

Marine Science Program

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# CONTAMINANTS

Selecting Better Products for Your Boating Needs

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### SELECTING BETTER PRODUCTS FOR YOUR BOAT CLEANING NEEDS

Cleaning needs for marine vessels are as variable as the boats themselves, ranging from occasional algae scrubs to preventative wax coats. However, the products used to meet these needs can have unintended consequences on aquatic environments. Many products are harsh, persistent, and toxic, but it doesn't have to be that way. By making small changes in the way you clean and the products you choose, you can positively impact the health of Pacific salmon and our entire aquatic environment. To assist in making informed decisions for the upkeep of your boat, PSF's Marine Science Team partnered with the Chemistry Department at Vancouver Island University to develop a searchable database of product information and advice on minimal-impact cleaning.

#### A clean boat is a necessity!

A shiny hull is a satisfying sight, however keeping a clean boat is not only important for your boat's appearance and function, but also for preventing the spread of invasive species.

Moving boats from one place to another can transfer harmful hitchhikers via bilge wells, bait buckets, and attachment to boat exteriors. Cleaning your boat helps remove invasive species, and is an important step in preventing the spread of those that pose a threat to habitats and the entire aquatic food web, such as European green crabs. The Canadian Council on Invasive Species in their "Clean, Drain, Dry" campaign also highlights the importance of allowing your boat and gear to dry fully, preferably in the sun to take care of tiny larvae, spores, and seeds that can survive in damp spots.

Boats that don't travel between waterbodies still have practical cleaning needs, from scrubbing off biofouling and deck washing to maintaining critical components, which if neglected can affect the performance and life of a boat. While taking the steps to keep your boat beautiful and functional, consider choosing products that minimize negative impacts to help keep our aquatic ecosystems healthy and productive into the future.



## A BIT ABOUT POLLUTANTS

A pollutant can be broadly described as anything that causes harm to the environment that isn't naturally found there or is present in much greater concentrations than usual. Pollutants include chemicals such as those used for cleaning or maintenance. Even motor noise, which has been shown to impact marine organisms' behaviour, can be a pollutant. For this newsletter, chemical pollutants used in cleaning and boat maintenance will be the focus. Here are a few key terms and concepts for understanding chemical pollutants:

**Globally Harmonized System (GHS)** – a recognized system that classifies and labels chemicals based on their potential hazards. For boaters, a crucial category to know is aquatic toxicity, which is indicated by a dead tree and fish symbol (Figure 1). The adverse effects of toxic chemicals vary depending on the chemical, its concentration, the route of exposure, and species. However, the consequences for Pacific salmon can negatively affect their ability to reproduce, cause changes in behaviours which can affect their ability to avoid predators or feed, malformation, or death.

GHS Aquatic Toxicity Rating - Aquatic toxicity is broadly grouped into chemicals that cause "acute" and "chronic" impacts. GHS classifications of aquatic toxicity are ordered from 1-4. Categorizations of 1-3 are assigned based on how much of the compound is required to cause harm, with 1 causing adverse effects with the least amount of a chemical. For chronic toxicity, degradability and bioaccumulation potential is also considered. Category 4 is a "safety net" classification, which addresses chemical that are not inherently toxic but have properties such as persistence in the environment and bioaccumulation potential. Details about how the Aquatic Toxicity Ratings are assessed can be found here. For any GHS class of hazard, the lower the category number, the more hazardous the substance. Each category number has well defined hazard and precautionary statements associated with it.

**Safety Data Sheet (SDS)** – or Material Safety Data Sheet (MSDS) is a summary document that provides detailed information about the hazards of a chemical product and the safety precautions that should be taken when using the product. They include GHS classifications and symbols to highlight risks to humans and the environment. For most products, the SDS can be found on the product website, or you may be able to find one using a simple Google search of "product name SDS".

**Acute toxicity** – indicates that even short-term exposure to a compound or mixture causes immediate negative impacts. An example is sodium hypochlorite, more **Figure 1:** GHS Symbol for Aquatic Toxicity

commonly known as chlorine bleach, which can cause immediate harmful effects. The hazard statements associated with acute aquatic toxicity are very toxic, toxic, or harmful to aquatic life for categories 1, 2, and 3, respectively. The precautionary statement for prevention is avoid release to the environment.

*Chronic toxicity* – indicates that damage from this chemical can occur over the life-cycle of the organism, in addition to any possible short-term effects. These may be bioaccumulating or endocrine-disrupting compounds. The hazard and precautionary statements for chronic aquatic toxicity are the same as for acute toxicity except that they state that the effects are long lasting.

**Endocrine disruptor** – means a compound interferes with the natural hormone cycles of the body and can cause adverse effects on, for example, reproductive cycles, leading to long-term harm. Endocrine disruptors are found in everyday products such as anti-bacterial soaps, solvents, and plastics. You can learn more from the <u>Endocrine Society</u>.

**Bioaccumulation** – means chemicals are found to concentrate more within an organism compared to the surrounding environment. This is particularly problematic for predators, such as salmon or orcas, as the concentration of these compounds in the organism increase through each step of the food chain, called biomagnification. Information on the bioaccumulation potential of a product can be found as Bioconcentration Factor (BCF) in SDSs, the higher the BCF value, the more bioaccumulative the compound. BCF levels of 500 or higher are considered dangerously bioaccumulative. Persistent chemicals are more likely to accumulate to toxic levels.

**Factors impacting toxicity** – Essentially anything can be toxic; however, the toxicity can vary depending on factors such as the concentration, the time of exposure, the physiology of the organism, and even the route of exposure. That is to say, the amount of chemical present, the time the creature is in contact with the chemical, the biological makeup of the creature themselves, and even the way they are exposed, e.g. inhaling vs eating, can all affect the toxic outcome of a chemical. Salmon can pick up contaminants through skin permeation, through their gills or via the gut lining post ingestion.

3



### ALTERNATIVES TO COMMERCIAL CHEMICAL PRODUCTS

The most effective way to avoid the use of potentially damaging chemicals is to avoid the use of any products at all. For example, hull scraping, pressure washing, and manual scrubbing are effective at removing a majority of biofouling. Lightweight pressure washers can be found in stores for as low as \$100, and give excellent results even against extreme biofouling, as shown in Figure 2.

Making homemade cleaners is also a safe and cost-conscious option. Ingredients you likely already have in your home, such as vinegar, lemon juice, and baking soda can be used to make effective cleaners that can address rust problems, scum deposits, and other grime. Figure 3 shows an example of these homemade cleaners used in comparison with a commercial pressure washer. Dilute acids such as vinegar or lemon juice are the most effective, but take more effort and time to achieve what the pressure washer can do in a matter of minutes.



VIU's Dr. Alexandra Weissfloch and student Lily Eggert.



**Figure 2:** Example of using pressure washing to remove biofouling from a boat hull. Left: Before. Right: After.



**Figure 3:** The use of homemade cleaning supplies in comparison with a pressure washer. **A.** Baking soda on a scrub pad. **B.** Dilute solution of vinegar and water on a scrub pad. **C.** 1800 PSI Ryobi electric pressure washer. Figure 2 and 3 photos by Lily Eggert.

### BETTER COMMERCIAL BOAT CLEANING PRODUCTS

Sometimes we simply cannot avoid the use of commercial products to handle tougher messes. To help consumers, student Lily Eggert, under the supervision of VIU Green Chemist Dr. Alexandra Weissfloch, conducted a survey of boat cleaning products for their aquatic toxicity. Lily visited chandleries, interviewed boaters about the products they use, and searched online boating forums to form the basis of products to review. Each product was scrutinized for potentially harmful impacts to the aquatic environment. The Safety Data Sheets (SDS) and ingredients lists were tracked down to look for aquatic toxicity ratings, cautions, and potentially harmful ingredients. The cleaning products were broadly categorized based on purpose – from fiberglass stain removers to waxes and sealants. Some products have multiple uses.

Following is a summary of the results with recommendations for the best options as well as some products with concerning ingredients. The full results can be found in a <u>database</u> on the <u>Strait of Georgia Data</u> <u>Centre</u> website. All of the products listed should be used as directed, and gloves and eye protection are always recommended; many of them are irritating or damaging to skin and/or eyes.

### Fiberglass Stain Removers



Since fiberglass is porous, acids are typically used to permeate and remove stains effectively. Acid stain removers are most often composed of oxalic and muriatic acids, which are readily biodegradable and not categorized as aquatic toxicants. For lighter stains, vinegar, which is dilute acetic acid, can do the trick. Commercial products often use oxalic acid as their primary active ingredients and are safe to use. All the fiberglass stain removers that were reviewed were safe to use from an environmental perspective.

Brand	Product	Availability/Cost	Brief Description
Star brite	Fiberglass Stain Remover	<u>Amazon,</u> \$56.24	Gel formula 'sticks' where applied, removes yellowing and waterline stains.
Aurora	Algae Strip	Aurora Boat Care Products \$28.45	For removing algae, mussels, and barnacles from fiberglass surfaces.
Davis Instruments	FSR Big Job	Harbour Chandler, \$16.99	Fiberglass Stain Remover.
Savogran	Wood bleach	<u>Amazon</u> , \$32.58	Used for removing scum and stains from boat sides.



### **Boat Washes**

To cut through the grime, many turn to boat soaps, which often contain surfactants and solvents that can be hazardous to aquatic life. Chemicals such as linear alkylbenzene sulfonates (LAS) have been found to have a more negative impact on marine species relative to freshwater species and should be avoided.

#### **Recommended products:**

Brand	Product	Availability/Cost	Brief Description
Star brite	Boat wash (blueberry scent)	Harbour Chandler, \$13.99	All surface boat cleaner.
Star brite	Instant Hull Cleaner	Harbour Chandler, \$30.99	Removes rust stains, marine growth, and scum lines with no rubbing required.
Star brite	Sea Safe Hull Cleaner	Harbour Chandler, \$34.99	Removes scum lines and staining.
Captain Phab	Boat Soap	Harbour Chandler, \$14.99	Strong foaming action removes scum and stains.
Captain Phab	Non-skid deck wash	Harbour Chandler, \$14.99	Formulated for use on rough surfaces to remove embedded grime.
Aurora	Inflatable Boat Cleaner	Aurora Boat Care Products, \$29.11	Removes dirt, grime, oil, soot, bird droppings, insect marks, chalk and most stains from inflatable boats.

#### Products with ingredients of concern:

Brand	Product	GHS Aquatic Toxicity Rating	Other Concerns
Star brite	Super Orange Citrus Boat Wash & Wax	Chronic 3, Acute 2	May cause an allergic skin reaction
Star brite	Ultimate Xtreme Clean	Acute 3	Suspected of causing cancer
Star brite	Boat Wash & Wax (blue- berry scent)	Acute 3	
Star brite	Power Pine Boat Wash	Chronic 3, Acute 3	May cause an allergic skin reaction Suspected of causing cancer
Star brite	Non-skid Deck Cleaner	Acute 3	

### Boat Wax, Polish, and Oil

Used to protect boat surfaces. Many commercially available brands include petroleum distillates and can vary a lot in what chemicals they contain, and may have unknown percentages of more toxic components, such as polycyclic aromatic hydrocarbons (PAHs) and naphthenic acids. Many PAHs are known to be carcinogenic, but naphthenic acids are also of concern, as they have been shown to disrupt mitochondrial action in rainbow trout, which renders the fish unable to effectively utilize energy in its body.

#### **Recommended products:**

Brand	Product	Availability/Cost	Brief Description
ЗМ	Marine Restorer & Wax	<u>Canadian Tire</u> , \$26.99	Removes heavy oxidation and chalking, and leaves a protective finish that helps slow UV damage. Note: Although it is not classified as an aquatic hazard, it is classified as a carcinogen and may cause cancer.

#### Products with ingredients of concern:

Brand	Product	GHS Aquatic Toxicity Rating	Other Concerns
Meguiar's	#50 One Step Cleaner wax	None	An ingredient present in 10 – 30% is classified as having aquatic chronic toxicity category 2.
CRC	On & Off Hull and Bottom Cleaner	Acute 2, Chronic 3	
ЗМ	Scotchgard Marine Liquid Wax	None	Suspected of damaging fertility or the unborn child. Suspected of causing cancer. An ingredient is officially recognized in the EU as being environmentally persistent, bioaccumulative, and toxic.
Star brite	Marine Polish	Acute 3	

### Degreasers/Bilge Cleaners

Used to clean dirt, grease and oil for engine and boat parts. Oil-based degreasers are usually toxic, harmful to the environment and should be avoided. Water-based degreasers are usually a better option.

#### Recommended products:

Brand	Product	Availability / Cost	Brief Description
Spray Nine	Spray Nine heavy-duty cleaner	<u>Canadian Tire</u> \$13.99	Multi-purpose cleaner for removal of grease, grime, stains, and bacteria.
Spray Nine	Earth Soap	Amazon	Industrial strength bilge cleaner.

#### Products with ingredients of concern:

Brand	Product	GHS Aquatic Toxicity Rating	Other Concerns
Flood	Penetrol	None	Suspected of causing cancer and an ingredient present in 50-75% is classified as having aquatic chronic toxicity category 2.
Star brite	Power Pine Bilge Cleaner	Acute 3, Chronic 3	May cause an allergic skin reaction. Suspected of causing cancer.

### Wood Maintenance

Beautiful wooden boats need special care, however, most commercial teak oils contain harmful distillates that are toxic. Alternatives for wood polishing needs include olive, almond, or walnut oil from the grocery store.

#### **Recommended products:**

Brand	Product	Availability/Cost	Brief Description
Semco	Teak cleaner	Harbour Chandler, \$59.99	Cleans and protects teak surfaces.

#### Products with ingredients of concern:

Brand	Product	GHS Aquatic Toxicity Rating	Other Concerns
Star brite	Premium Golden Teak Oil	Acute 3, Chronic 3	May cause cancer
Star brite	Teak Oil	Acute 3, Chronic 3	May cause cancer
Semco	Teak Sealer	None	Although SDS for product does not give a GHS aquatic toxicity rating, several ingredients present have aquatic chronic toxicity category 2.

### Surface Cleaners

For general cleaning needs around the boat or home, diluted dish soap or a vinegar solution, or CLR are safe and effective options. For other general cleaning, commercial products with trustworthy eco-labels should be chosen.

#### **Recommended products:**

Brand	Product	Availability/Cost	Brief Description
Dawn	Platinum dishwashing liquid	<u>Walmart</u> , \$2.99	Dish soap, when diluted can be used for surface cleaning.
Seventh Generation	Free and clear and other scents	Walmart, \$3.72	Dish soap, when diluted can be used for surface cleaning.
Simple Green	All-Purpose cleaner	Canadian tire, \$6.99	All-purpose cleaner and degreaser. Comes in concentrated and ready to use forms

### **CHOOSING PRODUCTS WISELY**

Knowing the ingredients contained in a product and understanding their environmental implications is a challenge. Firstly, it is rare to find cleaning products with full ingredient lists on the label, and sometimes the potential impact of a particular ingredient may require expert interpretation. Probably the most thorough approach to determining the safety of a product is reading the SDS sheets, but looking up and assessing this information in the aisle of a store is not always feasible. Eco-label certifications can help, however, consumers must be weary of misleading "green" branding that is often used to capitalize on the good intentions of buyers. Being a conscientious environmental consumer requires some research and effort! Here are a few tips and resources to help you choose the products you buy wisely:

Informative websites such as "What's in products"

contain a large repository of product information. What's in products includes access to ingredient lists with conveniently marked "CoC" labels to indicate "Chemicals of Concern." Note that these chemicals of concern are often flagged due to human health concerns as opposed to environmental effects, but it is a great resource for finding the ingredients to begin with. The website also has links to the Safety Data Sheet (SDS) for the products they have reviewed.

**Reading the Safety Data Sheets (SDS).** If you have an SDS for a product you are interested in, look for the Aquatic Toxicity symbol (Figure 1), read the hazard statements in Section 2, and read through the toxicological and ecological information, in Sections 11 and 12 respectively. These sections often include more detailed information about the effects of the product on mammals and aquatic creatures, as well as the persistence, degradability and the bioaccumulation potential of the product (Bioconcentration Factor, BCF). Additionally, SDS provide precautions to take with product disposal. Always check the date on the SDS, they should be updated regularly to ensure they contain the most up-to-date information.

*Trustworthy eco-labels* can provide an at-a-glance assessment of the effect a product has on the environment. To effectively vet products based on eco-labels, it is important that you understand what they mean and if they are reliable as many companies use "greenwashing" – vague or weak claims about the environmental friendliness of a product. Resilient Coasts for Salmon has an article about decoding ecolabels. The Global Ecolabeling <u>Network</u> and <u>Ecolabel Index</u> are great places to refer to if you see an unfamiliar label in a store. Below are a few examples of **good** eco-labels to look for:



**Safer choice:** This is a United States Environmental Protection Agency (US EPA) program dedicated to helping consumers identify products that are safe for both humans and the environment. Companies who choose to have their products verified agree to have all ingredients and packaging reviewed, which includes

strict criteria surrounding aquatic toxicity. These products must meet additional criteria to ensure they still perform as desired. The \_ provides a search engine to find brands that have met these criteria, and has an additional search engine to look up individual <u>ingredients</u>. Audits are performed to ensure that the label is still accurate.



*Ecologo:* This is a label certified by UL Solutions, a private company which specializes in safety science. Ecologo certification means that the product has been inspected from a life-cycle based perspective and has been "verified for reduced environmental and health impact".

Similar to the safer choice program, Ecologo conducts performance audits to ensure that certifications are still accurate.

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Being out on the water enjoying our productive and beautiful coast and waterways is one of the joys of living in B.C. Consider using these green cleaning tips for your vessel maintenance, and contribute to helping keep our coasts clean!

In addition to selecting environmentally safe products for your boat maintenance, there are steps you can take to keep our waters as pristine as possible! Check out Resilient Coasts for Salmon's <u>Tool Kit posts on the subject of eco-friendly boating</u>.



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