

## January 2003 Feature Article - Gill Netting in Chesapeake Bay

By: **Beth A. Versak**

Historically, nets have been used to gather food, dating back to the ancient Egyptians, Greeks and Romans (Alverson 1963). These nets have evolved into the nets currently used in today's commercial fishing industry. Gill nets first appeared in the Chesapeake Bay area in the spring of 1838 to fish for American shad (Chowning 1990). Use of these nets began in the Potomac River but they rapidly became the most popular type of fishing gear in the entire Chesapeake Bay region until overtaken by the introduction of the pound net in the 1870s. Currently in Maryland, gill nets are mainly used to fish for striped bass and white perch. There is also a small summer fishery in the lower bay for spot, croaker, sea trout, menhaden and a few other incidental species.

Gill nets are a type of passive capture gear, which means that fish are captured in a gear that is not physically moved by man or machine (Lagler 1978). Gill nets can be attached to stakes driven into the bottom, anchored or drifted with the water currents. Anchored and staked gill nets were banned in Maryland's portion of the Chesapeake Bay in 1992. The ban resulted from the need to reduce by-catch and kill of non-target species. Drift gill nets are deployed from the rear of the fishing vessel and have floats on the top line and weights on the bottom line. The net can be fished near the water's surface, near the bottom or at mid-water depths, depending on the amount of floats and weight used. Gill nets are typically deployed in a straight line and the net hangs like a curtain under the water, with the meshes extending down in diamond shapes. At slack tide, the net will hang completely vertical in the water. As the tide moves, the net is angled slightly in the water as the float line moves faster than the lead line, which bounces along the bottom. Perch and striped bass drift gill nets are typically eight to twelve feet in depth. Gill nets can be used in shallow or deep water that is free of snags and debris.



Some fishermen will set their nets in a circle, around a school of fish. Fish may be forced into the net by splashing the water surface inside or outside of the circle. This technique is used by some white perch fishermen in the Chesapeake Bay and for other species throughout the United States.

As fish encounter the nets, they can become captured in three different ways. The most common is gilled, in which the mesh slides over the head and behind the gill cover and the fish cannot back itself out. A fish is wedged in the net when it passes partially through the mesh and becomes stuck somewhere near the middle of its body. Finally, a fish can be netted where it is simply entangled by its mouth, teeth or fins in the fine threads of the net and not actually pushed through a mesh opening.



The effectiveness of a gill net depends on several factors. First, and foremost, the net must be set in an area where the target fish is present and will encounter it. If the water is very clear, fish can see the net and will avoid it. Strong water currents and wind can cause the net to fold or roll onto itself. Water depth can also play a role in the efficiency of a gill net. If a net is weighted to fish near the bottom in deep water, it may not encounter fish that are schooling near the surface.

The mesh in gill nets was initially made from linen and cotton. Cotton nets were difficult to maintain, as they had to be dried out every day or they would rot in storage. Nylon was developed in the 1940s and soon became the preferred material for gill netting. Multi-strand nylon gill nets first appeared in the Chesapeake Bay in the 1950s. Single strand monofilament twine nets are in use nationwide, but their use was prohibited in the Chesapeake Bay in 1963. Some fishermen in the white perch and lower bay gill net fisheries in Maryland currently use multi-strand monofilament nets.

Gill nets can be very selective to the type and size of fish they catch, depending on the mesh size used and the way the mesh is hung. If a mesh is large, and a small fish encounters the net, it should be able to swim completely through the mesh. Conversely, if a large fish encounters a small mesh, its head will not fit through the mesh far enough to become stuck. A large fish may get tangled in a small mesh, or may be able to break through the net. Smaller meshes are typically made of lighter twine than larger meshes and therefore have a lower breaking strength. Slight changes in the way the net is constructed can greatly influence the catch. A loosely hung net would have a higher number of meshes tied into one foot of top line. A net hung in this manner would offer less resistance when a fish encounters it, and the fish would be more likely to continue forward through the mesh, instead of trying to back out (personal communication, Cope Hubbard). Commercial fishermen throughout the Chesapeake Bay region have their own preferences as to how they rig their gill nets, but the basic design is the same.

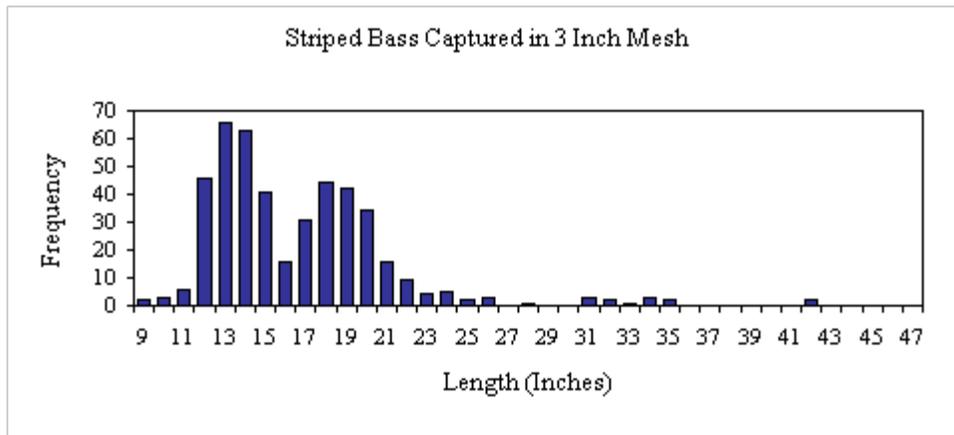
The commercial striped bass gill net fishery has always made up a substantial portion of the annual striped bass harvest. During the years 1975 through 1981, striped bass harvested in gill nets made up 97% of the annual catch in Maryland. Since then, Maryland has imposed strict regulations governing the gill net fisheries, including limited mesh sizes, dates and times for fishing, and restricted areas. In 2001, 31% of the striped bass harvest came from gill nets, with the remainder harvested from pound nets and hook and line. Currently, there are approximately 300 watermen participating in the Maryland striped bass gill net fishery, which runs from December 1 through February 28. With a mesh size limit of five to seven inches, the by-catch of sub-legal fish and smaller fish of other species is greatly reduced. A study of the commercial striped bass drift gill net fishery, using mesh sizes of five inches and greater, found only 5% of the captured striped bass were smaller than the 18-inch legal size.

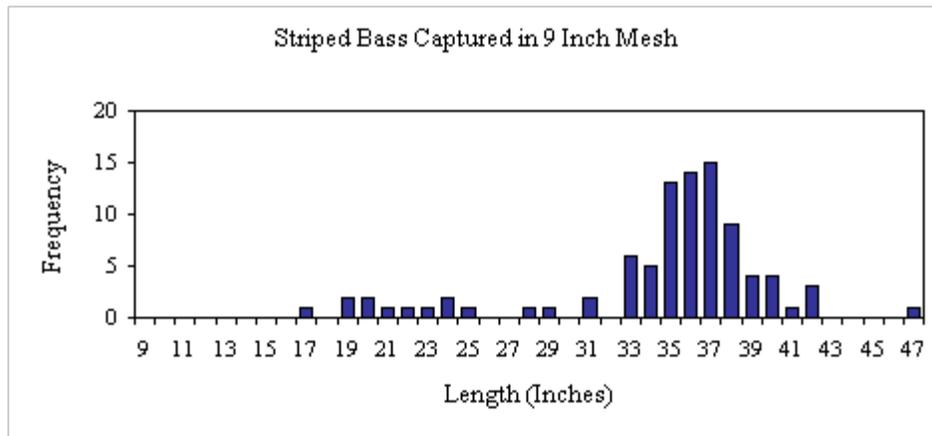
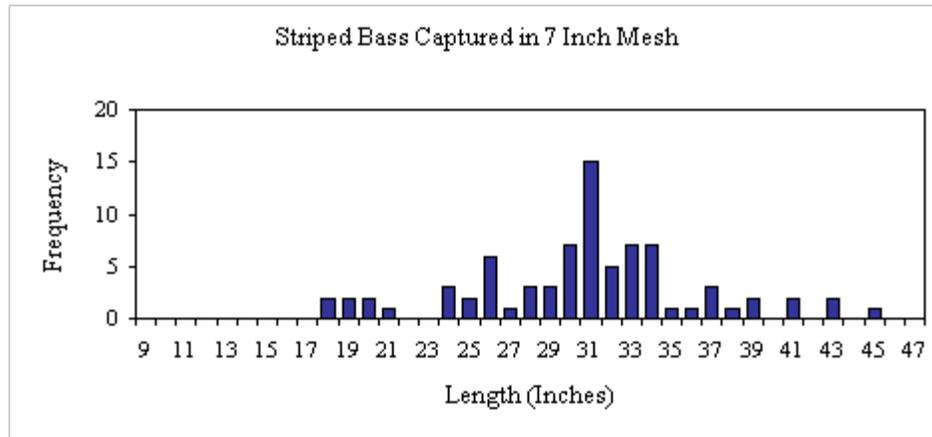
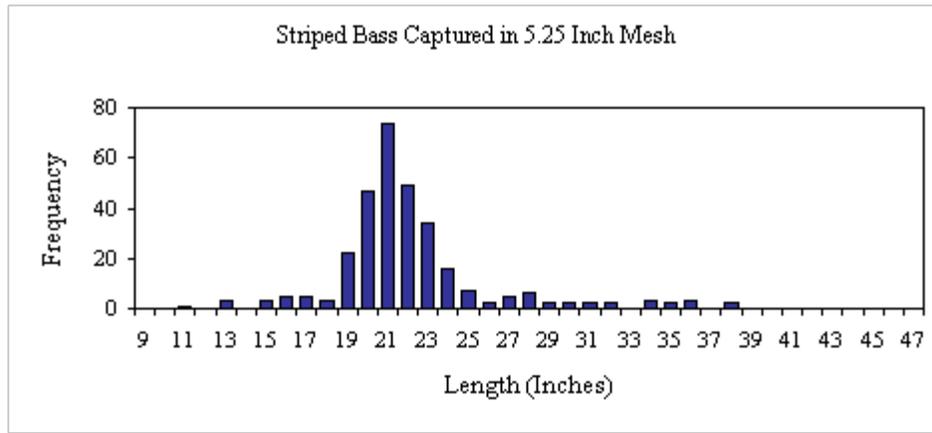
Maryland Department of Natural Resources (MD DNR), in cooperation with Chesapeake Bay watermen, has conducted several studies to examine the striped bass by-catch in the white perch gill net fishery. Small striped bass were caught in anchor and stake gill nets that were targeting white perch, since the white perch fishery uses smaller mesh sizes, and white perch and young striped bass share similar habitat and behavior. Anchor and stake gill nets were often set and left to fish overnight, and if bad weather interfered with retrieval, the nets could be left out for several days. Mortality of undersized perch and striped bass in these nets was very high. Several studies conducted in the 1980s showed that effort could be better directed at the target species with drift gill nets. These nets had to be retrieved within a matter of hours and undersized fish could be released

with lower mortality (Speir and Early 2001, Speir 2001). These findings combined with the declining striped bass stocks in the early 1980s led to the eventual prohibition of all forms of anchor and stake gill nets in Maryland's Chesapeake Bay (COMAR 08.02.05.02). Large mesh (5 to 7 inches) anchor and stake gill nets are still legal for striped bass in waters managed by the Potomac River Fisheries Commission but drift nets are not permitted. A 2001 study conducted during the winter white perch drift gill net fishery, showed similar results, with a striped bass by-catch mortality close to zero (Lukacovic 2002). When fished properly and legally, drift gill nets can be fished selectively for certain species.



MD DNR has conducted a survey for the past 20 years, using experimental drift gill nets, of the spring striped bass spawning run (photos above). The survey is conducted in the upper Potomac River and upper Chesapeake Bay with the help of a contracted commercial fisherman to work the nets. Ten different mesh sizes are fished, ranging from three to ten inches, which ensures that all sizes of striped bass are captured. The graphs below illustrate the selectivity of various mesh sizes. We catch striped bass ranging in size from nine to 50 inches. White perch, catfish, herring and shad are also sampled. The nets are set for approximately 30 minutes, and upon removal from the net, striped bass are measured, sexed, tagged and released. Gill nets are an excellent way to sample an entire fish population and get estimates of relative abundance, catch-per-unit-effort, length and age distributions and spawning stock biomass. The data have been valuable in demonstrating the poor condition of the stock in the 1980s and its recovery to present high levels. The annual findings are a major part of the data considered every year by the Atlantic States Marine Fisheries Commission in recommending management measures. Cooperation of the Maryland watermen is instrumental in maintaining one of the longest running, continuous striped bass surveys on the Atlantic coast.





## Literature Cited

- Alverson, D. L. 1963. Fishing gear and methods. Pages 45-64 in M. E. Stansby, editor. *Industrial fishery technology*. Robert E. Krieger Publishing Company, New York, New York, USA.
- Chowning, L. S. 1990. Harvesting the Chesapeake: Tools and Traditions. Tidewater Publishers, Centreville, Maryland. pp. 30-37.
- Lagler, K. F. 1978. Capture, sampling and examination of fishes. Pages 7-47 in T. Bagenal, editor. *Methods for assessment of fish production in fresh waters*. Blackwell Scientific Publications, Oxford, England.
- Lucakovic, R. 2002. Project 2: By-catch and Indirect Loss Quantification, Study 3: Mortality of Striped Bass

Caught in the White Perch Winter Gill Net Fishery. Maryland Dept. of Nat. Res., Fish. Ser., Resource Mgt. Div. 12 pp.

Maryland Division of Documents, COMAR 08.02.05.02., 1992.

Speir, H. and Early R. 2001. Investigation of the Potential for a Directed White Perch Fishery with Anchor and Stake Gill Nets in Selected Areas of the Chesapeake Bay. Fisheries Tech. Rept. No. 38. Maryland Dept. of Nat. Res., Fish. Ser., Resource Mgt. Div. 20 pp.

Speir, H. 2001. Analysis of Catch of White Perch and Striped Bass in Two Types of Gill Net in Chesapeake Bay, Maryland. Fisheries Tech. Rept. No. 39. Maryland Dept. of Nat. Res., Fish. Ser., Resource Mgt. Div. 26 pp.

Speir, H. and Early R. 2001. Some Characteristics of the Maryland Chesapeake Bay Sport and Commercial Fisheries for Striped Bass. Fisheries Tech. Rept. No. 40. Maryland Dept. of Nat. Res., Fish. Ser., Resource Mgt. Div. 29 pp.

Speir, H. and Early R. 2001. Analysis of Effects of Increased Minimum Gill Net Mesh Size on the White Perch Gill Net Fishery and Striped Bass By-Catch in this Fishery. Fisheries Tech. Rept. No. 41. Maryland Dept. of Nat. Res., Fish. Ser., Resource Mgt. Div. 32 pp.