



Becoming Europe: Southeast Asia in the Anthropocene

Richard T. Corlett¹*

¹Center for Integrative Conservation, Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, Menglun, Yunnan, China

*corlett@xtbg.org.cn

When I visited the Southeast Asian tropics as an undergraduate in 1973 it seemed as different from my European home as anywhere on Earth could be. The forest was already in retreat, but large contiguous tracts remained virtually intact. Fast-forward 40 years, however, and more than half of the original forest cover of Southeast Asia has gone, more than half of what remains has been logged or otherwise degraded, and the majority, logged or unlogged, has lost most or all of its large vertebrate fauna to hunting (Corlett, 2009). The non-forest areas are increasingly dominated by plantation monocultures, or by urban areas and their associated infrastructure, and most of the native biota is confined to areas with more or less intact forest cover, while a few native species and an increasing number of exotics have massively expanded their populations. Air pollution and nitrogen deposition are pervasive, but unstudied, problems and the impacts of climate change are becoming apparent.

The crop monocultures are trees rather than cereals, but in other ways the region is fast becoming a tropical version of Europe. The densely-populated Philippines and Vietnam have similar human population densities to Belgium and the UK, and relatively sparsely populated Laos to Sweden (Table 1). At the regional scale, Southeast Asia has a somewhat higher mean population density than the European Union (EU) and, since it is still less urbanized, rural population densities are even higher. The per-capita GDPs of the richer countries in Southeast Asia (excluding tiny Singapore and oil-rich Brunei) already overlap with the poorer countries in the EU, and are rising more rapidly. Other statistics are also converging, including infant mortality, life expectancy, and total fertility rates (Table 1). Both regions were once largely forested and their total remaining forest cover is similar today (44% for TEA, 37% for the EU), as is the variation among countries, although nowhere in Southeast Asia has as little forest left as the Netherlands, Ireland and the UK. Both regions have suffered few known extinctions in historical times (iucnredlist.org).

Despite these similarities, Europe is considered a relative success story in conservation terms, while Southeast Asia is widely seen as an on-going biodiversity crisis (Sodhi et al., 2004, 2010; Wilcove et al., 2013). There are good reasons for this. First, there is much more biodiversity at stake in Southeast Asia, which, in well-studied groups, supports 15–25% of global terrestrial species (Corlett, 2009). Europe, by contrast, has considerably fewer species (<5% of the global total) in a similar total land area. Secondly, species in tropical forests are likely to be more vulnerable to extinction, both because high biodiversity means small population sizes, but also because of the extreme contrast between the environment of closed-canopy tropical forests and the anthropogenic habitats that replace them. Few non-coastal native species can survive outside forest in Southeast Asia, while many have adapted to human-dominated landscapes in Europe. Thirdly, the ecological transformation of Southeast Asia has been extremely rapid and the persistence of many species only as tiny, isolated populations implies large extinction debts. Moreover, while European landscapes are now changing relatively slowly, there is no sign of a slowdown in Southeast Asia, implying a future with less forest and fewer species. Finally, Europe is the ecologically best-known region of the planet, while Southeast Asia is still among the least, to the detriment of conservation planning and implementation.

This new tropical landscape calls for a new tropical ecology: one that does not require large tracts of pristine forest, or ‘fragments’ of this forest isolated in a uniformly hostile matrix. An ecology of patches of irregular size, shape, history and composition, of novel ecosystems that combine species which have not previous met, of chronic disturbances and ubiquitous edge effects, of heterogeneity and change. European ecologists have always worked in such landscapes, since they have no others, but the foundations of this new ‘tropical countryside ecology’ have been laid in the most densely populated areas of the Neotropics,

Domain Editor-in-Chief

Donald R. Zak, University of Michigan

Knowledge Domain

Ecology

Article Type

Commentary

Received: September 17, 2013

Accepted: October 31, 2013

Published: December 4, 2013

Table 1. Statistics relevant to biodiversity conservation in Southeast Asia (ASEAN), Europe (EU), and representative countries from the two regions

Country or Region	Population density (km ⁻²) ¹	GDP per capita (PPP) ²	Infant mortality rate (deaths per 1000 births) ¹	Life expectancy at birth (years) ¹	Total fertility rate (children per women) ¹	Forest cover (%) (excluding rubber and oil palm plantations) ³	Percentage of terrestrial and marine area protected ⁴
Year(s)	2010-15	2012	2010-15	2010-15	2010-15	2010	2012
Cambodia	74	2,402	41	72	2.9	57	24
Indonesia	124	4,977	26	71	2.4	50	9
Laos P.D.R.	28	3,011	36	68	3.1	68	17
Malaysia	90	16,922	10	75	2.0	58	14
Myanmar	73	1,405	49	65	2.0	48	6
Philippines	326	4,430	21	69	3.1	26	5
Thailand	128	10,126	10	74	1.4	33	16
Vietnam	268	3,548	14	76	1.8	44	5
ASEAN	135	5,857	24	72	2.3	44	–
Belgium	352	37,883	3	80	1.9	22	24
Bulgaria	69	14,312	9	74	1.5	36	35
Finland	16	36,395	2	81	1.9	73	15
France	100	35,548	3	82	2.0	29	29
Germany	230	39,028	3	81	1.4	32	49
Italy	200	30,136	3	82	1.5	31	21
Netherlands	397	42,194	4	81	1.8	11	31
Poland	122	22,162	6	76	1.4	30	35
Romania	84	12,808	11	74	1.4	29	19
Spain	93	30,557	3	82	1.5	36	25
Sweden	21	41,191	2	83	1.5	69	14
U.K.	252	36,941	4	80	1.9	12	23
EU	115	32,021	4	80	1.6	37	21

¹UN (2013).²World Bank: http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD?order=wbapi_data_value_2012+wbapi_data_value+wbapi_data_value-last&sort=desc.³FAO (2010).⁴Millennium Development Goals Indicators: <http://mdgs.un.org/unsd/mdg/SeriesDetail.aspx?srid=616>.

doi: 10.12952/journal.elementa.000016.t001

including Costa Rica and parts of Brazil (e.g., Mendenhall et al., 2011; Tabarelli et al., 2012; Melo et al., 2013). The new tropical ecologists work at the landscape scale or above, or integrate studies across multiple spatial scales to separate landscape- and patch-level processes (Ewers et al., 2011). New tools are helping to make these approaches practical in the tropics, with high-resolution satellite data facilitating work in areas with poor access, GPS-based radiotelemetry documenting habitat use by animals (Price-Rees et al., 2013), and metabarcoding promising the direct assessment of total biodiversity (Ji et al., 2013). One noticeable trait shared with European ecology is a frequent focus on the ecology of one or a few species, since these can make ecological sense of complex and changing landscapes. The large, more or less uniform, forest plots that have dominated tropical ecology over the last 20 years still produce important data, but studies in them are now increasingly focused on anthropogenic impacts, including hunting (Harrison et al., 2013) and climate change (Clark et al., 2013).

Despite some early optimism that many tropical forest species could persist in human-dominated agricultural landscapes, the evidence increasingly suggests that their continuing persistence as these landscapes age will depend on active conservation management informed by ecological research (Corlett, 2013; Melo et al., 2013). This is another area where Southeast Asia can learn useful lessons from Europe, particularly the need for a top-down, regional approach to conservation prioritization and planning. The major mechanism to protect biodiversity in Europe is the EU's Nature 2000 network of protected areas, which covers 18% of the total land area, selected, top-down, to protect the region's most vulnerable species and habitats (ec.europa.eu/environment/nature/). Southeast Asia could also learn from the variety of landscapes and management systems incorporated into European protected areas, particularly in Indonesia, where logged forest has often been viewed as worthless, yet retains most of the biodiversity of unlogged sites (Gaveau et al., 2013). Other regional initiatives that could usefully be emulated in Southeast Asia include the European Red Lists and the standardization of approaches to invasive alien species. While nobody would suggest that these initiatives are

free of problems (e.g. Jantke et al., 2011; Dullinger et al., 2013; Henle et al., 2013), they provide opportunities for dealing with threats to regional biodiversity in Europe that are not currently available for the similar threats in Southeast Asia.

Emulating this top-down approach will be more challenging in Southeast Asia, however. The EU and its Southeast Asian equivalent, the Association of Southeast Asian Nations (ASEAN), are both intergovernmental organizations of independent states, but the EU is also a supranational entity with enforceable powers, which ASEAN is not. ASEAN's current regional conservation initiatives, such as the Centre for Biodiversity and the Wildlife Enforcement Network (www.aseanbiodiversity.org/), act in support of regional governmental agencies and lack powers of their own. Yet the need for effective supranational monitoring, priority setting, and action is at least as great in Southeast Asia as it is in Europe. Planning conservation solely at the national level not only risks gaps and duplication, but also the displacement of environmental impacts, such as logging and hunting, across borders. The big international NGOs (particularly Worldwide Fund for Nature, Wildlife Conservation Society, Conservation International, and Nature Conservancy) have partly filled this gap, with top-down regional prioritization exercises and the WWF-initiated 'Heart of Borneo' project, which aims to protect a 220,000 km² region shared by three countries, Brunei, Indonesia and Malaysia (Stone, 2007). However, foreign NGOs can only offer advice and some initial funding, and the long-term success of these initiatives depends on governments.

In many ways Southeast Asia has been recapitulating the economic and environmental transformation of Europe: completing in decades a process that took centuries in Europe. But in the last 30 years, Europe has stepped back from the environmental brink, trying to protect species and habitats, while controlling pollution and other impacts. Southeast Asia has not yet done this, but Europe shows how much can be achieved without sacrificing other values. Success in the recovery of a number of iconic large mammal and bird species after decades of conservation effort (Deinet et al., 2013), has spurred ambitious plans for 'rewilding' large areas of Europe: a trend diametrically opposed to what is currently happening in Southeast Asia. As their economies and life-styles continue to converge, however, ASEAN could do worse than adopt the slogan of the European Commission's new Environment Action Programme: "Living well, within the limits of our planet".

References

- Clark DA, Clark DB, Oberbauer SF. 2013. Field-quantified responses of tropical rainforest aboveground productivity to increasing CO₂ and climatic stress, 1997–2009. *Journal of Geophysical Research: Biogeosciences* **118**: 783–794.
- Corlett RT. 2009. *The Ecology of Tropical East Asia*. Oxford, UK: Oxford University Press.
- Corlett RT. 2013. Singapore: half full or half empty? In: Sodhi NS, Gibson L, and Raven PH, eds., *Conservation Biology: Voices from the Tropics*. Oxford, UK: Wiley-Blackwell: pp. 142–147.
- Deinet S, Ieronymidou C, McRae L, Burfield IJ, Foppen RP, Collen B, Böhm M. 2013. *Wildlife Comeback in Europe: The Recovery of Selected Mammal and Bird Species*. London, UK: Zoological Society of London.
- Dullinger S, Essl F, Rabitsch W, Erb K-H, Gingrich S, et al. 2013. Europe's other debt crisis caused by the long legacy of future extinctions. *Proceedings of the National Academy of Sciences of the United States of America* **110**: 7342–7347.
- Ewers RM, Didham RK, Fahrig L, Ferraz G, Hector A, et al. 2011. A large-scale forest fragmentation experiment: the Stability of Altered Forest Ecosystems Project. *Philosophical Transactions of the Royal Society B-Biological Sciences* **366**: 3292–3302.
- FAO. 2010. *Global Forest Resources Assessment 2010*. Rome: Food and Agriculture Organization of the United Nations.
- Gaveau DLA, Kshatriya M, Sheil D, Sloan S, Molidena E, et al. 2013. Reconciling forest conservation and logging in Indonesian Borneo. *PLoS one* **8**: e69887.
- Harrison RD, Tan S, Plotkin JB, Slik F, Detto M, et al. 2013. Consequences of defaunation for a tropical tree community. *Ecology Letters* **16**: 687–694.
- Henle K, Bauch B, Auliya M, Kuelvik M, Pe'er G, et al. 2013. Priorities for biodiversity monitoring in Europe: A review of supranational policies and a novel scheme for integrative prioritization. *Ecological Indicators* **33**: 5–18.
- Jantke K, Schleupner C, Schneider UA. 2011. Gap analysis of European wetland species: priority regions for expanding the Natura 2000 network. *Biodiversity and Conservation* **20**: 581–605.
- Ji Y, Ashton L, Pedley SM, Edwards DP, Tang Y, et al. 2013. Reliable, verifiable and efficient monitoring of biodiversity via metabarcoding. *Ecology Letters* **16**: 1245–1257.
- Melo FPL, Arroyo-Rodriguez V, Fahrig L, Martinez-Ramos M, Tabarelli M. 2013. On the hope for biodiversity-friendly tropical landscapes. *Trends in Ecology & Evolution* **28**: 462–468.
- Mendenhall CD, Sekercioglu CH, Brenes FO, Ehrlich PR, Daily GC. 2011. Predictive model for sustaining biodiversity in tropical countryside. *Proceedings of the National Academy of Sciences of the United States of America* **108**: 16313–16316.
- Price-Rees SJ, Brown GP, Shine R. 2013. Spatial ecology of bluetongue lizards (*Tiliqua* spp.) in the Australian wet-dry tropics. *Austral Ecology* **38**: 493–503.
- Sodhi NS, Koh LP, Brook BW, Ng PKL. 2004. Southeast Asian biodiversity: an impending disaster. *Trends in Ecology & Evolution* **19**: 654–660.
- Sodhi NS, Posa MRC, Lee TM, Bickford D, Koh LP. 2010. The state and conservation of Southeast Asian biodiversity. *Biodiversity and Conservation* **19**: 317–328.
- Stone R. 2007. Last-gasp effort to save Borneo's tropical rainforests. *Science* **317**: 192.
- Tabarelli M, Peres CA, Melo FPL. 2012. The 'few winners and many losers' paradigm revisited: Emerging prospects for tropical forest biodiversity. *Biological Conservation* **155**: 136–140.

UN 2013. *World Population Prospects: The 2012 Revision*. New York: United Nations.

Wilcove DS, Giam X, Edwards DP, Fisher B, Koh LP. 2013. Navjot's nightmare revisited: logging, agriculture, and biodiversity in Southeast Asia. *Trends in Ecology & Evolution* 28: 531–40.

Acknowledgments

I am grateful for comments, suggestions and encouragement from Alice Hughes, Ferry Slik, and two reviewers.

Competing Interests

The author declared that no competing interests exist.

Copyright

© 2013 Corlett. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.