A night view of the Hong Kong skyline, featuring a prominent skyscraper on the right side. The city lights are visible against a dark, cloudy sky. The water of the harbor is in the foreground.

Invasive bivalves of Hong Kong: their distribution, spread, and ecological impacts

LJ Falkenberg, PWS Joyce

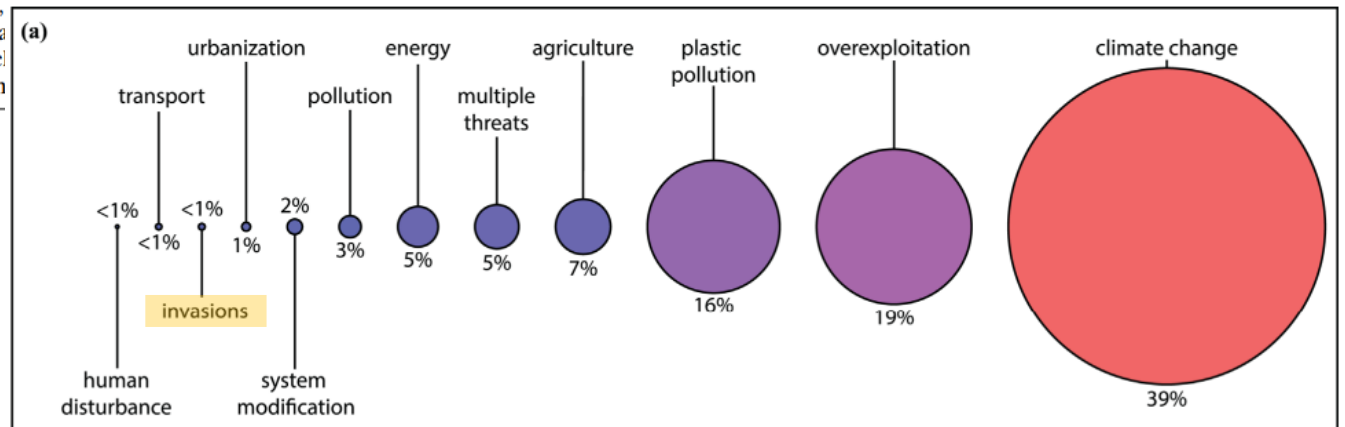
The Chinese University of Hong Kong; Supported by Environment and Conservation Fund

The significance of invasive species

- Invasive species can change community composition and threaten biodiversity
 - Yet, largely overlooked

Table 1. International Union for Conservation of Nature biodiversity threats (Salafsky et al. 2008) ranked by association with the most (1) to the fewest (10) threatened or near-threatened species (Maxwell et al. 2016).

<i>Threat rank</i>	<i>Threat</i>	<i>Subthreat examples</i>
1	overexploitation	logging, poaching, and fishing
2	agriculture	crops, livestock, and aquaculture
3	urbanization	housing, tourism, and industrial development
4	invasions	non-native species and disease
5	pollution	agricultural, domestic, industrial, and airborne
(5)	plastic pollution	microplastics, fishing line, and straws
6	system modification	fire and dams
7	climate change	habitat modification, drought, and heatwaves
8	human disturbance	recreation, work,
9	transport	roads, shipping lanes
10	energy production	mining, fossil fuel
>1 of 1-10	multiple threats	more than 1 of the



The significance of invasive species

- Invasive species can change community composition and threaten biodiversity
 - Yet, largely overlooked
- Occurrence is likely to be exacerbated where we have:
 - Increased connectivity – e.g., through shipping
 - Disrupted (hardened) shorelines
- Hong Kong has both high connectivity and artificial shorelines



Invasive species – and their impacts – in Hong Kong

- Documentations are relatively few, but do include a number of mussels



Xenostrobus securis



Mytilopsis sallei

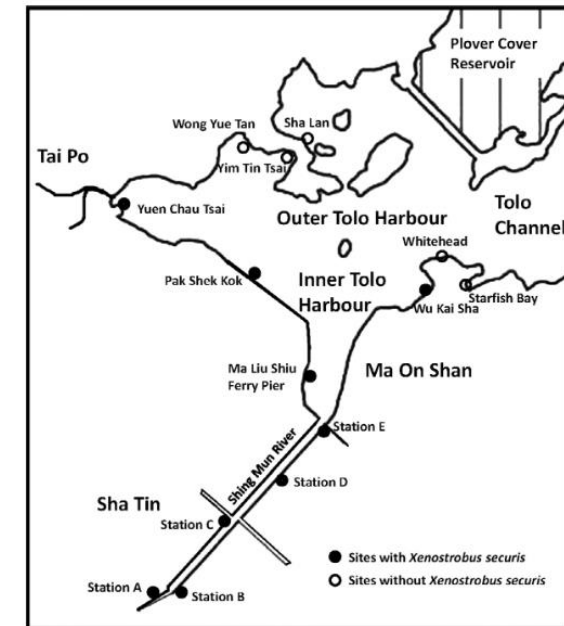
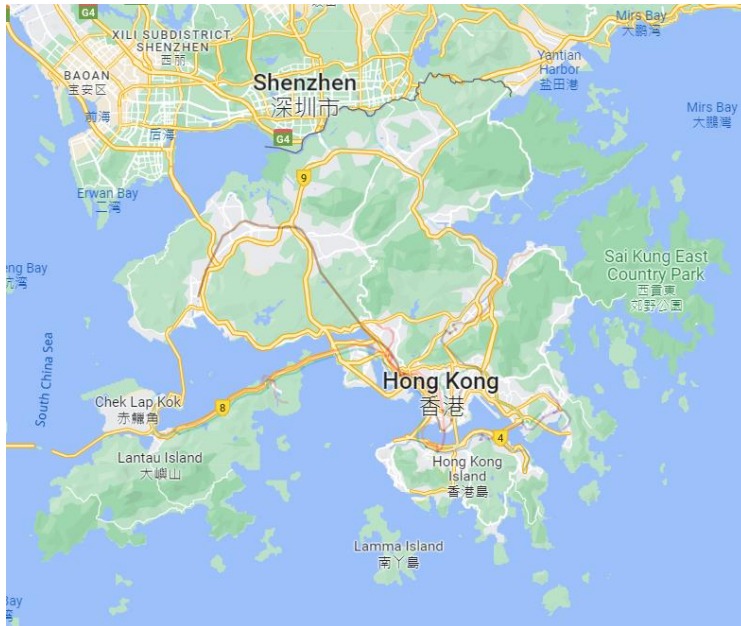


Mytilus galloprovincialis

- Natural range throughout Australia and New Zealand
- Established in a range of locations including northern Asia, the Mediterranean, and Iberian Atlantic
- Initial documentation in China (Hong Kong) published in 2015 (Morton and Leung)

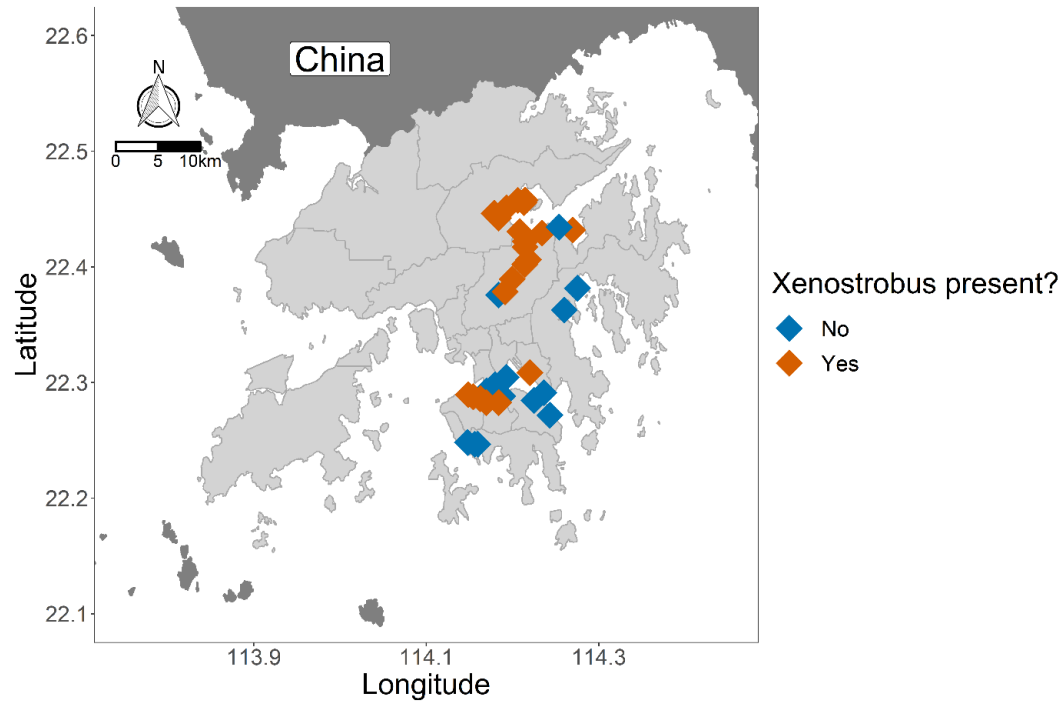
Invasive species in Hong Kong – the mussel *Xenostrobus securis*

- First noted in Hong Kong (Shing Mun River) in 2010
- Surveyed artificial structures (reclaimed shores, piers) in Tolo Harbour in 2011, overall negative
- Re-survey found on hard substrates in Shing Mun River, Inner Tolo Harbour in 2014

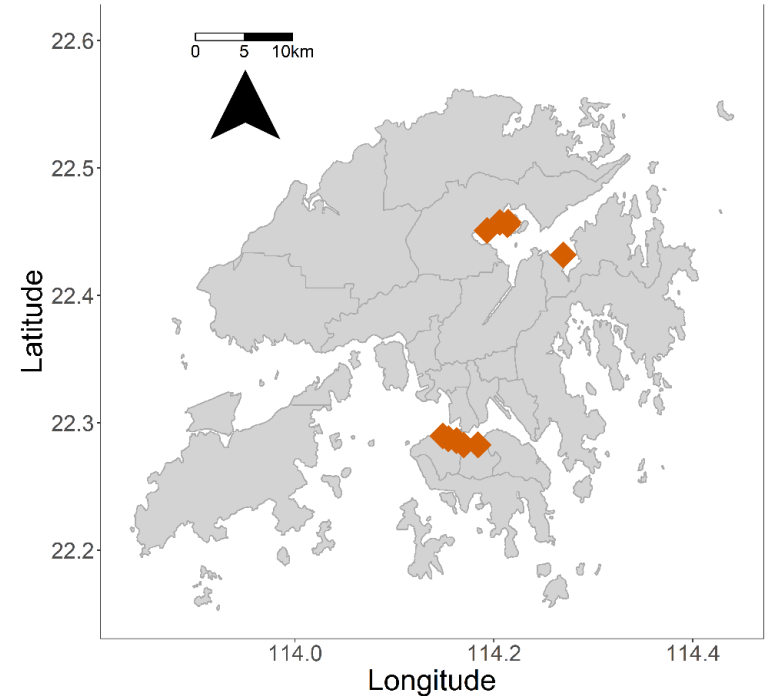


The current distribution of *Xenostrobus securis* in Hong Kong

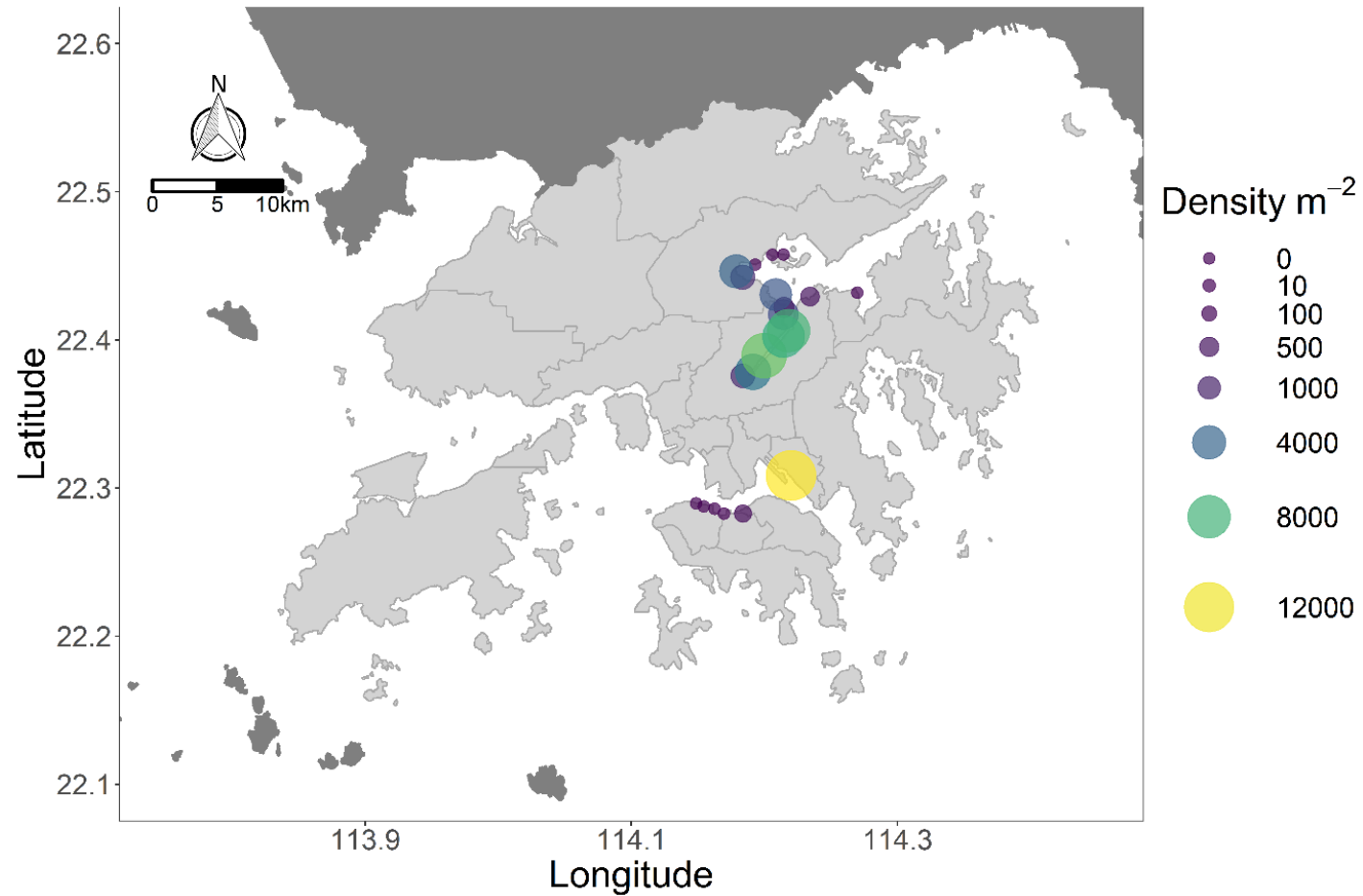
Presence/absence at surveyed sites



New sites with presence recorded



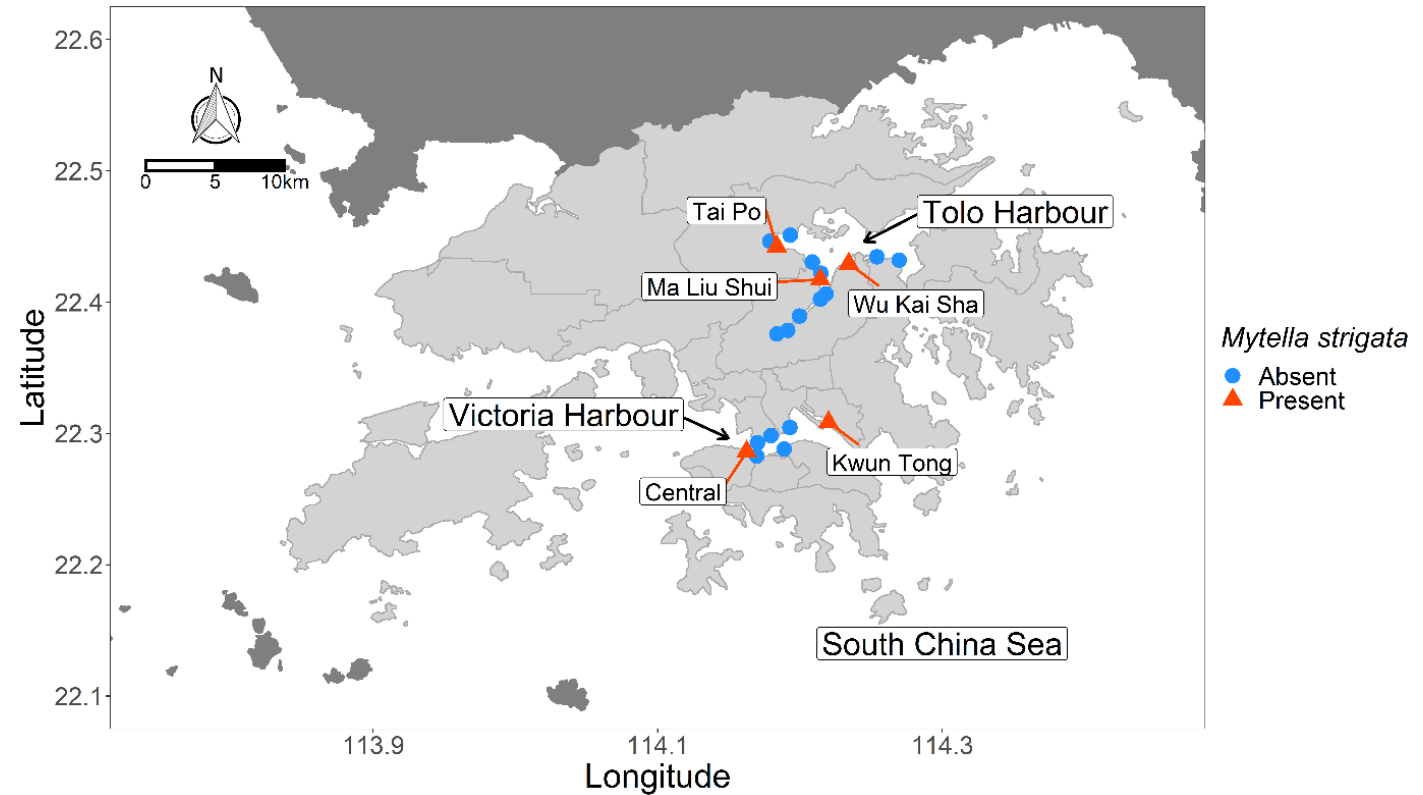
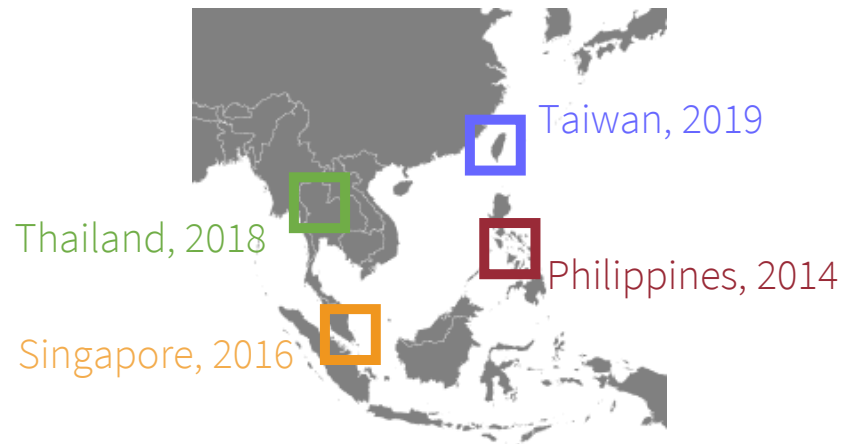
The density of *Xenostrobus securis*



The appearance of *Mytella strigata*

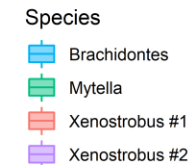


- The first report in Hong Kong
- Native to Central and South America
- Has invasive populations in North America; more recently reported throughout Asia



How will these species be affected in the future?

- Considered the responses of the different species under warming via a lab experiment
- Measured rates of physiological processes



Potential ecosystem effects of the spread

- Feeding trials to consider relationship of *Xenostrobus securis* with predators

Summary

- Updated understanding of invasive mussels in Hong Kong's marine waters
 - *Xenostrobus securis* continues to spread throughout Tolo Harbour, and occurs in Victoria Harbour
 - *Mytella strigata* is also found in Hong Kong
 - Indicates there are currently gaps in knowledge; number of invasive species and their distribution underestimated
- Initial lab experiments indicate all species considered may be similarly affected by warming
- Ongoing experiments will link the occurrence of organisms with ecological and economic consequences

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Acknowledgements

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