



WASHINGTON STATE  
UNIVERSITY  
EXTENSION



## BURROWING SHRIMP AND INVASIVE EELGRASS

### BY THE NUMBERS

- More than 25 grower and agency seminars, workshops, demonstrations, field days, and educational events were conducted in 2013, 2014, and 2015.
- More than 40 conference meetings with regulatory agencies and growers were held between 2013 and 2015.
- More than 10,000 acres of farmed shellfish ground were impacted by this project in terms of the ability to control these major pests.
- Three peer-reviewed scholarly products were authored or coauthored.

### 2016

#### ISSUE

Shellfish production in Washington is a \$60 million industry annually. Several major pests plague this industry, resulting in major crop loss. One of the most important pests is subterranean burrowing shrimp. These shrimp bioturbate (stir up) the sediment, causing the oysters to sink and die. For 60 years the industry had been using the insecticide Sevin to control this pest, but due to lawsuits, its use was phased out in 2013. Without alternative controls for shrimp, tens of millions of dollars in annual crop revenue will be lost and the industry will quickly lose its economic viability in southwestern Washington.

Within the past decade, a new aquatic weed, non-native Japanese eelgrass, has invaded the tidal flats, causing total crop losses in numerous commercial clam farms. This weed now dominates the upper tidal flats of several Washington estuaries and many clam farms have ceased operation due to its impact on production. Japanese eelgrass, not only threatens the economic viability of the shellfish industry, but has also resulted in significant changes in estuarine ecology. State and federal regulatory agencies have been resistant to management of eelgrass until more studies are conducted on the ecological impacts of this invasive species, and the potential non-target impacts of its management. For the shellfish growers to maintain their \$10 million clam industry, the negative impacts of invasive eelgrass have to be proven, the species be considered invasive by regulatory agencies, management options developed and implemented, and the non-target impacts of its control be documented.

#### RESPONSE

*Burrowing shrimp:* Over the past decade, we led a collaborative research effort to develop and test alternative mechanical, biological, and chemical control of burrowing shrimp. One chemical, imidacloprid, was the only viable solution. Next, we led a project to obtain a registration for imidacloprid to control burrowing shrimp in Willapa Bay. Funding and collaboration among stakeholders, industry, three universities, and state and federal agencies were obtained in order to proceed with the registration and permitting process. Extensive research on ecological impact and fate of imidacloprid was done. An Integrated Pest Management (IPM) approach was developed to achieve maximum efficacy with minimal impact. Outreach was provided in newsletters, presentations in workshops, numerous grower meetings and field days, conferences and professional meetings, project reports, and by holding numerous collaborative meetings and tours with regulatory agencies.



## QUOTES

*"WSU's engagement in this project has been pivotal to the long-term success of Washington's shellfish industry. They have worked on this project for over a decade, and without their leadership and effort, the industry would have not survived."*

## PARTNERSHIPS

Research partners include: USDA-IR4 program; Dr. Grue, Washington Cooperative Fish and Wildlife Research Unit, University of Washington; Dr. Ruesink, University of Washington; Dr. Dumbauld, USDA-ARS Hatfield Marine Science Center; Pacific Shellfish Institute; the Willapa Grays Harbor Oyster Growers Association; SeaGrant; NOAA-NMFS; WADOE; and WDFW.

Funding Partners include the Washington State Department of Fish and Wildlife Oyster Reserves, the Washington State Commission for Pesticide Registration, and directed proviso funding to WSU from Washington State Legislators.

*Japanese eelgrass:* Funding was obtained from the Washington Department of Fish and Wildlife, and the Washington State Commission for Pesticide Registration. Research was conducted to assess ecological and economic impacts of Japanese eelgrass and develop new effective and safe tools for its control. White papers, risk assessments, research reports, refereed journal papers, public meetings, agency tours and meetings, public workshops, hearings, and testimony were generated to document research findings to the industry, general public, and regulatory agencies.

## IMPACTS

*Burrowing shrimp:* The data package we submitted to the Environmental Protection Agency allowed us to obtain a federal registration of imidacloprid for use by the shellfish industry in 2013. We next submitted our report on "Sampling and Analysis Plan" (SAP) to define the sediment impact zone (SIZ), required for the National Pollutant Discharge Elimination System (NPDES) with the Washington Department of Ecology (WADOE). This extensive data package was approved by the regulatory agencies. This allowed the WADOE to authorize the industry to conduct large-scale use (400 acres) for additional non-target impacts and efficacy trials in 2014. Results from those 2014 studies were used by WADOE as guidance to issue an NPDES in March 2015. Once the NPDES is issued, the shellfish growers in southwest Washington will have an opportunity to control burrowing shrimp and remain sustainable for future generations. Approximately 500 acres are scheduled for annual treatment, once the permit is issued. In addition, this new control tool will have far less impact on non-target life (fish, crab, infauna) compared to the use of Sevin in the past 60 years.

*Japanese eelgrass:* As a result of our findings on the effects on shellfish production, and the endangered species green sturgeon, the Washington Department of Fish and Wildlife took Japanese eelgrass off the protected species list and the Washington Noxious Weed Board listed it as a noxious weed species.

Our research on control resulted in an herbicide being federally registered for use. This was followed by the Washington State Department of Ecology issuing an environmental impact statement and National Pollutant Discharge Elimination System to growers in May 2014 for the use of this herbicide. Growers treated 300 acres in 2014 and 2015. This control effort will increase the net returns to growers by 45% and increase the crop value of Manila clams in Willapa Bay by several million dollars per year.