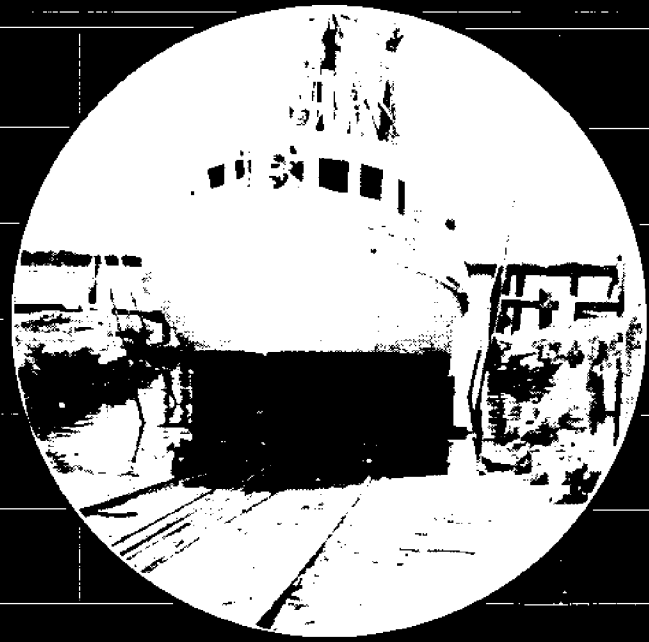
VESSEL HAULOUT MAINTENANCE



by Dan Colson

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NOTE: This publication is directed mainly to the vessel owner. It is not intended to be used as a how-to instruction guide, but as a general checklist for inspection and repair during haulout. The descriptions and illustrations contained in this brochure are the best judgements of The University of Georgia Marine Extension Service on effective and appropriate techniques for vessel haulout maintenance. However, there is no express or implied certification that such descriptions and illustrations assure proper and safe vessel haulout maintenance.

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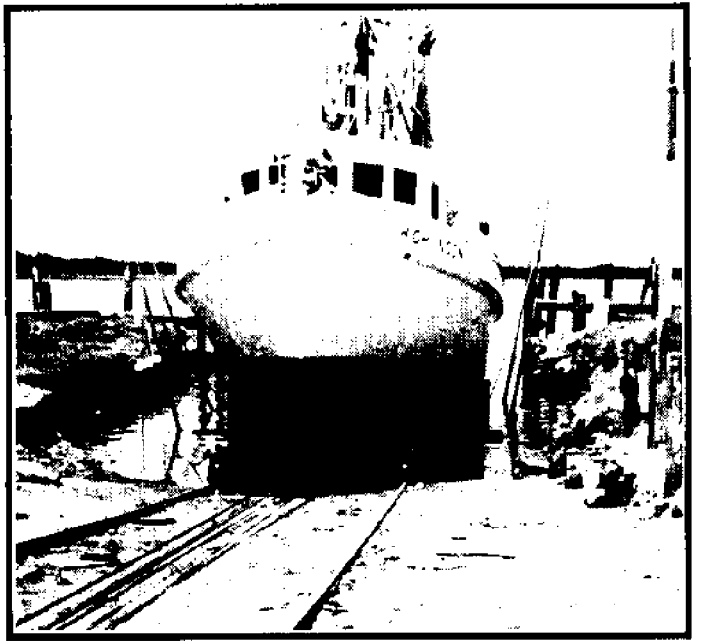

Figure 1. Shrimp boat headed for dry dock

Preliminary Procedures

All vessels, working and pleasure craft alike, require regular haulout maintenance and inspection. Factors which determine how often a vessel requires haulout include:

1. type of material used for construction (wood, steel, or fiberglass)
2. type of water in which vessel is kept (fresh, brackish, or salt water
3. temperature of water in which vessel is kept

Wooden vessels kept in salt water, especially warm salt water, require haulout more frequently than vessels constructed of other materials due to the increased activity of wood borers, barnacles, and electrolysis. Haulout maintenance procedures should be performed on such vessels a minimum of twice a year. Wooden vessels kept in fresh water usually require haulout only once a year since fresh water supports less marine growth than salt water.

Electrolysis also is slowed since fresh water is not as effective a conductor as salt water. Vessels made of fiberglass or steel require haulout only once a year regardless of whether they are kept in fresh or salt water. Haulout procedures normally performed include cleaning the bottom, replacing anodes, painting, and inspection of all hardware. A thickness check should be performed on all steel hull vessels once a year. This is done by drilling small holes and measuring the thickness of the steel. Pay particular attention to problem areas around the wet area of the stern. (Note: Circle holes with soapstone so none will be missed when they are welded later.)

Corrosion plays a major role in determining how often a vessel requires haulout. Corrosion is the wasting away of metal in water due to electrolytic and galvanic action. Vessel hardware which comes into contact with the water will suffer severe damage if it is not properly maintained. Corrosion damage also will occur on wooden hull fasteners located above the waterline because the wood soaks up water, which eventually makes the entire hull a conductor. This is especially true when the vessel is more than eight years old. It is important, therefore, to make certain all metal is bonded securely to zinc anodes (sacrificial metal) in order to reduce corrosion damage to your vessel.

Prior to haulout, check the vessel carefully for leaks and vibrations. If it is leaking, locate the area of the leak as closely as possible. This will help to pinpoint the leak later in dry dock while caulking. If the vessel is vibrating, a more thorough inspection of the propeller, propeller shaft, stern bearing, rudder, and rudder shoe will be necessary while in dry dock.

When haulout is made, give the hull a quick visual inspection before cleaning. Look at hardware that may require removal for repair. If

any damage is found, remove the hardware and take it to a repair shop as soon as possible, as such repairs often take several days.

In dry dock the hull can be cleaned easily and thoroughly with a pressure washer. Before washing, remove large barnacles from the hull with a scraper. Loose paint, small barnacles, and other marine growth can then be washed away. Be sure to remove all the old zinc anodes including the bonding straps between anode and hardware. Using a small scraper, remove old paint and barnacles from the hull where the anode was attached and wash the area thoroughly.

The keel cooler should be removed at least once a year for cleaning and inspection. (Note: All vessels do not have a keel cooler.) First loosen, but do not remove, the nuts (stud nuts) where the cooler head is attached to the thru-hull fitting. This will allow water to drain. After

Figure 2. Pressure washing the hull

the water has drained, and with both ends and head still attached, remove the middle straps which are supporting the cooler. Both ends and head of the cooler should be blocked or held up until all stud nuts are removed. With help, lower the cooler, but be careful not to drop it as damage to the tubes or O-rings may occur.

Remove the flat gasket from the cooler head. If it is not damaged, place it in water to keep it soft until time to replace the cooler. If the gasket is stuck, remove it with a scraper. Be careful not to let any debris from the gasket get into the cooler as it will end up in the engine.

After the gasket has been removed, and with someone to assist, turn the cooler and allow the remaining water to drain by tilting one end and then the other. After all the water has drained, place rags into the cooler head to keep out debris. Marine growth can be removed with a scraper, putty knife, or wire brush before washing.

Clean the keel cooler's mounting brackets by first removing anodes that are inserted in the brackets. Discard the anodes regardless of their appearance. Use a small putty knife or screwdriver to clean the mounting brackets, then wash them thoroughly. Put new anodes in the mounting brackets when the cooler is put back in place. If the head gasket was damaged, a new one can be purchased or cut from a multi-purpose gasket material. (Note: Coat the gasket with multi-purpose grease before installation to keep the gasket from sticking.) When installing the keel cooler, tighten nuts evenly, taking care not to strip them. Then fill the keel cooler with water and check for leaks before putting the vessel back in the water.

Caulking

Caulking, in a marine context, refers to rolled oakum or cotton which is driven into seams or the butting ends of hull planking to make them watertight. *Seam compound* is the pliable filler

that goes over the cotton to hold it in place and smooth the surface and is more akin to what most people think of as caulking.

After the hull has been cleaned, look closely at the butting ends of all hull planking for any signs of loose or missing seam compound. If any cracks are found, pull the remaining compound, but leave the caulking in place for the time being. These butts will be checked later.

Next, check each butt for tightness by using a caulking iron and mallet. Tamp the caulking to see if it is solid, especially at the outer end of each butt. If softness is felt or if a black muddy substance oozes out around the caulking, pull the butt and recaulk.

Caulk the butt by using the caulking iron and mallet to make short rolling tucks of caulking across the butt. Break the caulking off at the end of the butt and tamp solidly into place before making another pass. Continue until the

Figure 3. Caulking the hull

butt is filled to within 1/4 inch of being flush with the plank. This will leave a recess for the seam compound. Be sure to mark the butt once it has been checked or recaulked to assure that no butt will be missed.

Paint caulking with anti-fouling paint and allow to dry. After filling the butt recess area with seam compound, remove excess compound from the planking before painting.

The garboard seam should be checked in the same manner as the butts. Look for and remove loose compound. Water seepage is usually found along the shaft log and horn timber. Remove the compound and caulking in this area. If there are other areas of seepage along the keel, remove all the compound and caulking from the garboard seam from stem to stern and recaulk. The reason it is better to recaulk a longer seam rather than just the areas of seepage is that the seam will open ahead of the caulking as it is driven. If caulking is not tapered properly where it begins and ends, there will be a leak fore and aft of where the caulking was done. Also, it is best to caulk from one butt to another, because the seam will not open if caulking begins or ends at a butt. After caulking, paint the area with anti-fouling paint and let dry. Then fill with compound and be sure to remove any excess from the planking or keel.

Wood Borers

The hull should be thoroughly checked for wood borers. Severe damage will result if they go unnoticed. The two most damaging kinds of wood borers to look for are a mollusc, the *Teredo,* and the *Limnoria tripunctata*, which is an isopod crustacean. The *Teredo* (shipworm) is most damaging. It will enter the wood and eat away undetected until the planks or timbers are destroyed.

The other borer, the *Limnoria,* also causes

Figure 4 a. Damage caused by Teredo

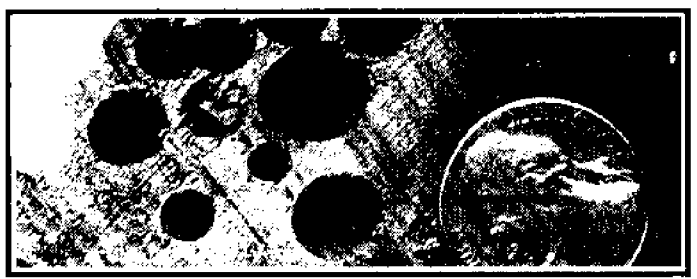

Figure 4 b. Damage caused by Teredo

Figure 4 c. Damage caused by Limnoria

severe damage. It can be detected easily by the presence of a hole or cluster of honeycomb holes about 1/8 inch in diameter. This borer sometimes can be seen in these holes about 1/4 inch into the wood. They will bore into the wood until the structure fails. Both of these borers can be killed by heating or cooling (freezing) the structure they inhabit.

Plan to put the infested vessel in dry dock when the temperature is expected to drop below freezing for a period of twelve hours or more. The cold weather will kill the borers. The *Teredo* will be on the ground or hanging out of the planks and timbers in long slimy strings. The *Limnoria* will back out and fall to the ground also if not already frozen.

If the vessel cannot be put in dry dock when or where the temperature falls below freezing, heat may be used to kill the borers instead. A broad flame such as that used to burn paint gives better results than a centered flame such as a

cutting torch flame. Heat the area slowly, giving the heat time to penetrate since the wood is water soaked. (CAUTION: The area to be heated where cotton has been used for caulking should be checked from the inside of the hull before leaving for the day.) When heat is applied, there may be several places where water (sometimes mixed with steam) will bubble out from very small holes about the size of a straight pin. If this happens, there are shipworms in the area. The presence of shipworms in a plank or timber can also be detected by the absence of paint, discoloration of the wood, or by dark streaks or spots in the wood. Worms can also be detected by a drumming sound when planks or timbers are tapped.

Stopwaters and Keel Bolts

If a leak has been found somewhere in the lower section of the bow stem or along the shaft log prior to haulout, and, upon caulking, the garboard was found to be solid, then a stopwater is most likely the cause of the problem. A stopwater failure may be caused by several things. The vessel may have been caught in rough seas or grounded. The keel bolts also could have deteriorated due to corrosion (galvanic or electrolytic). If galvanized bolts were used and are deteriorating, rust will be showing in the seams between the timbers where the bolts are located. When this is found, the bolts should be replaced. This is true in any seam where keel bolts are located. The keel bolts also could have loosened. If so, tighten them securely. It is also possible that the stopwater itself has deteriorated.

A new stopwater can be inserted without removing the garboard. Using a sharp ship auger bit (3/4 to 1 inch in diameter), drill across the seam as close to the garboard as possible where the stopwater is to be inserted. Use a wooden dowel (preferably cypress and the same size as the auger bit) for a stopwater. Before inserting

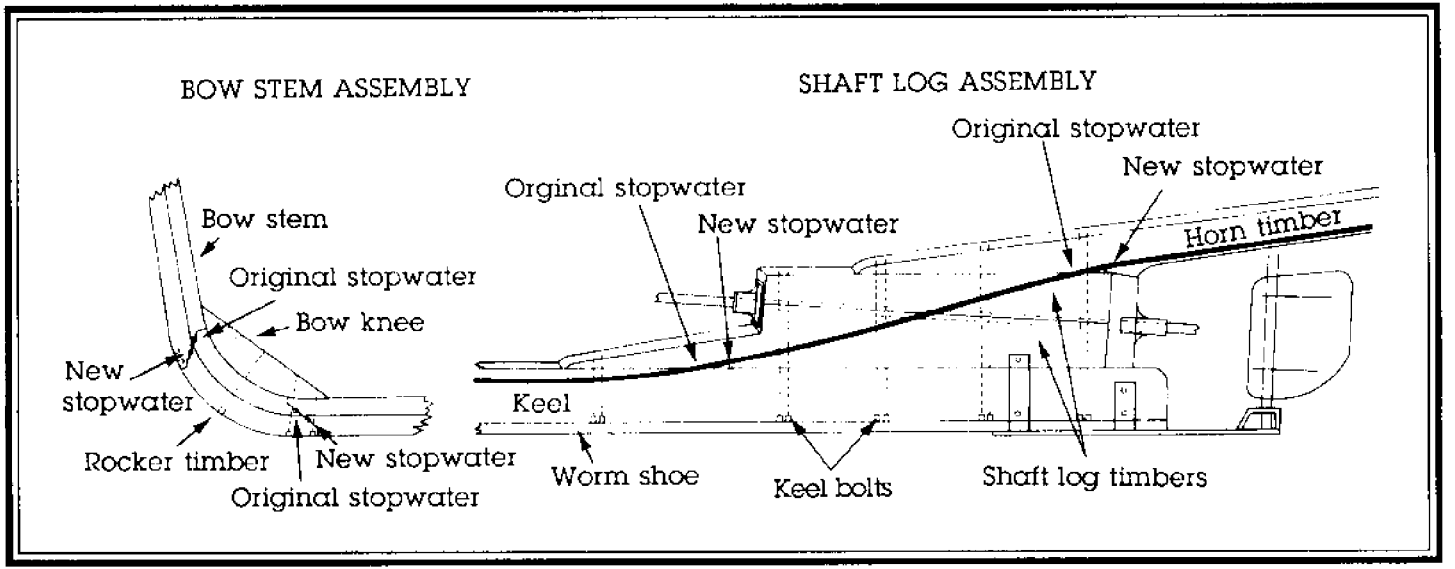

Figure 5. Bow stem assembly and keel timbers

the dowel, measure the thickness of the timber where the dowel is to be inserted, and mark the dowel at a point 1 inch longer than the timber is thick. Paint the dowel with bottom paint and insert it by driving continuously until the mark is reached or until the dowel extends out the other side. (CAUTION: DO NOT stop driving as the dowel may seize up and will not go any further.) Using a saw or a sharp wood chisel, cut the dowel off flush with the timber where it has been inserted.

Another place to look for leaks prior to haulout is where the shaft log seam extends inside the hull

from the garboard to the stuffing box. There is a stopwater that runs full-length where the two timbers are put together to form the shaft log (illustration). The shaft log is always full of water, and if either the stopwater or the keel bolts give way, water will enter the hull where the shaft log seam extends inside of the hull. First check all the keel bolts. If none are bad or loose, then the stopwater is causing the leak. This leak can be stopped by pouring wax into the shaft log. A household paraffin wax or a 50/50 mixture of wax and tallow may be used. The tallow and wax mixture seems to work best, as the tallow will keep the wax pliant.

First drill two holes in the upper part of the shaft log. The front hole closest to the inside box is where the wax will be poured until it runs up and out of the back hole. Using a bit 3/4 to 1 inch in diameter, drill down through the shaft log to the propeller shaft. Clean the holes out thoroughly to insure that the wax mixture will go all the way to, and around, the propeller shaft. Heat the

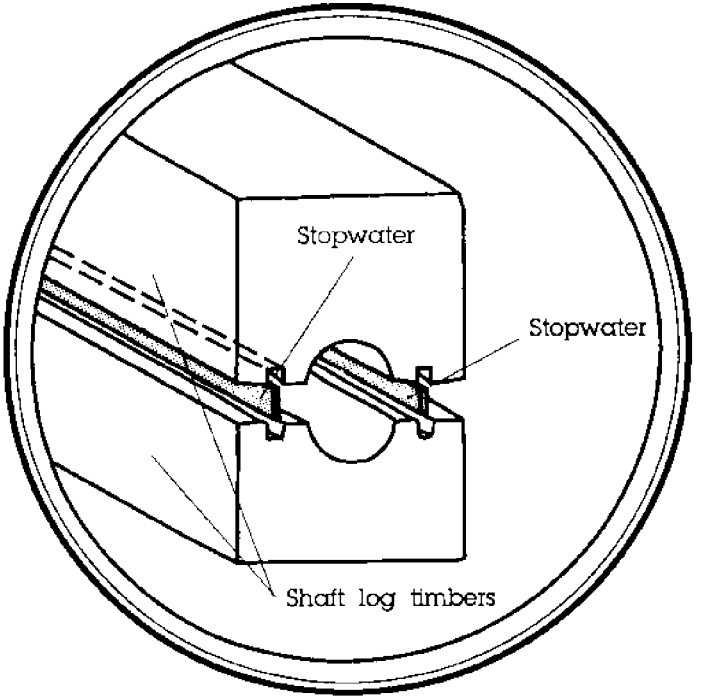

Figure 6. Shaft log stopwater

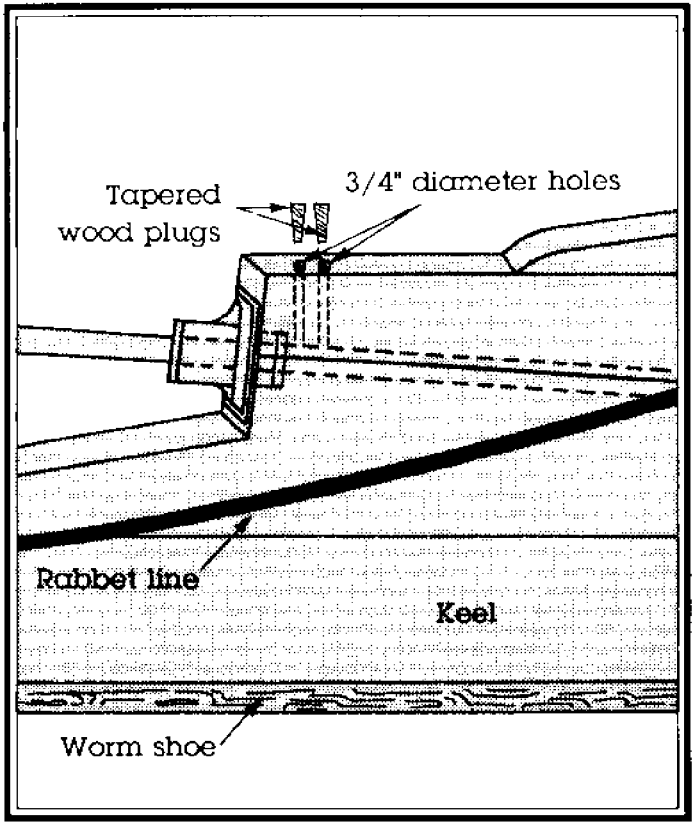

Figure 7. Diagram for pouring shaft log

wax slowly to a temperature of 300 to 350 degrees F. Do not exceed 435 degrees F. While the wax is being heated, place a rag tightly around the propeller shaft where it extends from the stern bearing. Also place rags into the water scoops which are located on the outer side of the stern bearing. This will keep the wax from escaping while the shaft log is being poured. Once the wax has been heated to the proper temperature, pour it into the front hole. It will run into and seal all areas inside the shaft log where leaks may occur. Be sure to rotate the propeller shaft slowly during and after pouring until the wax cools, as hot wax may adhere to the shaft and may subsequently cause the shaft to seize up. Once the shaft log has been poured, place wooden plugs tightly into the holes that were drilled.

Valves, Piping, Thru-hull Fittings

Once a year all valves, piping, hoses, hose clamps, and thru-hull fittings on the seawater

supply intake should be checked thoroughly. Disassemble all valves regardless of their appearance as sometimes valves look new from the outside but have deteriorated on the inside. Once opened, check the bonnets, gates, and valve stem threads to insure they have not been eaten away due to stress corrosion. If deteriorated, the valve may open or close randomly, which could result in serious damage or even sinking of the vessel.

Also check the bonding system throughout the entire vessel starting at the point where wire comes through the hull from the anode. Follow from one point to the next and check all connections for tightness. If there is one break in the line, the entire system from that point on will not be protected, thereby causing some form of corrosion.

Vessel maintenance is a time consuming reality for boat owners, but it is also the best insurance available since a vessel owner can be held liable for injury to person(s) or crew due to poor maintenance. Developing good haulout practices will keep your boat operating safely and efficiently. It can also save lives.

GLOSSARY

Anode: sacrificial metal (generally zinc) that is consumed in preventing electrolytic corrosion of protected metal hardware

Bonding system: tying together of all metal by using copper wire, copper tape, or copper strap which leads to an anode or anodes attached to the outer hull below the waterline

Bonnet (gate): the inside part of a valve which regulates the passage of water

Butts: where two planks come together end-to-end

Caulking: oakum or cotton driven in seams and butts to make them watertight

Caulking irons: tools made in several different shapes used to tamp caulking into butts and seams

Caulking mallet: a hammer made of wood for hitting caulking iron and tamping caulking

Cutless bearing (stern bearing): serves as a steady bearing for the propeller shaft and is mounted just forward of the propeller

Electrolysis: the wasting away of metal due to electrolytic action

Garboard iron: caulking iron shaped for tamping caulking into garboard seam

Garboard: plank which is next to the keel

Haulout: dry dock term meaning to take the vessel out of the water

Horn timber: timber which extends out over the propeller to the stern

Keel cooler: pipes mounted on the bottom of the hull (used to circulate engine water)

Planks: boards placed tightly together forming the outer layer of the hull

Pull the butts: dry dock term for removing compound and caulking from butt

Pull the garboard: dry dock term for removing compound and caulking from the garboard seam

Pouring the shaft: forming a watertight seam where the shaft log was put together

Rabbet: groove in keel and keel timbers for garboard to fit into

Seam: where planks or timbers come together, one above the other

Seam compound: pliable filler that goes over the caulking to hold it in and smooth the surface

Stopwater: wooden dowel inserted across or full-length in a seam where two timbers are placed together or come together

Thru-hull fitting: flange pipe fitting which extends through the hull of the vessel