



U.S. Fish & Wildlife Service

Alaska Region Invasive Species News

September - October 2007

Invasion and Climate Change in Alaska

"We expect most aspects of global change to favor invasive alien species ..."

(Dukes & Mooney 1999)

"With the inevitable expansion of international trade in the coming decades, the threat of invasions looms ominously ..." (UCS 2001).

Alaska is both an 'epicenter' of climate change and a major international hub for transportation, trade and shipping. One would suspect then, based on these two quotes, that Alaska faces a unique challenge from increased invasion.

Will climate change put Alaska at greater risk of invasion? Answers for individual species risks vary with the strength of the data. For example, in the 1980's purple loosestrife (see profile this issue of ARIS News) was widely regarded as unable to set seed in Alaska. However, as we have witnessed (Oct-Nov 06 ARIS News), this species has indeed set seed and is now in danger of becoming established in Alaska. Was this due to global warming, local adaptation, or simply dumb luck that it had not made it to the right habitat before 2005? We don't really know for sure.

For other species, the story is less obscure. Alaska's coastal ocean is slightly too cool for Chinese mitten crabs (Oct-Nov 06 ARIS News), but already just warm enough for European green crabs (Aug-Sep 06 ARIS News). Neither is yet known in Alaska waters, but if our ocean warms even a degree or two, mitten crabs may well become established and green crabs may spread clear across to the Bering Sea.

Still not sure? OK, then let's talk about the likes of "marine vomit" (see profile this issue of ARIS News). A closely

related invasive sea squirt, *Botrylloides violaceus*, is already known to exist at low levels in Alaska waters. However, recent studies in the Atlantic have shown this species settles earlier, grows faster and becomes dominant with even slightly warming water; while native species decline (Stachowicz et al. 2002). As they conclude, and as is almost surely the case in Alaska as well, "given that winter warming is expected to continue ... increased dominance by nonindigenous species and new invasions are likely."



Cargo ship plies the open sea.

Climate change can even create new pathways of invasion. An ice-free Northwest Passage in 2007 portends an increase in inter-ocean shipping activity across the Arctic and thus an increase in the movement of species in the ballast water and on the hulls of ships. As climate change enables an increase in arctic development (e.g., oil and gas development and its associated on- and offshore infrastructure), so too does it increase the likelihood of invasion from the movement of bio-fouled drilling rigs and other equipment.

So what do we do? Accept it and give up? Is there anything we can do to slow the incoming tide? Perhaps not the tide, but we can slow the invasion rate by consciously focusing our efforts, and those of our partners and clients, on taking effective actions to prevent, detect, and respond to new invasions now. In an upcoming ARIS News, we will highlight one prevention planning technique that may help – Hazard Analysis and Critical Control Points (HACCP) planning.



Ice-free Northwest Passage (orange line), September 2007.

So, will global warming put Alaska waters at greater risk of invasion? The answer is yes, but the specifics are not so easy to identify. For terrestrial species, the story is likely similar, but even fewer Alaska-related studies are known. Look for an update on the "dry side" of this issue in a future edition of the ARIS News.

References:

Dukes, J.S. and H.A. Mooney. 1999. Does global change increase the success of biological invaders? *Trends in Ecology and Evolution* 14(4): 135-139 (available at: <http://www.sciencedirect.com/science>)

Stachowicz, J.L., J.R. Terwin, R.B. Whitlatch, and R.W. Ostman. 2002. Linking climate change and biological invasions (available at: www.pnas.org/cgi/doi/10.1073/pnas.242437499)

Union of Concerned Scientists. 2001. *The Science of Invasive Species: an information update.* (available at: <http://www.ucsusa.org/assets/documents>)

Tunicates



G. Lambert

Botrylloides violaceus

Tunicates, or sea squirts, as a group have been increasingly noted as invaders of coastal waters in recent years. *Botrylloides* (pictured above) first appeared on the West Coast in the mid-70's in San Francisco Bay and was discovered in Alaska waters in the late 90's during a FWS-funded survey in partnership with the Prince William Sound Regional Citizens' Advisory Council (RCAC).

Other genera of invasive tunicates include *Styela* (found in same survey) and *Didemnum* (not yet known from Alaska). Tunicates are members of the phylum Chordata (which also includes humans!) and are primarily filter feeders. As adults these organisms can develop a thick covering, or tunic – thus the name!

Tunicates can grow on just about any firm surface, including boat hulls, buoys, docks, ropes, and even seaweeds. In fact, they are believed to often be transported from one location to another on the shells of



G. King

Didemnum (aka “marine vomit”) overgrowing mussel cage in British Columbia.

oysters or on the hulls of ships. Once in place, they overgrow native mussels and barnacles and are particularly problematic in the aquaculture industry where they can smother cultured oysters and even entire grow-out cages.

Massive colonies of *Didemnum* are overgrowing huge swaths of scallop fishing grounds off New England, and it has recently shown up in both Puget Sound and British Columbia. Where this genus has invaded, it has been found in water depths from intertidal to over 61 meters (200 ft).

For more information visit: http://www.exoticguide.org/species/pages/b_violaceus.html -- or -- <http://woodshole.er.usgs.gov/project-pages/stellwagen/didemnum>

Purple Loosestrife

(*Lythrum salicaria*)



L. Zaumseil

Purple loosestrife creeps toward Westchester Lagoon in Anchorage.

Purple loosestrife – such a pretty thing, how can it be bad? Where it is native (Eurasia), it is of course not “bad,” but where it has invaded the results are anything but pretty.

Purple loosestrife has a spike of pinkish-purple flowers not unlike fireweed in appearance, but its stem is four-sided instead of round, and it tends to bloom after fireweed has finished blooming. Mature purple loosestrife plants can have 30 or more spikes and produce over two million seeds per year. So, if allowed to set seed, it can spread rapidly and its seed bank can last for years.

Introduced as an ornamental in the 19th century, it escaped domestication and now occurs across the United States. Purple loosestrife invasion carries a high cost – it crowds out native plants and dramatically reduces food, shelter, and nesting sites for a wide range of wetland-dependent species. It has also been estimated to cause roughly \$50 million per year in damage and control costs.

In Alaska, this combination of effects is scary! With over 100 million acres of wetlands that serve as nesting and rearing habitat for migratory birds, a purple loosestrife invasion in

Alaska would have global implications. Unfortunately, it has now escaped cultivation even in Alaska, so we are not dithering in its removal (Oct-Nov 2006 ARIS News).

Biological control can help with large infestations but does not often achieve full eradication – and eradication is what we hope to achieve in Alaska. Diligent hand-pulling or spot use of herbicides can eradicate small infestations.

For more information visit: <http://www.invasivespeciesinfo.gov/aquatics/loosestrife.shtml> -- or -- http://www.sgnis.org/kids/moreinfo_purple.html -- or -- <http://www.nps.gov/plants/ALIEN/fact/lysa1.htm>

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