


THE XERCES SOCIETY
FOR INVERTEBRATE CONSERVATION

Protecting the Life that Sustains Us

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Derek Rockett
derek.rockett@ecy.wa.gov
Washington State Department of Ecology Water Quality Program
Southwest Regional Office
PO Box 47775
Olympia, WA 98504

Dear Mr. Rockett:

Thank you for providing the opportunity to comment on the *Draft National Pollution Discharge Elimination System, Waste Discharge Permit No. WA0039781* (draft permit) and *Draft Environmental Impact Statement: Control of Burrowing Shrimp* [*U*]*sing Imidacloprid on Commercial Oyster and Clam Beds in Willapa Bay and Grays Harbor, Washington* (draft EIS).

The draft permit demonstrates the Department of Ecology's (Ecology) interest in ensuring thorough monitoring to evaluate negative impacts from imidacloprid use and instituting mitigation measures to limit resulting harm to the ecosystem. The Xerces Society for Invertebrate Conservation (Xerces Society) is pleased that Ecology included these important components of an Integrated Pest Management (IPM) Plan in the draft permit.

However, Xerces Society has substantial concerns about the plan set forth in the draft permit and draft EIS. While the draft EIS notes that there is uncertainty regarding the specific risks associated with the preferred alternative of imidacloprid use, it fails to highlight existing published research that demonstrates the potential for wide-range ecological damage from imidacloprid. These risks, coupled with the lack of data on how imidacloprid will impact sensitive marine environments like Willapa Bay and Grays Harbor, warrant greater caution. However, the current draft permit will, if granted, expand the allowed annual pesticide-based management of burrowing shrimp both temporally and spatially in Willapa Bay and Grays Harbor.

Furthermore, the draft permit fails to require a robust and complete integrated pest management (IPM) plan. The preferred alternative for managing native species of burrowing shrimp (ghost shrimp *Neotrypaea californiensis* and mud shrimp, *Upogebia pugettensis*) fails to: (a) confirm appropriate economic thresholds for burrowing shrimp; (b) determine a method to accurately measure shrimp population density; and (c) institute integrated management methodologies in order to diminish reliance on a single control method.

Xerces Society respectfully requests that Ecology consider the following comments.

I. CURRENT RESEARCH EXEMPLIFIES THE SIGNIFICANT RISK IMIDACLOPRID PRESENTS TO AQUATIC INVERTEBRATES

Imidacloprid has the potential to damage the rich marine ecosystems of Willapa Bay and Grays Harbor. It is water soluble and highly toxic to aquatic invertebrates.[1,2] Its persistence and largely irreversible mode of action in invertebrates make it particularly dangerous in these ecosystems.[3] Imidacloprid's impact on these key species can also cause a cascading trophic effect, harming the fish, birds, and other organisms that rely on them for sustenance.[4,5]

This cascade effect must be considered in the final EIS as Grays Harbor and Willapa Bay are critically important for migratory shorebirds. The two estuaries are among the most important migratory bird stopover sites on the west coast.[6] The proposed imidacloprid applications could significantly affect the invertebrate prey base on which these migratory shorebirds depend.

Neonicotinoids, including imidacloprid, were recently evaluated by a large panel of experts chartered under the International Union for the Conservation of Nature (IUCN), known as the Task Force on Systemic Pesticides. This panel of 29 independent scientists assessed effects of systemic insecticides at an ecosystem level, reviewing approximately 800 peer-reviewed articles on neonicotinoids.

Their report, entitled the "Worldwide Integrated Assessment on Systemic Pesticides," was published serially in *Environmental Science and Pollution Research.* Key findings include:[7]

- Neonicotinoids are present in the environment "at levels that are known to cause lethal and sublethal effects on a wide range of terrestrial (including soil) and aquatic microorganisms, invertebrates and vertebrates."
- The active ingredients persist, with half-lives of months and, in some cases, years.
- The metabolites of neonicotinoids can be as or more toxic than the active ingredients.
- Standard methods used to assess the toxicity of a pesticide (e.g. short-term lab toxicity results) fail to identify the subtle, yet severe impacts of neonicotinoids.

The Task Force's article specific to invertebrates, *Effects of neonicotinoids and fipronil on non-target invertebrates*, further argues that:

> *"Despite large knowledge gaps and uncertainties, enough knowledge exists to conclude that existing levels of pollution with neonicotinoids and fipronil resulting from presently authorized uses frequently exceed the lowest observed adverse effect concentrations and are thus likely to have large-scale and wide ranging negative biological and ecological impacts on a wide range of non-target invertebrates in terrestrial, aquatic, marine and benthic habitats."*[8]

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[1] Morrissey, C.A., et al. 2014. Neonicotinoid contamination of global surface waters and associated risk to aquatic invertebrates: A review. *Environment International* 74 (2015) 291–303

[2] Roessink I, et al. 2013.The neonicotinoid imidacloprid shows high chronic toxicity to mayfly nymphs. *Environ Toxicol Chem* 32(5):1096-100. doi: 10.1002/etc.2201

[3] Morrissey, C.A., et al. 2014. *supra*

[4] Hallmann C.A., et al. 2014. Declines in insectivorous birds are associated with high neonicotinoid concentrations. *Nature* doi:10.1038/nature13531

[5] Mineau, P. and C. Palmer. 2013. "The Impact of the Nation's Most Widely Used Insecticides on Birds." American Bird Conservancy. Available at: http://www.abcbirds.org/abcprograms/policy/toxins/Neonic_FINAL.pdf. (Accessed November 18, 2014).

[6] The draft EIS fails to note that Willapa Bay supports three Important Bird Areas (IBA), including one Global IBA (Sand and Gunpowder Islands), and two state-level IBAs (North Willapa Bay, and South Willapa Bay). The draft EIS also fails to note that Grays Harbor Estuary has been designated a hemispheric reserve by the Western Hemisphere Shorebird Reserve Network as a site of international significance. The estuary is visited by over 500,000 shorebirds annually during spring and fall and is used as roosting and foraging grounds by shorebirds (www.WHSRN.org), as well as many other marine bird species. Grays Harbor Estuary also supports six state-level IBAs.

[7] Van der Sluijs J.P., et al. 2014. Conclusions of the Worldwide Integrated Assessment on the risks of neonicotinoids and fipronil to biodiversity and ecosystem functioning. *Environ Sci Pollut Res* doi:10.1007/s11356-014-3229-5

[8] Pisa, L.W., et al. 2014. Effects of neonicotinoids and fipronil on non-target invertebrates. *Environ Sci Pollut Res* doi 10.1007/s11356-014-3471-x

Another recent review by independent scientists specific to neonicotinoid impacts on aquatic invertebrates concluded that:[9]

- "[N]eonicotinoids can exert adverse effects on survival, growth, emergence, mobility, and behavior of many sensitive aquatic invertebrate taxa at concentrations at or below 1 ug/L under acute exposure …"
- "Existing information presented here suggests that stricter regulations and use of neonicotinoid insecticides are warranted to protect aquatic ecosystems and the broader biodiversity they support."

The review goes on to recommend ecological thresholds for concentrations of neonicotinoids in aquatic systems. The threshold for acute exposure is below 0.2 ug/L, and below 0.035 ug/L for long-term chronic exposure. Adding caution to those numbers, the reviewers stated that "[t]he application of safety factors may still be warranted considering potential issues of slow recovery, additive or synergistic effects and multiple stressors that can occur in the field."

The 2013 *Risk Assessment for Use of Imidacloprid to Control Burrowing Shrimp in Shellfish Beds of Willapa Bay and Grays Harbor, WA*, which is cited by the draft EIS, reports peak off-bed water concentrations from 0.35 ug/L to 4,200 ug/L. The risk assessment also reports imidacloprid levels that exceed the chronic threshold, citing studies that found up to 0.4 ug/L on beds up to 28 days after treatment.[10] These levels are clearly above the recommended ecological thresholds to protect aquatic invertebrates. As such, non-target invertebrates at and around the treated beds could suffer significant impacts.

The risks outlined above raise significant concern with Ecology's preferred alternative. Ecology is proposing that imidacloprid be used on a total of 2,000 acres in Willapa Bay and Grays Harbor annually. That is an increase from the 800 total acres that is currently approved for the use of carbaryl annually. The draft EIS has not provided sufficient information regarding the possible risks of imidacloprid. Therefore, Ecology has not justified the use of imidacloprid, especially on such an expanded acreage.

II. GRANTING A PERMIT FOR IMIDACLOPRID USE IN WILLAPA BAY AND GRAYS HARBOR IS PREMATURE

The imidacloprid products listed in the draft permit, Protector 0.5G (granular form) and Protector 2F (flowable form), were granted conditional registration by the U.S. Environmental Protection Agency (EPA).[11] Conditional registration allows a new active ingredient to enter the market for an unspecified period of time while the registrant gathers safety data requested by EPA. EPA's own analysis of the program between 2004 and 2010 confirms that this process has been misused in 98% of cases. Approximately 65% of the 16,000 currently registered pesticide products—including neonicotinoids—have been put on the market through conditional registration before basic toxicity testing is completed.[12]

Ecology highlights some of these data gaps in the draft EIS, stating that many existing studies "may not be directly transferable to aquatic organisms in an estuarine environment where tidal exchange occurs four times per day."[13] Ecology goes on to explain that:

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[9] Morrissey, C.A., et al. 2014. *supra*

[10] McGaughey, B. et al. 2013. "Risk Assessment for Use of Imidacloprid to Control Burrowing Shrimp in Shellfish Beds of Willapa Bay and Grays Harbor, WA." Plauche & Carr. Compliance Service International. Available at: http://www.ecy.wa.gov/programs/wq/pesticides/imidacloprid/docs/ImidaclopridRiskAssessment.pdf. (Accessed November 14, 2014).

[11] Ecology (Washington State Department of Ecology). 2014. "Draft Environmental Impact Statement: Control of Burrowing Shrimp using Imidacloprid on Willapa Bay and Grays Harbor, Washington. Appendix A." Available at: http://www.ecy.wa.gov/programs/wq/pesticides/imidacloprid/docs/ImidaclopridDEIS.pdf. (Accessed November 21, 2014).

[12] Sass, J. M. Wu. 2013. "Superficial Safeguards: Most Pesticides Are Approved by Flawed EPA Process." Natural Resource Defense Council. Available at: http://www.nrdc.org/health/pesticides/files/flawed-epa-approval-process-IB.pdf. (Accessed November 24, 2014).

[13] Ecology. 2014. *supra.* 1-33

"*Studies of imidacloprid and one of its degradation products in these specific estuarine environments have been conducted recently and are ongoing at the time of this writing. Ecology will continue to review the results of these studies and consider their applicability to the proposed use of imidacloprid to treat burrowing shrimp on commercial shellfish beds in Willapa Bay and Grays Harbor*."[14]

While Xerces Society appreciates Ecology's willingness to revise and review data as it comes available, completion of the EIS prior to gaining these important data would be premature. The final EIS should include analysis of the results of these studies. Furthermore, the limitations of the studies should also be accounted for in the final EIS, as experiments on treatment plots of 10 acres cannot be assumed to correlate directly to treatment areas being proposed under the draft EIS.[15]

III. ECOLOGY DOES NOT PROVIDE THE STRUCTURE FOR A ROBUST INTEGRATED PEST MANAGEMENT PROGRAM

Taking into account that integrated pest management programs in aquaculture systems are in the early stages of their development relative to terrestrial agricultural IPM programs, it is still troubling that the draft permit fails to include several basic components of IPM. To support the stated overall goal of the 2002 Memorandum of Agreement between Ecology and oyster growers to "reduce reliance on conventional broad-spectrum pesticides",[16] Ecology must strengthen IPM requirements for any burrowing shrimp control permit. Xerces Society also suggests the State of Washington explore options to further incentivize and support IPM in shellfish production.

As written, the draft permit and draft EIS fail to provide fundamental components of an IPM plan. If this National Pollution Discharge Elimination System (NPDES) permit is to include IPM, Ecology must include the following elements.

A. Establish a scientifically valid treatment threshold for ground (on-bottom) culture

The draft permit proposes to maintain the economic treatment threshold of 10 shrimp burrows/m^2 . However, research into integrated pest management for oyster production in Willapa Bay calls that threshold into question, acknowledging that "existing regulatory criterion of 10 shrimp burrows m^{-2} was not based on a scientific assessment." Researchers instead recommend an empirical decision tree be used to determine if and when treatment is required. Noting that substantial oyster losses occur at 20 to 40 burrows/m^2, the researchers recommended a treatment threshold of 10 or 20 burrows/m^2, depending on the type of bed.[17]

B. Establish scientifically valid treatment thresholds for long line and stake oyster production as well as clam production

Off-bottom culture (long line and stake oyster production) can likely withstand a higher density of shrimp burrows. This point is mentioned but not explored in the draft EIS. "Consideration has been given to whether alternatives to on-bottom culture systems may be more compatible with beds with high levels of burrowing shrimp."[18] This important point deserves more research, as expanding the use of off-bottom culture would make oyster production more compatible with higher shrimp density.

Clam production also lacks an established economic threshold for treatment: "Field research data are lacking regarding how burrowing shrimp affect clams, and the threshold for damage to clam beds."[19] A

[14] Ecology. 2014. *supra*.1-33 to 1-34
[15] Ecology. 2014. *supra*. 1-35
[16] Ecology. 2014. *supra*. 2-24
[17] Dumbauld, B.R. et al. 2006. An integrated pest management program for burrowing shrimp control in oyster aquaculture. *Aquaculture* 261 (2006) 976-992
[18] Ecology. 2014. *supra*. 2-53
[19] Ecology. 2014. *supra*. 1-35

scientifically valid verifiable threshold must be established for economic injury levels and treatment of clam beds.

C. Make the treatment thresholds a requirement, not optional

The draft permit allows growers to treat at a density lower than the current established threshold of 10 burrows/m^2.[20] Any NPDES permit should require that the economic threshold for control of burrowing shrimp be met prior to treatment.

D. Develop an accurate monitoring program to measure the density of shrimp in order to determine if and when an economic threshold for treatment has been met

Developing an accurate shrimp population census method "is fundamental to all aspects of an IPM plan" according to research performed in Willapa Bay to support the adoption of IPM in oyster production. The researchers go on to state that: "[t]he existing practice of using burrow counts taken in early spring (March-May) was deemed to provide poor estimates of the shrimp populations."[21] An accurate monitoring program must be in place for a shrimp IPM plan to be implemented.

Furthermore, the draft EIS does not take into account the ecological value provided by burrowing shrimp. As native species in Willapa Bay and Grays Harbor, ghost shrimp *Neotrypaea californiensis* and mud shrimp *Upogebia pugettensis* serve a function within those ecosystems. The benefits from these species are likely to include ecosystem services such as substrate bioturbation, improving water quality and nutrient availability. An evaluation of these benefits should be part of the scope of the final EIS.

E. Incorporate a broader a set of management methods

The current plan focuses exclusively on applying imidacloprid for shrimp management. While the draft EIS provides an overview of numerous alternatives considered, they were all eliminated from the detailed evaluation, and a greater exploration of these methods is needed.

First and foremost, while the draft EIS acknowledges that bottom culture is the preferred oyster production technique,[22] exploring the possible expansion of the use of off-bottom culture would diversify production and limit reliance on chemical controls of shrimp. This system is already being used successfully, as organic growers have been growing and producing oysters using stake culture in Willapa Bay for more than two decades."[23]

Beyond diversified oyster production methods, some of the control options described in the draft EIS that provided reliable yet lesser control could be incorporated into an integrated approach. Other control methods that should be researched further include:

- Water jets. The use of water jets to reduce burrowing shrimp numbers requires more evaluation. The draft EIS argues that while burrow density was reduced, the technique was not found to bring the shrimp burrow density below 10 burrows/m^2. Still, the practice could be an important component of shrimp management, as the decrease in burrow density that accompanies its use could help reduce the amount of imidacloprid applied or the areas treated.
- Enhancement of predator populations. The practice of conservation biocontrol, in which populations of natural enemies of a pest organism are promoted and sustained, has demonstrated effectiveness in terrestrial agriculture and should be considered as an element of this plan. The draft EIS introduces studies that demonstrate the value of native predators in suppressing shrimp populations, including

[20] Ecology. (Department of Ecology). *Draft National Pollution Discharge Elimination System, Waste Discharge Permit No. WA0039781.* Available at: http://www.ecy.wa.gov/programs/wq/pesticides/imidacloprid/docs/WillapaGraysHarbor-OysterGrowers-DraftPermit.pdf. (Accessed on November 25, 2014).
[21] Dumbauld. 2014. *supra*
[22] Ecology. 2014. *supra*. 2-53 footnote
[23] Larry Warnberg, Personal communication. November 16, 2014

research that found an 18% increase in shrimp populations when predators were excluded but a 15% decrease in shrimp populations when predators were present.[24] The findings from this study also raise the question as to whether chemical controls could negatively impact predator populations, reducing their efficacy and further increasing the shellfish industry's dependence on chemicals.

Oyster production practices and pests differ between regions, but large-scale aquaculture systems will have some issues in common regardless of location. For this reason, it would be valuable to further research oyster production and pest management practices in Oregon and California oyster production.

F. Establish the appropriate window for each control method

In contrast with the July - October application window granted for the use of carbaryl against burrowing shrimp, the draft permit allows imidacloprid use throughout a much longer period, from April 15 - December 15. However, there is uncertainty as to whether that length of time is needed for efficacy, and if it will appropriately protect non-target species.[25] Any NPDES permit, regardless of the control method, should have a clear treatment window that ensures treatment only when needed and at a time determined to reduce non-target impacts.

IV. CONCLUSIONS

In summary, Xerces Society appreciates that Ecology's preferred alternative includes monitoring and mitigation efforts, but we believe there are substantial problems with this plan, as it lacks a comprehensive evaluation of the potential impacts on non-target species from imidacloprid use, and fails to provide a basic framework for an IPM program. Ecology has not adequately justified the use of imidacloprid, especially not the expanded acreage currently proposed.

Xerces Society recognizes the challenges and complexity of managing burrowing shrimp in the economically important shellfish production of Willapa Bay and Grays Harbor, but we ask Ecology to respond to the concerns outlined in these comments, and address them prior to issuing an NPDES permit for the control of burrowing shrimp. Thank you for your consideration of our comments in this important decision-making process. If you have any questions, please do not hesitate to contact us.

Sincerely,

Celeste A. S. Mazzacano

Aimee Code, M.S.
Pesticide Program Coordinator

Celeste A. Searles Mazzacano, Ph.D.
Aquatic Conservation Director

American Bird Conservancy
Audubon Washington
Beyond Pesticides
Center for Biological Diversity
Center for Food Safety
Coalition To Protect Puget Sound Habitat
Friends of the Earth
Institute for Fisheries Resources
Northwest Environmental Defense Center
Pacific Coast Federation of Fishermen's Associations

[24] Ecology. 2014. *supra*. 2-55
[25] Ecology. 2014. *supra*. 1-35.