Technical Memo No. 20

Three new Exotic Species of the Chesapeake and Coastal Regions

Over the past 300 years, approximately 50,000 non- native species have become established in the United States. Most of these introductions such as com, wheat, rice, cattle, poultry, etc have proved beneficial and provide more than 98% of the U.S. food production at a value of approximately $800 billion per year. At least 4,500 of these have established free -living populations, of which 15% cause environmental or economic damage. Over the past 90 years, just 79 of these have caused an estimated $97 billion in losses (D.Pimentel, 1999, P.N.Windle, 1996).

The introduction to Maryland of the ring neck pheasant, brown trout and channel catfish has established reproducing populations which are socially and economically beneficial. Others like the gypsy moth, starling, carp, Japanese beetle and nutria have proved economically and environmentally detrimental. In the Chesapeake, more than 150 non-native species have been identified (Bay Journal, June, 1999). These species, introduced either accidentally or intentionally, have proved difficult to control, often firmly establishing themselves and competing for forage and space with more beneficial species.

Native species from the Americas have been introduced into other parts of the world as well and have even moved from one part of the U.S. to another. The white perch, a native to Atlantic coastal regions was accidentally introduced to the Great Lakes where it is now a prolific competitor of native fish species and may be affecting walleye populations.

With the realization that many introduced species were detrimental to the ecosystem and economy, individual states and the federal government took steps to control their intentional introduction. However, as the world moved towards a more global economy in the 20" century, the accidental introductions began to increase. A primary source of exotic introductions to the aquatic environment comes from transoceanic ships and the overboard discharge of ballast water in harbors and coastal areas from ships engaged in international trade. Ballast water is local water pumped into a ship's ballast tanks to enhance its stability for an ocean crossing. Upon arriving at its destination, this water is pumped overboard to ease dockage and maneuvering in the shallow, congested waters of coastal and riverine ports. In the process of taking on ballast water, the larvae or adults of many hardy creatures may be pumped in and inadvertently transported to distant waters. With some species producing up to 800,000 larvae per individual, there could be thousands of larvae or eggs in a single gallon of seawater. A study of organisms contained in ballast water in the ports of Baltimore and Norfolk suggest that the risk of invasion by non- indigenous species into the Chesapeake system is extremely high (Ruiz, et al, 1996). This study indicated that in 1994, bulk cargo carriers in Baltimore discharged 1.5 billion gallons of ballast water into the harbor. In Norfolk, this quantity was 2.5 times higher. Of the vessels sampled, 91% contained live aquatic organisms and a i -ninimtim of 282 distinctly different taxa were identified. Although most organisms deballasted in Baltimore harbor wouldn't survive due to the low salinity (3 - 8 ppt.), those deballasted in Norfolk could survive as the salinity is considerably higher (20 - 28 ppt.).

In Maryland's coastal waters and in the lower Chesapeake, at least three exotic species have been detected and identified: the European green crab, *Carcinils maenav*, the Japanese shore crab, *Hemigrapsus sanguineus*, and the veined rapa whelk, *Rapana ve,-iosa*.

A native of the Atlantic coasts of Europe and Africa, the green crab was introduced into the waters of Massachusetts in the mid- I 800's and, during the 1900's, has spread both north and south. It has had a significant negative impact on native species. A voracious predator of mussels, oysters, clams, scallops and juvenile crabs, this exotic is believed to

be a major contributor to the demise of the New England soft clam fishery (Sea Technology, Dec. 1998). It also consumes large quantities ofjuvenile clams planted by local New England fishermen. In the 1990's, this species was found on the Pacific coast, posing a potential threat to the region's clam and oyster growing industries and to the Dungeness crab fishery. In its native habitat, it is adapted to a wide range of salinities (5 to 30 ppt) and temperatures (4 I' to 86' F). Despite its name, the crab isn't always green; rather, it can change color to orange and red with yellow patches on its abdomen during its mating cycle.

In Maryland, the green crab occupies rocky jetties, bulkheads and other structures but forages over open flats and tidal marshes. Growing to a maximum size of 3 inches, it can survive in a wide range of salinity and temperature. In Maryland, this crab is currently only found in the coastal bays near the Ocean City inlet, Green crabs can be purchased as bait in Maryland and they are frequently used as bait for tautog. Since this is a non-native species, leftover baits should be discarded shoreside and not returned to the water. The same method of discard applies to other live baits - minnows, worms, etc. that are not native to the particular body of water where they are being used. There are currently no local surveys to monitor its spread or effects on local clam populations.

The Japanese shore crab is a relative newcomer to the East Coast, being first identified in 1988 from collections on the New Jersey shore. Since then, it has spread north to Cape Cod and south to the mouth of Chesapeake Bay. A native of the western North Pacific, it prefers the rocky intertidal or shallow subtidal habitat around Ocean City's inlet. In 1999, Maryland DNR personnel found as many as 23 in a single square yard of rocky intertidal bottom. Unlike the green crab, this crab is generally smaller, reaching a size of a little over 11/2 inches in carapace width. Its carapace color is mottled with colors ranging from green to purple to orange-brown. It is also prolific, producing eggs twice during a single season and tolerant of salinities as low as 10 ppt, As this crab is new to the East Coast, its ultimate impact is still unknown.

A more recent introduction to the region is the veined rapa whelk, a native of the Sea of Japan. Found in 1998 in the lower Chesapeake Bay, this whelk or shelled snail can reach a length of almost 7 inches. Although different in shape and coloration, it is generally similar to the knobby and channeled whelks currently being commercially harvested in the Atlantic Ocean. The latest information suggests that it inhabits hard sand bottoi-n in depths of 30 - 200 feet and salinities of 18 to 28 ppt. Laboratory observations suggest that its preferred food is the hard clam, a species harvested commercially and recreationally in both Virginia and Maryland waters. Once it encounters a clam, it will wrap its foot around the shell margin until the clam opens, then inserts its mouth through this opening and begins feeding on the clam.

Like the Japanese Shore Crab, this species is new to the area and its effect on the ecosystem is currently unknown. In 1998, the Virginia Institute of Marine Science began providing a reward a for this whelk in order to collect information on its distribution in the lower Chesapeake. As of January, 2000, they have recorded more than 650 adult specimens. Its known range has been extended from the mouth of the Chesapeake Bay, north to the mouth of the Rappahannock River Sea Technolgy, March, 2000). They are also examining the potential effect of this species on shellfish resources.

As ballast water appears to be the most likely means of transport for other exotic species, efforts are being made to regulate the discharge of this water in or near coastal areas. Interim Federal regulations this year extend a 1996 law asking ocean vessels to empty their ballast tanks at sea and replace it with sea water,

flushing out any exotic species. Since this would occur in international waters outside U.S. jurisdiction, it can only be requested. Open ocean disposal of ballast water is considered a suitable alternative as there is little forage available for non- indigenous species and many are benthic dwellers couldn't survive at the abyssal ocean depths. By July, 2000, ships entering U.S. waters are required to inform the government as to the steps they've taken on the high seas to protect our waters from potentially invasive exotic species. Several states are also taking measures to monitor and limit the spread of exotics while a few studies are examining the potential of existing predators or parasites to control them.

On February 3, 1999, President Clinton signed an executive order to coordinate a federal strategy to address the growing environmental and economic threat of invasive species. The Departments of Interior, Agriculture and Commerce have created an" Invasive Species Council to develop a comprehensive plan to minimize the economic, ecological and human health impacts of invasive species and determine further steps to prevent the introduction and spread of additional invasive species."(USDI, 1999). Some measures are already underway:

1. The U.S. Department of Agriculture now has more than 1300 inspectors in 90 ports of entry inspecting commodities. They are being assisted by the Beagle Brigade, a group of dogs trained to sniff out prohibited agricultural products.
2. The U.S. Fish and Wildlife Service is building a barrier in the Chicago Ship Canal to prevent the spread of invasive species between the Great Lakes and the Mississippi River basins.
3. The National Oceanic and Atmospheric Administration (NOAA) is sponsoring research on new technologies for treatment of ballast water to reduce the threat of foreign organisms being discharged into U.S. waters.

There are other pathways for the introduction of non- native species from human activities. Aquaculture, the culture of finfish and shellfish was historically a source of both intentional and accidental introductions. The aquarium trade is another. The release or escape of its preferred non- native species like the goldfish and piranha create a nuisance and concern. The use of biological controls to target and control other unwanted species may at times prove detrimental. The grass carp, introduced to control unwanted aquatic plants in inland lakes resulted in native plants being decimated. The construction of channels, locks and canals to connect waterways removes physical barriers to the movement of many species and can accelerate the spread of unwanted species. The introduction of unwanted species through the live bait industry, the gardening and nursery industries, research institutions and public aquariums and seafood retail and processing can also occur.

Each person plays an important role in preventing the introduction of non- native species, Here are some suggestions on how you can help:.

- Don't transport plants and animals when you travel or move without checking with local authorities.
- Never release pets, aquarium plants or animals or non-native plants into the wild.
- Plant only native plants on your property.
- Be familiar with the pathways through which non-native species can enter our lands and waters and do your part to stop their accidental release or movement.
- Report any sitings of known or suspected invasive species to your state natural resource agency. A record of these sitings is necessary to determine the distribution of these species and monitor their effect.

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