

A (Highly) Partial Field Guide to British Canals: Introducing some processes and beings

Heather Anne Swanson and Sonia Levy, 2021

Ballast

Ballast refers to any substance added to a vessel to improve its stability. For centuries, countless materials, including stones, iron bars, and old cannon balls, have been used to make ships more sure and manoeuvrable. Although transport goods can be used as ballast, when ships lack heavy cargo, their mariners seek out these alternative sources of onboard weight. From the 1870s, water — held in onboard tanks — gradually began to replace other types of ballast. For mariners and shipping companies, water is more convenient and cost-effective: with the advent of pumps, it does not require substantial labour to load and unload, and it is readily available at all times. But for aquatic ecologies, ballast water has been a source of disruption, scrambling assemblages of species by rapidly transferring once regionally-specific water-dwelling organisms around the world. In England, more than half of introduced aquatic animals and plants are likely attributable to shipping, either via ballast water or ship's hulls. While there are new international regulations around ballast water treatment and management, they are not fully effective.¹

Corbicula fluminea

Meet the creature who launched this collaborative project and who appears several times in the film. Across Asia, Corbicula

fluminea is called the golden clam, prosperity clam, or good luck clam, but in European conversations, it is most often given the common moniker of “the Asian clam,” emphasizing its “exotic” and “foreign” origins. Such naming practices — along with wider debates about invasive species — are often intertwined with xenophobic vocabularies and suppositions. Yet the multidimensional problems bound up with such species should not be ignored. It is important to notice how *C. fluminea* have led to impoverishment of many of the new environs in which they have been deposited, in some situations causing changes in biogeochemistry and declines in other species of clams. Yet at the same time, their ability to rapidly filter turbid and debris-laden water can provide environmental benefits.

Much remains unknown about both their basic biology and ecological effects. Their filtering process is among the most complex, adaptable, and efficient among clams: they can feed through both their feet and siphons, ejecting pellets of coagulated sediments (called pseudofeces) that sink to the bottom of the water column. These feeding processes are visible within the film.

With a remarkable ability to inhabit a wide-range of temperatures, conditions, and waterways, *C. fluminea* flourish in canals. The film shows the work of Loughborough University researchers who are investigating the filtering abilities of the clams, with special attention to how the speed at which they siphon out suspended particles may render the waters in which they dwell less cloudy, or turbid. Professor Paul Wood, Dr. Simone Guareschi, and PhD student Sarah Evans, all of Loughborough University, very generously shared their knowledges of *C. fluminea* with

1. For more information specifically about England, see Eno, N. Clare, Robin A. Clark, and William G. Sanderson. *Non-native marine species in British waters: a review and directory*. Peterborough: Joint Nature Conservation Committee, 1997. While more recent texts can also be found online, this report provides an accessible overview. To learn more about ballast water and related issues, see, Bailey, Sarah A. *An overview of thirty years of research on ballast water as a vector for aquatic invasive species to freshwater and marine environments*. *Aquatic Ecosystem Health & Management* 18, no. 3 (2015): 261-268, as well as Davidson, Ian C., Christopher Scianni, Mark S. Minton, and Gregory M. Ruiz. *A history of ship specialization and consequences for marine invasions, management and policy*. *Journal of Applied Ecology* 55, no. 4 (2018): 1799-1811.

us and helped to shape our explorations of canal worlds.

Creatures of

This phrase echoes the work of historian Virginia Anderson, who used the phrase “creatures of empire” to examine how animals were deployed and transformed within North American settler colonial projects. We extend her general sensibilities toward empire and more than human worlds to focus specifically on the generative and creative forces of structural and infrastructural projects.²

Dikerogammarus villosus

These so-called “killer shrimp” were not unusually aggressive predators in the Ponto Caspian region where they evolved. While they were known for shredding their prey and for sometimes killing organisms that they do not consume, they were not ecologically dominant and were just another member of the region’s life webs. After the Rhine-Main-Danube canal was completed in 1992, boat traffic instigated their rapid long-distance dispersal. Subsequently, the new habitats to which they were transported sparked the shrimp to develop more aggressive behaviours with outsized effects on food chains.

In these new places, they consume large quantities of aquatic insect larva and lead to marked declines in other freshwater crustaceans. While these shrimps are not easily visible in the film (some can be glimpsed in-between the clusters of Zebra mussels), they were frequently found during its research and sampling and are thus present within it.

Dreissena polymorpha

Also known as Zebra mussels, *Dreissena polymorpha* were initially located in the lakes of southern Russia and Ukraine, but are increasingly widespread in Europe and North America. Since the 19th century, European canal-building has fostered their spread, as they tend to cling to ships. Although

they first arrived in England 200 years ago, their numbers have dramatically increased in the past 20 years. They thrive in altered habitats, frequently clustering on and clogging water intake pipes, to the annoyance of infrastructure maintenance workers, and their population increases can adversely affect other mussel species. They are the most prominent crustaceans on the concrete and brick surfaces and underside of boats shown throughout the film.

Ecological globalization

The film and overall project attempt to grapple with questions about the arrangements and processes we refer to as “ecological globalization”. We ask how practices of trade, development, and management remake landscape ecologies by connecting geographically distant places. As ships and planes move growing quantities of goods, they connect ecological regions that have had little biological exchange between them. Supply chains typically transport more than they intend: aquatic species (like the introduced organisms presented in the film and this guide) have travelled in ballast water, grass species in packing crates, and insects on nursery plants. At the same time, infrastructures of transportation and production themselves transform lands and waters, as canals, roadways, and industrial complexes create radically different habitats. How do we better understand the spatial and historical enfoldings of such processes—and their effects on more-than-human worlds? For us, the relations of British imperial trade, the creation of inland waterways, and introduced species are a key site from which to consider the challenges of ecological globalization.³

Elodea canadensis (Canadian waterweed)

This aquatic plant appears in many of the canal images. *E. canadensis* was only found in North America until the 19th century, when trade practices began to spread it widely around the world. The plant was actively

2. See Anderson, Virginia DeJohn. *Creatures of empire: How domestic animals transformed early America*. Oxford University Press, USA, 2004.

3. See more about the concept and affiliated research project here: <https://projects.au.dk/ecoglobal>

introduced to new lands as it became a highly popular aquarium and garden pond decoration; it was further transported to new environments by boats and fishing equipment, often coming to thrive in slower-moving waters, such as ponds, canals, and ditches. *E. canadensis* rapidly expands into new areas because it reproduces vegetatively, by sprouting from plant fragments rather than by pollination and seeds. Due to its especially rapid growth, *E. canadensis* causes a variety of problems, it often displaces other plant species, leading to single-species patches with lower biodiversity. Ironically, while it is prized for its ability to add oxygen to fish tanks, in outdoor waters, *E. canadensis* often does the opposite, as its dense stands further reduce water movement and foster anoxic conditions that can kill invertebrates and fish. Today, it is found across Britain and Ireland.⁴

Eutrophication

Eutrophication is an emblematic example of how industrial processes seep into the world's metabolism. When waterways are flooded with nutrients, especially nitrogen and phosphorus, they can lead to rapid growth in aquatic plants and communities of microalgae giving waters a vivid green hue. Such bursts of growth can choke off light, deplete dissolved oxygen, and alter pH levels. Such processes can shift the dynamics of aquatic webs, triggering harmful algal blooms. These massive changes can kill fish and cause long-term disruptions for ecological communities. Common causes of eutrophication include agricultural runoff and sewage discharges. Canals frequently suffer from eutrophication not only because such altered waters often flow into them, but also because canals – in contrast to rivers – are sluggish and slow-moving, meaning that inputs tend to accumulate.⁵

The most significant cause of eutrophication is the dramatic increase in

fertilizer use, beginning in the 19th century and exponentially accelerating in the second half of the 20th century. The turn to fertilizers – part of agricultural intensification projects – also displaced peasants, drove urbanization, and created a burgeoning working class with few choices other than wage-labour. If urban human waste is not collected, but instead flushed out to sea, it breaks the relationships of people and soil, extracting the wealth of rural soils and concentrating it in cities. Soils are either depleted or dosed with repeated applications of external nutrients to maintain their fertility. Marx – who was deeply interested in the implications of fertilizers – analyzed these processes as part of his work on what he termed the “metabolic rift.”⁶

The dynamics of fertilizers extend to the questions of global trade at the heart of this art-research work. Britain has long sought nutrients to fertilize its fields from abroad, including with nitrogen-rich bird guano from Peru and phosphate rock from Nauru and Christmas Island. In both cases, from the mid-19th century onward, these highly extractive industries were enacted through exploitative contracting and transoceanic industrial imaginaries.⁷ While nitrogen can now be synthesized, phosphate cannot, leading to concerns about global shortages. At present, large suppliers of phosphate include Morocco, China, the US and Russia.⁸

“Here smooth canals...”

The poetic lines that open the film are an excerpt from ‘The Invitation’ (1773) by Anna Laetitia Barbauld, an English writer, social analyst, and literary critic. Barbauld’s work spanned a wide range of genres from

6. See Foster, John Bellamy. *Marx's ecology: Materialism and nature*. NYU Press, 2000.

7. A text which specifically inspired our thinking around the nutrient-related ecological impacts of British imperialism is: Clark, Brett, and John Bellamy Foster. *Ecological imperialism and the global metabolic rift: Unequal exchange and the guano/nitrates trade*. *International Journal of Comparative Sociology* 50, no. 3-4 (2009): 311-334

8. See de Ridder, Marjolein, Sijbren de Jong, Joshua Polchar and Stephanie Lingemann. *Risks and Opportunities in the Global Phosphate Rock Market*. The Hague: The Hague Centre for Strategic Studies (HCSS), 2012. https://www.phosphorusplatform.eu/images/download/HCSS_17_12_12_Phosphate.pdf

4. <http://invasivespeciesireland.com/species-accounts/established/freshwater/canadian-waterweed>

5. For a more detailed description of eutrophication, see: <https://www.nature.com/scitable/knowledge/library/eutrophication-causes-consequences-and-controls-in-aquatic-102364466/>

political essays to children's books to scholarly texts on the history of the novel.⁹ This poem celebrates the early period of canal construction in England albeit not without hints of anxiety about the rapid transformations of the Industrial Revolution. The poem was likely inspired by Barbauld's familiarity with the Duke of Bridgewater's canal, which was ran close to the town of Warrington, where she lived prior to her marriage.

"I sing . . ."

This poem, often attributed to Samuel Fortrey (circa 1660-1680), but of unclear authorship, focuses on the 17th century draining of eastern England's fenlands.¹⁰ It was included in a 1685 publication about the drainage processes. In contrast to canals, such as Grand Union and Regent's, which were constructed first and foremost as transportation corridors, the ditches and channels of the Fens were primarily aimed at land drainage and agricultural industrialization. Despite their different goals, these two water transformation projects are part of intertwined projects of industrialization and ecological transformation.

Lines (and linearization)

A number of widely cited humanities scholars, such as Deleuze and Ingold, offer a variety of thought-provoking conceptual engagements with lines. Our use of the term, however, draws on different lineages: we are most directly inspired by landscape ecologists and landscape architects, who have explored the effects of roads, railways, and pipelines on ecological communities. Although they operate in different conceptual registers, two

key sources for our thinking have been:

Warwick, Hugh. *Linescapes: Remapping and Reconnecting Britain's Fragmented Wildlife*. Random House, 2017.

Latham, A. David M., M. Cecilia Latham, Mark S. Boyce, and Stan Boutin. *Movement responses by wolves to industrial linear features and their effect on woodland caribou in northeastern Alberta*. *Ecological Applications* 21, no. 8 (2011): 2854-2865.

We also combine attention to landscape lines with critical analyses of commodity/supply chains, as well as of monocrop agriculture and plantation and factory labour regimes. Anthropological scholarship, especially that of Anna Tsing, has been important for our engagements with such topics, as has the water-focused work of architect, planner, and theorist Dilip Da Cunha, who explores the colonial history of the conceptual and drawn lines used to separate water from land in urban planning, mapping, and beyond.

Monocondition (as manifest in limited fish diversity)

The problems of monocrop industrial agriculture are well established, ranging from its often-exploitative labour relations to its propensities for evolving and spreading ever-more virulent pests and diseases. Yet what about the homogenization of aquatic spaces? The fish and plants in this film are overwhelmingly members of the very small number of species who can thrive in the conditions offered up by heavily modified water bodies, such as nutrient-saturated and sometimes otherwise polluted canals. Roach (*Rutilus rutilus*) and perch (*Perca fluviatilis*), the most common fish we documented in the canals, have relatively broad diets and tolerate slow-moving water, heavy metal contamination, and fluctuations in temperature better than many other kinds of fish. Roach, in particular, tend to thrive in eutrophic waters. We use the neologism "monocondition" to gesture toward something similar to what natural scientists point towards when they use the term "ecological simplification": a loss of biodiversity and

9. For an overview of Barbauld's life and work, see: https://en.wikipedia.org/wiki/Anna_Laetitia_Barbauld#Poetry as well as McCarthy, William. *Anna Letitia Barbauld: Voice of the Enlightenment*. Baltimore: Johns Hopkins University Press, 2008, which includes details about her time in Warrington and The Invitation (pp. 64-66).

10. The poem is found within Knight, Jonas Moore. *The History Or Narrative Of The Great Level Of The Fens, Called Bedford Level, With A Large Map Of The Said Level, As Drained, Surveyed, & Described by Sir Jonas Moore Knight, His late Majesties Surveyor-General of his Ordnance*. London: Moses Pitt, at the Angel in St. Paul's Church-Yard, 1685. <https://quod.lib.umich.edu/e/eebo2/A51238.0001.001?rgn=main;view=fulltext>

habitat diversity, often characterized by the proliferation of a handful of species alongside the loss of many others. Yet we also gesture towards political and economic processes within our concept-work.

Suez/Lessepsian Migration

Canals have played an outsized role in the transformation of aquatic ecologies. One example is the mass migration of organisms from the Red Sea to the Mediterranean, due to the opening of the Suez Canal in 1869. As a consequence of a slight difference in elevation, about 300 Red Sea-dwelling species have been swept into Mediterranean habitats unaccustomed to their presence with wide-ranging ecological effects. Only a handful of species have been transferred in the opposite direction against the direction of flow. Named for Ferdinand de Lesseps, the founder of the Suez Canal Company, the Lessepsian migration emerges from an effort to pierce narrow pieces of land to reduce transit costs. Writing in 1890, J. Stephen Jeans, a British newspaper owner and industrial booster, phrased it this way:

In the eyes of engineers, the defects of natural geography were made to be corrected by their skill, experience, and ingenuity. Hydraulic engineers are the high priests of science, whose mission it is to publish the bans of marriage between seas and oceans, and complete the nuptials in a way that no man may put asunder. By their sacerdotal functions, the Mediterranean has been married to the Red Sea, the Caspian to the Black Sea, the North Sea to the Atlantic, the Adriatic to the Archipelago, and the Atlantic almost to the Pacific. The importance of these alliances to the trade, the wealth, the intercourse, the facility of intercommunication, and the general convenience of the world, not to speak of strategical and political considerations, affecting individual nations, can hardly be over-estimated.¹¹

11. Quote from: Jeans, J. Stephen. *Waterways and Water Transport In Different Countries with a description of the Panama, Suez, Manchester, Nicaraguan, and other canals*. London and New York: E. & F. N. Spon, 1890 [2018]. <https://www.gutenberg.org/ebooks/56560>

Although initially worried by the French Suez Canal construction project at a time when Britain dominated other routes to the East, Britain soon colonized Egypt and established both military and commercial dominance over the canal until the Suez Crisis and British retreat from the canal zone in 1956.

“Trade is the golden girdle of the globe...”

These lines are excerpted from the poem ‘Charity,’ published in 1782 by William Cowper, a well-known and critically acclaimed English writer.¹²

While this excerpt ostensible extolls the virtues of transoceanic commerce, the full poem – a noted antislavery text – positions this description of exchange as a prelude to a discussion of the moral unacceptability of the trade in human beings.

Turbidity

In tests of water quality, turbidity is a measurement of opacity. How cloudy or clear is the water, due to the volume of particulate matter suspended within it? Canals tend to be muddy, clouded, or turbid as a result of both the large quantities of plant matter and plankton that grow and die in eutrophic waters and the churning of sediments by boat traffic. Canal maintenance practices, such as dredging, also stir up sediments in canal waters. Analytically, we also see canals as *perturbed spaces* – those that are unsettled, and even irritated by, the up-ending acts of industrial landscape-making.

12. For more on Cowper and his poetry, see: <https://www.poetryfoundation.org/poets/william-cowper>

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