The environmental afterlife of the Suez Canal

Marine species transformation and biodiversity in the Mediterranean Sea

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Abstract

The Mediterranean Sea is undergoing an unmatched species transformation, due to a species influx enabled by successive dredging of the Suez Canal. So far, 350 tropical species have settled in the Mediterranean. More will come. Invasive species threaten the biodiversity; fishermen see declining catch; migrant jellyfish clog industrial cooling systems; pufferfish poison people. But this is not a story of rogue invasive species only, but the addition of a new layer of biota. Most new species have found own ecological niches; they are habitually consumed, and they will likely survive rising sea temperature as endemic species perish.

This more-than-human study explores this environmental and social afterlife of the Suez Canal through two aims. **Aim I is** to write a social and cultural history of this species transformation, so far only described in biological terms, to account for its roots and recent acceleration by charting the complex and coincidental interplay between anthropogenic, geological, and biological processes. **Aim II** studies ethnographically how people in Egypt and Lebanon, who are heavily affected experience and adapt to drastically changing lifeworlds. Approaching the transformation as a process propelled by 19th- and 20th-century infrastructural projects that now returns to haunt Mediterranean worlds, the project seeks to document one of our time's largest environmental processes and provide holistic insights into this unforeseeable afterlife of the Suez Canal.

Objective and aim

This more-than-human project studies the world's largest unfolding underwater species transformation, the addition of a new layer of biota from the Indian Ocean to the Mediterranean Sea. **Two aims** underpin the project:

- **Aim I**: to write a more-than-human history of current marine species transformation in the Mediterranean Sea
- **Aim II**: to ethnographically study how coastal and scientific communities in the Mediterranean region understand and adapt to this transformation.

Moving species in a heating world

A year ago, a giant cargo ship blocked the Suez Canal, drawing attention to the magnitude of global shipping and the 'world that the Suez Canal made' (Jakes 2021, Leivestad *et al* 2021). At its 1869 inauguration, international attendees celebrated Man's ability to control nature and part the desert. Karabell 2003). The new global highway linked East and West and transformed the Mediterranean Sea from a cul-de-sac to a central line of global shipping (Abulafia 2011, Huber 2012).

And yet, under the surface of megaships and *human* affairs, a more astonishing phenomenon has unfolded. With successive dredging to allow for larger vessels, the Suez Canal has become a free-flowing sea-level passageway between the Red Sea and the Mediterranean – a thoroughfare for fish and other sea dwellers (Galil 2006). Other canals rely on locks and freshwater systems, limiting species mobility (Gollasch et al 2006, Carse 2014). This makes the Suez Canal a larger "achievement" than at its opening: never before and never since has humans merged two distant oceans and blended their separated ecologies.

So far, 350 marine species (fish, mollusks and smaller organisms) have migrated through the Canal and settled in the Mediterranean. The phenomenon is called Lessepsian Migration after the canal's mastermind, Ferdinand de Lesseps. Biologists describe the species influx as a transformation without equivalent. The situation is past the point of no return. In the Eastern Mediterranean, new species are threating endemic species and driving a biodiversity collapse. Fishermen see changing and declining catches; migrant jellyfish species clog industrial cooling systems and sting tourists; migrant pufferfish poisons people. Some endemic species might soon go extinct, and without the native vongole, *spaghetti vongole* will also be a dish of the past (Albano 2022). (*Spaghetti vongole*-lovers don't panic, there is migrant *vongele* replacer.)

Yet, the transformation is not only apocalyptic. While a few invasive species wreak havoc, most newcomers have found their ecological niches. They comprise 20% of the Eastern Mediterranean catch, filling plates and changing cuisines (EastMed 2010). Beyond villains and heroes, a complex set of processes explain this species transformation: the Suez Canal, global warming, overfishing, shipping, geology and species constitution. The latter carries a promise: with continued rise of sea temperature, endemic species may perish while tropical migrants will keep the sea populated (Albano *et al* 2021).

In short, the biota of the Mediterranean will never be the same (Por 2010, Albano *et al* 2021). The ongoing massive transformation is affecting the environments and the livelihoods of the region's 145 million inhabitants. Yet, the transformation's socio-historical roots and its variegated effects on more-than-human lifeworlds remains unstudied.

State of the art

In *The Columbian Exchange*, Alfred W. Crosby explores the global socio-biological processes set in motion by transatlantic trade and mobility. On the American side, 50-99% of native Americans and Caribbeans died from diseases introduced by European colonizers. For the the colonizer, the Caribbean offered favorable conditions for cultivation of sugar; a highly sought-after but labor-intensive crop brought from the Old World. The shortage of local workforce due to disease gives a new perspective to the slave trade: enslaved Africans were more resistant to Eurasian diseases, turning them into exploitable bodies in this horrendous process. From the Americas, new staples were brought to Eurasia. Generating six times as many calories per area unit compared to wheat, potato and corn triggered European population growth, which in turn accelerated settler colonialism in the Americas. Crosby's nuanced environmental history showed how exchange of flora, fauna and microbes were never side effects of human mobility: they fundamentally redrew the map of existence for humans and non-humans alike.

Crosby's insights are as valid today. Animal and plant mobility propelled by human activities pose one of the largest threats to biodiversity. They affect humans in unforeseeable ways globally (Lindqvist 1992, Mitchell 2002, Barak 2013, Egan 2017), underling how these processes have to be studied empirically and as entangled with humans, not isolated biological processes. More-than-human scholarship has critically examined assumptions in "conservation and invasive biological scholarship." Underpinned by nativism, this paradigm sees endemic species as parts of balanced ecosystems that migrant species disturb; invasive species become targets of eradication (Orion 2015, Khalil 2019); non-invasive aliens

are evaluated according to their ability to integrate. The parallels to problematic discourses on human migration are often blatant (Haraway 2016, Ticktin 2017).

The conservation paradigm as also been challenged from pragmatic angles. Questioning the desire to "restore" ecosystems to an assumed healthy original state, critical scholars (e.g. those cited above) have documented lifeforms that survive and blossom in the wake of man-made destruction, unlivablility, and heat (Masco 2006, Tsing *et al* 2017). They suggest a radically different perspective on non-human species mobility: migrant species are not always villains but perhaps the inhabitants of the future as endemic species struggle.

Anthropologists have lately approached oceans not as "wild nature" but as social worlds (Helmreich 2009, Hastrup & Hastrup 2015, Dua 2017). Ethnographic research has explored colonial afterlives through the traces of fish (Lien 2015, Swanson 2017). Studies of the Mediterranean coastal communities have showed how modernization put fishermen under pressure and economic hardship (Ben-Yehoyada 2017), how sustainability practices are codified in law to *allow* fishermen to evade these policies (Said et al 2018), and detailed Greek fishermen's antagonistic relationship with the migrant pufferfish that threaten their livelihood (Kompatsiaris 2018). Emphasizing how people and other species are entangled in a range of relationship and practices, these studies confirm long-term anthropological concerns that climate change-driven research risk ignoring local knowledge and sustainable cohabitation practices. By making local knowledge a central concern, this study seeks to understand changing lifeworlds through the eyes of those of live with and of the sea.

Theoretical framework

This project contributes to debates within the environmental humanities. It brings the phenomenon of species transformation (Lessepsian Migration), so far primarily a topic for biologists, into the purview of the humanities and social sciences. It also writes non-human species into the history of the Suez Canal and the world that the Canal has given birth to. As such, the project constitutes a double re-reading of the afterlife of the Suez Canal that breaks with the ecological or human exceptionalism that dominate previous scholarship on the Canal and Lessepsian Migration. Approaching this species transformation as a process propelled by 19th- and 20th-century infrastructural projects that now returns to haunt Mediterranean worlds, the project seek to provide holistic insights into this unforeseeable afterlife of the Suez Canal.

To approach the species transformation, the project starts from insights from anthropology and more-than-human studies, as discussed in the state of the art, but also takes them in new directions. It is attentive to the fact that the current species transformation in the Mediterranean does not correspond to the stereotypical pattern of invasive species, where a few "rogue species" wreak damage. Much like the Columbian exchange, this underwater addition of a biota and "faunal complexes of hundreds of species" (Por 2010) cannot be understood, let alone acted on, through a conservation or simplified invasive-species framework. To better understand the ongoing processes, the study will be operationalized through three theoretical concepts: *emergent ecologies* (Kirksey 2015) *more-than-human socialities* (Tsing 2015), and *imperial debris* (Stoler 2008).

Emergent ecologies suggest moving beyond notions of closed ecosystems, equilibrium and stability. Instead, it captures how life in most places surfaces as emerging and changing "contingencies of unexpected connections" (Kirksey, 2015: 5) of "multi-species communities" (p. 3), which have developed and continue to change through interplay with other species. The concept helps me think beyond the binary of endemic and alien species, which has been a starting point for most research on Lessepsian migration. It also allows me to explore unruly and creative ways in which species find ways of living on this planet.

Tsing's (2015: 27*f*) concept *more-than-human socialities* adds an additional layer to this approach. Tsing's ambition is to undo another the divide: that between humans and other species. By expanding anthropology's key expertise – the study of relations and humans as first and foremost social beings – to other species, Tsing uses *more-than-human socialities* to study the cohabitation of human and non-human inhabitants with ethnographic methods and theories. The view of these inhabitants as *social beings* adds other insights to ecological and biological perspectives. *More-than-human socialities* allow me to bring humans into the story of the sea and sea creatures into the stories of human life, thus transcending stifling binaries that have long obfuscated our understanding of what is happening in the Sea. In combination, Kirksey's and Tsing's concepts help me to move beyond an apocalyptic view of

damaged ecosystems, and the implicit nativism and salvage moralism permeating current biodiversity paradigms, so to instead turn focus to the variety of entangled lives that unfold, perish or thrive in the Mediterranean today.

To give the study historical depth, the project also uses Ann Stoler's (2008) concepts *imperial debris* to analytically trace the afterlife of empire in human lives and environments. It invites us to "rethink what constitute an effective history of the present" (Stoler 2008: 211). Through the concept, the project approaches animal mobility not as an ecological phenomenon only, but as a remain of imperial interventions in nature that returns with unintended effects on these emergent ecologies and more-than-human socialities. In another register, imperial debris sheds light, not only on material-imperial lastings, but on how imperial attitudes and dichotomies colonize and domesticate the contemporary world and its inhabitants, e.g., in conversations on 'endemic' and 'alien' species.

Project design & method

To structure the research and provide holistic insights into this unforeseeable afterlife, the project is centred around **two aims**. **Aim I** seeks to write the social and cultural history of this species transformation, so far only described in biological terms. This environmental history will account for the roots and recent acceleration of the transformation by combining archival research with existing scholarship from different disciplines to tell the complex and coincidental interplay between anthropogenic, geological, and natural processes propelling the species influx. **Aim II** will ethnographically document how people at the frontline experience and adapt to drastically changing lifeworlds. It will focus on people in the fishing chain, the tourist sector and marine science in Egypt and Lebanon.

Aim I: writing a more-than-human history of the species transformation

Data for **Aim I** will be gathered through desk and archival research. A core part of this research is to extensively review biological scholarship on Lessepsian migration and the species influx since the canal opening in 1869 and until today. This intellectual history will allow me to chart the developing understandings of Lessepsian migration over time along with technological advancement in the research the species influx. As important is the charting of shifting paradigms (in a Kuhnian sense) within the discipline when it comes migrant species, biodiversity and conservation, and the role assigned to human activities and anthropogenic factors in creating today's crisis. This research track will further strengthen my ethnographic research with practicing marine biologists (see Aim 2). In addition to core track, I will survey previous scholarship in various disciplines (history, geology, social sciences, global shipping, fishing) to survey the various factors known to contribute to today's situation. If I manage to locate relevant archives, I will also collect catch statistics of species and pricing. I can read English, Arabic, German and French, which allows me to consult documents in the Suez Canal Company Archives, the National Archives of the UK, Cue, The French National Archives in Paris, Mucem in Marseille, and Dar al-Kutub and Dar al-Wathaiq in Cairo.

Aim II: documenting experiences and understanding of the species transformation among coastal and scientific communities in the Mediterranean region

To gather data for **Aim II** I will conduct nine months of ethnographic research (over three trips) in the Eastern Mediterranean, the region that is most affected by species influx. Because the "field" in this case is the Eastern Mediterranean Sea, a *multi-sited* methodology is required. Egypt is an obvious site: the Suez Canal runs through the country, and the shores of northern Egypt are the first destination for marine newcomers and sea traffic through the canal. The second site will be Lebanon, a country highly dependent on sea life, for food, tourism, and leisure. To structure the data collection and capture the experience of diverse groups affected, the methodology will also be *multi-perspectival*.

Three different points of views will be studied:

- **"From the boat"** focuses on experience of fishermen
- **"From the shore"** explores impacts on coastal communities and actors along the fish chain and tourist sector,
- **"In the laboratory"** focuses on activities among marine biologists.

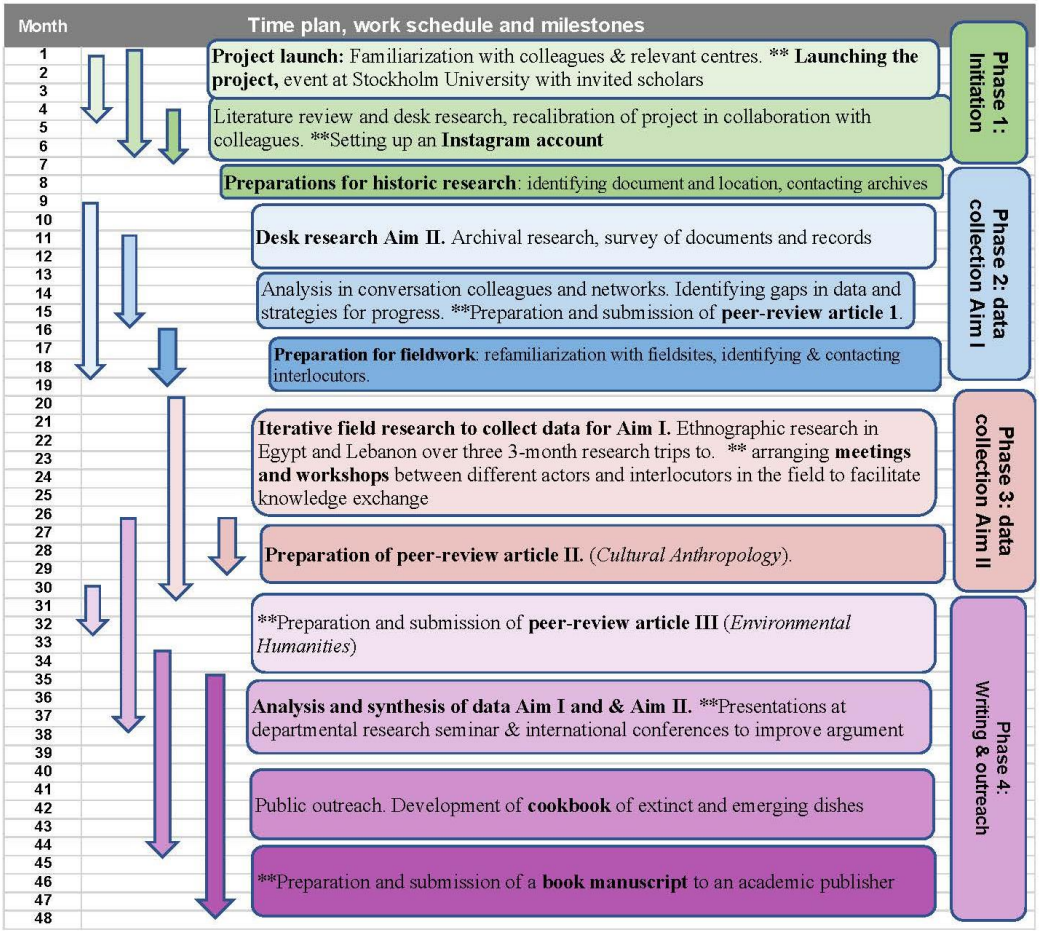
Ethnographic research with all groups will entail participant observation and interviews. It is important to note that the object of research is the species transformation and its impacts on different actors, not an in-depth exploration of the lifeworld of one particular group.

- **"From the boat"** collects data about how new species have impacted fish stock, catch and fishermen's livelihood, and how fishermen remember and adapt to these changes.
- **"From the shore"** documents how new fish have impacted fish price, seafood consumption and cuisine, as well as the tourist industry. A special focus here will be given to seafood restaurants and the shifting menus and dishes as a result of the species transformations.
- **"In the laboratory"** gathers data on how marine biologists produce knowledge today, and chart how future scenarios and solutions are modelled and promoted.

Together, these different strands allow me to collect a wide array of data that provides insights into a range of ecological, economic and social aspects of this massive change. This holistic set of data will form the basis for my analysis, allowing for a thorough empiric description and analysis of the phenomenon.

Time plan, implementation and milestones

- Phase 1 (months 1-6): Initiation phase.
- Phase 2 (months 7-18): Data collection Aim I. Desk and archival research.
- Phase 3 (months 18-29): Data collection Aim II. Ethnographic field research in Lebanon and Egypt
- Phase 4 (months 30-48): Writing and outreach phase.



Publication and communication plan for scholarly communities

'Findings will be disseminated to the scholarly community through **three peer-reviewed articles** (at least one open access) in journals such as *Cultural Anthropology* and *Environmental Humanities* during year 2, 3 and 4. By the end of year four, I will have prepared a **book manuscript** ready for peer-review submission to an academic publishing house. I will present research findings at half a dozen **international conferences** such as EASA (European Association of Social Anthropologists), POLLEN, AAA (the American Anthropological Association) and MESA (Annual Meeting of the Middle Eastern Association).

Benefits to society and contributions to sustainable development

145 million people live in the Mediterranean Sea currently. It is a sea that for millennia of years been deeply integrated in human worlds and activities. It constitutes a source of nutrition; it provides livelihood fishing and tourism, and it is constituting one of the world's most important shipping lines. Counted as a whole, it is the world's largest tourist destination. Seafood consumption is popular among both locals and visitors. Since the 1990s, fish catch has been declining and 93% of the fish stock is threatened by overfishing. The sea is surrounded by not less than 23 different nation-states and has become the container for industrial and human waste. Actors with an interest in the future of the sea range from inter- and transnational organizations to tiny fishermen collectives. Their visions rarely meet. Adding to the complexity of the situation is the Law of the Sea (the 1982 UN Convention of the Law of the Seas) that gives states different type of control of resources and territories through a zone-system that both acknowledges and limits national sovereignty. As such, the Mediterranean Sea is crucial for many people's wellbeing and yet, it presents a situation of different and competing commons, interests and resources: fish as a resource & source of livelihood, a keeper of biodiversity, and a surface allowing for freedom to roam and mobility (for global shipping and tourism).

Here we see the dilemma of finding a way forward due to different needs and how concerns formulated the SDGs no. 1, 2, 3, 9 and 14 are in friction and create collateral damage, creating a Faustian deal that will push the sea into species depletion and pollution. Here, the migrant species are just the last addition. And yet, underpinned by all these factors, the species transformation in the Mediterranean Sea is one of our time's largest environmental processes that not only illustrates the entanglement of nature and human life, but underline how the way to a sustainable future has to take conflicting interests and values into account.

Communication with stakeholder and the public

- This project seeks to document experience and voices from different stakeholders (fishermen, coastal communities and the research community) to better understand the needs, challenges and adaption strategies. Such studies are needed to allow future policy makers to develop strategies that for a balance between social, economic and environmental sustainability.
- Meetings and workshops with different research participants (who are also stakeholders) will be organized in the field to allow exchange of knowledge and strategies. This is important, because grassroots solutions based on local conditions have been shown to lead to more realistic plans compared with top-down plans. These meetings also function as a way of communicating my research findings to involved stakeholders.
- As the sea is already at a point of no return, the species transformation requires thinking beyond biodiversity paradigms since migrant might be the species that survive as sea temperature rises. Here, the documentation of how people adjust to the new situation will be relevant for other communities in the Wester Mediterranean, who will soon experience similar ecological shifts.
- This knowledge will also serve as a blueprint for what will likely be the new normal as the planet is becoming warmer: climate refugees cannot be spared for humans. These insights will be communicated to the public through an Instagram account. The account will also serve as an alternative voice to the many accounts that propagate killing of invasive species.

- Last, but not least, a cookbook on extinct and emerging species will be produced at the end of the project. Given that most of the sea creatures of this study will not be charismatic megafauna, a cookbook promises to be an effective way to illustrate the ongoing changes in the sea.

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