COMMENTARY

Testing absolute and percentage thresholds in the identification of key biodiversity areas

G. J. Edgar[1,2] & T. M. Brooks[2,3,4]

1 Tasmanian Aquaculture and Fisheries Institute, University of Tasmania, Hobart, Tas., Australia
2 NatureServe, Arlington, VA, USA
3 ICRAF-the World Agroforestry Center, University of the Philippines Los Baños, Laguna, Philippines
4 Geography and Environmental Studies, University of Tasmania, Hobart, Tas., Australia

Correspondence

G. J. Edgar, Tasmanian Aquaculture and Fisheries Institute, University of Tasmania, GPO Box 252-49, Hobart, Tas 7001, Australia
Email: g.edgar@utas.edu.au

Just as quantitative criteria associated with the IUCN Red List of Threatened Species provide a benchmark of relative species extinction risk, criteria that identify 'key biodiversity areas' (KBAs, Eken et al., 2004) allow consistent recognition of sites with global significance for biodiversity conservation. Clearly, with habitat change ranking as the major threat worldwide (Baillie et al., 2004), site conservation approaches are urgently needed to stem the current extinction crisis (Boyd et al., 2008). This is articulated in the recently agreed 2020 strategic plan for the Conservation of Biological Diversity (http://www.cbd.int/decision/cop/?id = 12268), which sets explicit targets to stop extinction (Target #12) and to protect sites of particular significance for biodiversity (Target #11). Global recognition of sites of high biodiversity value assists managers when planning protected area networks, increases local ownership of and pride in natural heritage, and allows conservation and intergovernmental organizations to direct funding and focus activities at sites where needed most. The identification of KBAs and related critical areas for conservation has accelerated greatly in recent years through initiatives from civil society [e.g. the Alliance for Zero Extinction (http://www.zeroextinction.org)], international collaborations [e.g. the Global Ocean Biodiversity Initiative (http://openoceans deepseas.org)] and the private sector [e.g. the Integrated Biodiversity Assessment Tool (https://www.ibatforbusiness.org)].

The complex task of developing appropriate KBA criteria requires many tradeoffs (Bennun et al., 2007; Knight et al., 2007). First, a scale mismatch exists between the need to develop criteria through top-down decisions in order to allow repeatable assessment of patterns worldwide, and the bottom-up need for criteria to be accepted and applied by local stakeholders who are responsible for on-ground actions. Second, criteria appropriate for one taxon may not be

as appropriate for others, particularly if life-history traits are quite different. Third, quantitative thresholds associated with KBA criteria need to be established such that sites with real importance for global biodiversity conservation are not overlooked but at the same time the number of sites identified is not so excessive that the KBA currency devalues. The challenge of balancing these requirements has been mandated to a taskforce on 'biodiversity and protected areas', convened jointly by the IUCN Species Survival Commission and World Commission on Protected Areas (http://www.iucn.org/biodiversity_and_protected_areas_taskforce).

Bass et al. (2011) have made an important contribution to this process by addressing the second two of these issues through testing application of standard KBA criteria (Langhammer et al., 2007) to Melanesian sites frequented by marine turtles. Whereas KBA criteria have now been widely applied for a range of taxa in terrestrial environments, this new study is among the first to tackle their use in marine ecosystems. If KBA criteria were to be strictly applied as currently conceived, tens of thousands of KBAs for turtles would be recognized – most of them probably of less than global significance. Faced with this problem when identifying KBAs for highly threatened but widely distributed marine iguanas, pinnipeds and turtles in Galapagos, Edgar et al. (2008) proposed modifying the criteria to utilize percentage (perhaps >1% of the global population) rather than absolute population thresholds.

Bass and colleagues tested both absolute and percentage thresholds. They examined four different absolute thresholds (1, 10, 20 and 50 breeding females), finding that no less than 257 populations meet the first of these thresholds (presence only), but that the number of populations meeting the three higher thresholds is both much lower and much more consistent. Indeed, considering Bass and colleagues

table 2, threshold level and number of populations are related by a highly significant negative power function with an exponent of ~ -0.4. Based on this, Bass and colleagues propose defining 'vagrancy' to exclude populations of <10 breeding females, a decision rule which yields 54 Melanesian KBAs for marine turtles in total. They also tested application of a population threshold of 1% at two different geographic scales: regional (the level of 'management units') and global. The former yielded a set of regionally significant KBAs, similar to those identified using the absolute threshold; the latter a much smaller set of 11 globally significant KBAs.

Successful application of KBA criteria to marine turtles – one of the more problematic groups – is extremely encouraging, as it increases the likelihood that quantitative criteria can be established that apply regardless of biome and taxon. Such a universally relevant set of criteria would be ideal, if the criteria remain practical and application does not require idiosyncratic compromises for particular groups. Clearly, more testing of criteria is needed, particularly through application to a much wider range of taxonomic groups. It will be particularly interesting to examine the generality of Bass and colleagues's finding that absolute population thresholds yield identification of regionally significant KBAs, and by extension that a percentage threshold (e.g. 1%) may be more effective in identifying globally significant sites. For the marine biome, this process will be greatly facilitated as a consequence of increased Red List assessments by IUCN Specialist Groups (http://www.iucn. org/about/work/programmes/species/about_ssc/specialist_ groups/directory_specialist_groups) and the Global Marine Species Assessment (http://sci.odu.edu/gmsa), through on-line collation of distributional information in websites such as Fishbase (http://www.fishbase.org), SeaLifeBase (http://www.sealifebase.org), Algaebase (http://www.algaebase.org), Reefbase (http://www.reefbase.org), the Ocean Biogeographic Information System (http://www.iobis.org) and the Global Biodiversity Information Facility (http://www.gbif.org) and through new broad-scale data gathering initiatives such as the Reef Life Survey (http://www.reeflifesurvey.com). In terms of application, data emerging from these processes will identify many more marine KBAs in Melanesia – surely including many which hold populations of marine turtles not meeting the thresholds proposed by Bass and colleagues.

Bass and colleagues conclude by emphasizing the need for action using best data currently available, rather than waiting for the 'ideal' set of information. We heartily concur: an enormous amount can be done with available data, providing a blueprint for systematic site planning to safeguard populations of threatened species in marine jurisdictions.

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