

# DIGEST



Providing current information on monitoring and controlling the spread of harmful nonindigenous species.

## Predicting Future Aquatic Invaders; the Case of *Dikerogammarus villosus*

By Jaimie T.A. Dick and Dirk Platvoet

The accumulation of case studies of invasions has led to formulations of general 'predictors' that can help us identify potential future invaders. Coupled with experimental studies, assessments may allow us to predict the ecological impacts of potential new invaders. We used these approaches to identify a future invader of North American fresh and brackish waters, the amphipod crustacean *Dikerogammarus villosus*.

### Why Identify *D. villosus* as Invasive?

*Dikerogammarus villosus* (see Figure 1) originates from an invasion donor "hot spot", the Ponto-Caspian region, which comprises the Black, Caspian, and Azov Seas' basins (Nesemann *et al.* 1995; Ricciardi & Rasmussen 1998; van der Velde *et al.* 2000). This species has already invaded western Europe, has moved through the Main-Danube canal, which was formally opened in 1992 (Tittizer 1996), and appeared in the River Rhine at the German/Dutch border in 1994-5 (bij de Vaate & Klink 1995). *D. villosus* is currently sweeping through Dutch waters (Dick & Platvoet 2000) and has

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Figure 1. *Dikerogammarus villosus*  
Photograph by Ivan Ewart

## The Nutria Nuisance in Maryland and the Search for Solutions

By Dixie L. Bounds, Theodore A. Mollett, and Mark H. Sherfy

Nutria, *Myocastor coypus*, is an invasive rodent native to the South American countries of Argentina, Bolivia, Brazil, Chile, Paraguay, and Uruguay. However, the nutria's range has expanded through intentional introductions in Europe, Africa, the Middle East, the Soviet Union, Japan, Canada, and the United States (Nowak 1991). In the United States, nutria were introduced intentionally to contained sites in 22 states for fur farming or weed control (Willner *et al.* 1979, LeBlanc 1994, Hess *et al.* 1997). Some held in captivity were eventually released or escaped into the wild. Today, nutria populations are estab-

lished in 15 states nationwide, all reporting a variety of damage caused by this nuisance species

### Destructive Behavior

Nutria compete for habitat and food resources with a variety of native wildlife species (Bounds 2000). One factor that makes this invasive species particularly problematic is its destructive feeding behavior. Unlike native muskrats that eat the stems of vegetation, nutria excavate entire marsh plants to feed on the succulent roots, destroying wetland ecosystems. They will also eat agricultural crops and

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**ANS Task Force**

## *Dikerogammarus villosus* continued from page 25

recently been found in France (Devin *et al.* 2001). There is potential for this species to reach North America via the ballast water of transoceanic ships, particularly since the species can withstand variable salinities, temperatures, and oxygen levels (Dick & Platvoet, 2000; van der Velde *et al.* 2000; Bruijs *et al.* in press). Other species from the Ponto-Caspian, such as the zebra mussel, have invaded the Great Lakes area and many rivers in North America. Zebra mussels may act to facilitate establishment of this potential invader by providing suitable habitat (Stewart *et al.* 1998). Should *D. villosus* reach North America it is likely to establish populations, since elsewhere it has overcome any “biotic resistance” of new host communities and has become established in a wide range of communities (Dick & Platvoet 2000; van der Velde *et al.* 2000). *D. villosus* is capable of establishing itself quickly due to its dispersal behavior and high fecundity (van der Velde *et al.* 2000). It is trophically diverse in its feeding habits (Marguillier 1998), preying on both native and exotic amphipods (Dick & Platvoet 2000). All of these characteristics are ‘predictors’ of other successful invasions. Thus, this species is likely to invade continental Europe, the British Isles, the North American Great Lakes and elsewhere (see also Ricciardi & Rasmussen, 1998; Dick & Platvoet, 2000).

Given its potential for spread and damage to freshwater and brackish ecosystems, every attempt should be made to prevent the spread of *D. villosus* to North America.

### Could *D. villosus* Be Damaging?

*D. villosus* is increasingly recognized as an aggressive predator of invertebrates (Dick & Platvoet 2000). In Holland, the disappearance of the native amphipod *Gammarus duebeni* was attributed to *D. villosus*, which kills and consumes both recently molted and inter-molt *G. duebeni* females. *Gammarus tigrinus*, a successful North American invader of Europe, has declined significantly in lakes invaded by *D. villosus*. Evidence of *D. villosus* impacts on invertebrate populations in the field are supported in laboratory experiments where *D. villosus* consistently eliminated large numbers of *G. tigrinus*, the North American species being reduced to body parts. The fact that *D. villosus* has already been strongly implicated in the decline of a North American species, albeit in Europe, is a rather unique demonstration of the potential of a future invader to decimate native species!

Our laboratory experiments conducted in Holland compared the predatory impact of *D. villosus* and *G. duebeni* on native macroinvertebrates. Using similar size males of the two amphipods, we found that *D. villosus* significantly killed a wide range of invertebrates, from mayfly nymphs to large damselfly nymphs, and even hard-bodied water boatmen. Disturbingly, because of its aggressive behavior, *D. villosus* not only ate victims, but also simply killed and injured large numbers with ‘bites’ to heads and bodies. A comparative examination of mouthparts showed those of *D. villosus* to be considerably more developed compared to those of *G. duebeni*. We also now have film footage of *D. villosus* attacking species such as the hard-bodied ‘hoglouse’, *Asellus aquaticus*. Footage shows a *D. villosus* using its antennae to sweep a victim towards its mouthparts, followed by grabbing of the victim with the gnathopods (often used in mating) and the victim being shredded alive. Our film star followed this with ‘dessert’ of several chironomid larvae!

### The Future of *D. villosus*

The Great Lakes have been invaded by many Ponto-Caspian species, (Dermot *et al.* 1998), with more possibly to follow. Although tolerant of salts, temperature change and low dissolved oxygen, *D. villosus* appears unable to withstand full strength seawater (van der Velde *et al.* 2000; Bruijs *et al.* in press). Thus, ballast water exchange may kill any *D. villosus* aboard vessels. With females carrying large numbers of developing embryos, typically

*Dikerogammarus villosus* continued on next page

## *Dikerogammarus villosus* continued from previous page

about 50, a very few individuals could rapidly colonize a new area. *D. villosus* is also a particularly large amphipod, with males reaching three centimeters, such that fish predators may often be gape-limited to be an effective control. Also, we have observed *D. villosus* attack small fish and speculate whether vertebrates may be at risk, particularly vulnerable life stages such as eggs, larvae, and juveniles. Little is known of the parasites/pathogens carried by *D. villosus*, but we know that amphipods are intermediate hosts for acanthocephalan worms, the final hosts being birds and fish. Given its potential for spread and damage to freshwater and brackish ecosystems, every attempt should be made to prevent the spread of *D. villosus* to North America. 

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## Upcoming Conferences and Meetings

16th Annual Symposium  
Florida Exotic Pest Plant Council  
September 12-14, 2001  
Casa Monica Hotel  
St. Augustine, Florida  
Contact: Dan Thayer  
E-mail: [dthayer@sfwmd.gov](mailto:dthayer@sfwmd.gov)

6th International Conference on the Ecology and Management of Alien Plant Invasions  
September 12-15, 2001  
Loughborough University  
Leicestershire, UK  
Contact: Lois Child  
E-mail: [L.E.Child@lboro.ac.uk](mailto:L.E.Child@lboro.ac.uk)

Western Regional Panel on Aquatic Nuisance Species Annual Meeting  
September 25-27, 2001  
New Frontier Hotel  
Las Vegas, Nevada  
Contact: Tina Proctor, USFWS Aquatic Species Coordinator  
Phone: 303-236-7862 Ext. 260  
E-mail: [bettina\\_proctor@fws.gov](mailto:bettina_proctor@fws.gov)

Eleventh International Conference on Aquatic Invasive Species  
October 1-4, 2001  
Hilton Alexandria Mark Center, Alexandria, VA  
Contact: Elizabeth Muckle-Jeffs  
Phone: 800-868-8776  
Fax: 613-732-3386  
E-mail: [profedge@renc.igs.net](mailto:profedge@renc.igs.net)

Risk Analysis for Invasive Species  
October 21-23, 2001  
Las Cruces, New Mexico  
Contact: [mpowell@oce.usda.gov](mailto:mpowell@oce.usda.gov)

Invasive Species Management Workshop  
October 24, 2001  
Fort Detrick  
Frederick, Maryland  
Contact: Steve Manning  
Phone: 615-385-4319  
E-mail: [stevemanning@pop.mindspring.com](mailto:stevemanning@pop.mindspring.com)

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Deadline for the next issue is October 1, 2001.

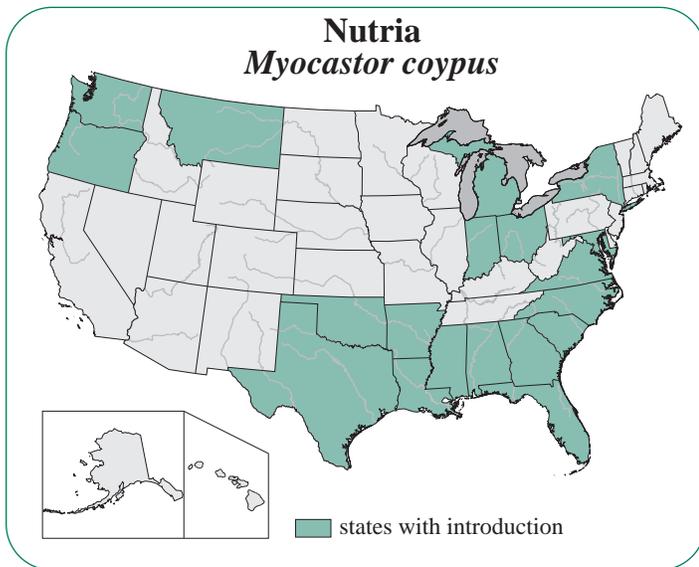


Figure 1: U.S. states with nutria  
Map courtesy of U.S. Geological Survey

will dig into the banks of water control structures such as dikes, levees, and impoundments, causing these structures to work improperly (Kinler et al 1987, Bounds 2000). Nutria are found on more than one million acres of National Wildlife Refuge lands managed by the U.S. Fish and Wildlife Service (Bounds 2000). These animals are a factor contributing to the significant loss of vital wetland habitats resulting in the destruction of coastal and inland ecosystems. Through eradication or control programs, land managers may have the ability to reduce the negative effects of nutria.

Nutria were introduced to Maryland fur farms in 1943 and are now found throughout the Eastern Shore (east of the Chesapeake Bay) and in the Potomac and Patuxent Rivers west of the Chesapeake Bay. Wetlands and tidal marshes have rapidly declined over the last several decades throughout the Eastern Shore of Maryland due to several factors including sea level rise, land subsidence, increased salinity, and herbivory by nutria. Land managers have little, if any, control over factors such as sea level rise, but action can be taken to control the destructive effects of nutria.

### The Maryland Nutria Partnership

Created in 1997, the Maryland Nutria Partnership consists of 24 federal, state, and private organizations working together with the common goal of nutria eradication in Maryland. Preliminary fieldwork for a three-year pilot program began in August 2000 to determine if nutria eradication in Maryland is feasible. The objectives for the pilot program are:

- develop population estimates before and during intensive nutria collection;
- determine how movement patterns of males and

- females change in response to intensive collection;
- evaluate nutria reproductive status prior to and during intensive collection;
- assess nutria health before and during intensive collection;
- determine the most efficient and effective trapping strategies to optimize intense nutria collection to achieve nutria population reduction and minimize impacts on non-target species;
- develop management recommendations for nutria control and possible strategies for nutria eradication;
- evaluate the cumulative effects and interactions among three factors (nutria population reduction, planting of wetland vegetation, and soil deposition) in determining the success of marsh restoration; and
- educate the public about the value of Maryland's wetlands and the impacts of invasive exotic species on native fish, wildlife, and their habitats.

### Three-Year Pilot Project

Currently, a three-year pilot program is focusing on three study areas which represent the political composition of the Maryland Nutria Partnership: 1) a federal area - Blackwater National Wildlife Refuge; 2) a state area - Fishing Bay Wildlife Management Area; and 3) a private area - Tudor Farms, Incorporated (Figure 2). Blackwater National Wildlife Refuge estimates that at least 7,000 of the 17,000 acres of marsh habitat have been lost during the past few decades by an estimated nutria population of 35,000-50,000 animals (Bounds and Carowan 2000). Tudor Farms, a privately owned business with approximately 7,000 acres, has an annual nutria harvest of about 4,000-5,000 animals; however, despite this annual hunt, nutria population estimates range from 13,000-20,000 animals (Ras 1999). Nutria population estimates are not available for Fishing Bay Wildlife Management Area, but populations are known to exist.

Within each study area there are three sites: treatment, control, and buffer. Each buffer site is located in between a treatment and control site. Currently, in the first year of the project (January 2001- December 2001), baseline data is being collected to study nutria population parameters before the treatment phase in years two and three. Animals are being captured live, marked, and released for population estimates and to track animal movements. Nutria are captured using a combination of box traps and foot-hold traps.



Nutria, *Myocastor coypus*

*Nutria continued from previous page*

Each animal is marked with a uniquely numbered tag in the web of each hind foot. Mark-recapture models will be used to develop population estimates at each of the treatment, control, and buffer sites (N=9 total sites). Five adult females and five adult males will be radio-collared to track their movements (N=90 nutria). Each year of the study, five female and five male adult (>4.5 kg) and five female and five male sub-adult (<4.5 kg) nutria will be collected and euthanized for necropsy to examine reproductive status and health parameters in each of the three treatment and three control sites (N=120 nutria). No nutria will be collected for necropsy from the three buffer sites. Based on necropsies, nutria



Female Nutria with Young

will be assigned a condition score (1-5), which is determined by abdominal fat reserves and size of the inguinal and axillary fat pads (1=emaciated and 5=obese). All major internal organs will be examined for lesions and the adrenal glands, spleen, and reproductive organs weighed. Incidence of parasites, litter size, fetal viability, as well as fetal weight and sex will be recorded. Using this information, the overall health, estrous cycle activity, pregnancy rates, and embryonic resorption rates will be used to assess nutria productivity. During years two and three of this project, 12 professional trappers will intensively collect and destroy nutria at the treatment sites (N=3) using a variety of control techniques. Various trapping techniques will be compared to determine which is the most effective method to reduce nutria with the least impact on non-target species.

In August 2000, program leaders hired 12 nutria trappers, a field supervisor, and two graduate students. Boundaries of the nine study sites (treatment, control and buffer) within the three study areas at Blackwater NWR, Fishing Bay WMA, and Tudor Farms were identified. From August - December 2000, nutria were captured using unbaited box traps set along established nutria runs. Initially, the capture success with box traps was fairly high; however, nutria quickly learned to avoid the box traps and captures declined. Attempts to increase capture success using baits (corn, sweet potatoes, and carrots) did not significantly

increase capture success. Instead, capture efforts were augmented using soft-catch, padded-jaw foot traps in addition to box traps.

In January 2001, the full study was implemented. Most of the nine study sites are accessible only by boat; therefore, the nutria trappers work in teams of two. To maximize the number of trap nights, the trappers work 10-day sessions alternating with four days off. During the first 10-day session each month, six teams of trappers are assigned to three treatment and three control sites. At each of these treatment and control sites nutria are captured using 50 box traps and 75 soft-catch, padded jaw foot traps. The trappers bring in the first five adult males and five adult females that they capture for necropsy, health, and reproductive studies. If nutria previously marked with a radio collar are re-captured, the animal is released so that it may be used in the population estimate or movement studies. Any additional captured animals are marked and released for population estimates or movement studies.

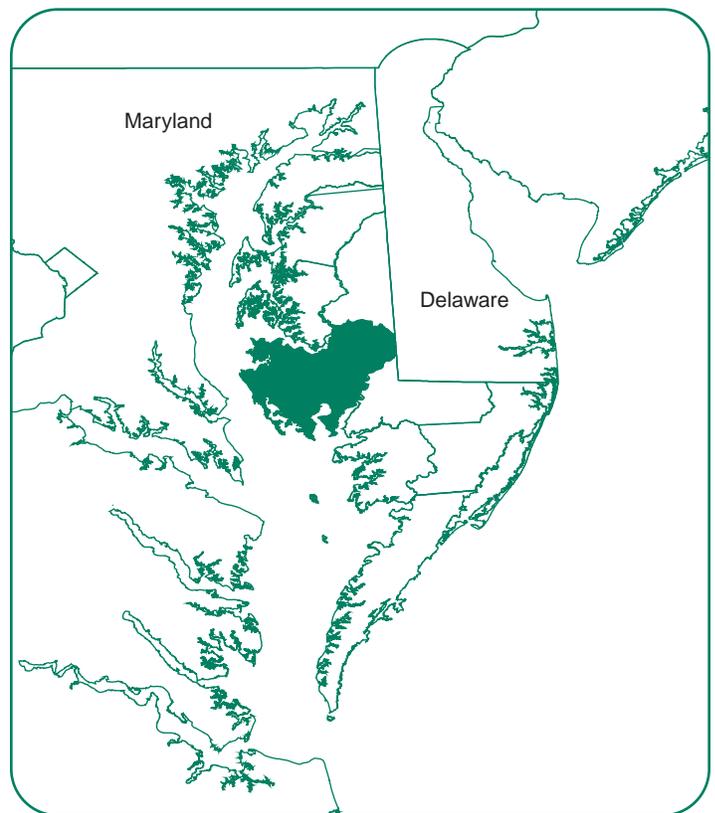


Figure 2. Marsh Restoration/Nutria Control Study  
Map by Mark Sherfy

During the second 10-day session each month, efforts focus on the three buffer sites, radio-telemetry, and data entry. At each buffer site, nutria are captured with 50 box traps and 75 foot traps. All nutria in the buffer sites are captured live, marked, and released unless the animal is severely injured, in which case, it is euthanized and necropsied. No animals are collected for health or reproductive evaluation from the buffer sites.

### Preliminary Results

From August 20, 2000 – March 29, 2001, 1,832 nutria were captured. Of these, 144 animals were radio-collared (74 males and 70 females). Twenty-eight percent (n=40) of the radio-collared animals have died (19 males and 21 females).

Researchers found significant seasonal weight changes in nutria. For example, one animal weighed 12 lbs. (5.5 kg) in August 2000 when it was first captured, but weighed only 8 lbs. (3.6 kg) when it was recaptured in January 2001. Consequently, it is difficult to maintain radio collars on nutria with such fluctuating weight changes. In June 2001, radio implants surgically inserted in the belly will be evaluated as a possible alternative to radio collars.

From January 2001-March 2001, 325 nutria were collected for necropsy, including 107 adult males, 118 adult females, 53 sub-adult males, and 47 sub-adult females. About 65 percent of the females were pregnant with an average litter size of 4.4 young. The average body condition score was 3.0 for males and 2.8 for females. Sub-adult body condition scores averaged 2.5 and did not vary between males and females.

Nutria marked from August 2000-March, 2001 total 1,507. Initially population estimates were expected to be developed within each 10-day session; however, marked individuals were generally not recaptured within a 10-day session to provide reliable population estimates. Given the complexity of the study design, preliminary results suggest that sophisticated modeling will be needed to accurately estimate nutria population levels. Researchers hope to obtain additional funding so that a post-doctorate position may be hired to model population estimates. The large volume of data that is collected daily by the 12 nutria trappers has proven to be a challenge to manage. Study leaders also plan to hire technicians for data entry and checking data accuracy.

### Wetland Restoration

The goal of the study is to evaluate strategies for reducing nutria populations in Chesapeake Bay wetlands to levels that do not allow sustainable reproduction. When broadly implemented, the resulting strategy will mitigate a significant factor in marsh loss on the Delmarva Peninsula. However, habitat conditions are such that marshes degraded by nutria will not be naturally recolonized by wetland plants. This is due primarily to the permanent loss of the marsh root mass in areas that have experienced nutria foraging. Re-vegetation is complicated since even a slight change in marsh elevation and flooding has a profound influence on the area's ability to support wetland plants, due to its flat topography and low tidal amplitude. Consequently, the project will include an evaluation of methods for restoring degraded marshes. This will be accomplished by testing all possible combinations of three factors to determine the most desirable approach to marsh restoration. The three factors are: 1) reduction of nutria populations by intensive collection; 2) planting marsh vegetation; and, 3) raising marsh elevations through thin-layer deposition of sediment. Preliminary experiments to test these three factors were slated to begin during summer 2001 under a comprehensive restoration program for Blackwater National Wildlife Refuge led by the U.S. Army Corps of Engineers,

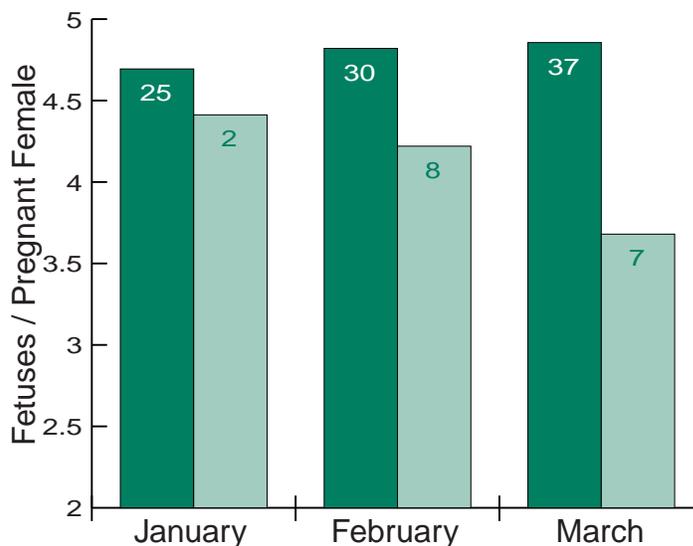


Figure 3. Potential Production Per Pregnant Female Nutria  
Chart by Mark Sherfy

Baltimore District. This program will also evaluate current hydrology and sedimentation rates in the Blackwater River basin to determine if other measures, such as plugging man-made ditches or remediation for hydrological barriers, are necessary.

### Outreach

The Partnership has convened an Outreach Committee to address the public education needs associated with the project. This group recognizes that raising public awareness of the serious ecological consequences of nutria is important, particularly among constituents residing outside the range of nutria in Maryland (e.g., west of Chesapeake Bay). While funds to implement an outreach program are lacking, the committee has developed a list of tools that could be used to reach the public. Many of these tools will capitalize on the abundance of environmental and natural resources educational facilities and high public visitation rates in the Chesapeake Bay region. Media coverage, newspaper and magazine articles, cable and local television stations, and nationally syndicated radio have helped to draw attention to the problem and raise public awareness. In addition, visibility among the scientific community has been raised through presentations at conferences and publication of articles describing project goals and results.

### Control Methods

Although options other than lethal control have been considered, strategies such as immunocontraception or relocation of animals have not been found to effectively manage this invasive species. Immunocontraception is difficult given the nature of administering such drugs to large numbers of nutria. Also, because eradication is the goal, immunocontraception is not applicable as the animals continue to damage the habitat and experience increased longevity (Bounds 2000). Relocation of nutria is not an option since this animal is unwanted.

*Nutria* continued from previous page

A demand for the fur and meat of nutria existed in the early 1900s. However, today the low number of nutria trapped for these uses does not have a significant impact on the population in infested areas.

### Is Eradication Possible?

Nutria were successfully eradicated from Great Britain (Gosling 1989). Dr. Morris Gosling, the leader of the eradication campaign in Great Britain, visited the Eastern Shore of Maryland to assess the nutria infestation. Dr. Gosling believes that eradication of nutria in Maryland is possible if approaches similar to the Great Britain campaign are followed. He believes that a number of factors make the prospects of eradication in Maryland even more likely than in England due to the wider variety of trapping techniques, better mobility over water, and lower population fecundity for nutria. Dr. Gosling recommends the following: develop a pilot eradication program; study nutria movements; develop accurate population estimates; and initiate a proactive public relations campaign. Dr. Gosling's recommendations are being implemented with the three year pilot program described. Researchers will continue baseline data collection through December 2001. Intensive nutria collection will begin in January 2002 and continue through December 2003. Study leaders believe that by conducting research and outreach through public relations efforts, eradication of nutria in Maryland may be possible. It is expected that results in Maryland will be useful to the other 14 states that currently have this invasive and exotic species. For additional information about this project, please contact any of the authors. 

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*The authors would like to acknowledge Sherry Daugherty, Brian Eyer, Karrie McGowan and the 12 nutria technicians for all of their efforts with this program.*

# Nuisance Notes from the Western Regional Panel on ANS

## State Updates

**Colorado:** A request for a project to develop and implement a statewide invasive species management plan has been submitted for funding under a CJS Wildlife Grant (CARA). If approved, the project will be initiated in late 2001 or early 2002, and is expected to involve various agencies and stakeholders. A three-year effort to conduct baseline surveys of mollusks and crayfish in eastern Colorado was initiated in May, 2001. The project will focus on determination of status and distribution of native species and on determining presence/absence and distribution of known and possible invasive species, such as Asian clams, zebra mussels, and various species of crayfish. The Colorado Division of Wildlife continues to consider and evaluate various species for possible inclusion in the state prohibited species list. As of March, 2001, prohibited aquatic species include: pirana, trahira, snakeheads or murrels, sticklebacks, tilapia (with a few exceptions for fish culturists), grass carp, big head carp, silver carp, Indian carp, gars, bowfins, walking catfish, rudd, green frog, zebra mussel, quagga mussel, and rusty crawfish. State WRP Contact: Chuck Loeffler CDOW (303-291-7451).

**Kansas:** 30 half shells of zebra mussels were found at a water intake pipe at a Kansas City area power plant on the Missouri River. Raw water samples did not contain veligers. However, the power plant will continue to closely monitor the situation. Kansas posted warning signs at all boat-launching sites on the river and at state parks in the area. State WRP Contact: Tom Mosher (316-342-0658).

**Montana:** New Zealand Mudsail monitoring and outreach efforts are ongoing, including studies at Montana State University on how snails effect the primary productivity of a stream. WZMTF Contact: Tim Gallagher (406-444-2448). Two short-range radio (TIS) systems will be located in Montana to educate boaters regarding ANS danger. Contact: Tim Gallagher MTFWP (406-751-4554).

**Nebraska:** Staff will be contacting boaters, handing out ANS literature, and inspecting boats at irrigation and power reservoirs in western Nebraska. The same activities will occur at all Missouri River access sites. WRP Contact: Steve Schainost, NGP (402-471-5443).

**North Dakota:** The state is collecting information from boater surveys along highways for two years. Staff will be putting signs at boat ramps and working on increasing awareness for anglers and duck hunters. WRP Contact: Terry Steinwand, North Dakota Game and Fish Department (701-328-6313) or Lynn Schlueter (701-662-3617).

**Oklahoma:** The numbers of zebra mussels in the Arkansas River are decreasing. However, the mussels are surviving in warmer waters better than expected and reproduced continuously last summer, even in water of 90° F. OK Department of Wildlife established a native mussel reserve on Poteau River on the Arkansas-Oklahoma border. State Department of Agriculture has developed a prohibited list of plants plus a species of concern list. Grass carp fingerlings have been found in Lake Takoma. WZMTF Contact: Everett Laney, USACOE (918-669-7411).

**Oregon:** The Oregon ANS plan is complete and was submitted to the ANS Task Force at the July meetings. The Oregon legislature passed two bills relating to ANS this session. SB 895 establishes a ballast water management program. The bill strongly supports a federal program with regional input. The law requires exchange of ballast water for ships entering OR waters from outside the EEZ and for ships from coastal ports south of 40° N latitude and north of 50° N latitude. The bill establishes a task force to report to the legislature during the next session. HB 2181 establishes an Invasive Species Council in Oregon to coordinate management in the state. Contact: Mark Systma, Portland State University (503-725-3833) or Andrew Schaedel, OR Dept. Environment (503-229-6121).

**South Dakota:** Curly leaved pondweed has been found in several lakes, most recently in the Black Hills. SDGFP is documenting locations and educating boaters on the ANS. 100th Meridian surveys are on-going this summer. A partnership with SD B.A.S.S. Federation and cooperative car washes has been developed to produce signage and offer boat washing services. WRP Contact: Cliff Stone, SD Department of GFP (605-734-4538).

**Texas:** The fight continues with Giant Salvinia in the Toldeo Bend Reservoir and Lake Texana. The good news is that there is no evidence of Giant Salvinia in Lake Conroe and Lake Sheldon this spring. State WRP Contact: Earl Chilton, TPW (512-389-4652).

**Utah:** Bright yellow ANS brochures are being handed out at contact points. Red STOP signs are positioned to warn boaters of possible ANS contamination. Utah has established an ANS Action Team. Contact: Randy Radant, Utah Division of Wildlife Resources (801-538-4812). Utah ANS website: [www.nr.state.ut.us/dwr/ans.html](http://www.nr.state.ut.us/dwr/ans.html).

**Washington:** The state is implementing a ballast water management program. The ANS coordinating committee is working on ideas for NISA reauthorization. Also working on ideas to implement an effective screening program for invasive species. WRP Contact: Scott Smith, WDFW (360-902-2724).

**Pacific States Marine Fisheries Commission:** The Commission continues to administer a project with Portland State University on education and monitoring for mitten crabs in the lower Columbia River. Mitten crabs have not been found in this area yet. Trailered watercraft will be surveyed in ID, MT, OR, and WY to determine potential for zebra mussel introduction with funds from WDFW and USFWS. The Commission is also administering a project by Portland State University, with Bonneville Power Authority and WDFW funding, to design and construct zebra mussel colonization substrates for distribution in WA, OR, ID, MT, and WY. The purpose is to monitor for settling juveniles and adult zebra mussels. Contact: Stephen Phillips PSMFC (503- 650-5400).

**Puget Sound Water Quality Action Team:** The Team adopted an ANS program in December 2000, as part of the long-range Puget Water Quality Management Plan. The program monitors for green crab, coordinates a Spartina management program, and produces and distributes educational materials. Contact: Kevin Anderson (360-407-7324).

## Tribal Contacts

### Columbia River Intertribal Fisheries Commission:

The Commission is meeting with FWS and the Lewis and Clark Bicentennial Council. The Council will create a brochure dedicated to Trail stewardship, including invasive species issues. Brochures will be available all along the Lewis and Clark Trail from the east to west. The Council will send letters to state tourist agencies to suggest they include *Zap the Zebra* brochures in literature that they send to trail travelers.

## Provincial Update

**Manitoba:** Letters have been sent to commercial boat haulers regarding ANS. Boats will be monitored again this year. Letters have also been sent to cottage associations to ask their cooperation in looking for ANS. Contact: Wendy Rally, Manitoba Conservation, (204-934-8146). Contact: Dwight Williamson, Manitoba Conservation (204-945-7030).

**Saskatchewan:** In the past year, Saskatchewan Environment and Resource Management (SERM) has been aggressively addressing the issue of ANS. Two research reports were written to identify the risk of potential colonization of zebra mussel in area waterbodies and the likely pathways zebra mussels would travel to enter Saskatchewan. A prevention committee has been formed involving provincial agencies and fisheries stakeholder groups concerned about the risk of zebra mussel introduction. A public awareness campaign utilizing the *Zap the Zebra* brochure and boater awareness signs has been launched. Contact: Rick Sanden, Saskatchewan Department of Environment and Resource Management (306-787-7813).

## Federal Updates

**Sea Grant:** OR and WA Sea Grant, The Pacific NW Marine Invasive Species Team (MIST), and Oregon-Washington Sea Grant partnership, anticipate a summer release of the new educational video "You Ought To Tell Somebody! - Dealing With Aquatic Invasive Species." This production addresses the need for early detection of NIS introductions in the Pacific Northwest, focused particularly on mitten crabs. MIST exhibit development projects at the Hatfield Marine Science Center (OR) and Point Defiance Aquarium (WA) are in progress, and MIST continues to maintain a monthly "ANS Update" electronic newsletter on its website at <http://seagrant.orst.edu/mist>. Contact: Paul Hemowitz, OR Sea Grant (503-722-6718) or Nancy Lerner, WA Sea Grant (206-616-8403). NY Sea Grant maintains an aquatic nuisance species information clearinghouse and publishes an information review, *Dreissena polymorpha*. Contact: Charles O'Neill, Jr. (716-395-2638). CA Sea Grant Contact: Jodi Cassell CA Sea Grant (650-871-7559).

## Great Lakes Panel Update

The Panel held its spring meeting in Ann Arbor, Mich., on May 18. A highlight of the meeting was the Panel's approval of the revised

*Information/Education Strategy on Aquatic Nuisance Prevention and Control*. Progress also was made in advancing the strategy's implementation plan as initial steps were taken to encourage organizations in the region to take on appropriate I/E activities. Other key agenda items included planning for reauthorization of the National Invasive Species Act (NISA) and reaching agreement on updating Panel membership with the addition of "at-large" positions. There also was discussion on the distribution/implementation of the Panel's *Ballast Water Management Policy Statement* (online at [www.glc.org/ans/anspubs.html](http://www.glc.org/ans/anspubs.html)). Special recognition was given to Dr. Philip Moy (Wisconsin Sea Grant), co-chair of the Ballast Water Committee, for his leadership in the development of the policy statement.

In conjunction with the Panel meeting, a symposium titled *Looking Forward, Looking Back: Assessing Aquatic Nuisance Prevention and Control* was held May 15-16. The symposium yielded draft recommendations for the upcoming NISA reauthorization process. These recommendations will be compiled in a proceedings document for wide-scale distribution.

All ten governors and premiers in the Great Lakes-St. Lawrence region have now signed the Panel-coordinated *Great Lakes Action Plan for the Prevention and Control of Aquatic Nuisance Species*. Public release and implementation are underway. More information will be available in the next Update. **Contact:** Katherine Glassner-Shwayder, Great Lakes Commission, 734-665-9135, [shwayder@glc.org](mailto:shwayder@glc.org)

## News from Around the Basin

**ILLINOIS/INDIANA:** A grant to the Illinois Natural History Survey, Illinois-Indiana Sea Grant and the University of Illinois will allow for implementation of the state management plan through appointment of an ANS coordinator. The new ANS training curriculum on "hazard analysis and critical control points" (HACCP) targeting baitfish wholesalers in the state, has been distributed. The purpose of the curriculum, developed by the Great Lakes Sea Grant Network, is to involve state fish hatcheries in implementing HACCP principles. Sea Grant also conducted an ANS identification workshop for conservation officers assigned to Lake Michigan. Indiana's 4-H clubs are raising and releasing *Galerucella* beetles again this summer for purple loosestrife biocontrol. **Contact:** Pat Charlebois, II-IN Sea Grant, 847-872-0140, [p\\_char@ix.netcom.com](mailto:p_char@ix.netcom.com); or Gwen White, IN Dept. of Fish and Wildlife, 317-232-8150, [gwhite@dnr.state.in.us](mailto:gwhite@dnr.state.in.us).

**MICHIGAN:** Additional funding has been provided by the U.S. Fish and Wildlife Service (USFWS) to support the state's ANS management plan. Under the plan, the Department of Environmental Quality (DEQ) will fund a Lake Superior monitoring study for exotic species to determine if there is a significant number of unidentified invaders in the lake. DEQ is also initiating a field study onboard a ship to test ballast water treatments. The Office of the Great Lakes is compiling a list of ANS educational materials to be used in updating the state plan. **Contact:** Emily Bankard, MI DEQ, 517-241-7927, [bankarde@state.mi.us](mailto:bankarde@state.mi.us).

**MINNESOTA:** The Department of Natural Resources (DNR) has provided national seaplane guidelines to attendees of a recent meeting of the Minnesota Seaplane Pilots Association. The Minnesota Lakes Association included a zebra mussel session at their May annual meeting. Lake Zumbro, the Zumbro River and part of the St. Croix River were designated as infested waters because they now contain zebra mussels. Lake Zumbro is the first inland lake in the state infested with zebra mussels. **Contacts:** Jay Rendall, MN DNR, 651-297-1464, [jay.rendall@dnr.state.mn.us](mailto:jay.rendall@dnr.state.mn.us).

**NEW YORK:** Work has begun on revising the state's ANS management plan. Since 1995, federal ANS funds have been used to monitor ecological impacts of zebra mussels in the Finger Lakes region. A detailed report on the first four years of monitoring has been completed. It reviews water quality data collected, and compares lakes at various stage of zebra mussel colonization, including lakes currently not colonized. Also discussed is the role of zebra mussels in changing fisheries management strategies. **Contact:** Timothy Sinnott, NYSDEC, 518-402-8970, [txsinnot@gw.dec.state.ny.us](mailto:txsinnot@gw.dec.state.ny.us).

**ONTARIO:** The Fish Rescue Program, designed to reduce ANS releases by finding homes for unwanted aquarium pets, is now up and running. Pet owners in Ontario can call 800-563-7711 to participate. The program will be advertised with flyers inserted into new aquariums. The invasive plant fanwort is now well established in central Ontario's Kasshabog Lake. A 2-year research project has been initiated to investigate its impacts, potential for spread and proposed control methods. **Contact:** Alan Dextrase, OMNR, 705-755-1950, [alan.dextrase@mnr.gov.on.ca](mailto:alan.dextrase@mnr.gov.on.ca).

**PENNSYLVANIA:** A five-foot drawdown of Endinboro Lake was initiated in December 2001 to control its zebra mussel population. Results suggest that zebra mussels in water less than two feet deep were killed but many mussels in water between two and five feet deep survived. DEP estimates that the lake's zebra mussel population was reduced by 41 percent. It is believed that the heavy ice and snow

pack on the lake (which froze prior to the drawdown) insulated the mussels in deeper water and reduced the efficacy of the drawdown. **Contact:** Kelly Burch, PA DEP, 814-332-6816, [kburch@state.pa.us](mailto:kburch@state.pa.us).

**WISCONSIN:** Rainbow smelt have invaded a number of lakes in northern Wisconsin over the past few decades. Recent data indicate how the smelt have dramatically changed fish diversity in those lakes. In particular, native fishes such as walleye have declined significantly as a result of competition with smelt. The DNR is featuring a special ANS insert, *Out of Place*, in the June edition of the Wisconsin Natural Resources magazine. The edition details the history of aquatic invaders in Wisconsin, how they alter state waterways and management efforts currently underway. **Contacts:** Contact: Ron Martin, WI DNR, 608-266-9270, [martir@dnr.state.wi.us](mailto:martir@dnr.state.wi.us).

## National ANS Task Force

The next meeting of the ANS Task Force will be held October 4-5, 2001, in conjunction with the 11th Annual International ANS Conference. **Contact:** Sharon Gross, ANS Task Force, 703-358-2308, [Sharon\\_gross@fws.gov](mailto:Sharon_gross@fws.gov).

## Upcoming Events

*International Ballast Treatment Investment Fair*, Sept. 20-21, 2001, Chicago, Ill. **Details** available at [http://www.nemw.org/fair\\_about.htm](http://www.nemw.org/fair_about.htm).

*11th International Conference on Aquatic Invasive Species*, Oct. 1-4, 2001, Alexandria, Va. Special Session: *Building Consensus for Regional Policy on Aquatic Invasive Species Prevention and Control*. **Details** available at [www.aquatic-invasive-species-conference.org](http://www.aquatic-invasive-species-conference.org). Telephone: 800-868-8776.

## On The Bookshelf

*Harmful Exotic Species of Aquatic Plants and Wild Animals in Minnesota: Annual Report for 2000*. **Contact:** Jay Rendall, MN DNR, 651-297-1464, [jay.rendall@dnr.state.mn.us](mailto:jay.rendall@dnr.state.mn.us).

*Aquatic Nuisance Species Report: An Update on Sea Grant Research and Outreach Projects 2000*. Cost \$13.00 **Contact:** Nancy Cruickshank, [cruickshank.3@osu.edu](mailto:cruickshank.3@osu.edu). Available online (by end of July) at: [www.sg.ohio-state.edu/publications/topics/fts-nuisance.html](http://www.sg.ohio-state.edu/publications/topics/fts-nuisance.html).

*Out of Place: How Aquatic Exotic Species Alter Wisconsin Waterways*. Insert of the Wisconsin Natural Resources Magazine, June 2001. **Contact:** Ron Martin, WI DNR, 608-266-9270, [martir@dnr.state.wi.us](mailto:martir@dnr.state.wi.us).

Full copies of the ANS Update, a quarterly newsletter prepared by the Great Lakes Panel on Aquatic Nuisance Species, are available upon request from the Great Lakes Commission. **Contact:** Katherine Glassner-Shwayder, Great Lakes Commission, 734-665-9135, [shwayder@glc.org](mailto:shwayder@glc.org).

# Recreational Water Users Are Empowered

The Aquatic Nuisance Species Task Force released *Recreational Guidelines to Limit the Spread of Aquatic Nuisance Species* this past June, during National Fishing and Boating Week. In conjunction with the U.S. Fish and Wildlife Service, the ANS Task Force co-sponsored the first ever resource-oriented workshop held during the week's activities in Washington, DC. The ANS Task Force held the workshop to bring a variety of groups together to unveil the Recreational Guidelines and to gather input for the reauthorization of the National Invasive Species Act. Active workshop participants included representatives from federal and state resource agencies, the recreational fishing and boating industries, and various groups including seaplane pilots and waterfowl hunters. The workshop was very successful in attaining support for the guidelines. The Task Force will continue to promote these guidelines throughout the U.S. Please contact Joe Starinchak at 703-358-2018 if you would like more information about the Guidelines or the ANS Task Force's outreach activities.

## Generic Guidelines

Some guidelines are appropriate for any water-based recreational activity. The ones listed below apply to most recreational activities occurring in marine and inland waters. States and provinces may include other specific laws and guidelines.

### Always Do the Following

- Inspect equipment, looking for visible plants and animals and removing everything from equipment before traveling;
- Drain water from equipment before transporting;
- Clean equipment and working dogs when leaving infested waters and before going to other waters;
- Report questionable species and contact your local resource agency for identification assistance. ANS information is available from many sources; but specimens are needed to confirm sightings. Different locations have different rules regarding possession and transport. Always consult your resource agency for instructions.

### Always Avoid the Following

- Transporting animals and plants, specifically, mud, aquatic plants and animals from lakes, rivers, wetlands, and coastal areas;
- Releasing animals and plants, including all aquarium species, bait, pets or water garden plants. Do not release these into the wild without knowing that the organism is native to the water body.

## SCUBA Diving

SCUBA divers can unintentionally transport ANS between waters. Precautions should be taken to reduce the risk of carrying ANS, especially when diving in different waters on the same or repeated days. Many divers believe zebra mussels have benefited the sport by improving water visibility. But zebra mussels encrust underwater objects, which makes diving less enjoyable. Thus, the harm caused by ANS outweighs any benefit. Divers can reduce the impacts by following a few basic steps.

### Guidelines

- Check gear, clean organic matter/mud;
- Drain tank, regulator, buoyancy compensator (bc), boot, and other equipment;
- ANS can survive for a period of time on wet scuba gear. To prevent this:
  - Rinse and dry suit and equipment before diving in different waters;
  - Rinse inside of bc with hot or salt water;
  - Wash/rinse suit, equipment and inside of bc with hot (<40° C or 104°F) or salt (1/2 cup salt/gallon) water.

## Waterfowl Hunting

ANS can significantly damage wildlife habitat. Waterfowl hunters should be aware that it is possible to inadvertently spread ANS from a contaminated lake or wetland via boats, motors, trailers, and decoys. Waterfowlers should also assume that all aquatic plant fragments are potentially harmful and should not be moved between aquatic areas. Zebra mussels and their larvae can attach to aquatic plants. If plant fragments are moved, they can carry larvae to other waters. Hunters can prevent ANS impacts with these steps.

### Guidelines Before the Hunting Season

- Switch to bulb-shaped, or strap anchors on decoys to avoid aquatic plants;
- Clean boats, if moored in waters known to contain zebra mussels; Use these tips to remove or kill zebra mussels and other aquatic life that adhere to boat:
  - Remove visible zebra mussels;
  - Wash/rinse with hot water;
  - Spray with high-pressure water;
  - Dry for five days before entering new water body.

### After the Hunting Season

- Inspect waders/hip boots, remove plants, and rinse mud;
- Remove plants, animals, and mud that are attached to lines or anchors;
- Drain boats before going to new waters.

### Between Hunting Trips

- Inspect/remove mud, aquatic plants, and animals from equipment and hunting dogs;
- Follow the boater guidelines.

## Bait Harvesting

These guidelines apply to non-commercial bait harvesting. ANS can lodge in nets and other equipment and can be unintentionally transported into other waters. Some species can survive up to two weeks out of water and remain viable when dislodged into another water body. Non-target ANS such as ruffe and round goby, and plant fragments, such as hydrilla or Eurasian water milfoil, can be harvested with baitfish. If moved, they can negatively impact fish populations in other waters. Use these measures to reduce ANS impacts.

### Guidelines

- Inspect for and remove non-target species;
- Dispose of excess live bait on land before leaving the water. Never release or transport bait or aquatic plants between waters;

# with Tools to Fight the Spread of ANS

- Clean boats, trailers, and equipment on shore before leaving the access point;
- Hand clean and dry nets before re-use;
- Drain water from boats and equipment before leaving any water body access;
- Never use water known to contain ANS to transport live bait. In many states and provinces, it is illegal to obtain bait from these waters. Before harvesting, check with your local resource agency about any regulations;
- In areas known to harbor ANS where bait harvest is legal, do not use the same equipment in other water. Some ANS can survive out of water for two weeks. By thoroughly drying equipment, this risk can be reduced;
- Rinse and dry equipment, boats, and trailers for five days. Before re-use, roll out, hand clean, and dry nets for ten days;
- The following formulas can be used to clean hard-to-treat equipment. Use 100% vinegar dip for 20 minutes to kill zebra mussels and other ANS. Chemical treatment with a 1% solution of table salt for 24 hours can replace the vinegar dip.

## Angling

ANS can cause significant changes in aquatic ecosystems. Fish populations (prey and game fish) can be harmed by ANS such as sea lampreys, Asian swamp eels, Asian carps, and zebra mussels. Some plants such as hydrilla and water hyacinth can limit fishing. Prevent the ANS expansion with these steps.

### Guidelines

- Dispose of excess live bait on land. Never release into new waters;
- Wash/dry boat and equipment to kill ANS;
- Inspect for and dispose of all non-target species.

## Boating

Recreational boaters can inadvertently transport ANS due to the high survivability of these organisms. These guidelines can help prevent this spread.

### Guidelines

- Before leaving, inspect boat and equipment and remove all plants and animals;
- Drain water from motor, livewell, bilge, and transom wells on land;
- Wash and dry boat, trailer, downriggers, and other boating equipment to kill ANS not visible at the boat launch;
- Before traveling to other waters, do one of the following:
  - Rinse boat and equipment with hot (< 40 °C or 104 °F) water;
  - Spray with high-pressure water or dry for five days.

## Seaplane Operations

Seaplanes can transport ANS between water bodies on their floats. It is important to clean the aircraft and remove ANS before traveling, rather than after landing in new waters. Pilots are advised to include these steps into their flight operations. As always, safety is the first priority when using the guidelines.

### Guidelines Before Entering the Aircraft

- Inspect/remove plants from floats, wires or cables, and water rudders;
- In infested water, check transom, bottom, chine, wheel wells, and float step area;
- Pump water from floats;
- Use these methods to kill ANS:
  - Wash/spray floats with hot or high-pressure water;
  - Dry for five days.

### Before Takeoff

- Do not taxi through heavy aquatic plant growth prior to takeoff;
- Raise and lower water rudders to clear off plants, minimize cable stretch, and improve steering effectiveness.

### After Takeoff

- Raise/lower water rudders several times to free aquatic plant fragments while over the waters you are leaving or land;
- If aquatic plants remain visible on the plane, return and remove them.

### Storage or Mooring

- Remove aircraft from the water and allow parts to dry. Summer temperatures will kill adult zebra mussels (more time is required for cool, humid weather);
- Aircraft moored for extended periods in waters may have ANS attached and should be cleaned regularly. In remote locations, zebra mussels or other ANS may be present. If no cleaning equipment is available, the best prevention option is to hand-clean the submerged floats with a scrub brush and to physically remove any ANS.

## Personal Watercraft Use

Personal watercraft (PWC) have jet-drive systems requiring extra precautions to avoid ANS transport. A pump pulls water in an opening under the PWC, and an impeller forces water out, moving the PWC ahead. If moved to different waters, beware of ANS that have been lodged in the jet-drive. The impellers could catch a plant fragment that could result in an infestation of new waters. The jet drive holds extra water, which could harbor live zebra mussels and spread them to other waters. With these steps, you can ensure an ANS-free PWC.

### Guidelines in the Water

- Do not run PWC through aquatic plants;
- After loading onto trailer, run engine to blow out excess water and vegetation.

### On the Trailer

- After trailering PWC, run engine to blow out excess water and vegetation;
- After shutting down, pull plants out of the steering nozzle. Inspect trailer and other equipment for aquatic plant fragments, and remove them before leaving the access area.

### After Trailering and Before Re-use

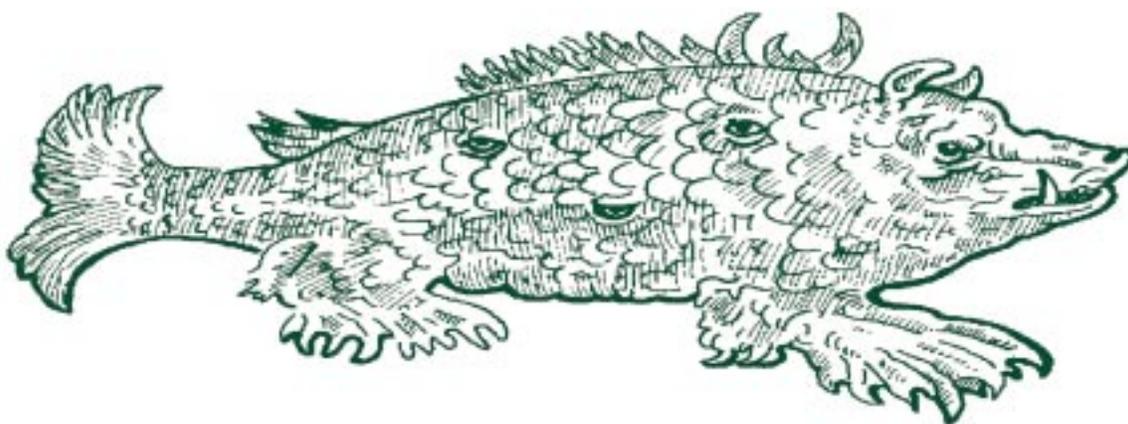
- Wash and dry PWC to kill/remove ANS not visible at the boat launch;
- Disinfect before entering new waters by:
  - Rinsing PWC, other equipment with hot (< 40 °C or 104°F) water;
  - Spraying with high-pressure water;
  - Drying for five days.



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