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Joshua Ulan Galperin

Elisabeth Haub School of Law at Pace University

Sara Kuebbing

Yale University

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Eating Invaders: Managing Biological Invasions with Fork and Knife?

Joshua Ulan Galperin and Sara E. Kuebbing

The snakehead fish is not an attractive animal. It is long, up to four feet, shaped like a cylinder; its protruding lower jaw and large head fins give it the unflattering name. But the pancaked flounder and beady-eyed catfish are also unsightly. What troubles people, and what sets the snakehead apart, is fear the snakehead might join the cabal of non-native fish, like Asian carp and lionfish, that wreak ecological havoc in rivers, streams, and oceans. The snakehead is particularly alarming because it can walk, and it can breathe air. This is not an exaggeration. Unlike other fish that must hitch a ride from pond to pond, a snakehead can pull itself out of water, drag itself across land, and find its way to new habitat.

The environmental impacts of this lifestyle are heightened because the snakehead is not native to North America. A non-native species is any organism that humans transport from its ecosystem of origin into a new ecosystem. The snakehead is native to Asia but fish traders brought it to America to sell and eventually dumped unwanted snakeheads in local waters. When non-native species adapt to their new homes and spread widely from the site of their introduction, causing harm to the environment, economy, or public health, the non-native is termed “invasive.” Harm can come in the form of decreases in populations of native species, as with the decline of the Eastern bluebird brought about by the introduction of the European starling, or disruption of ecological processes, such as the increased frequency of wildfires attributable to the introduction of cheatgrass in the American West. Organisms that live beside invaders in their new range have not adapted to their behaviors and are naive to their dangers. They simply cannot compete. Imagine dropping a Grey Wolf in with the Pugs and Pomeranians at the Westminster Kennel Club.

Recognizing the risk of invasive species, Congress, states, and presidents have taken steps to address invasions. Federal laws like the Lacey Act, 16 U.S.C. §§ 3371–3378, and the Plant Protection Act, 7 U.S.C. §§ 7701–7786, restrict the spread of invaders or prohibit the import or interstate transportation of certain threatening plants and animals.

The brown tree snake (an actual snake, not a fish with a snakelike head) arrived in Guam during World War II and killed over 80 percent of the island’s songbirds. In 1998, President Clinton traveled to Guam and heard the forests devoid of song. Upon his return the president requested that Congress

double the \$1.6 million budget for tree snake eradication. The following year the president issued Executive Order 13112, directing federal agencies to prevent and manage invasions, establishing the National Invasive Species Council, and directing the council to create a national invasive species management plan. See Exec. Order No. 13112, 64 Fed. Reg. 6183 (1999).

But the snakehead arrived this century, a hundred years after Congress’s first efforts to curb such invasions. European starlings still harm bluebird populations, wildfires still thrive on the fuel provided by cheatgrass, boars roam the Southeast, lionfish are swimming up the Atlantic coast, and Asian carp are threatening the Great Lakes.

Environmentalists, scientists, farmers, hunters, and homeowners have seen the lack of progress in preventing and managing invasives and have cried for alternatives. Prevention is the priority, but this article focuses on one management proposal that has recently gained attention. From the *New York Times* to the local bookstore and the blogosphere, one can read about a novel idea: attack the invaders “one bite at a time.” See *Eat The Invaders: Fighting Invasive Species, One Bite at a Time*, EatTheInvaders.org (last visited May 13, 2013). The premise is simple. Humans have eaten species to extinction before and can do it again, but this time with a focus on invaders.

There are advantages and disadvantages to this proposal, but perhaps the biggest challenge to managing biological invasions with forks and knives lies in the laws established to prevent invasions in the first place. These laws are designed to prevent the spread of invasives, but the invasivore movement encourages spread—albeit commercial and cultural, not ecological—thereby raising legal barriers that will prevent widespread consumption of invasive species.

One Bite at a Time

The “eating invaders” or “invasivore” movement has taken many forms. Joe Roman is a biologist at the University of Vermont, Jackson Landers is a hunting instructor and author in Virginia, and Bun Lai is a sushi chef in Connecticut. From diverse perspectives, each of these men has taken on the duty of eating—and advocating that others eat—invasive species. Dr. Roman runs EatTheInvaders.org, which, among other things, offers invasive recipes. Jackson Landers travels the country hunting invaders and recently authored the book *EATING ALIENS: ONE MAN’S ADVENTURES HUNTING INVASIVE ANIMAL SPECIES*. Bun Lai runs a sushi restaurant with a menu dedicated to invaders.

Beyond the grassroots, governments are also taking up the invasivore mantle. In spring 2010, the National Oceanic and

Mr. Galperin is the Associate Director of the Yale Center for Environmental Law and Policy and a Clinical Lecturer at the Yale Law School. Ms. Kuebbing is a Doctoral Candidate in the Department of Ecology and Evolutionary Biology at the University of Tennessee, Knoxville. Mr. Galperin may be reached at joshua.galperin@yale.edu and Ms. Kuebbing may be reached at skuebbin@utk.edu.

Atmospheric Administration (NOAA) began a new campaign: "If you can't beat them, eat 'em." *Filleting the Lion*, Nat. Oceanic and Atmospheric Admin., <http://oceanservice.noaa.gov/news/weeklynews/june10/eatlionfish.html>. With a catchy video, NOAA explains the damage the indo-Pacific-native lionfish is causing in the Atlantic and argues that turning the fiend into food can help address the problem. See *All You Can Eat*, [oceanservice.noaa.gov](http://oceanservice.noaa.gov/all-you-can-eat/), <http://oceanservice.noaa.gov/all-you-can-eat/>. "Why wait?" the video concludes, "get 'em on your plate!" *Id.*

In 2011 Illinois began to promote eating Asian carp. To convince the public that carp are a delicacy, the Department of Natural Resources provided free Asian carp sliders to attendees at Taste of Chicago, one of the nation's premiere food festivals. If the fussiest foodies can help popularize Asian carp as a desirable food, then perhaps nationwide demand will grow and carp populations will dwindle. If foodies will not bite, Illinois might still create demand elsewhere. The state has made efforts to harvest and serve carp in soup kitchens and food pantries. And if Illinois cannot convince local consumers, they are also spending two million dollars to ship the fish to China where they are already a delicacy.

There are powerful arguments in favor of these efforts, not least of which is that many other attempts to manage invasive species have not worked but humans *have* effectively harvested other species, albeit non-invasives, such as the American bison, wild turkey (they have now rebounded), bluefin tuna, and others to the brink of extinction.

Some invasive management projects have been successful, but they are the exception and their practical scope is limited. Examples include eradication of invasive rats from nearly 300 islands across the globe, "killer algae" from California coastal lagoons, witchweed from agricultural fields in the Carolinas, and zebra mussels from a Virginia quarry. But these examples were successful because they were on public lands, discrete populations, economically devastating agricultural pests, often all of the above, and were therefore financially and politically palatable. The most common and most effective tactic is a scorched-earth approach of extensive hunting or poisoning, which works well on small islands, but for which there is no political appetite even in the most heavily invaded continental areas of the United States.

Though not for poisons and sharpshooters, Americans do have good appetites. McDonald's sold more than 200 million Filet-O-Fish sandwiches in 2012, and while the chain uses pollock, those fried patties could come from invasive Asian carp. Asian carp are disrupting the food chain in the Mississippi River and threatening the Great Lakes but are unlikely to disrupt the palate of a diner eating fried fish slathered in tartar sauce, draped with cheese, and stuffed between two buns. The filet in a single Filet-O-Fish sandwich weighs 2.7 ounces. At 200 million sandwiches sold last year, the American people, through McDonald's alone, could eat 540 million ounces, or 33.75 million pounds of carp. Carp weigh around 50 pounds, resulting in roughly 675,000 individuals gobbled down with fries and a soda.

Even if this rate of consumption is not enough to impact an invasive population, it is a powerful tool for education. Whether at McDonald's, Taste of Chicago, or Bun Lai's restaurant, simply talking about the possibility of eating invaders is a management tool because it raises awareness. Public awareness can help stop future invasions, for instance, by building

political support for broader action. Public awareness can turn those Filet-O-Fish sandwich eaters into masses of educated invasive hunters and foragers. These educated champions of invasive management can play a frontline role in early detection efforts, notifying land managers about non-native populations before they become invasive.

So what is stopping the world from devouring invaders?

To Eat or Not to Eat?

The eating invaders movement is not without its critics who argue that the effort could result in intentional cultivation or accidental spread of invasives. Indeed, humans have pushed bison, bluefin, and others to the brink of extinction, but in so doing they have generated cultural or economic demand for these species. The reason, in other words, that bison and bluefin are on the brink, and not entirely extinct, is because their potential disappearance became a rallying cry for those who see value—economic, cultural, aesthetic, or otherwise—in the species. It is true that at least in the case of the American bison, part of this endearment is for a native icon, but it is wrong to assume that people do not have the capacity to grow attached to non-native species. Popular outrage ferments when one suggests controlling non-native wild horse populations, or clearing eucalyptus stands, which have become common sights in American landscapes but invade native habitats.

Likely more powerful than the cultural backlash, if an invasive becomes a culinary staple, there will be demand to maintain the species. If efforts to eat invaders are successful at creating markets, market participants will not be anxious to divest their last shares. The *New York Times* reported on wild boars invading Michigan where owners of game preserves and "other businesses with a stake in keeping [the pigs]" oppose bans and extirpation. Erica Goode, *When One Man's Game Is Also a Marauding Pest*, N.Y. TIMES, Apr. 28, 2013, at A18.

Popularizing invasive species for any purpose, consumption or otherwise, can lead to new invasive populations. Wild boar are a problem species in Alabama, but they are also a popular food and hunting target. Some hunters were loath to travel hundreds of miles to find the nearest boar and instead captured wild individuals and transported them home to establish local populations. In its article on northern pig invasions, the *New York Times* reported that pigs have spread northward as hunters have transported them or as they have escaped from hunting preserves. If an invasivore movement leads to wider invasion, it will have achieved the exact opposite of its goal.

This threat is doubled when it comes to plants, which could be transported for intentional introduction but can spread accidentally when, in transport, plant parts are deposited into new ranges. The shoots of Japanese knotweed contribute to a delicious strawberry-knotweed pie, but uneaten and discarded joints are liable to sprout a new plant when simply thrown into backyard compost.

Potential for cultural or economic endearment or the threat of spreading populations are concerns, but opponents of the eating invasive movement also note that the endeavor simply may not work, culturally or biologically.

Eating habits are hard to change. A fried fish sandwich may not demand much culinary discernment but other invasives could be a hard sell. Entrepreneurs brought giant African snails to Brazil hoping to introduce them to the market only to find that Brazilians detested them. Rather than forcing a

new delicacy, the entrepreneurs dumped their inventory in the jungle where snails have since become one of the worst invaders in the country. THIENGO, S.C., ET. AL., *Rapid spread of an invasive snail in South America: the giant African snail, Achatina fulica, in Brasil*, *Biological Invasions* 9:693–702 (2007).

The same fate could befall invasive consumption in the United States. Every story of restaurants serving invaders conveys the same tale of those who love the pioneering food, those who will try anything once, and those who are happy with their broiled bass or California rolls but do not need any sautéed snakeheads or Asian shore crab in their sushi. Even with an open-minded clientele, Bun Lai confronts patrons who look queasy at the thought of eating shore crab or burdock—a large woody Eurasian plant now invasive on the East Coast. The *New Yorker* quoted one of Lai’s patrons as sneering: “this hasn’t made me want to rush out to my back yard and dig up my burdock.” Elisabeth Kolbert, *Alien Entrees*, *NEW YORKER*, Dec. 10, 2012, at 32.

Where changing behavior is hard, changing the population of well-established invaders is harder still. Every population of animals or plants has a natural rate of mortality. For example, biologists estimate that the natural mortality for Asian carp is around 70 percent annually. To have an ecological impact, invasives would need to harvest individuals above and beyond natural mortality. In biological terms, this is called “additive mortality.” Thus, in the case of Asian carp, invasives need to eat *more* than 70 percent of the population each year to shrink its size. Likewise, fishermen cannot harvest only the largest fish, as is common for economic reasons, they must harvest all the fish they can catch. The Filet-O-Fish example suggests that a significant harvesting for consumption could be easy, but there are many species of concern beyond Asian carp. Hunting enough pigs or pulling enough burdock is a gargantuan task. The traits that make good invasives—quick reproduction, fast growth—are the same that make additive mortality difficult to achieve. Dr. Patrick Ruzs, of the Michigan Wildlife Conservancy, said that even year-round hunts will not control the boar population in Michigan and even with the existing hunting regime, the Michigan boar population is growing. Erica Goode, *When One Man’s Game Is Also a Marauding Pest*, *N.Y. TIMES*, Apr. 28, 2013, at A18. The population is growing because female boar are particularly fecund. A female boar begins reproducing around one-year of age and can have a litter of over a dozen piglets. If an aggressive hunting party takes ten–twelve boar in a single day, they would merely have offset the offspring of a single female for that year.

Regarding plants, were a forager to embark on an effort to collect Japanese knotweed to make the bread for which recipes are available on the Internet, that forager would need only the stalks. Unfortunately, knotweed spawns through its root system and collecting hundreds of pounds would have no population impact if the roots, which plunge up to six feet deep, are left behind.

Overcoming Biology, Congress, and Bureaucracy

Biology aside, extensive regulatory limitations also attach to harvesting and transporting wild plants and animals and pose a possibly existential hurdle to the eating invader movement.

The Lacey Act prohibits the interstate transport, import, export, sale, purchase, or acquisition of any wild animal “in

violation of any law, treaty, or regulation of the United States,” or any plant “in violation of any law or regulation of any state, or any foreign law, that protects plants,” or those animals found on the Fish and Wildlife Service’s prohibited list. 16 U.S.C. § 3372(a). The prohibition with respect to wild animals applies whether living or dead and “plants” is broadly defined to include “roots, seeds, parts, or products thereof.” 16 U.S.C. § 3371(a) and (f).

The Act authorizes, but does not mandate, the Secretary of the Interior to regulate animal species “injurious to human beings, to the interests of agriculture, horticulture, forestry, or to wildlife or the wildlife resources of the United States.” 18 U.S.C. § 42(a)(1). Under this provision Congress and the Department of the Interior has effectively prohibited all commercial activity related to darlings of the eating invaders movement including certain catfish, crabs, snakeheads, and Asian carp.

Asian carp are disrupting the food chain in the Mississippi River and threatening the Great Lakes but are unlikely to disrupt the palate of a diner eating fried fish slathered in tartar sauce, draped with cheese, and stuffed between two buns.

For an invasive effort to succeed in managing invasive species, it would require broad uptake and commercialization, which may be impossible if federal law does not permit putting the fruits of an invasive harvest in interstate commerce.

Congress passed the Plant Protection Act for “the detection, control, eradication, suppression, prevention, or retardation of the spread of plant pests or noxious weeds . . . for the protection of the agriculture, environment, and economy of the United States.” 7 U.S.C. § 7701(1). The Act restricts the import, export, or movement of plant pests through interstate commerce and authorizes the Secretary of Agriculture to maintain a Noxious Weed List of regulated plants. 7 U.S.C. § 7711(a). As with regulations under the Lacey Act, the Noxious Weed List contains a number of edible plants including wild blackberry, wild sugarcane, certain rice, and prickly pears.

As evidenced by both laws, for over a century the standard way to address invaders was to restrict movement. This directly conflicts with the eating invader effort, which realistically requires harvest and then movement to a family’s plate, at a minimum, and likely requires commercialization to be effective.

In addition to those laws directly concerning the environmental impacts of invasion, food safety laws also prevent the

widespread harvest of invasive meat.

It is illegal to sell hunted wild game. Under both the Food and Drug Act, 21 U.S.C.A. § 301 *et. seq.*, and the Meat Inspection Act, 21 U.S.C.A. § 601, the sale of adulterated meat is prohibited. Meat that is not inspected before slaughter or is not slaughtered pursuant to USDA regulations is deemed adulterated. See also 21 U.S.C.A. § 601(m)(5) and § 644. As such, any meat (though not fish) harvested by hunting is not properly inspected and therefore is prohibited from interstate sale.

Commercial farmers are able to efficiently raise and slaughter livestock, including otherwise wild game such as elk and bison, in a way that meets the demands of food safety laws. Economically, it may be possible to farm nutria, pythons, or wild boar in order to overcome food safety restrictions. But practically, establishing invader farms in order to deplete invasive populations is self-defeating.

Federal restrictions make significant invasive ingestion unrealistic and states further solidify the movement's regulatory hurdles. The limits described above on the sale of wild game apply to interstate commerce, but states also prohibit commercialization of hunted game. Many states further establish their own noxious weed lists prohibiting the possession or transport of listed species even within a state. The U.S. Dept. of Agriculture maintains a comprehensive listing of state lists at <http://plants.usda.gov/java/noxiousDriver#state>. States likewise can prohibit possession, transport, or sale of any non-indigenous species of plant or animal, making a vibrant food culture impossible or illegal.

Despite the red tape, the Illinois program to promote Asian carp as both a gastronomic delight and a plentiful food for the hungry proves that states are also playing an enabling role. A number of states have created councils or charged existing agencies to promote invasive species education. In Florida the Fish and Wildlife Conservation Commission has made

efforts to loosen restrictions on lionfish harvests and promote the practice more broadly. They have also generated attention with the recently completed 2013 Python Challenge. That event brought well over 1,000 people to Florida to hunt the invasive python. After two days the challengers killed 68 pythons, a number that is insignificant for managing the estimated Everglades' population of 30,000, especially considering that female pythons lay over 100 eggs per clutch. However, the hunt did attract attention in the press, no doubt making the event a huge success from an educational perspective. (Notably, Florida officials warned participants not to eat their kill, not because python are inedible, but because they are contaminated by another environmental threat, toxic mercury.)

From regulation to education, government plays a dissonant role in the eating invaders movement, stifling efforts by limiting possession, transport, or consumption on the one hand but outwardly promoting campaigns on the other. Intentional or not, this dichotomy is logical. The invasivore movement cannot grow effectively because of regulation. The movement should not grow because of the consequential risks—of cultural or economic endearment and the probability of further invasive spread—along with the existential barriers—of eating habits and biological population dynamics. Nevertheless, making lemonade from the invasive lemon grabs headlines. It brings over 1,000 people to the swamps of central Florida to kill snakes, and they leave understanding that they were hunting a serious ecological threat.

In this effort the advocates and educators should not forget that the goal is not eating for the sake of eating, foraging for the sake of foraging, or hunting for the sake of hunting. It is education for the sake of extirpating. Anybody who sits down at a local restaurant and digs into the grilled, sautéed, or deep-fried snakehead must understand that the snakehead arrived in the United States in the first place because people wanted it here for food. Little good that did. 🐍

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