

COMMENT

Tropical Conservation Biology: response to Lugo's tendentious review

Scientific textbooks deserve substantial scrutiny because they generally appeal to a wider audience than technical papers; book reviews in journals are one mode of critiquing a book's scientific content. However, when a review reflects the author's personal biases rather than providing an objective appraisal, it is necessary to respond. We contend that the review by Lugo (2008) of our book *Tropical Conservation Biology* (Sodhi *et al.* 2007) was based on a superficial reading, was at times patronizing, and exhibited poor appreciation of some basic principles and literature in conservation science. Lugo's slanted view unfortunately paints a misleading and unfair picture of our book. Here we briefly refute Lugo's major criticisms (numbers correspond to those in Lugo's review).

- (1) Lugo stated that we consider forestry issues in both negative (deforestation) and positive (income) contexts, but that we did not 'consolidate' our appraisal. The reality is that forestry does provide employment opportunities for local people but must be managed sustainably. This has patently not happened throughout most of the tropics (we dedicated Chapter 1 to quantifying, with multiple lines of evidence, the worldwide trends in massive deforestation; see also Bradshaw *et al.* 2009). Lugo apparently missed sections 1.2.3 on commercial logging (pp. 21–24) and 10.3 on improving logging practices (pp. 252–255).
- (2) Lugo commented that we only considered negative edge effects and did not provide any 'positive' examples. It is undergraduate-level knowledge that edge effects arising from fragmentation, such as higher relative rates of predation and parasitism and microclimatic changes, are the universal norm experienced by sensitive moist tropical forest species. Lugo may have confused this with the notion that edge creation can result in temporary higher species richness (for example owing to the temporary crowding of species into insufficiently sized remnant fragments). The resultant edge communities are inflated by generalist and common predators, scavengers and parasites. Indeed, it is nearly a conservation law that secondary and fragmented forests host depauperate species assemblages relative to intact habitat (for example see Laurance *et al.* 2002; Gardner *et al.* 2007), such that edge effects are nearly always negative for the preservation of the sensitive species. Lugo claimed that edge effects can be positive in riparian areas, yet riparian areas are axiomatically narrow habitat strips (mostly comprising 'edge' habitat), so intuitively most species naturally found there are adapted to cope with these permanent edge-like conditions. Nonetheless, studies show that edge effects even in these naturally linear habitats can suppress sensitive forest species (Stewart & Mallik 2006).
- (3) The claim that our projections of the future fate of tropical biodiversity are based on 'short-term observations' was inaccurate. For example, the habitat-based extinction predictions are based on empirical data from Singapore, where species inventories date back to the 1800s.
- (4) Lugo lamented that 'seasonal, moist and rainforests are used interchangeably', neglecting to mention that on pp. 6–9 we discussed explicitly the loss of different types of forests, and in Chapter 4 (pp. 78–79) described how burning of different types of forests affects biodiversity.
- (5) Lugo's statement that we '...do not recognize a single positive contribution of alien species to the biota' missed important examples we highlighted. For instance, on p. 99: 'Honeybees (*Apis mellifera*), for example, have invaded ecosystems worldwide and they can be effective pollinators in some, but not all, systems... In some cases, invasive pollinators can serve the pollinator role that would otherwise be lost with the decline of native pollinators. In Hawaii, a vine (*Freycinetia arborea*) that was originally pollinated by an extinct bird now survives thanks to introduced Japanese silveryeye (*Zosterops japonica*)...'. We must admit it was difficult to find many positive examples of invasive species because the reality, clearly reflected in the published literature, is that most are negative (Clavero & García-Berthou 2005; Molnar *et al.* 2008).
- (6) By stating that 'The section on climate change confuses CO₂ effects with temperature effects', Lugo demonstrated his misunderstanding of climate science. CO₂ is a major greenhouse gas contributing to global warming (see <http://www.epa.gov/climatechange/>). Its climate forcing impact will cause temperatures to rise and rainfall patterns to change, but it also has a direct effect on marine systems (for example ocean acidification) and plant physiology (for example water balance). All of these impacts of CO₂ are caused ultimately by industrial and land-use carbon emissions, and so it is quite appropriate that they be discussed together within a main chapter on climate change.
- (7) Lugo fretted that we focused on gloom-and-doom scenarios for biodiversity, yet also warned readers

that they are debatable, without detailing alternatives. We intended for readers to make precautionary interpretations of the material and because the book is not meant to be a body of primary research itself, we presented alternatives only when readily quantified (see for example fig. 8.5). Even when discussing extinctions, we pointed out that some species may be able to cope with or flourish under human disturbance (pp. 232–237). However, let us be clear, there are few examples worldwide (especially in the tropics) where a gloomy outlook for endemic species is not warranted (Bradshaw *et al.* 2009).

- (8) We also did mention that the simple species–area relationship depends, in reality, on numerous complicating variables (p. 211), a topic that can be further pursued by interested readers (see Guilhaumon *et al.* 2008 for an overview). Space prevented us from expanding on the mechanics and controversies surrounding species–area equations.

Some of Lugo’s other statements suggest he did not read our text carefully. He claimed that we did not clearly discuss conservation in human-dominated systems, thereby disregarding our section on restoration, reintroductions and urban management (Chapter 10). The feature box on G.C. Daily was included specifically to convey the importance of conservation in human-dominated landscapes. Lugo was patronizing (and plainly wrong) when he assumed we instructed featured scientists to be ‘assertive’ when presenting their credentials. The featured scientists are of such high international standing that they do not need promoting, and moreover, we would not deign to instruct them on how they must compose their biographies.

Lugo asks: ‘does the tropical biota lack capacity to adapt or adjust to environmental change?’ Our research, specifically from South-east Asia, shows that forest species will be heavily impacted by current land-use changes (Peh *et al.* 2005; Soh *et al.* 2006; Sodhi *et al.* 2009). The human population living with in tropical regions may be largely oblivious to biodiversity loss and deforestation (Jepson 2001), so we felt compelled to summarize the state of tropical biodiversity. As to ‘what solutions or alternatives are available to the society beyond an awareness of a problem?’, we respond that existing or even postulated solutions are limited; otherwise, we would not be witnessing ongoing and unprecedented habitat loss in the tropics. The scale of the biodiversity emergency clearly needs a broader degree of awareness-raising if effective broad-scale action is to be accepted. Lugo did not mention that we scoured the literature for realistic conservation and management options (see Chapters 4, 5, 6, 7, 8 and 10).

We hope that Lugo is incorrect in asserting that our book will not be of interest to students, managers and policy makers; indeed, it is the only existing book on the subject to date. But we agree that our book will not interest those who have preconceived or overly optimistic notions about the

relative security of tropical biodiversity in the face of global change. Lugo is well-known for his far-from-mainstream views about conservation (Laurance 2009) and his belief that models over-estimate extinction risk (e.g., Lugo 1993, 1999), even in the face of mounting, convincing evidence to the contrary (Brook *et al.* 2006; Laurance 2007; Brook *et al.* 2008). We therefore ask the reader to judge our book on its merits, and not on the preconceptions of one tendentious reader.

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