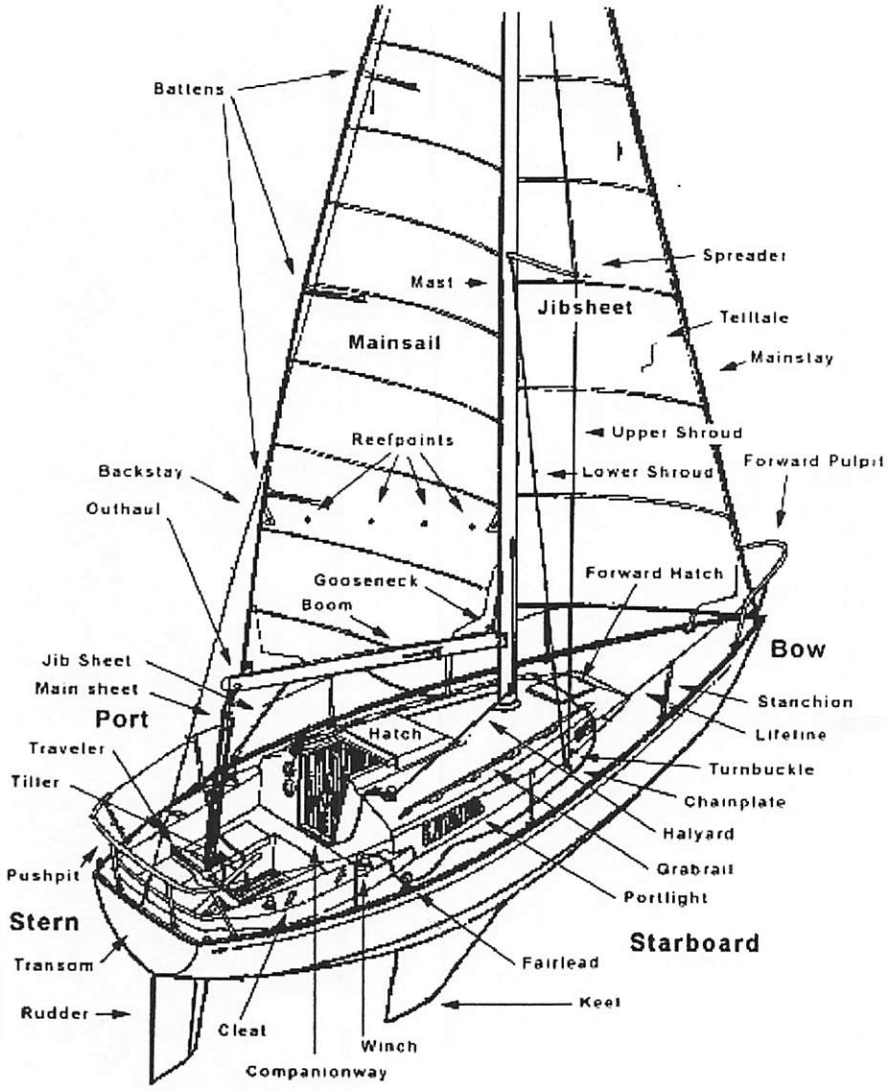


When the wind blows astern, the boat is driven forward by the force of resistance to the wind. Thus, the bigger the sail area, the bigger the resistance, the faster the boat will move. Think about spinnakers – they are very large sails with a parachute-like shape – we use them (most often!) when sailing "before the wind".

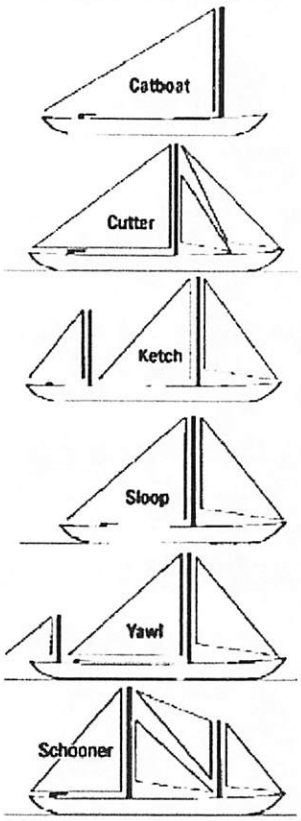
However, when the wind blows from the front, the sails shouldn't offer resistance anymore. The should deflect the (apparent) wind, and this is achieved by making the sail flatter. In this way, the force driving the boat forward is the pressure built up on the windward side (the side of the sail on which the wind blows), and the low pressure formed on the other side of the sail (the leeward side). All this results in suction. (Think about airplanes – it really is the same idea!) These two pressures form a force that is called "sailing thrust", or a "lift" (it is often said that you're "sailing in the range of lift"). In order that this force can have a full effect the sails must be set in the most advantageous angle to the wind (around 10 to 25 degrees to the wind).



At this point two forces act on the boat: the force of propulsion (parallel to the axis of the boat's length), and the transverse force (vertical to the axis of the boat's length). The former is advantageous – it propels the boat, the latter is disadvantageous – it causes the boat to make leeway and heeling, thus it pushes the boat on its side. Modern boats, however, can make up for this force greatly, and they often can reach very high speeds without making leeway (the keel/centerboard help), and with very little heeling (especially when the crew is helping out by sitting on the windward side - the reason I'm on the leeward side on this picture, is that I need to see both the jib and the main, which is possible only from this spot, the rest of the crew IS sitting on the windward side).



Main Types of Rigs



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Learn how to sail from the comfort of your computer. For screen shots and more information click below.



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Sailing Tip:

Getting the most out of your sail: Do not sail directly against the wind, and most importantly don't allow the angle of your sail to be less than 45 degrees. This will cause the wind to hit the lee side of the sail, which will make it flutter.

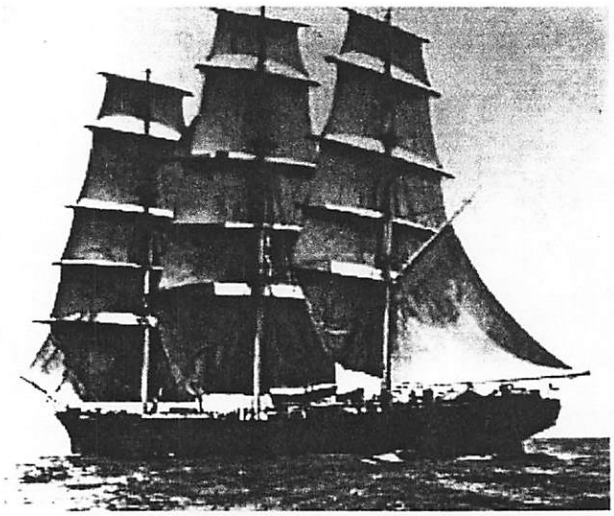
Click here to read other useful sailing tips....

Full-rigged ship

A vessel that has at least three masts, all of them fully square rigged is called a *full-rigged ship* or just a *ship*. Most such ships also have a small gaff sail on their sternmost mast.

Note that usage of the term *ship* often leads to confusion because any large vessel is commonly regarded a ship, although strictly speaking only *full-rigged* ships are *ships*.

The ship on the picture is perhaps the most well-known full-rigged ship ever, the Cutty Sark.

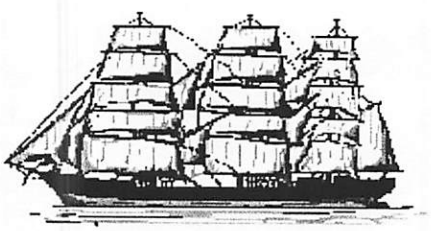


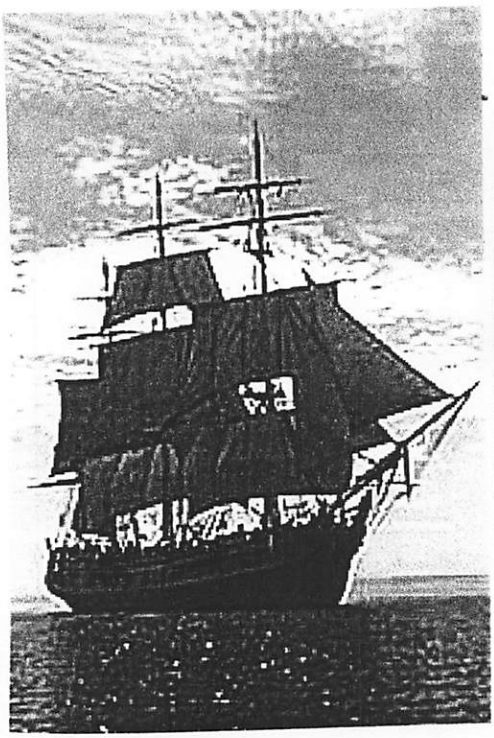
The full-rigged ship was a very common deep-water cargo-carrier in the 19th century. By far most of them had three masts, but many four-masted ships were built at the end of the 19th century. Many of them were later converted to four-masted barques because it was realized that a barque in most cases is a better sailer, is cheaper to maintain, and can be handled by a smaller crew.

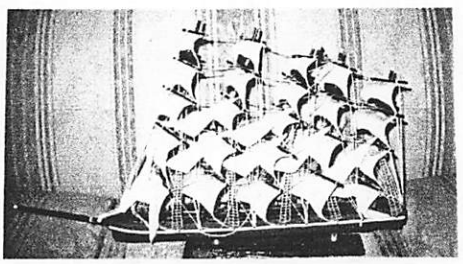
Only one five-masted full-rigged ship was built, the Preussen.

The full-rigged ship has also been very popular for school ships because it's the most complicated type of rigging and there is a lot of work to do with all the square sails. There are a few such fine full-rigged ships that are still sailing, for example the Danish ships Georg Stage and Danmark and the Norwegian Sørlandet and Christian Radich.







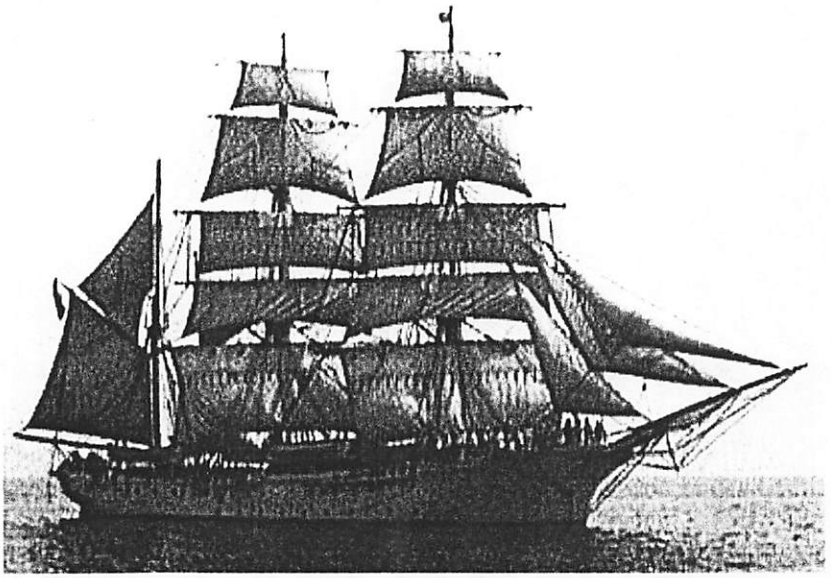


Full Rigged Ship
In the days of sail a ship meant one thing: a sailing vessel with 3 or more masts, square-rigged on all of them. Everything else was a vessel, not a ship

Barque

A barque is a vessel with at least three masts, all of them fully square rigged except for the sternmost one, which is fore-and-aft rigged.

The wooden three-masted barque was the most common type of deep-water cargo-carrier in the middle of the 19th century. However, only one such vessel has survived to our days - the Sigyn.



The typical cargo-carrier of the early 20th century was the four-masted steel barque. When four-masted barques started to appear in the 19th century, they were often called full-rigged ships since they had three square rigged masts, and a *ship* was more highly regarded than a *barque*. In America, the term *shipentine* was also used in reference to four-masted barques. This semantic confusion mostly got settled by the end of the 19th century.

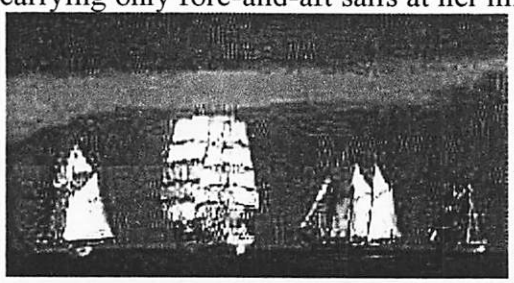
Only six five-masted barques were built, the first one being the France, built in 1890.

There are some fine barques that are still sailing, for example the four-masted barques Sedov and Kruzenshtern, and the three-masted barques Statsraad Lehmkuhl, Eagle, Sagres and Gorch Fock.

Vessels and Rigging

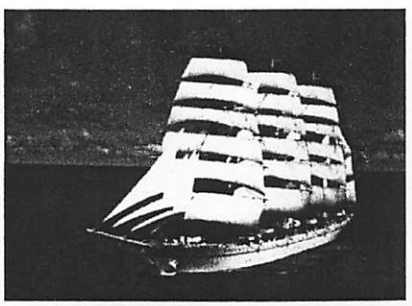
Barque (or Bark)

A barque is square-rigged at fore and main masts, and differs from a ship in having no top, and carrying only fore-and-aft sails at her mizzenmast. She has at least three masts. All of them are rigged with at least three square sails each, except for the sternmost one, which is rigged with fore-and-aft sails.



The wooden three-masted barque was a common sight in the port of san Francisco in the middle of the 19th century. A look through Vessels In Port will give quick indication of how important barques were in California's early development. Until the fast, elegant clippers and huge steamers began arriving in 1850-1851, barques, ships and brigs carried huge cargo loads from around the world, as is exampled by the French barque *Maria*.

The typical cargo-carrier of the early 20th century was the four-masted steel barque. The Japanese ship *Kaiwo Maru*, pictured here, is a four masted-steel barque.



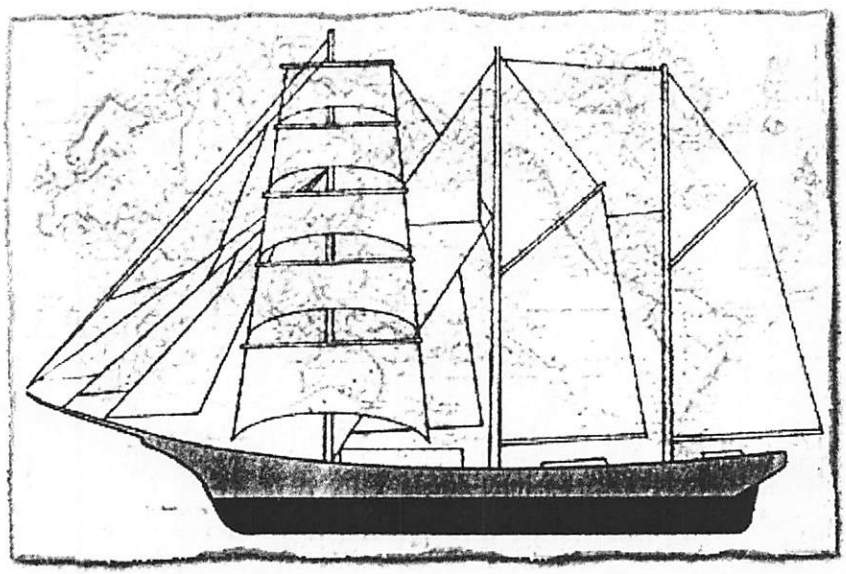
Barquentine (Or Barkentine)

A barquentine is a vessel with at least three masts, all of them fore-and-aft rigged, except for the foremost one, which is square rigged.

Three-masted barquentines were very common in the Baltic and the North Sea, and three- and four-masted barquentines also sailed on deep-water trades. A number of five-masted barquentines were built, and even some six-masted ones in America.

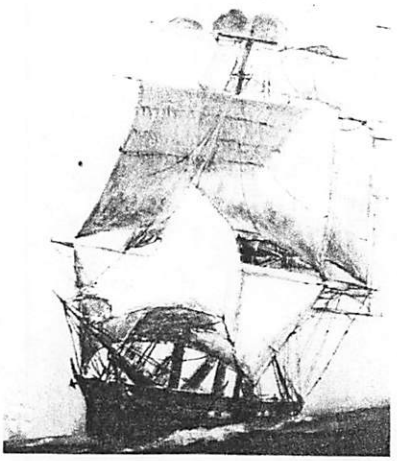
It can be argued that the barquentine belongs to the family of schooners; indeed, in Scandinavian languages the barquentine is referred to as a `schooner ship.'

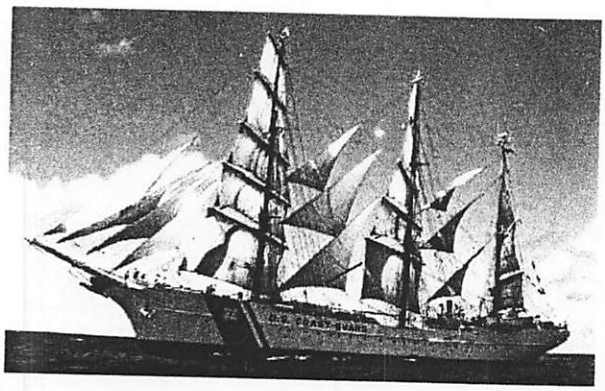


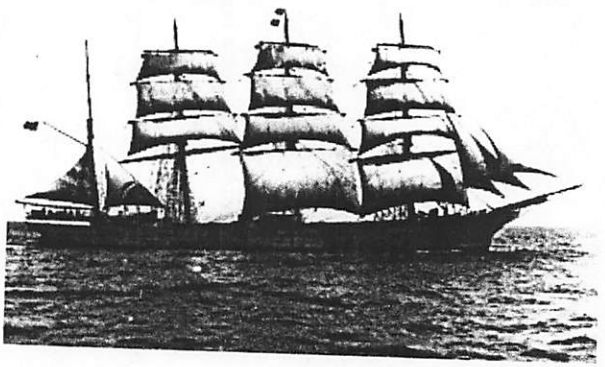


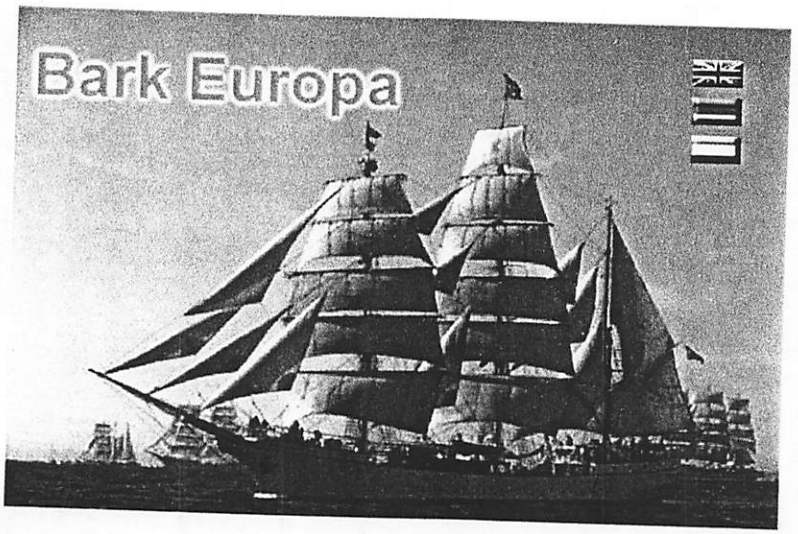


Bark
A ship with at least 3 masts, all square rigged, except the aftermost one which is fore-and-aft rigged.









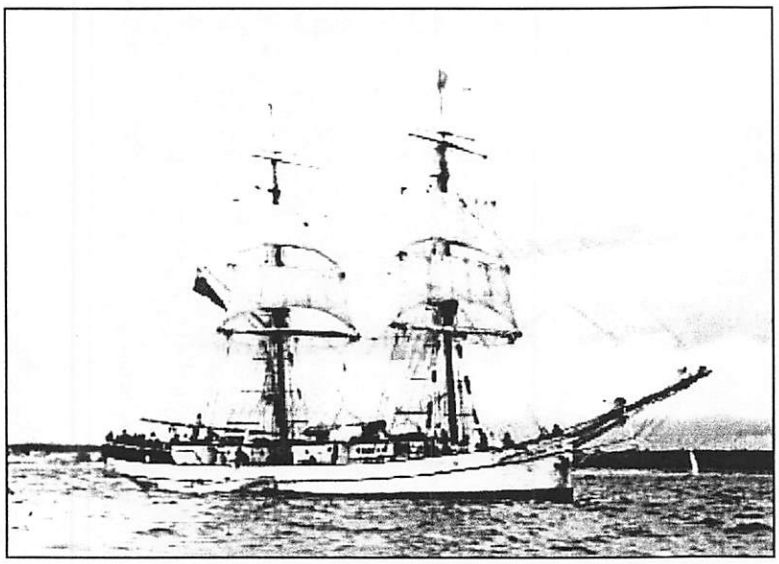
Brig

A brig is a two-masted vessel with both masts square rigged. On the aft mast, the main mast, there is also a gaff sail, in some languages referred to as the *brig sail* but in English often called the spanker.

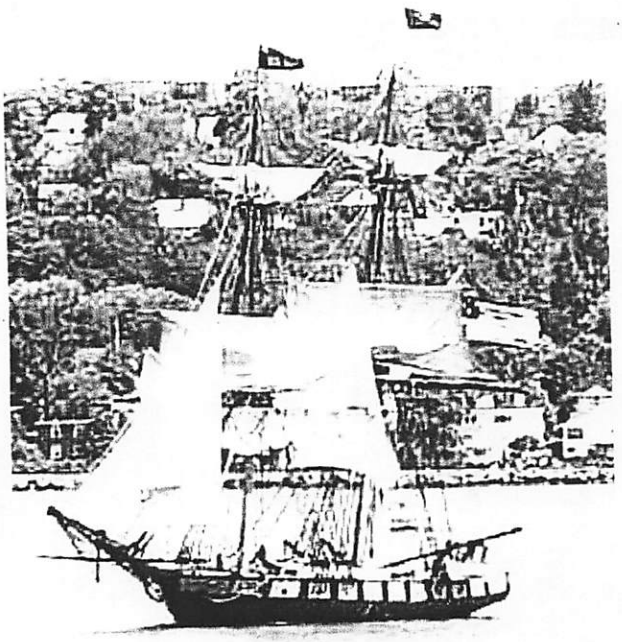
Some brigs have the gaff sail rigged on a separate mast just a bit astern of the main mast. This mast is called the *snow mast*, and such a brig is called a *snow brig*.

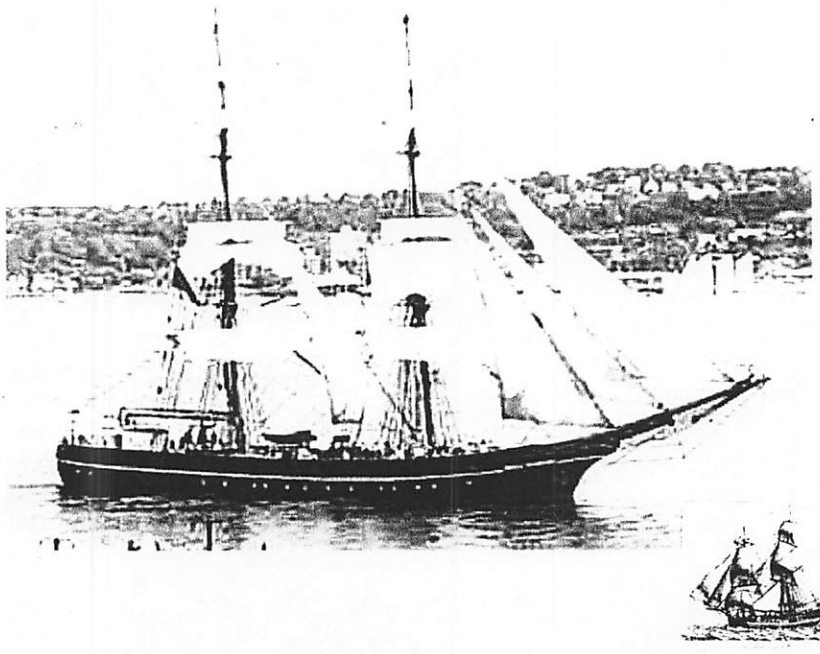
The brig with her two fully squared rigged masts possessed some unique sailing qualities, and a skilled master could manouver her with great ease and elegance; a brig could for instance turn around almost on the spot!

Brigs that are currently in service include the Astrid and the Royalist.

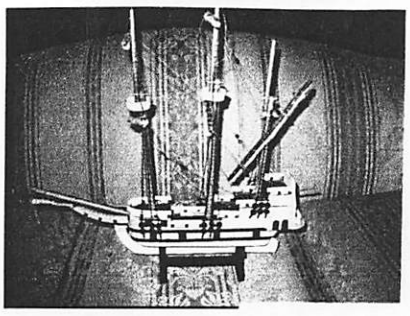


(Brig) **ASTRID** *(UK)*
Hull Length: 33.2m, Bowsprit: 10.1m, Built: 1918.









Old Style Brig

Brigantine

A brigantine is a two-masted vessel with her foremast fully square rigged and her mainmast rigged with both a fore-and-aft mainsail (usually a gaff sail) and square topsails (and possibly topgallant sails).

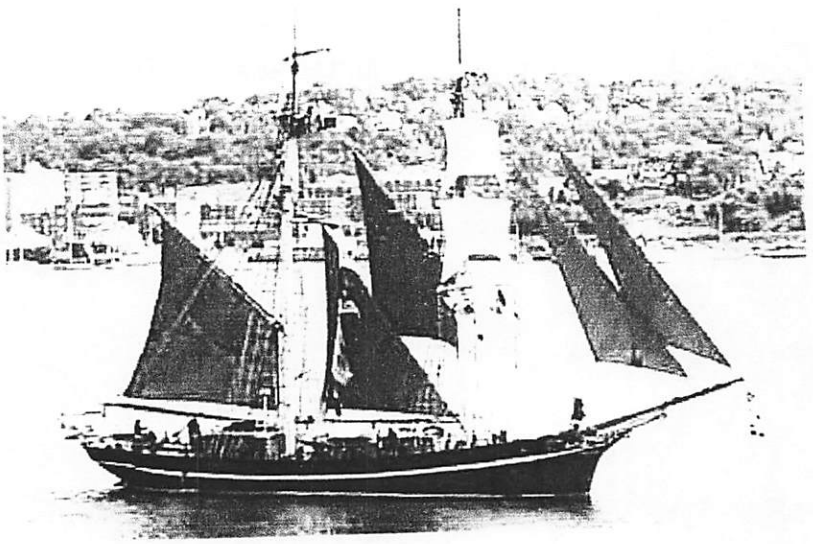
A vessel that fits the above definition is a true brigantine. However, today the term brigantine usually means something else, namely a vessel that is more accurately called a hermaphrodite brig, one with the foremast square rigged and the mainmast fore-and-aft rigged without any square sails.

There is currently only one sailing true brigantine in the world, the Eye Of The Wind.

The brigantine can be said to belong to the family of schooners; in Scandinavian languages the brigantine is sometimes referred to as a `schooner brig.'

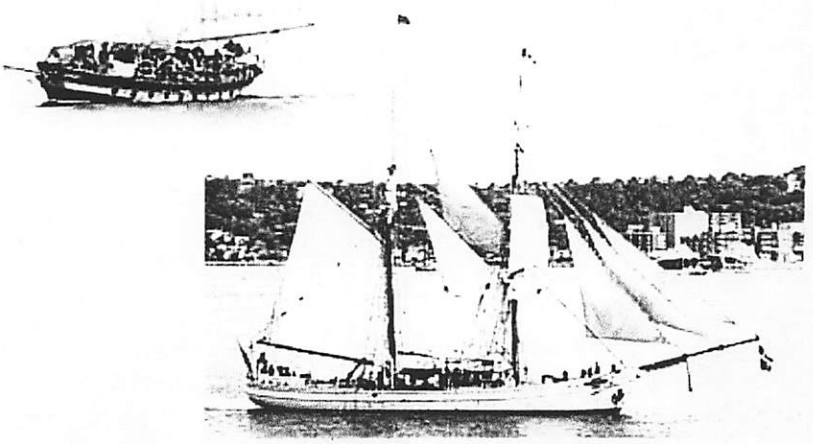
"Eye of The Wind"









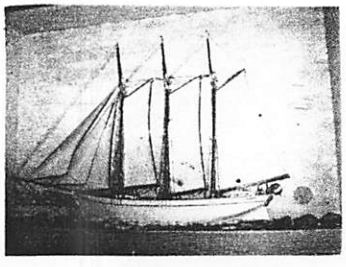


Schooner

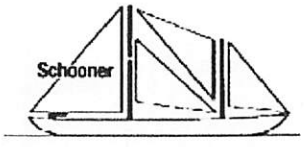
The schooner is not a specific kind of vessel, but a large family of ship types. What every schooner has in common is that it's mainly fore-and-aft rigged (the main sail *must* be a fore-and-aft sail), and that it has at least two masts (a foremast and a mainmast; a two-masted vessel with a mainmast and a mizzen mast is not a schooner).

A *Fore-and-aft schooner* is rigged solely with fore-and-aft sails. Two-masted fore-and-aft schooners are small, fast and handy vessels, often used as fishing vessels in the 19th century. Three-masted fore-and-aft schooners were at one time very common for trading in the Baltic. There have been large four-, five-, and six-masted fore-and-aft schooners as well, especially in America, but their gaff sails were so large that they became very hard and dangerous to handle. There was even one seven-masted fore-and-aft schooner, the only seven-masted sailing vessel ever, the Thomas W. Lawson, built to carry coal. She was considered a man-killer; for huge sailing ships like these square sails are much safer.

A *Topsail schooner* is similar to a fore-and-aft schooner, but carries square topsails, and sometimes a topgallant sail on its foremast. A few topsail schooners were rigged with square sails on two of their masts; such a vessel is called a *two-topsail schooner*.

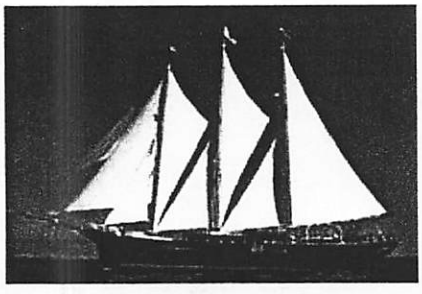


Schooner

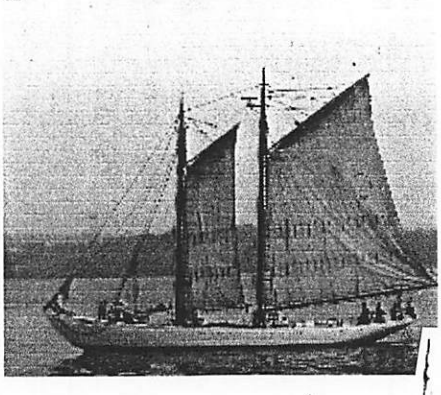


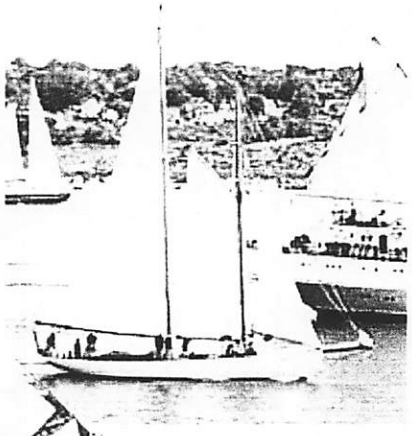


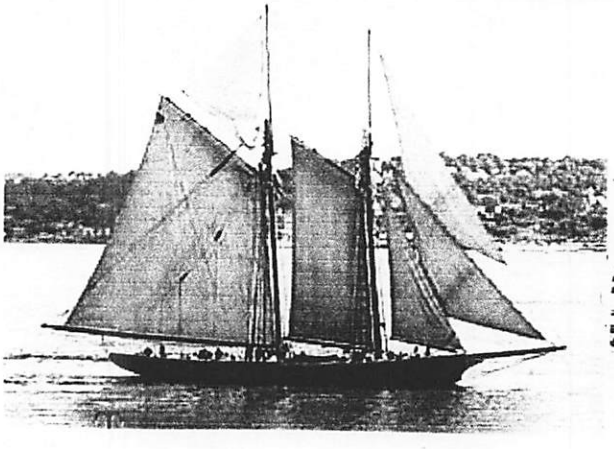
First seen among 19th-century ships. It is multimasted and furls triangular sails. The foremost mast is always shorter than the others.

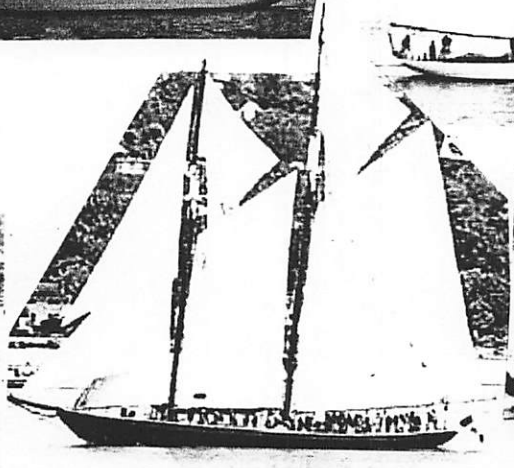


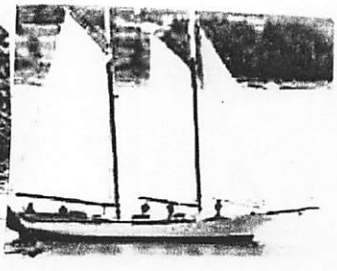
Benetti 161 3 Masted Schooner







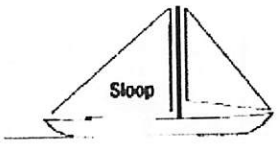




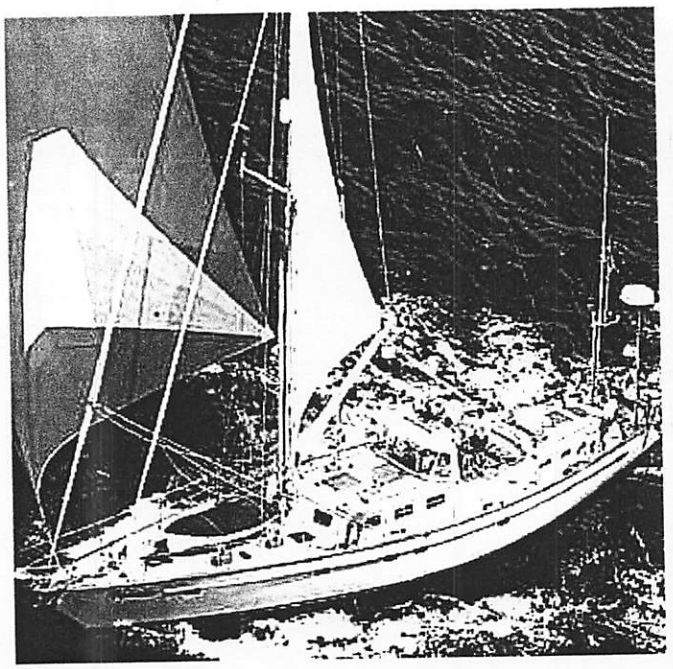
Sloop

A sloop is a one-masted fore-and-aft rigged vessel with one jib (staysail) before the mast.

If there is more than one jib, the boat is a cutter.

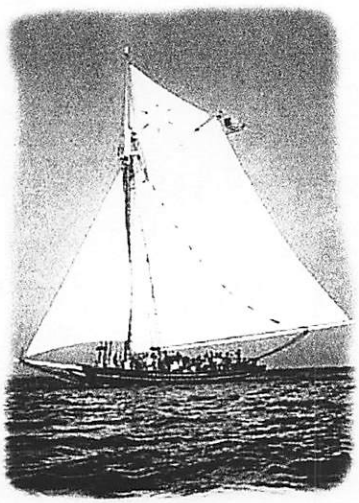


Sailing vessel rigged with one mast and a single jib and mainsail.



Sparkman 66 Sloop

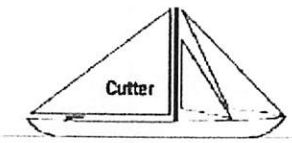




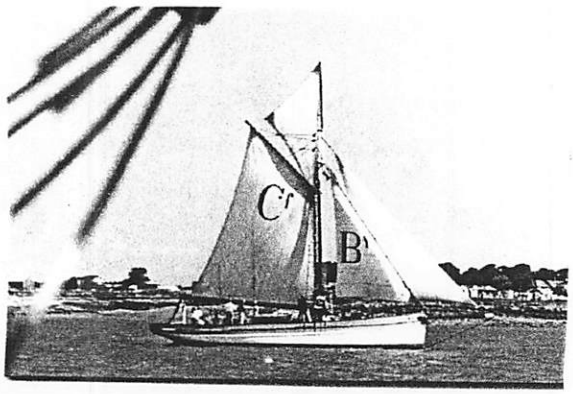
Cutter

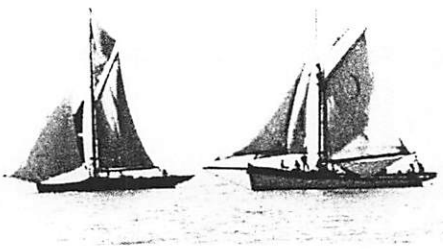
A cutter is a one-masted fore-and-aft rigged vessel with more than one jib (staysail) before the mast.

If there is only one jib, the boat is a sloop.

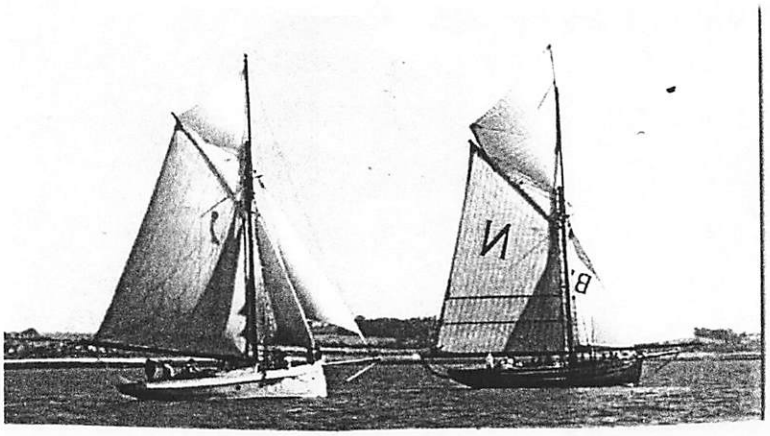


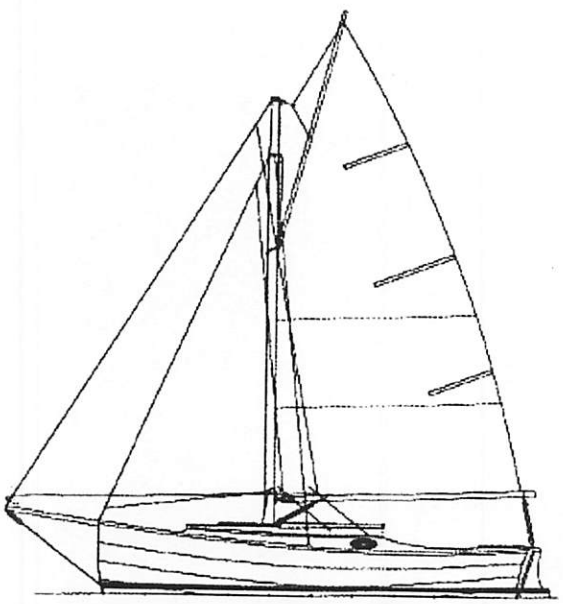
Similar to a sloop except sails are arranged so that many combinations of areas may be obtained.









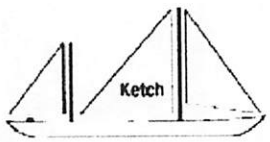




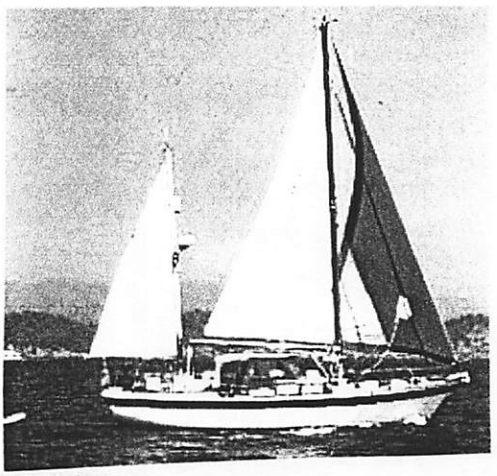
Ketch

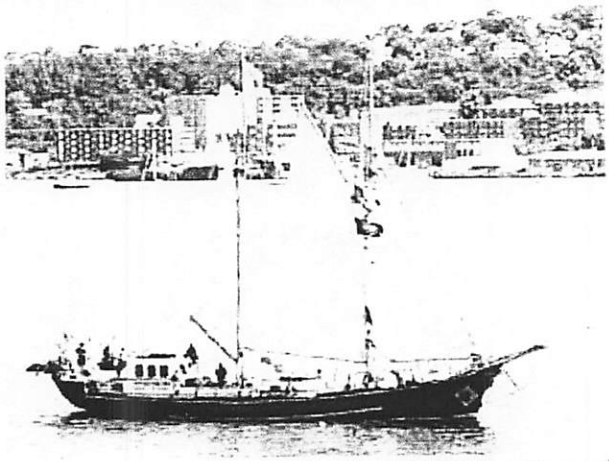
A ketch is a two-masted fore-and-aft rigged vessel with the first mast taller than the aft mast, and the steering position behind the aft mast (the mizzen mast). If the steering position is ahead of the mizzen mast, the vessel is a yawl.

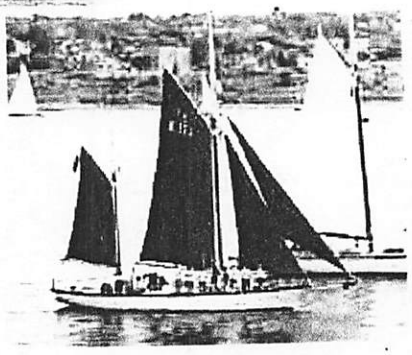
Ketch

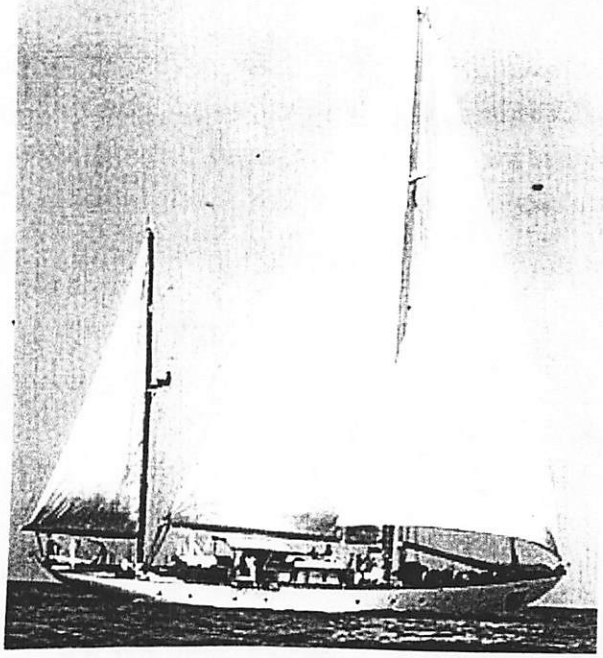


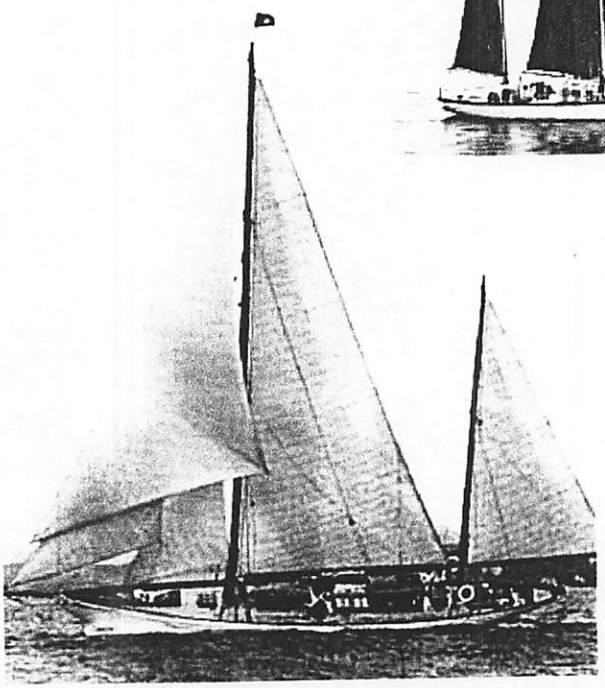
Two-masted boat where the mizzenmast stands before the helm.

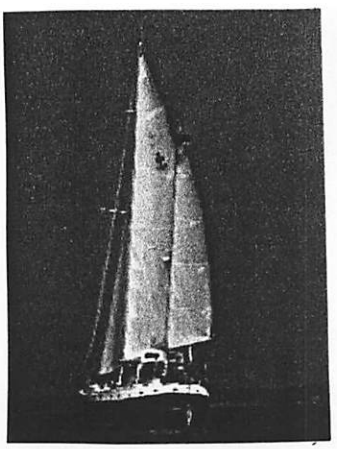








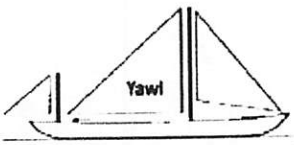




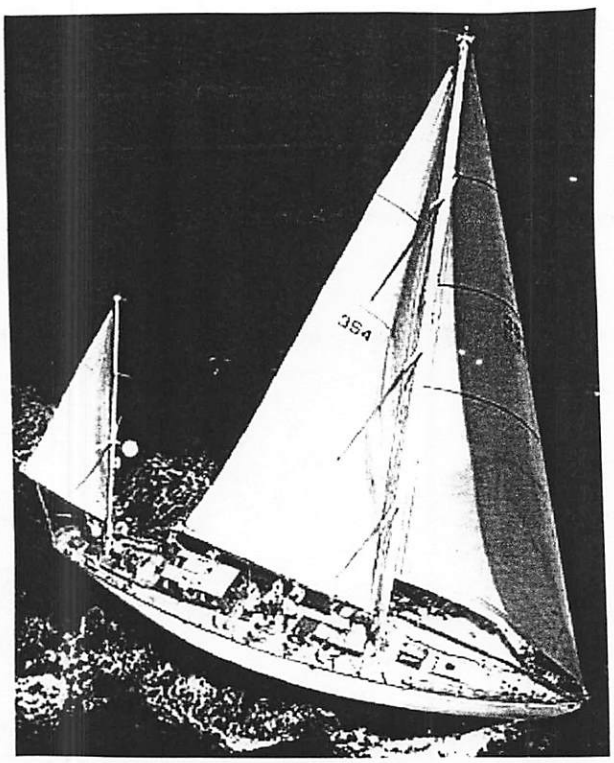


Yawl

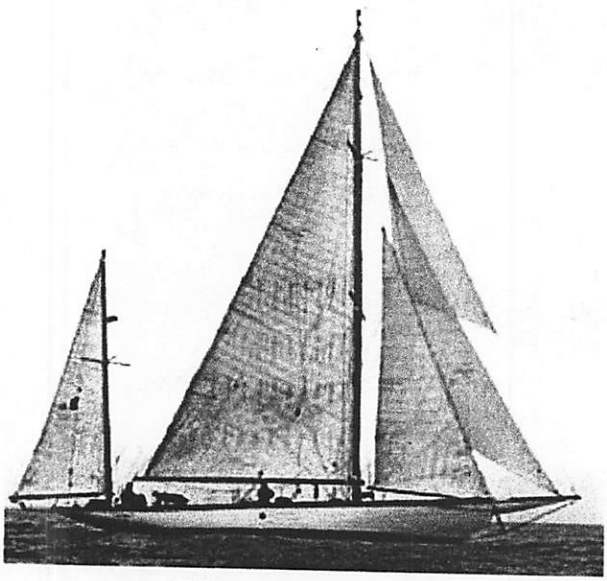
A yawl is a two-masted fore-and-aft rigged vessel with the first mast taller than the aft mast, and the steering position ahead of the aft mast (the mizzen mast). If the steering position is behind the mizzen mast, the vessel is a ketch. Typically, the mizzen mast of a yawl is very short.



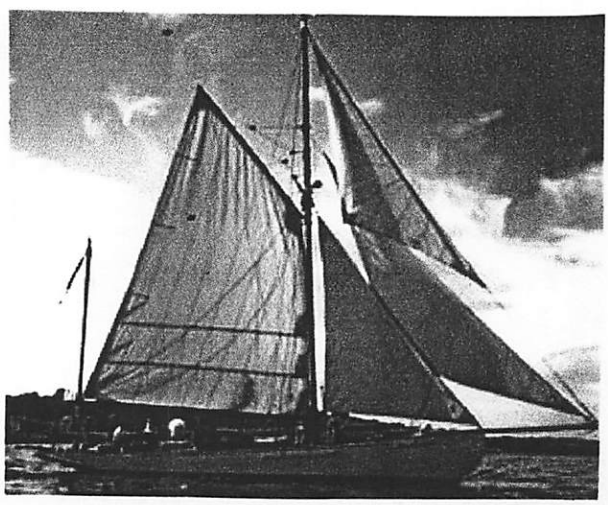
Two-masted boat where a smaller, shorter mast, called a mizzen, is located behind the steering mechanism, or helm.







F.Sheperd 55 Yawl



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