

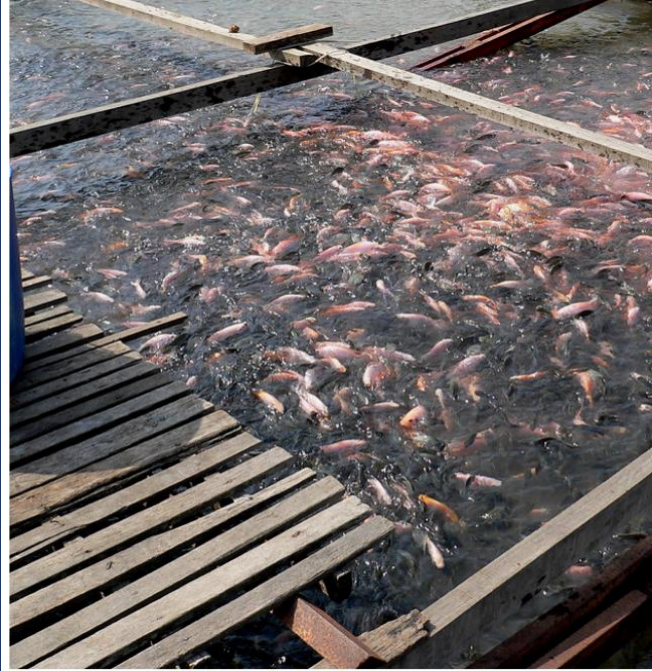
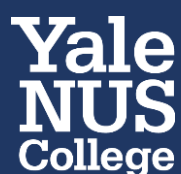
WHEN SPECIES TRAVEL

On the Rise and Consequence
of Invasive Ecologies in
Asia and the West Pacific

17-18 February 2020

AS8 Building, Seminar Room 04-04
10 Kent Ridge Crescent
Singapore 119260

For more information and registration
www.ari.nus.edu.sg



This conference is organised by Asia Research Institute, National University of Singapore, with support from Yale-NUS College.

Rapid biodiversity decline has imperiled not only nature's capacity to provide essential ecosystem services, but also, and perhaps more gravely, society's reliance on these vital services for food production, economic security, and global health. Human drivers have accelerated the loss of biodiversity, particularly since the turn of the twentieth century. As home to one of the world's richest regions of terrestrial biodiversity as well as the planet's foremost center of marine life—a unique biogeographical space known as the Coral Triangle—Southeast Asia and the West Pacific are at the heart of today's environmental crisis and the catastrophic consequences posed by unprecedented biodiversity decline. Similar issues are also a concern for governments in other parts of Asia and for a variety of transnational companies, NGOs, and IGOs, such as the UN.

According to a recent UN report on biodiversity and ecosystem services, invasive species constitute one of the most serious drivers of ecosystem change and biodiversity loss across the Asia-Pacific region (IPBES (2018), *Regional Assessment Report on Biodiversity and Ecosystem Services for Asia and the Pacific*: xii-xiii). From plants and animals to pathogens and microbes, invasive alien species have increased in number and abundance in Asia and the West Pacific region since the end of the nineteenth century, often traveling through trans-regional networks of trade, transport, and migration. These channels and infrastructures of mobility have expanded the spread of invasive ecologies, directly threatening island habitats, coastal edges, agricultural zones, and port cities. From Singapore's estuarine waters and Vietnam's upland forests to Chinese rivers and Japanese fishing grounds, alien forms of flora and fauna have become pervasive and notorious, impacting native biodiversity as well as ecosystem functioning and productivity (xxiv). For example, among scientists and policy-makers in the region and beyond, urgent attention has been drawn to how aquatic invasive species endanger—both ecologically and economically—the ocean's food webs and critical fisheries. Moreover, a growing body of scientific evidence contends that climate change further compounds—in known and unknown ways—these complex risks especially in tropical Southeast Asia's marine environment. In fact, recent research suggests that the annual economic loss attributed to invasive species is estimated at \$33.5 billion in Southeast Asia (xxiv). And yet, our knowledge of invasive species—from understanding their histories to explaining their implications—remains uneven and fragmented across disciplines, languages, and regions.

This conference aims to foster a base of critical knowledge on the rise and the consequence of invasive ecologies in Asia and the West Pacific region. By bringing together scholars who work on alien species, biodiversity, and environmental transformations in water, land, and air, it seeks to cultivate a repository of policy-relevant information as well as a set of timely tools drawn from different intellectual, methodological, and cultural traditions. In this way, the conference will strengthen Singapore's capacity for urgent environmental work by building inter-area and inter-disciplinary linkages through the study of invasive species. In the face of climate change and rapid biodiversity decline, the event plans to demonstrate how interactions between the natural sciences, social sciences, and humanities sharpen not only our forms of social and historical analysis, but also, and more importantly, it will emphasize the environmental humanities' role in understanding biodiversity decline and for providing policy advise.

CONFERENCE CONVENORS

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17 FEBRUARY 2020 (MONDAY)

09:15 – 09:30	REGISTRATION
09:30 – 10:00	OPENING & WELCOME REMARKS
09:30	<p>Tim Bunnell <i>National University of Singapore</i> Stefan Hübner <i>National University of Singapore</i> Anthony D. Medrano <i>Yale-NUS College, Singapore</i></p>
10:00 – 12:00	PANEL 1
Chairperson	Anthony D. Medrano <i>Yale-NUS College, Singapore</i>
10:00 via SKYPE	<p>Discussant David Dudgeon <i>University of Hong Kong</i> Non-native Freshwater Fishes of Singapore Heok Hui Tan <i>National University of Singapore</i></p>
10:20	<p>Discussant Darren C.J. Yeo <i>National University of Singapore</i> Three Alien Fish: Knowledge Making in British Malaya, 1923-1942 Ruizhi Choo <i>National University of Singapore</i></p>
10:40 via SKYPE	<p>Discussant Zeehan Jaafar <i>National University of Singapore</i> Dangerous Frictions: Development and Change in a Fishing Community Ma. Mercedes G. Planta <i>University of the Philippines–Diliman</i></p>
11:00	<p>Discussant Miles Alexander Powell <i>Nanyang Technological University, Singapore</i> The Landscape Genomics of the Invasive African Sharptooth Catfish, <i>Clarias Gariepinus</i>, In Southeast Asia Bi Wei Low <i>National University of Singapore</i></p>
11:20	QUESTIONS & ANSWERS
12:00 – 13:00	LUNCH

13:00 – 15:00	PANEL 2
Chairperson	Stefan Hübner <i>National University of Singapore</i>
13:00 via SKYPE	Discussant Darren C.J. Yeo <i>National University of Singapore</i> Hundred Years of Crayfish Eating in Asia: From Imperial Crayfish Bisque in Japan to Spicy Crayfish Craze in Mainland China Sidney C. H. Cheung <i>The Chinese University of Hong Kong</i>
13:20 via SKYPE	Discussant Yiwen Zeng <i>National University of Singapore</i> Troubling Ecologies and Biocultural Opportunities of the Pacific Oysters Mariko Yoshida <i>The Australian National University</i>
13:40 via SKYPE	Discussant Ting Hui Ng <i>National University of Singapore</i> Natives, Aliens, and Hybrids Submerged: The Difficulties of Defining an Akoya Pearl Oyster Kjell Ericson <i>Kyoto University, Japan</i>
14:00	Discussant Serena Lay-Ming Teo <i>National University of Singapore</i> International, Regional and National Context for Invasive Species Risk Assessment John Mumford <i>Imperial College London, UK</i>
14:20	QUESTIONS & ANSWERS
15:00 – 15:30	TEA BREAK
15:30 – 17:30	PANEL 3
Chairperson	Eunice Tan <i>Yale-NUS College, Singapore</i>
15:30 via SKYPE	Discussant Kwek Yan Chong <i>National University of Singapore</i> How Species Fail to Travel: A Case Study of a Failed Forestry Project in Taiwan during the Japanese Colonial Rule (1895-1945) Kuang-Chi Hung <i>National Taiwan University</i>
15:50 via SKYPE	Discussant Lily Chen <i>NParks, Singapore</i> Greening the Nation: Exotic Species in the Twentieth-Century Reforestation Projects in the Philippines Ruel V. Pagunsan <i>University of the Philippine–Diliman</i>
16:10	Discussant Kwek Yan Chong <i>National University of Singapore</i> Trees, Reserves and Invasive Species in Singapore Timothy P. Barnard <i>National University of Singapore</i>
16:30 via SKYPE	Discussant Ruel V. Pagunsan <i>University of the Philippine–Diliman</i> Homeless Gods and Ghosts: Invasive Spirits and Species in Singapore’s Anthropogenic Landscape Joshua Comaroff <i>Yale-NUS College, Singapore</i>
16:50	QUESTIONS & ANSWERS
17:30	END OF DAY 1
17:45	BUS TRANSFER TO DINNER VENUE
18:15 – 20:00	CONFERENCE DINNER (For Speakers, Chairpersons & Invited Guests)

18 FEBRUARY 2020 (TUESDAY)	
10:00 – 10:20	REGISTRATION
10:20 – 12:00	PANEL 4
<i>Chairperson</i>	Naoko Shimazu <i>National University of Singapore & Yale-NUS College</i>
10:20 <i>via SKYPE</i>	<i>Discussant</i> John Mumford <i>Imperial College London, UK</i> Insects, Entomologists, and Parasites on the Move: The Mediterranean Fruit Fly, Biological Pest Control, and Agricultural Governance in Early Twentieth-Century Hawai'i Jessica Wang <i>University of British Columbia, Canada</i>
10:40	<i>Discussant</i> Faizah Zakaria <i>Nanyang Technological University, Singapore</i> Invasiveness and Large Hydropower Dams in the Mekong River Basin Ian G. Baird <i>University of Wisconsin–Madison, USA</i>
11:00	<i>Discussant</i> Anthony D. Medrano <i>Yale-NUS College, Singapore</i> When Development Invades a Fishing Community: Impacts on Humans and Habitats Serina Rahman <i>ISEAS-Yusof Ishak Institute, Singapore</i>
11:20	QUESTIONS & ANSWERS
12:00 – 13:00	LUNCH
13:00 – 15:00	PANEL 5
<i>Chairperson</i>	Serina Rahman <i>ISEAS-Yusof Ishak Institute, Singapore</i>
13:00 <i>via SKYPE</i>	<i>Discussant</i> Liz P.Y. Chee <i>National University of Singapore</i> The Gentle Invader: The AMAZEing Story of Asian Tea Peter C. Perdue <i>Yale University, USA</i>
13:20 <i>via SKYPE</i>	<i>Discussant</i> Shi Lin Loh <i>National University of Singapore</i> Invasives or Allies? The Multispecies Biopolitics of Oil Palm Ecologies in West Papua, Indonesia Sophie Chao <i>University of Sydney, Australia</i>
13:40	<i>Discussant</i> Hallam Stevens <i>Nanyang Technological University, Singapore</i> Toolkit for Ecosystem Service Site-Based Assessment (TESSA): A Potential Tool for Measuring the Impact of Invasive Alien Species on Ecosystem Services Kelvin Peh <i>University of Southampton, UK</i>
14:00	<i>Discussant</i> Joshua Comaroff <i>Yale-NUS College, Singapore</i> The Wild and Rewilding: Asian Elephants and the Rhetoric of Invasion Faizah Zakaria <i>Nanyang Technological University, Singapore</i>
14:20	QUESTIONS & ANSWERS
15:00 – 15:30	TEA BREAK
15:30 – 16:30	DISCUSSION & CLOSING REMARKS
15:30	Stefan Hübner <i>National University of Singapore</i> Anthony D. Medrano <i>Yale-NUS College, Singapore</i>
16:30	END OF CONFERENCE

Non-native Freshwater Fishes of Singapore

Heok Hui Tan

Lee Kong Chian Natural History Museum, National University of Singapore

An overview of all available published literature on freshwater fishes of Singapore was reviewed, including selected fisheries reports. A total of 120 species (including 8 hybrids) are presently known from Singapore (1849 to present), of which about 40 species have establishing breeding populations in mainly artificial habitats. Currently 43 native fish species are still extant in the waterways of Singapore; thus 73.6 % of freshwater fish taxa in Singapore are non-native in origin. The more recent records have been based on personal sightings, e-journals and efforts of citizen science. The origins of these non-native fish species is briefly discussed and illustrated with some examples.

Speaker **Heok Hui Tan** obtained his formal degrees researching freshwater fishes: Honours (1996) on taxonomy of fighting fishes (Osphronemidae: *Betta*); Masters (1999) on faunistic survey of the inland fishes of Batang Hari basin in Sumatra; and PhD (2003) on the systematics of Borneo Suckers (Gastromyzontidae: *Gastromyzon*, *Neogastromyzon* and *Hypergastromyzon*). He has published widely and described more than 120 new fish taxa, including one of the smallest vertebrate animals – *Paedocypris progenetica* (Cyprinidae) from peat swamp forest habitats. At present, he is involved with ecological and conservation work of freshwater fishes in Singapore, documentation of the marine fishes of Singapore, and continuing in taxonomical pursuits in freshwater and coastal fishes of Southeast Asia.
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Discussant **David Dudgeon** is Chair Professor in Ecology and Biodiversity at the University of Hong Kong, where he has spent over 30 years researching the ecology, biodiversity and conservation of the animals that inhabit the streams and rivers monsoonal Asia. His recent work concerns food-web dynamics and energy flow in streams, the relationship between biodiversity and ecosystem functioning, and the broader issue of freshwater biodiversity conservation in a rapidly-changing, human-dominated world. Dudgeon is the author of over 190 papers in international journals, as well as book chapters, books and other articles. In 2000, he was awarded the Biwako Prize in Ecology in recognition of his contributions to freshwater ecology and conservation in Asia. His latest book, *Freshwater Biodiversity: Status, Threats and Conservation*, will be published by Cambridge University Press in May 2020.
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Three Alien Fish: Knowledge Making in British Malaya, 1923-1942

Ruizhi Choo

Department of History, National University of Singapore

In the early hours of Saturday, 18 April 1935, the S.S. Antenor arrived off the shores of Penang, carrying 20,000 rainbow trout ova from Britain in its cavernous holds. These eggs were the progenitors of Malaya's first trout fishery, one of several fish-rearing experiments conducted by the Fisheries Department of the Straits Settlements and Federated Malay States in the late colonial period.

Presently, existing historical accounts of ichthyological introductions into Malaya are found primarily in scientific papers rather than as the subjects of focused historical investigations. Consequently, these accounts often lack a rigorous archival research methodology. Such oversights often result in superficial understandings of the historical processes which led to these piscine introductions. By reviewing the Department's annual reports, newspaper articles and other contemporaneous sources, this essay will demonstrate that there is now enough documentary material to renovate such a gap in the historical record. This paper will examine the Department's investigations into three alien fish - snakeskin gourami, Chinese carp and English trout - through 'networked' conceptions of colonial science, as a means to apprehend some of the processes by which foreign biological organisms were studied, selected, and introduced into Malaya.

Ultimately, it argues that the research eventually produced by the Department arose through epistemological processes which were hybrid, collaborative and contingent. This paper thus nuances existing historical narratives on introduced freshwater fish in Malaya by illustrating how knowledge of these alien fish were actually connected to complex networks of science and empire.

Speaker **Ruizhi Choo** recently completed his Masters degree at the Department of History in the National University of Singapore. His research presently focuses on the experiments of the Fisheries Department of British Malaya and the globally interconnected nature of its investigations. His broader research interests include environmental and Singaporean histories. In his free time, Ruizhi runs @singapore_stories, an Instagram account dedicated to offering alternative imageries, reflections and perspectives about Singapore.
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Discussant **Darren C.J. Yeo** is Associate Professor at the Department of Biological Sciences, National University of Singapore (NUS), where he is Principal Investigator of the Freshwater and Invasion Biology Laboratory. He is also Deputy Head of the Lee Kong Chian Natural History Museum, and a Research Affiliate of the Tropical Marine Science Institute (both NUS). His main research interests are in aquatic invasions, freshwater ecology and biodiversity, and freshwater decapod crustaceans, which the lab investigates through studies of freshwater ecosystems in Singapore and other parts of tropical Asia.
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Dangerous Frictions: Development and Change in a Fishing Community

Ma. Mercedes G. Planta

Department of History, University of the Philippines–Diliman

This paper is an ethnographic study of an aquaculture community in Barangay Tapong, Municipality of Pulpandan, Negros Occidental, through one of its most important produce, the *tilapia* or St. Peter's fish. Tilapia is the common name of nearly a hundred species of the cichlid fish (*Cichlidae*) and is the second most important farmed fish in the Philippines next to milkfish (*Chanos chanos*; bangus). While the milkfish is native to the Philippines, the Mozambique tilapia (*Oreochromis mossambicus*) was first introduced to the country from Thailand in 1950, followed by the Nile tilapia (*O. niloticus*) in 1972, and other species (*O. aureus*; blue tilapia, *O. urolepis* hornorum; wami tilapia, *Coptodon zillii*; redbelly tilapia, and *Sarotherodon melanotheron*; blackchin tilapia). Tilapias are mainly freshwater fish but over the years aqua farmers in Barangay Tapong and Negros Occidental Province, as a whole, have successfully cultivated it in brackish water and continues to have a major impact on aquaculture developments in the area.

In the early 2000s, Malaysia's fisheries department started a breeding program to develop genetically improved farm tilapia (GIFT) that was eventually exported to the Philippines, including the fishing community of Barangay Tapong. GIFT brought a boon to tilapia production in the province, particularly in terms of harvest weight. Since then, GIFT has been considered a valuable genetic resource for Negros Occidental's aquaculture industry. Gradually, however, the aqua farmers of Barangay Tapong have realized that it has jeopardized the local variety that they have acclimatized over the years (to the brink of extinction), as the latter have become spoils to the stronger, bigger, and invasive GIFT.

While the example of GIFT highlights the change that technology brings and its impact on the environment and food production, this paper, most importantly, also seeks to illustrate the debates between modernity and change by exploring the former's mechanisms and implications for different societies in terms of notions of taste, values, and social class.

Speaker **Ma. Mercedes G. Planta** is Associate Professor of History and Lecturer at the Asian Center, University of the Philippines–Diliman. She is currently Deputy Editor of the *Regional Journal of Southeast Asian Studies (RJSEAS)*, an online, bi-annual, peer reviewed journal in English that seeks to provide a platform for Southeast Asian scholars in Southeast Asia to share their research internationally. Her book, *Traditional Medicine in the Colonial Philippines, 16th to the 19th Century*, won the 2018 Best Book in Science Award by the National Book Awards of the Philippines.
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Discussant **Zeehan Jaafar** is Lecturer with the Department of Biological Sciences at the National University of Singapore. Her research interests include the ecology and evolution of fishes. She also engages in broad marine conservation issues and strives to understand anthropogenic impacts on natural marine systems. Notably, she is the lead editor for the Singapore Blue Plan 2018, a conservation roadmap for the conservation of marine areas in Singapore. In addition, she is the author of two books, *Fishes Out of Water: Biology and Ecology of Mudskippers*, and *The Endangered Forested Wetlands of Sundaland*.
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The Landscape Genomics of the Invasive African Sharptooth Catfish, *Clarias Gariepinus*, In Southeast Asia

Bi Wei Low

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Heok Hui Tan

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Darren C. J. Yeo

Department of Biological Sciences, National University of Singapore

The African sharptooth catfish, *Clarias gariepinus*, is a highly invasive species with known severe impacts, including native species declines through ecological (e.g., competition, predation) and genetic interactions (e.g., hybridization, introgression). The species was introduced to Southeast Asia in the mid-1970s and has since become widely established. In this study, we used genome-wide genetic markers to investigate the origins, genetic structure and connectivity of feral populations in Southeast Asia, with reference to populations from the species' native distribution in Africa and Asia Minor. Our results indicate that non-native *Clarias gariepinus* populations are closely affiliated with Central and North African genotypes, and that differential admixture from disparate native-range sources has enhanced genetic variation and subsequent colonization success in the region. Furthermore, we uncovered patterns of gene flow with native congeners and demonstrate that further range expansion of the species can lead to detrimental and irreversible impacts on threatened freshwater communities. Our findings highlight the immediate need to manage the introduction, spread and impacts of invasive *Clarias gariepinus* in Southeast Asia, and help shed light on the factors contributing to phenotypic evolution and invasiveness of introduced species in novel environments.

Speaker

Bi Wei Low is Research Fellow at the Freshwater and Invasion Biology Laboratory, Department of Biological Sciences, National University of Singapore. His research interests lie in the ecology and taxonomy of Southeast Asian freshwater fishes, biological invasions as well as community ecology of freshwater systems, which stems from a life-long passion in fishkeeping and the design of aquascapes. For his PhD, he investigated the invasion biology (life history and impacts) of the African sharptooth catfish, *Clarias gariepinus*, in Southeast Asia, as well as diversification patterns in the native common walking catfish, *Clarias batrachus*. His current post-doctoral work focuses on the ecological role of odonates (dragonflies and damselflies) in urban aquatic macroinvertebrate communities, and their potential as biological control of mosquitoes and other insect pests in urban water bodies.

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Discussant **Miles Alexander Powell** is Associate Professor of Environmental History at the School of Humanities, Nanyang Technological University, Singapore. He received his BA and MA from Simon Fraser University, where he researched the environmental history of Native herring fisheries in British Columbia. He completed doctoral studies at the University of California-Davis, developing fields in environmental history, American history, and world history. Dr Powell's first book, *Vanishing America: Species Extinction, Racial Peril, and The Origins of Conservation* (Harvard UP, 2016), uses discourses of extinction to explore connections between racial attitudes and environmental thought in late-nineteenth and early-twentieth-century America. Currently, he is researching the global history of human interactions with sharks in the twentieth century.
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Hundred Years of Crayfish Eating in Asia: From Imperial Crayfish Bisque in Japan to Spicy Crayfish Craze in Mainland China

Sidney C. H. Cheung

Department of Anthropology, The Chinese University of Hong Kong

It was 1916 in Japan and a crayfish bisque was prepared by Akiyama Tokuzo for more than 2,000 diplomatic guests coming to Japan from various countries for the Taisho Emperor's coronation ceremony. Chef Akiyama was appointed the Master Chef of the Imperial Court in the same year, shortly after he came back from France; during those years, French cuisines being part of the *yoshoku* (洋食) was commonly used for Imperial and diplomatic as well as official events; therefore, crayfish bisque was prepared base on Akiyama's culinary experience in France with local crayfish found in Hokkaido. In 1930, Louisiana crayfish was brought to Jiangsu, China by the Japanese, although the reason is still unclear. Jiangsu people tended to believe that there was a Japanese conspiracy to use the crayfish to destroy their rice paddies, since crayfish like to eat the roots of crops, and more importantly, they dig holes which drain water away from the rice paddies. Therefore, the local people did not welcome the crayfish at all; given that crayfish brought no benefits to the people, and that they could still survive in dirty water, it was not considered edible by most people. However, in the 21st century, spicy crayfish (盱眙十三香小龍蝦) has become one of the popular and nationwide famous dish, but at the same time, it became luxury dishes. Local people in Xuyi (盱眙) always mentioned that they are not able to afford eating that anymore; in 2015, it was widely reported in the media that the total consumption of crayfish in China would be around 600,000 tons while 200,000 tons were consumed in Jiangsu which only produced 100,000 tons indeed. Regarding the related job position of the crayfish industry, it was expected over 10 million. The market for spicy crayfish is still expanding as the online purchase gives it a big push, and the outcomes need to be investigated. Crayfish has a strong territorial character and does not spread out easily; in other words, it has low mobility and does not seem to be a global animal. Again, in my study, I would like to emphasize that crayfish was mobilized for different reasons from North America to Japan, and then from Japan to China; also, the famous spicy crayfish dish originated from Jiangsu area is now delivered to almost any location where the speedy door-to-door delivery reaches in mainland China. Finally, crayfish might be just one of the many cases of food being mobilized in modern societies, and it draws out attentions to rethink about what and how we live with such a kind of food mobility in the context of globalization.

Speaker **Sidney C. H. Cheung** is Professor of the Department of Anthropology, Associate Dean of the Faculty of Arts and Associate Director of the Institute of Future Cities, The Chinese University of Hong Kong, he has carried out field research in Japan, Hong Kong, mainland China, Southeast Asia and Louisiana, and published his research on visual anthropology, anthropology of tourism, cultural heritage, food and identity in journals such as: *Visual Anthropology*, *International Journal of Heritage Studies*, *Annals of Tourism Research*, etc. and is co-editor of *Tourism, Anthropology and China*, (White Lotus, 2001), *The Globalization of Chinese Food* (RoutledgeCurzon 2002), *Food and Foodways in Asia: Resource, Tradition and Cooking* (Routledge 2007) and editor of *Rethinking Asian Food Heritage* (Foundation of Chinese Dietary Culture, Taiwan 2014). He serves as General Editor for the *Berkshire Encyclopedia of Chinese Cuisines, Volumes 1-5*, which is expected to be out in 2020.

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Discussant **Darren C.J. Yeo** is Associate Professor at the Department of Biological Sciences, National University of Singapore (NUS), where he is Principal Investigator of the Freshwater and Invasion Biology Laboratory. He is also Deputy Head of the Lee Kong Chian Natural History Museum, and a Research Affiliate of the Tropical Marine Science Institute (both NUS). His main research interests are in aquatic invasions, freshwater ecology and biodiversity, and freshwater decapod crustaceans, which the lab investigates through studies of freshwater ecosystems in Singapore and other parts of tropical Asia.

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Troubling Ecologies and Biocultural Opportunities of the Pacific Oysters

Mariko Yoshida

Crawford School of Public Policy, College of Asia and the Pacific
The Australian National University

In this paper, I bring together the implications of biotechnological practices performed in the contemporary Pacific oyster's ecoregion stretching from Tasmania, Australia to Japan. Attentive to relationalities of ambiguous agents, a so-called quasi-species or quasi-living, I ask how the ecosystem services that oysters provide and community's reliance on these services for the sake of stable seafood production co-evolve. Specifically, I illustrate Japanese oyster producers' encounter with Australian oyster producers' response to the outbreak of Pacific Oyster Mortality Syndrome (POMS), a disease which affects Pacific oysters and is caused by a virus called OsHV-1 micro variant. Australia's policy approach to oyster restoration unveils the way in which ecological vulnerability and instability are produced, intensified, and managed. I examine how Bivalve Culture Limited, the first Australian commercial oyster hatchery for Pacific oysters, tightened biosecurity control when POMS massively wiped out southern Tasmania's Pacific oysters. The outbreak of POMS has made Japanese marine biologists and policy-makers aware that this virus spread can be caused by the movement of non-native seed oysters, which bring invasive alien species that traveled through transport. Japanese oyster producers have started to recently engage in harvesting native seed oysters locally in order to eliminate dependence on seed oysters produced in Miyagi, where the increase in seawater temperature also has become a new risk for the oyster population. I argue that these practices are locally-situated through interdependent enmeshments of networks in action, dynamics, and stabilization - in which multiple heterogeneous actors are intertwined.

Speaker **Mariko Yoshida** is a PhD candidate at The Australian National University. Her research focuses on knowledge practices of ecological uncertainty and socio-economic precarity through the process in which human and nonhuman entanglements emerge at local, national, and international levels, shifting and creating new forces and agents. Her doctoral dissertation investigates the trajectory of ecological risks surrounding of Pacific Oysters, questioning how unevenly distributed values and meanings have been dealt with by various communities including oyster producers, marine biologists, market authorities, distributors, and consumers. Her MA thesis (2013, Columbia University, Best Thesis Prize at the Department of Anthropology) investigated the gap between Tuvaluan people and their policy-makers in responses to the long-term risks of sea-level rise as an epistemological ground. Her broader interest includes environmental anthropology's extended engagement with political economy, Science and Technology Studies (STS), multispecies anthropology, and new materialism. She will join NUS-ARI as a postdoctoral fellow in July 2020.
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Discussant **Yiwen Zeng** is currently a post-doctoral researcher in the Carrasco Bioecon Lab in the Department of Biological Sciences at NUS. His research thus far has largely been focused around applying geospatial techniques to address global/regional ecological and conservation concerns. During his PhD, he worked heavily on invasive species—studying the behaviour, ecology and distribution of invasive/non-native freshwater crustaceans (shrimps and crayfishes) in Singapore and parts of Southeast Asia. The goal of which was to better understand the risks and impacts associated with these potentially (ecologically) harmful species.
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Natives, Aliens, and Hybrids Submerged: The Difficulties of Defining an Akoya Pearl Oyster

Kjell Ericson

Center for the Promotion of Interdisciplinary Education and Research & Graduate School of Letters
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Is an Akoya oyster a Japanese oyster? This question came to the forefront a quarter century ago, when a new disease reddened the flesh of Akoya pearl oysters and left millions of them weakened or dead in farms along the coasts of western Japan. My paper traces understandings of this malady, now called "Akoya Oyster Disease" in English, which transformed alongside ideas of what constituted an "Akoya" shellfish.

Akoya Oyster Disease appeared at a 1990s moment when decades of Japanese prominence in pearl cultivation were being threatened by epidemics and overseas competition. In Japan, scientists linked the new disease to Japanese aquaculturists who had begun to import juvenile "Akoya" pearl oyster spat from south China. The outbreak prompted the first sustained attempts in Japan to selectively breed pearl oysters when researchers crossed "Japanese Akoya" pearl oysters with "Chinese Akoya" counterparts. The resulting "Sino-Japanese" Akoya hybrids, produced in an attempt to foster disease resistance, today constitute a sizable proportion of cultivated pearl oysters in Japan. The threat of Akoya Oyster Disease, in turn, has sparked parallel efforts to locate "native Japanese" Akoya populations along "disease-free" coastlines.

Akoya Oyster Disease and Akoya hybrids spurred debate over what, if any, difference existed between pearl oysters in Japan and elsewhere in the world. What is clear is that ecologies of invasiveness, hybridity, and purity have reconfigured the boundaries of the Akoya oyster.

Speaker **Kjell Ericson** is Program-Specific Assistant Professor in the Center for the Promotion of Interdisciplinary Education and Research along with the Graduate School of Letters at Kyoto University. He works on histories of technology, law, and the environment, with a focus on aquacultural issues in Japan and East Asia. Forthcoming publications include a chapter rethinking the history of Japan's Misaki Marine Biological Station in *Why Study Biology by the Sea?* (University of Chicago Press) and a chapter on early twentieth century Japanese debates about public domains of knowledge and what we might today call biopatenting in *Patent Cultures: Diversity and Harmonization in Historical Perspective* (Cambridge University Press). He is now completing a book manuscript about the Japanese region that was the world's center of saltwater pearl cultivation for most of the twentieth century.
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Discussant **Ting Hui Ng** is Lecturer and Curator of freshwater molluscs and worms at the Lee Kong Chian Natural History Museum. She studies freshwater molluscs and non-native species in Singapore and Southeast Asia. Her areas of research include the biodiversity, ecology, impacts, and key introduction pathways (including the ornamental pet trade) of freshwater snails and bivalves.
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International, Regional and National Context for Invasive Species Risk Assessment

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Invasive alien species affecting the natural environment must be assessed and managed in a manner consistent with other risks from exotic organisms in the environment, such as agricultural pests and animal diseases, for which there are internationally agreed standards. National and regional approaches should be consistent with these standards. Invasive species pose particular challenges due to the diversity of taxa, receptor environments and multiple protection goals involved. Risk management also differs in being more opportunistic and involves a wider group of stakeholders. Ideally risk management should be proportionate to the risks, so risk assessments and risk management performance assessments should be based on common frameworks. Invasive species risk assessment schemes that have operated effectively in Europe have been adapted for SE Asia. Risk management performance assessments, however, are not as well developed. Risks can be assessed with and without management as part of the initial risk assessment process. This has been done for a wide range of plant pests in the United Kingdom through a process of sectoral stakeholder workshops. Regional risk assessments are now required in Europe, with a system that builds on national risk assessments being reviewed for wider regional relevance. These various assessment schemes offer some lessons for national and regional approaches in SE Asia.

Speaker

John Mumford is Professor of Natural Resource Management in the Centre for Environmental Policy at Imperial College London. At a national level, since 2007 he has chaired the Great Britain Non-native Species Risk Analysis Panel, which oversees all invasive species risk assessment for the three national authorities in Great Britain and is a reviewing body for European invasive species risks. At the European level he has worked on risk modelling and assessment guidance with the European Food Safety Authority. His work in the EU PRATIQUE project led to revisions of the pest risk assessment and management scheme for EPPO, the regional plant protection organisation. At an international level he works extensively in area-wide agricultural and public health pest management, as an expert contributor with FAO, IAEA and WHO projects, and with UK DfID and USAID. He has been a member of IPPC working groups on revisions to international standards in plant health.

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Discussant

Serena Lay-Ming Teo is a marine biologist, and currently Facility Director for St. John's Island National Marine Laboratory (SJINML) and Deputy Director at the Tropical Marine Science Institute (TMSI) at the National University of Singapore. She has been actively involved in marine biological studies on Singapore shores since undergraduate. Her research motivations lie in biodiversity conservation and its relationship with maritime industry. This leads to her interests in marine biosecurity which encompasses many aspects of environment management, antifouling research, invasive/pest species and ballast water management. As the leading global transshipment hub situated within a very small densely populated country, Singapore's marine environment faces unprecedented challenges from maritime activities. Her research focuses on sustainability, i.e. how maritime industry can be sustainably managed to minimize impacts on marine biodiversity. Specific research interests cover development of new environment-safe antifouling technology, management of biofouling (and its impact on corrosion) in maritime industry; and marine biosecurity (spread of invasive species through fouling and ballast water). Her current interests include ocean plastics pollution and its effects on natural ecosystems.

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How Species Fail to Travel: A Case Study of a Failed Forestry Project in Taiwan during the Japanese Colonial Rule (1895-1945)

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During the early period of the Japan's colonial rule in Taiwan, colonial foresters attempted to introduce camphor trees from Japan to improve what they deemed to be an unregulated and abnormal natural forest. Yet, the project of improvement and introduction proved to be a failure. This essay uses this failed project as a case to interrogate the intersection among the history of species, the history of capital, and the history of science. Beginning with a genealogical analysis of how modern forestry came into being in imperial Japan, this essay shows that by the late nineteenth century, forestry professionals in Japan had adopted the "mutualist" or *sōrikyōsei* principle to guide Japan's forestry policies: that is to say, instead of monopolizing the benefits generated by forest management, the government should build mutually beneficial and reciprocal relationship with the people and share the benefits with them. This mutualism of forest management soon found its way to Japan's colonial forestry in Taiwan. Of critical importance is that the colonial forestry department enclosed a large portion of Taiwan's forests and designated them as the national forest, and in the meantime recruited "trustworthy and devoted" actors (i.e. capitalists from Japan), cultivated them, and collaborated with them in order to "normalize" Taiwan's natural forests. Nevertheless, those who got entangled in what may be called the environmental subjectification refused to be subject to the colonial forestry regime, while those being excluded, mostly the so-called *Hontōjin*, or the Taiwanese people, who used forests according to customs, conducted "everyday forms of resistance" to undermine the colonial government's authority over the national forest. In consequence, the colonial forestry department found that the cost of maintaining the national forest skyrocketed, to the extent that it was next to impossible to practice the mutualist principle that had for some time constituted the core of Japan's imperial forestry. It was against the backdrop that the introduced camphor trees "refused" to stay in the network, which truncated an otherwise fruitful colonizing project. While studies of how species become invasive have produced some of the most remarkable scholarship, this essay suggests that more attention be paid to how species fail to travel, for a subject as such should shed fresh light on certain understudied engagements of the modern state, capital, and species.

Speakers **Kuang-Chi Hung** received his PhD in the history of science from Harvard University. His research interests include the history of colonial forestry, the history of biogeography, and geography of scientific knowledge. He is currently Assistant Professor in the Department of Geography, National Taiwan University.
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Jialun Chang is a postdoctoral researcher affiliated with the Geography Department at National Taiwan University. He received his PhD in history from National Taiwan Normal University. Dr Chang specializes the history of reforestation and social history of trees, in particular camphor trees.
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Discussant **Kwek Yan Chong** is a Senior Tutor at the Department of Biological Sciences, National University of Singapore. His key research interests are in tropical forest ecology, urban ecology, and plant invasion ecology. Among his published work include the checklist of Singapore plants including non-native species, the ecology and spread of the Neotropical pioneer tree *Cecropia pachystachya* in Singapore, and the exotic-dominated secondary vegetation in Singapore.
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Greening the Nation: Exotic Species in the Twentieth-Century Reforestation Projects in the Philippines

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In 2011, the Philippine Government launched the National Greening Program (NGP) targeting to cultivate 1.5 billion trees over 1.5 million hectares of public lands within the span of six years. In the initial year of the program's implementation, the government was set to purchase 25 million seedlings of exotic trees and only 5 million seedlings of native species. Academics and environmental advocates were alarmed by the decision favoring the exotic species, and argued that indigenous trees are the kinds of species that satisfy the NGP's mission of rehabilitating the nation's forests. The criticism pushed the government to prioritize native tree seedlings for its planting stock in a move of providing the NGP with "a truly Filipino character."

During the Philippine Commonwealth (1935-1946), incorporating exotic trees in reforestation programs was seemingly unchallenged. Filipino foresters Florencio Tamesis and Carlos Sulit, echoing their American colonial predecessors, defined reforestation as the restoration of a locality to forest through natural and artificial methods. In 1936, Tamesis, the first Filipino director of the Bureau of Forestry, secured a huge government funding for a nationwide reforestation program that included the cultivation of exotics in the country's National Parks. As the Philippines was preparing for eventual independence, the Bureau's foresters rushed to restore the nation's forests by planting rapid-growing exotic species.

This paper historicizes the use of exotic trees in the Philippine greening projects. Focusing on Mt. Makiling, a forest reserve south of Manila and the laboratory station of the University of the Philippines College of Forestry, it examines state-led scientific investigations on the value of introduced trees to the country. The changing notion and appreciation towards exotic trees, the paper argues, was shaped not only by scientific studies but also by various interests framed within national ideologies.

Speaker **Ruel Pagunsan** is a faculty member at the Department of History, University of the Philippines–Diliman. He holds a PhD in History at the National University of Singapore. His current research focuses on the environmental history of nation-building in the Philippines.
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Discussant **Lily Chen** is a Senior Researcher (Plant Taxonomy) with the Singapore Botanic Gardens. The current focus of her research is on revising the Cleomaceae, Loranthaceae and Santalaceae for the Flora of Singapore. She is also documenting the naturalised flora for Singapore, and will expand her work on the naturalised flora for the South-east Asian region, with a particular interest in Malaysia and Indonesia.
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Trees, Reserves and Invasive Species in Singapore

Timothy P. Barnard

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Invasive species have played a vital role in the creation of a natural landscape in Singapore that is celebrated today as part of the “garden city.” Much of this is originated in the massive deforestation the island experienced in the nineteenth century, when up to 92 per cent of the forest cover was eliminated, leading to a “catastrophic” collapse in biodiversity and corresponding issues related to potable water and access to resources. Following these developments, botanists in the 1880s imported trees—particularly the African gum copal (*Hymenaea verrucosa*), mahogany (*Swietenia mycrophylla*), Brazilian ironwood (*Libidia ferrera*) and the American Rain Tree (*Samanea saman*)—and began replanting the forests, thus creating nature reserves throughout the island filled with exotic species, which then spread out to the surrounding landscape. This paper will consider these reforestation efforts as both an invasive entry and one that is considered to be an important component of the national (and natural) character of the modern Singaporean environment as a response to stresses colonial policies placed upon the ecosystem of a small island.

Speaker **Timothy P. Barnard** is Associate Professor in the Department of History at the National University of Singapore (NUS), where he specializes in the environmental and cultural history of Southeast Asia. He has written and edited numerous works on Singaporean history including *Nature Contained* (NUS Press, 2014) and *Nature’s Colony* (NUS Press, 2016).
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Homeless Gods and Ghosts: Invasive Spirits and Species in Singapore's Anthropogenic Landscape

Joshua Comaroff

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It is an unexpected aspect of Singapore—often a symbol of the rational and technologically advanced nation—that invasive spirits often shadow the development of the national landscape. Singapore's complex and volatile anthropogenic ecology is the result of successive revolutions in land-use and urban planning, and consists predominantly of introduced species selected for productive and ornamental qualities. At the same time, the Garden City is also home to patches of “jungle,” remnant secondary forest patches and dense tangles where maintenance has been suspended. These spaces are often associated in the public imagination with spiritual forces: ghosts and gods associated with the history of the island's multiple religions. Trees are seen as traditional homes for spirits, who may become vengeful when they are not approached properly (giving rise to a tradition of haunting stories in areas of dense foliage). At the same time, the former KTM Malaysia railway line crossing the country is understood as “home” to Sri Muneeswaran, a minor member of the Hindu pantheon, who came from India with railway workers. This paper will explore the specific relations between invasive natures and migratory or homeless spirits, in the figures of Muneeswaran and the “hungry ghosts” who are thought to travel with non-native species and inhabit landscapes of human disturbance.

Speaker **Joshua Comaroff** was born in Manchester, UK, and raised in Chicago. Dr Comaroff studied literature and creative writing at Amherst College before joining the Master of Architecture and Master of Landscape Architecture programmes at Harvard University Graduate School of Design, where he worked as part of Rem Koolhaas' Harvard Project on the City. In 2009, he completed a PhD in cultural geography at University of California Los Angeles (UCLA), writing on the subject of haunted landscapes and urban memory in Singapore. He has published writing about architecture, urbanism, and politics, with an Asian focus. His articles have been published in *Public Culture*, *Cultural Geographies*, *Journal of Architectural Education*, *Journal of Southeast Asian Studies*, *CITY*, and elsewhere. He is also a regular contributor to the *Harvard Design Magazine*.
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Insects, Entomologists, and Parasites on the Move: The Mediterranean Fruit Fly, Biological Pest Control, and Agricultural Governance in Early Twentieth-Century Hawai'i

Jessica Wang

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Agricultural officials in early twentieth century Hawai'i hoped a wide range of tropical and subtropical fruits could become an economic mainstay for the islands. The Mediterranean fruit fly followed the pathways of empire to Hawai'i in 1910, however, where it quickly destroyed ambitions for the mass growing and marketing of avocados, mangoes, citrus, and other fruits vulnerable to fruit fly infestation. In 1913-14, the Territory of Hawaii's Board of Commissioners of Agriculture and Forestry sponsored an entomological expedition to West Africa in order to identify and collect parasites that could be introduced to Hawai'i to control the Mediterranean fruit fly population and defend fruit production in the islands. This paper explores the inter-imperial networks that supported the work of entomologist Filippo Silvestri, as well as the relationships between the territorial government and laypersons that facilitated the introduction of parasite species to the Territory of Hawaii. The attempt to establish a market for fresh Hawaiian fruit, the inadvertent introduction of unwanted insects, and intentional efforts to bring in parasites to control those insects speaks to the biological and ecological relationships that conditioned imperial agriculture and its governance globally during the era of high imperialism in the late nineteenth and early twentieth centuries.

Speaker **Jessica Wang** is Associate Professor of U.S. History at the University of British Columbia, where she works on the historical relationships between knowledge and modern state power in the United States. Her most recent publication is *Mad Dogs and Other New Yorkers: Rabies, Medicine, and Society in an American Metropolis, 1840-1920*, published by Johns Hopkins University Press in October 2019. Wang's other publications include *American Science in an Age of Anxiety: Scientists, Anticommunism, and the Cold War* (1999), as well as articles and essays on the history of cold war American science, science and democratic political theory, social science and New Deal political economy, internationalism and U.S. foreign relations, and social knowledge, state power, and American globalism. Her current research focuses on tropical agriculture and the U.S. insular empire in the early twentieth century.
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Discussant **John Mumford** is Professor of Natural Resource Management in the Centre for Environmental Policy at Imperial College London. At a national level, since 2007 he has chaired the Great Britain Non-native Species Risk Analysis Panel, which oversees all invasive species risk assessment for the three national authorities in Great Britain and is a reviewing body for European invasive species risks. At the European level he has worked on risk modelling and assessment guidance with the European Food Safety Authority. His work in the EU PRATIQUE project led to revisions of the pest risk assessment and management scheme for EPPO, the regional plant protection organisation. At an international level he works extensively in area-wide agricultural and public health pest management, as an expert contributor with FAO, IAEA and WHO projects, and with UK DfID and USAID. He has been a member of IPPC working groups on revisions to international standards in plant health.
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Invasiveness and Large Hydropower Dams in the Mekong River Basin

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Invasive species—also known as introduced species, exotic species and alien species—are amongst today’s most serious environmental challenges. Encyclopedia Britannica defines invasive species as “any nonnative species that significantly modifies or disrupts the ecosystems it colonizes.” However, racialized immigration politics are sometimes associated with rhetoric associated with invasive species, such as with the “Asian Carp” in the Midwest of the United States. At the same time, other domesticated animals and plants originating from elsewhere, such as dogs or blackberry bushes, are conceptualized as fundamentally *belonging*. Infrastructure projects fundamentally alter ecological processes and dependent communities of species, driving similar types of biodiversity losses to those caused by introduced living species. Dams also create conditions under which invasive species can thrive. So, how should we conceptualize invasiveness in a multispecies world, at a time when there is increased interest in thinking about the interactions and agency of animate nonhumans and inanimate nonhumans? Invasiveness is related to entities that don’t belong, and are a threat to other species. In this paper, I theorize about certain types of relationships between human-built infrastructure and various species, both human and nonhuman. Indeed, large hydropower dams can be thought of as introduced inanimate nonhumans that “modify or disrupt the ecosystems colonized.” I draw upon long-term field research on the politics of the environmental and social impacts of large hydropower dams in the Mekong River Basin, and particularly the Khone Falls area in southern Laos, to think about invasiveness. Taking a political ecology approach, I consider the relationship between humans, ecological processes, and animate and inanimate nonhumans. While Ashley Carse has theorized *Nature as Infrastructure*, I explore *Infrastructure as (invasive) Nature*.

Speaker **Ian G. Baird** is Associate Professor of Geography at the University of Wisconsin-Madison. He is also the director of the Center for Southeast Asian Studies and the coordinator of the Hmong Studies Consortium at UW-Madison. His research interests are broad but include political ecology, science and technology studies, political geography, large-scale dam construction in the Mekong River Basin, Mekong fisheries management, large-scale land concession land grabbing in Laos and Cambodia, political contestation in Southeast Asia, and agrarian change in mainland Southeast Asia. He has a particular interest in marginalized peoples, including the ethnic Lao people in northeastern Cambodia, and ethnic Hmong and Brao people. He conducts most of his research in Laos, Thailand and Cambodia. In January 2020, his most recent book, *Rise of the Brao: Ethnic Minorities in Northeastern Cambodia during Vietnamese Occupation*, was published by the University of Wisconsin Press.
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Discussant **Faizah Zakaria** is Assistant Professor of History at Nanyang Technological University, specializing in modern Southeast Asia. She holds a PhD in history from Yale University and an MA in Southeast Asian Studies from NUS. Her book *Spiritual Anthropocene: Ecology of Conversions in Maritime Southeast Asian Uplands* is under contract with University of Washington Press (anticipated publication, 2021).
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When Development Invades a Fishing Community: Impacts on Humans and Habitats

Serina Rahman

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This paper will discuss both human and habitat impacts of multiple developments on a fishing community in the southwest of Johor, Malaysia, much of which entails the reclamation of large islands and other facilities in the narrow Tebrau Strait that lies between Singapore and Malaysia. Extensive coastal development and other land-based issues have also had an impact on this area, which also encompasses two large river estuaries of great biodiversity. The area supports not only megafauna such as dugongs and turtles, but also cryptic endangered species such as the seahorse and many artisanal fishermen who depend on the habitats for their livelihoods. The intertidal mudflats, coastal mangroves and seagrass meadows, along with the rocky shores and soft coral reefs of a nearby tiny island and their inhabitants have suffered numerous impacts from these developments. However, there have been some surprising benefits. The import of sand from the east coast of Johor also brings with it shrimp fry; prawn harvests since development began have boomed. The sand also brought with it a type of bivalve (clam or *Iala*—possibly *Donax faba*) that the local community now harvests and sells at the lowest tides. While little work has been done on the negative impacts of other invasive species that may have come with the sand, these unexpected positives for local livelihoods have been documented. Invasive species also come in the form of migrant workers and contractors from China that are part of every PRC international development package. The impacts of having these foreigners and a foreign development in what used to be a quiet, rustic stretch of rather conservative fishing villages along the coast will be examined.

Speaker

Serina Rahman is currently a Visiting Fellow under the Malaysia Studies Programme at the ISEAS-Yusof Ishak Institute. Her research interests lie in rural and coastal community attitudes and behaviour with regards to religion and ritual, politics, natural habitat use and urbanisation. Her practice is in community empowerment for marine ecosystem preservation and citizen science. She obtained her PhD in Science from Universiti Teknologi MARA and a Masters in Applied Linguistics from the University of Wales, Cardiff. Serina also teaches Malaysian and Southeast Asian Politics part-time at the National University of Singapore. She is the co-founder of Kelab Alami, a community organisation in Mukim Tg Kupang Johor, Malaysia, that works to empower and enable the fishing community in this region to participate in and benefit from urbanisation through citizen science, ecotourism and community research. Serina is an Iskandar Malaysia Social Hero Award Winner for Environmental Protection (2014).
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Discussant

Anthony D. Medrano is Presidential Young Professor of Environmental Studies at Yale-NUS College. He also holds appointments in the Department of Southeast Asian Studies at NUS as well as in the Inter-Asia Engagements Cluster at ARI. Medrano's research examines the history and legacy of human interactions with marine environments in South and Southeast Asia. His book manuscript, *The Edible Ocean: Science, Industry, and the Rise of Urban Southeast Asia*, is under contract with Yale University Press. Prior to joining Yale-NUS College, he was a Ziff Environmental Fellow at Harvard University. His next book project seeks to rethink a history of Southeast Asia in the long twentieth century as a history of alien fishes and biodiversity changes.
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The Gentle Invader: The AMAZEing Story of Asian Tea

Peter C. Perdue

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Most likely, when someone mentions “invasive species”, tea does not come to mind. Current concerns with invasive species focus on threats to ecosystems from the demand for many products, ranging from exotic ones like birds’ nests and sharks’ fins to the cultivation of sugar or rubber, but tea is of course a familiar native Asian crop. But if the term “invasive species” includes any systematic propagation of new crops in areas where it was formerly only grown in the wild, then we can learn from the story of tea production in China and India. Since the Song dynasty, Chinese farmers have moved to hill lands and planted large amounts of the bush *Camilla sinensis* in order to profit from commercial production, and these propagation efforts have drastically transformed the local ecology. Even though the shrub grows natively all over China, consumer preferences for tea from the hills promoted concentration of tea production in particular mountain regions, such as Sichuan, Fujian, and Yunnan. As systematic cultivation spread, it replaced other hill products, and along with the plant came the world’s most invasive species, *Homo sapiens*. Chinese farmers moved into hill country, but often employed non-Han peoples who were indigenous inhabitants of the hills, drawing them into far flung commercial networks. Guided by the conviction that current policies on invasive species need to take advantage of the historical record, this paper will look at how tea production transformed hill mountain ecologies and its consequences for environmental change.

Speaker **Peter C. Perdue** is Professor of History at Yale University. He focuses on East Asian environmental and frontier history. He is the author of *Exhausting the Earth: State and Peasant in Hunan, 1500-1850 A.D.* (Harvard University Press, 1987), *China Marches West: The Qing Conquest of Central Eurasia* (Harvard University Press, 2005), and the co-editor of two books on empires: *Imperial Formations*, (SAR Press, 2007) and *Shared Histories of Modernity: China, India, and the Ottoman Empire*, (Routledge, 2008). He has co-authored *Global Connections: Politics, Exchange, and Social Life in World History* (2015), and *Asia Inside Out*, three volumes on inter-Asian connections (2015-2019). He has just published in Chinese a series of lectures on environmental history, entitled *Environmental History: Its Origins and Prospects* (万物并作：中西方环境史的起源与展望). His current research focuses on Chinese frontiers, Chinese environmental history, and the history of tea.
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Discussant **Liz P.Y. Chee** is a historian, and jointly appointed as Research Fellow at the Asia Research Institute and a Lecturer and Residential Fellow at Tembusu College where she teaches courses in food and animal studies. Her forthcoming book, from Duke University Press, is on the production of animal-based drugs in China during the Mao period. Liz has also published book chapters and articles on the politics of shark fin eating in China’s Republican period, fish liver oil, and China’s Human Proteome Project. Recently, Liz has branched into research on household technology, with an article on the Singapore Cold War kitchen currently under review by the journal *Technology and Culture*.
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Invasives or Allies? The Multispecies Biopolitics of Oil Palm Ecologies in West Papua, Indonesia

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This paper examines the divergent meanings attributed to monocrop oil palm ecologies by indigenous Marind communities in Indonesian West Papua. Drawing from multispecies ethnography and related posthumanist currents, I examine how non-human species destruction, parasitism, and commensalism speak in veiled ways to indigenous Papuans' own experiences of oppression as reluctant subjects of the Indonesian state and its top-down developmental agendas. Many villagers identify with the fate of native species that, like Marind, are being displaced or dispossessed to make way for plantations and their primarily non-Papuan labor force and operators. On the other hand, oil palm parasites that invade plantations and subvert capitalist agendas by undermining oil palm's growth become figures of hope for Marind who conceive resistance to the state and corporations as the only legitimate path to self-determination. Meanwhile, introduced species that entertain commensalistic relations with oil palm point to cooperation as a better survival strategy under hegemonic political and capitalist regimes. The diverse biotic relations that animate oil palm's ecology complicate the characterization of monocrops as anthropogenic landscapes engineered solely by and for humans. Instead, capitalist natures reveal themselves complex realms of interspecies negotiation, collaboration, and friction. The multispecies biopolitics of monocrop ecologies also bring us to interrogate what organisms, invasive or native, benefit from plantation expansion – which lives matter within capitalist nature, and to whom. In turn, species alternately threatened by, threatening to, or thriving with oil palm, come to act as conflicting exemplars of the fates and futures of Marind themselves as they struggle to reconcile aspirations for survival and self-determination under entrenched and emergent regimes of color and capital.

Speaker **Sophie Chao** is Postdoctoral Research Associate at the University of Sydney's School of Philosophical and Historical Inquiry and the Charles Perkins Centre. She holds a Bachelor of Arts in Oriental Studies and a Master of Science in Social Anthropology from The University of Oxford. Her PhD at Macquarie University was funded by an International Endeavour Scholarship and received a Vice-Chancellor's Commendation in 2019. Sophie's research explores the intersections of capitalism, ecology, and indigeneity in Indonesia, with a specific focus on changing interspecies relations in the context of deforestation and agribusiness development. Sophie previously worked with indigenous rights organization Forest Peoples Programme and has published extensively on human rights and the palm oil sector in Southeast Asia. Her academic research has appeared in *Cultural Anthropology* (2018), *Environmental Humanities* (2018), *Ethnos* (2019), and *Oceania* (2019). For more information, please visit www.morethanhumanworlds.com.
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Discussant **Shi Lin Loh** (Lin) is Assistant Professor in the Department of History at the National University of Singapore, who specializes in modern Japanese history and the social studies of science, technology and medicine. After completing compulsory education in her native Singapore, she pursued her higher education at Harvard University in the program on history and East Asian Studies, with a secondary field in science, technology and society. She has conducted archival and field work in Japan on the history of radiation science and technology, as well as on the emergency medical response to the radiation crisis in Fukushima. In addition to extant publications on those topics in *Social Studies of Science* and *EASTS*, she is currently preparing a book manuscript on the social and cultural history of X-rays in Japan before Hiroshima, as well as a new project on the environmental history of palm oil between Japan and Southeast Asia.
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Toolkit for Ecosystem Service Site-Based Assessment (TESSA): A Potential Tool for Measuring the Impact of Invasive Alien Species on Ecosystem Services

Kelvin Peh

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Sites that are important for biodiversity conservation can also provide significant benefits (i.e. ecosystem services) to people. Decision-makers need to know how the presence of invasive alien species (IAS) in a site, would affect the delivery of services and the distribution of any benefits among stakeholders. However, there are relatively few empirical studies that present this information. One reason is the lack of appropriate methods and tools for ecosystem service assessment that do not require substantial resources or specialist technical knowledge, or rely heavily upon existing data. Here we address this gap by describing the Toolkit for Ecosystem Service Site-based Assessment (TESSA). It could guide local non-specialists through a selection of relatively accessible methods for identifying which ecosystem services may be important at a site, and for evaluating the magnitude of benefits that people obtain from them currently, compared with those expected under alternative state with the presence of IAS. The toolkit recommends use of existing data where appropriate and places emphasis on enabling users to collect new field data at relatively low cost and effort. By using TESSA, the users could also gain valuable information about the impact of IAS; and data collected in the field could be incorporated into regular monitoring programmes.

Speaker **Kelvin Peh** interests range from forest ecology to urban wildlife in respect to diversity and distribution. He is interested in all areas of wildlife-human conflict and wildlife ecology in human-dominated landscapes, and in the application of his research results to the conservation/management of biological resources. He also has a strong interest in topics such as invasive alien species and environmental governance. He is best known for his leading role in the development of TESSA (Toolkit for Ecosystem Service Site-based Assessment; <http://tessa.tools/>). He is currently working on the ecosystem service assessment project, which develops and tests novel tools for rapidly assessing the net impact of site-based conservation on the provision of ecosystem services. This project runs in collaboration with the University of Cambridge, the Royal Society for the Protection of Birds, BirdLife International, Tropical Biology Association, Anglia Ruskin University and UNEP-World Conservation Monitoring Centre.
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Discussant **Hallam Stevens** is Associate Professor of History at the School of Humanities at Nanyang Technological University (NTU) and Associate Director of the NTU Institute of Science and Technology for Humanity. He is the author of *Life out of sequence: a data-driven history of bioinformatics* (Chicago 2013), *Biotechnology and Society: An Introduction* (Chicago 2016) and the co-editor of *Postgenomics: Perspectives on Biology after the Genome* (Duke 2015). He is currently working on a book about the rise of the life sciences in China.
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The Wild and Rewilding: Asian Elephants and the Rhetoric of Invasion

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Translocation—the practice of relocating animals for the purposes of conservation—has recently blended into the “rewilding” movement, which aims to restore an area of land into its past uncultivated state. A plan arising from this blending seeks to transplant endangered megafauna, namely, the Asian elephant, into rewilded territory in the US and Europe where they could theoretically breed and roam free. Such approaches are controversial, with opponents viewing such translocated elephants as invasive species while proponents emphasize that the elephant is a natural descendent of extinct mammoths once native to the region. This discourse points towards a larger debate: When are species perceived as invasive? How porous are the categories of invasive and non-invasive?

This paper addresses these questions by tracing how the Asian elephant became entangled in the rhetoric of invasion over the course of the twentieth century. Focusing on former British colonies, the Malayan peninsula and Burma, it highlights colonial roots of invasive metaphors that were used to justify hunting and policing of wild megafauna that came into conflict with agriculturalists. This discourse rhetorically alienated the elephant from their native surroundings, enabling the translocation of elephants from areas slated for development to bounded reservations within the state in the post-colonial period. With greater global investment in restoring wilderness at the close of the century, however, there grew to be greater interest in naturalizing the elephant outside their local environments. Seen in the context of this history, rewilding initiatives underscore that “invasive species” are defined not just through ecological fitness but also through social constructions of wilderness.

Speaker **Faizah Zakaria** is Assistant Professor of History at Nanyang Technological University, specializing in modern Southeast Asia. She holds a PhD in history from Yale University and an MA in Southeast Asian Studies from NUS. Her book *Spiritual Anthropocene: Ecology of Conversions in Maritime Southeast Asian Uplands* is under contract with University of Washington Press (anticipated publication, 2021).
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Discussant **Joshua Comaroff** was born in Manchester, UK, and raised in Chicago. Dr Comaroff studied literature and creative writing at Amherst College before joining the Master of Architecture and Master of Landscape Architecture programmes at Harvard University Graduate School of Design, where he worked as part of Rem Koolhaas' Harvard Project on the City. In 2009, he completed a PhD in cultural geography at University of California Los Angeles (UCLA), writing on the subject of haunted landscapes and urban memory in Singapore. He has published writing about architecture, urbanism, and politics, with an Asian focus. His articles have been published in *Public Culture*, *Cultural Geographies*, *Journal of Architectural Education*, *Journal of Southeast Asian Studies*, *CITY*, and elsewhere. He is also a regular contributor to the *Harvard Design Magazine*.
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ABOUT THE ORGANISERS & CHAIRPERSONS

Anthony D. Medrano is Presidential Young Professor of Environmental Studies at Yale-NUS College. He also holds appointments in the Department of Southeast Asian Studies at NUS as well as in the Inter-Asia Engagements Cluster at ARI. Medrano's research examines the history and legacy of human interactions with marine environments in South and Southeast Asia. His book manuscript, *The Edible Ocean: Science, Industry, and the Rise of Urban Southeast Asia*, is under contract with Yale University Press. Prior to joining Yale-NUS College, he was a Ziff Environmental Fellow at Harvard University. His next book project seeks to rethink a history of Southeast Asia in the long twentieth century as a history of alien fishes and biodiversity changes.

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Eunice Tan is Assistant Professor of Science (Environmental Studies) at Yale-NUS College. She graduated with a Life Sciences degree from the National University of Singapore. Her honours project involved studying the paternity of highland moss using microsatellite markers. The project sparked her love for field biology and her Masters' research studied the functional significance of web decorations of orb-weaving spiders in Yunnan, China and Singapore. For her doctoral research at the University of Melbourne, she examined the evolution of colour patterns in Australian chrysomeline leaf beetles using a combination of phylogenetic comparative analyses and field experiments. During her postdoctoral fellowship at Yale-NUS College, Dr Tan examined the function of butterfly colour patterns and the genes involved in butterfly courtship behaviour.

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Naoko Shimazu is Professor of Humanities (History) and Associate Dean of Faculty at Yale-NUS College, and Professor at the Asia Research Institute, National University of Singapore. Her current major work is a monograph, *Diplomacy as Theatre: The Bandung Conference and the Making of the Third World*. She has published widely on the cultural history of global diplomacy, notably in *Diplomatica*, *Modern Asian Studies* and *Political Geography*. Her major publications include *Imagining Japan in Post-war East Asia* (co-editor, Routledge, 2013), *Japanese Society at War: Death, Memory and the Russo-Japanese War* (Cambridge University Press, 2009), *Nationalisms in Japan* (editor, Routledge, 2006), *Japan, Race and Equality: Racial Equality Proposal of 1919* (Routledge, 1998).

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Serina Rahman is currently a Visiting Fellow under the Malaysia Studies Programme at the ISEAS-Yusof Ishak Institute. Her research interests lie in rural and coastal community attitudes and behaviour with regards to religion and ritual, politics, natural habitat use and urbanisation. Her practice is in community empowerment for marine ecosystem preservation and citizen science. She obtained her PhD in Science from Universiti Teknologi MARA and a Masters in Applied Linguistics from the University of Wales, Cardiff. Serina also teaches Malaysian and Southeast Asian Politics part-time at the National University of Singapore. She is the co-founder of Kelab Alami, a community organisation in Mukim Tg Kupang Johor, Malaysia, that works to empower and enable the fishing community in this region to participate in and benefit from urbanisation through citizen science, ecotourism and community research. Serina is an Iskandar Malaysia Social Hero Award Winner for Environmental Protection (2014).

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Stefan Huebner (Hübner) is an international historian whose work is focused on issues rooted in modern Japan, Asia, and the West. Among the issues he is particularly interested in are the histories of modernization, development, and—post-Fukushima—of global environmental transformations. He was U.S. SSRC Transregional Research Fellow at Harvard University, Fulbright scholar also at Harvard, History and Public Policy Fellow at the Woodrow Wilson International Center for Scholars, and postdoctoral/doctoral fellow at the German Historical Institute Washington, DC and the German Institute for Japanese Studies Tokyo. He received his PhD from Jacobs University Bremen, Germany, in 2015. His current research project is a global history of the colonization and industrialization of the ocean since the early 20th century. He argues that Earth's surface is experiencing an amphibious transformation, since offshore energy transitions, a shift in offshore food production, and the cybernetics-driven offshore expansion of urbanization mean that a rapidly growing number of human-built structures are floating on the surfaces of marine regions and are turning these places into part of the human habitat.

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Tim Bunnell is Professor in the Department of Geography and Director of the Asia Research Institute (ARI) at the National University of Singapore, where he leads the cluster on inter-Asia engagements. The main focus of Tim's research is urban development in Southeast Asia, and that region's global connections. His latest books are *From World City to the World in One City: Liverpool through Malay Lives* (Wiley, 2016), and *Urban Asias: Essays on Futurity Past and Present* (Jovis, 2018—co-edited with Daniel P.S. Goh).

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