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EDITORIAL

Linking biodiversity and ecosystem service science to societal actors

In this Editorial to Issue 12–3 (2016) of *International Journal of Biodiversity, Ecosystem Services & Management (IJBESM)*, we introduce this Issue's articles, which can be of relevance to a wide range of stakeholders, such as local and (inter)national decision-makers, large international firms, farmers, fishery managers and protected area managers. We discuss how various stakeholders could use the findings and, if applicable, how researchers can optimise dissemination and utilisation of their findings. Finally, we welcome a new Editorial Board member and look ahead at the publication of a Special Issue that will address the use of ecosystem services in planning at different scales.

Globally relevant yet understudied ecosystem services

In this Issue, Harrison-Atlas et al. (2016) describe a review on the context of freshwater management and decision-making and on how research methods of hydrological ecosystem services actually align with selected key criteria. Decision-makers are increasingly making use of tools and information relating to hydrological ecosystem services, such as water supply, flood mitigation, erosion prevention and water purification (Harrison et al. 2010; Green et al. 2015). Harrison-Atlas et al. (2016) evaluated 49 case studies published within the last decade and documented approaches for mapping and quantifying hydrological ecosystem services and classifying the decision context using multiple criteria for credibility, legitimacy and saliency. Particularly, credible research approaches were encountered in studies with advanced operational phases (planning and management). Legitimacy was highest in the planning phase and when stakeholder involvement increased due to landscape-scale management. Salient information was provided when common ecosystem service tools like trade-off and scenario analysis were conducted during the planning phase (Harrison-Atlas et al. 2016). The authors propose to evaluate consistently how standards for scientific research vary throughout stages of the policy process (e.g. assessment, planning and management phases). Such a framework can assist researchers, practitioners and decision-makers to identify goals, formulate relevant questions and select informative approaches for quantifying and assessing hydrological ecosystem services as well as ecosystem services in general.

Of slight concern is that Harrison-Atlas et al. (2016) found methods to be rarely described in sufficient detail to permit independent replication, especially when referring to data sources and validation procedures. The authors provide several important suggestions to researchers in order to optimise utility of their findings by decision-makers. These include: (1) increase the publication of management-oriented studies, to provide a robust scientific basis to guide land-use decisions; (2) identify the actors and areas that benefit from each ecosystem service; (3) relate the methodological choices and research questions to decision-making as much as possible, allowing for replication and elucidating why particular methods were preferred and which uncertainties are present.

The ecosystem service category 'life-cycle maintenance', i.e. providing a nursery habitat for juvenile or migratory species, is another crucially important yet understudied and underappreciated ecosystem service (Whitfield & Patrick 2015; Lique et al. 2016). Demonstrating the benefits of coastal and marine habitats to society can provide additional arguments for protecting these vulnerable and often biodiversity-rich habitats. However, the importance of the nursery habitat service has rarely been accounted for in coastal and marine management. From a scientific point of view, inconsistent definitions and operationalisation of the nursery habitat service contribute to this limited uptake, as well as the fact that few studies have managed to quantify the actual service (Sheridan & Hays 2003; Van Oudenhoven et al. 2015). Quantification requires large amounts of consistently collected data, collected often in unforgiving environments and in collaboration with local fishers. In this Issue, we present a study by Kent et al. (2016) that has done such an elaborate quantification in the North-East Atlantic.

Kent et al. (2016) report on a study conducted in horse mussel (*Modiolus modiolus* (L.)) reefs, a 'Priority Marine Habitat' in the North-East Atlantic. The researchers worked together with local fishers and examined the abundance and demographics of commercially important whelks (*Buccinum undatum*). They found whelk catches to be three times higher on reef sites as compared to off-reef habitats and a greater number of smaller individuals were also caught on the reefs. Therefore, it could be argued that these reef sites provide nursery habitat because evidence is provided of juvenile individuals maturing into adults due to shelter and food

provided as well as on the higher abundance of individual whelks as compared to off-reef habitats. Both measures are commonly accepted albeit poorly quantified indicators of the nursery habitat ecosystem service (Sheridan & Hays 2003; Van Oudenhoven et al. 2015). In addition, Kent et al. (2016) demonstrate the 'Essential Fish Habitat' (EFH) value of these now rare *M. modiolus* reefs to decision-makers and fishers. The whelk fishery is of high importance for the Welsh economy, as it is the second-most valuable shellfishery in recent years. Although whelk fishing occurs throughout the UK, coastal managers have not yet made the link between fisheries productivity and horse mussel reef habitats. As discussed by Kent et al. (2016), horse mussel reefs are still being discovered and should be recognised in emerging coastal and marine conservation plans.

Identifying and conserving biodiversity-rich areas

Eken et al. (2016) report on a study that applied the Key Biodiversity Area (KBA) methodology on a national scale in Turkey. The KBA method is an increasingly used method to identify biodiversity-rich areas in a standardised manner (Eken et al. 2004). KBAs are sites of global importance for biodiversity conservation and their selection occurs through a bottom-up, iterative process (Edgar et al. 2008). The study shows that Turkey's KBAs are particularly important for plants and freshwater fish, due to their high rate of endemism in the small and closed basins of Anatolia. Furthermore, rivers and other freshwater habitats were found to be the most threatened habitats within KBAs in Turkey, because of extensive damming, irrigation and drainage projects. For instance, irrigation and drainage projects would affect 225 KBAs and dams in at least 185 sites. Moreover, Eken et al. (2016) conclude that most KBAs in Turkey are inadequately protected and that currently protected areas insufficiently represent Turkey's biodiversity, with especially the steppic habitats, river valleys and Mediterranean scrublands missing in current policies. Although there seems to be a long way to go towards align conservation plans with spatial development and hydrological planning, the authors emphasise that KBAs offer attractive possibilities for demonstrating ecologically responsible governance, thereby building on scientific and indigenous knowledge. Apart from Turkey, the findings and reflections of Eken et al. (2016) can be of global significance, considering ongoing efforts to make KBAs work elsewhere, such as in China (Zhang et al. 2016) and the Philippines (Mallari et al. 2016). The framework can potentially be applied globally and is robust enough that they can be applied across multiple taxonomic groups and ecosystems as well. This

is illustrated by the fact that the International Union for Conservation of Nature World Commission on Protected Areas and Species Survival Commission Joint Task Force on Biodiversity and Protected Areas recently also adopted the KBA method as a framework for global site selection standard. Although there is a long way to go, a global KBA network might play an important role towards protecting global biodiversity as well as the indigenous knowledge thereof.

Biodiversity also plays a crucial role on smaller spatial scales, i.e. in home gardens and subsistence farms (Idohou et al. 2014). Mwavu et al. (2016) assessed agrobiodiversity in more than 100 home gardens as well as their contributions to rural household livelihoods in eastern Uganda. Understanding these contributions is crucially important to local people as well as plantation managers, because most home gardens are nowadays embedded in commercial monoculture sugarcane plantation (Obayelu et al. 2015). Agrobiodiversity in home gardens underpins food provision, income generation and domestic biomass energy needs. Mwavu et al. (2016) found that bananas and coffee are the major sources of food and income but also that agrobiodiversity is generally decreasing. Traditional food crops, such as cowpeas, soya beans, finger millet and cotton have been almost entirely lost or abandoned by households. This loss could be attributed to ever increasing commercial monoculture sugarcane cultivation, which has claimed land that would otherwise be used for indigenous crops cultivation (Mwavu et al. 2016). Finally, the authors stress the need to adopt agroforestry practices to support biodiversity conservation in home gardens and surrounding farmed landscapes.

Human-wildlife conflicts: reconciling biodiversity conservation and livelihoods

Two papers in this Issue describe the conflicts that could arise from, on the one hand, protecting large and charismatic animals from a global biodiversity conservation and eco-tourism perspective and, on the other hand, ensuring a safe environment and sustained livelihoods for people dwelling adjacent to or within protected areas. Lyamuya et al. (2016) describe and analyse carnivore-livestock conflicts in Tanzania, whereas Mutanga et al. (2016) compare attitudes towards biodiversity conservation of protected area staff and (other) local community members in Zimbabwe.

Livestock owners retaliating livestock predation has been a major obstacle for conserving large carnivore species, particularly in the Serengeti ecosystem. As reported by Lyamuya et al. (2016), losses have been reported due to, for instance, lion (*Panthera leo*), leopard (*Panthera pardus*), spotted hyenas (*Crocuta crocuta*) and African wild dogs (*Lycaon pictus*) in the

eastern Serengeti (northern Tanzania). The authors investigated herding efficiency of pastoralists facing livestock depredation in the Loliondo Game Controlled Area, specifically aiming to identify specific herding practices that may aid in reducing the likelihood of predation. Data were obtained through semi-structured questionnaires and extensive field visits and observations. Lyamuya et al. (2016) found that 50% of the observed livestock herds had been attacked by carnivores, despite the presence of herders. When looking in more detail at the problem, it was found that adult male herders are more efficient in caring for livestock than females due to having received training that involved fighting dangerous wild animals. The role of gender in livestock and agricultural management has been noted by many researchers (e.g. Idohou et al. 2014), but is still often overlooked in local decision-making. Lyamuya et al. (2016) stress the importance of this finding due to the likelihood of female herders passing their negative attitudes towards large carnivores to their families. In general, herders who were equipped with bush knives and spears suffered the fewest attacks on their herd, although the use of such equipment did not differ between gender or age class. However, in most cases herds were too large to oversee for one herder, which suggests increasing the number of trained and equipment-carrying herders per herd might be a good option. Finally, herders of tribes living closer to the park boundaries (Maasai) reported more attacks from wild carnivores than those living further away (Sonjo tribe), which suggests the importance of considering locality and distance from park boundaries in terms of livestock management and spatial planning.

Observed and perceived changes in benefits to local communities are also at the core of the issue studied by Mutanga et al. (2016) in protected areas in Zimbabwe. Interestingly, most state-protected areas used to be inhabited or used by people who were then displaced upon park establishment. Suddenly, crucial resources for survival could sometimes only be found in now protected areas, which forms the basis for a conflict between local people's wish for direct exploitation of natural resources and protected area's management for the sake of biodiversity conservation and eco-tourism. Community involvement and support for natural resources conservation has often been suggested as a prerequisite for the long-term sustainability of protected areas. However, Mutanga et al. (2016) found that communities perceived their relationship with protected area staff as negative while protected area staff generally perceived a positive relationship with local communities. Differences in levels of trust for each other can be attributed to different values and understanding of conservation issues, as well as the fact that not all protected area staff were local people.

Forced relocation in the past naturally still marks current generations. Mutanga et al. (2016) suggest that history cannot be changed, but communities could benefit through compensation and co-benefit schemes for instance by allocating tourism revenues to communities or offering increased employment opportunities. Other recommendations provided by the authors included capacity building of local communities to ensure potential future benefits such as improved employability in higher paying jobs, starting tourism ventures and more effectively managing natural resources. Finally, enhancing community participation in conservation is suggested as a means to reduce the prevalence of illegal activities, such as illegal hunting and livestock grazing in the protected areas.

How are businesses enhancing biodiversity conservation?

Finally in this Issue, Potdar et al. (2016) evaluated the performance of business organisations in reporting the biodiversity-related environmental performance indicators. As reported before in *IJBESM*, businesses are increasingly looking to invest in biodiversity conservation or to contribute in other forms (Lambooy & Levashova 2011; Bhattacharya & Managi 2012). Although several reporting frameworks are available for companies, the Global Reporting Initiative (GRI) is the most dominant framework used. Interestingly, this voluntary reporting initiative is being improved continuously through multi-stakeholder initiatives and can be used by organisations of any size, sector or location. Potdar et al. (2016) assessed 101 randomly selected companies on their reporting of environment performance indicators related to biodiversity. Without singling out individual companies (for that we refer to the actual article), the maximum rating was obtained by just 13% of the reporting companies. However, most of the sampled companies (82%) reported the indicator that requests companies to describe the 'significant impacts of their activities, products and services on biodiversity in protected areas and areas of high biodiversity value outside protected areas'. In addition, whereas 34 European companies were found to report on biodiversity indicators, only 33 companies from Asia, Africa, Oceania, North America and Latin America collectively were found to do so.

Potdar et al. (2016) acknowledge that governments and non-governmental organisations alone cannot contribute to halting biodiversity loss. Getting businesses on board will be crucial for future global biodiversity conservation and it can work, as was shown in New Zealand by Greenhalgh and Hart (2015). Emerging markets for companies willing to invest in biodiversity and ecosystem services include (1) sustainable forestry; (2) ecotourism; (3) carbon sequestration through forestry, agricultural projects and REDD (Reducing Emissions

through Deforestation and Forest Degradation); (4) watershed management and (5) nature conservation and restoration. Potdar et al. (2016) state that companies are increasingly taking proactive steps for biodiversity conservation. An example is the increased formation of international alliances between companies and NGOs. Such multi-stakeholder initiatives are, ironically, usually formed by the major oil and mining organisations who, thus, play a vital role in conserving biodiversity through these partnerships.

New Editorial Board member and upcoming Special Issue on spatial planning and ecosystem services

As already highlighted in a previous Editorial to Issue 11–4 (Schröter et al. 2015), *IJBESM* is particularly aiming to publish findings with relevance for decision-making and management. Many of our recently published and well-received papers do indeed focus on how to make biodiversity conservation and management work, while at the same time ensuring sustained ecosystem services provision (e.g. Blicharska and Grandin 2015; García-Márquez et al. 2016; Löf et al. 2016).

In this light, *IJBESM* welcomes Davide Geneletti to the Editorial Board. He has vast experience in the field of ecosystem services in relation to spatial and urban planning (e.g. Geneletti 2011), and tools such as environmental impact assessment and multi-criteria analysis. Davide Geneletti is Associate Professor on Planning for Ecosystem Services at the Department of Civil, Environmental and Mechanical Engineering, University of Trento. In addition, he is currently involved in the coordination of a Special Issue to be published in *IJBESM* (early 2017), together with Sandra Luque (IRSTEA, France and University of St Andrews, UK), Christine Fürst (Karlsruhe Institute of Technology) and Guillermo Martínez Pastur (CADIC CONICET, Argentina).

The Special Issue will be entitled ‘Ecosystem services supporting integrative natural resource management’ and is based on output of two symposia organised within the framework of International Association for Landscape Ecology (IALE) & International Union of Forest Research Organizations (IUFRO). These symposia addressed the use of ecosystem services in planning at different scales, thereby focusing on different sectors but in particular integrative forest management. Inputs from members of the ‘forest cluster’ of the EU-OpenNess project (<http://www.openness-project.eu/>) were also considered during those two symposia.

Disclosure statement

No potential conflict of interest was reported by the authors.

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References

- Bhattacharya TR, Managi S. 2012. Contributions of the private sector to global biodiversity protection: case study of the Fortune 500 companies. *Int J Biodivers Sci Manage.* 9:65–86.
- Blicharska M, Grandin U. 2015. Why protect biodiversity? Perspectives of conservation professionals in Poland. *Int J Biodivers Sci Manage.* 11:349–362.
- Edgar GJ, Langhammer PF, Allen G, Brooks TM, Brodie J, Crosse W, De Silva N, Fishpool LDC, Foster MN, Knox DH, et al. 2008. Key biodiversity areas as globally significant target sites for the conservation of marine biological diversity. *Aquat Conserv.* 18:969–983.
- Eken G, Bennun L, Brooks TM, Darwall W, Fishpool LINCOLNDC, Foster M, Knox D, Langhammer P, Matiku P, Radford E, et al. 2004. Key biodiversity areas as site conservation targets. *Bioscience.* 54:1110–1118.
- Eken G, Isfendiyaroglu S, Yeniuyurt C, Erkol IL, Karataş A, Ataol M. 2016. Identifying key biodiversity areas in Turkey: a multi-taxon approach. *Int J Biodivers Sci Manage.* 12:181–190.
- García-Márquez J, Krueger T, Páez CA, Ruiz-Agudelo CR, Bejarano P, Muto T, Arjona F. 2016. Effectiveness of conservation areas for protecting biodiversity and ecosystem services: a multi-criteria approach. *Int J Biodivers Sci Manage.* doi:10.1080/21513732.2016.1200672
- Geneletti D. 2011. Reasons and options for integrating ecosystem services in strategic environmental assessment of spatial planning. *Int J Biodivers Sci Manage.* 7:143–149.
- Green PA, Vörösmarty CJ, Harrison I, Farrell T, Sáenz L, Fekete BM. 2015. Freshwater ecosystem services supporting humans: pivoting from water crisis to water solutions. *Glob Environ Change.* 34:108–118.
- Greenhalgh S, Hart G. 2015. Mainstreaming ecosystem services into policy and decision-making: lessons from New Zealand’s journey. *Int J Biodivers Sci Manage.* 11:205–215.
- Harrison P, Vandewalle M, Sykes M, Berry PM, Bugter R, De Bello F, Feld CK, Grandin U, Harrington R, Haslett JR, et al. 2010. Identifying and prioritising services in European terrestrial and freshwater ecosystems. *Biodivers Conserv.* 19:2791–2821.
- Harrison-Atlas D, Theobald DM, Goldstein JH. 2016. A systematic review of approaches to quantify hydrologic ecosystem services to inform decision-making. *Int J Biodivers Sci Manage.* 12:160–171.
- Idohou R, Fandohan B, Salako VK, Kassa B, Gbèdomon RC, Yédomonhan H, Glèlè Kakai RL, Assogbadjo AE. 2014. Biodiversity conservation in home gardens:

- traditional knowledge, use patterns and implications for management. *Int J Biodivers Sci Manage.* 10:89–100.
- Kent FEA, Gray MJ, Last KS, Sanderson WG. 2016. Horse mussel reef ecosystem services: evidence for a whelk nursery habitat supporting a shellfishery. *Int J Biodivers Sci Manage.* 12:172–180.
- Lambooy T, Levashova Y. 2011. Opportunities and challenges for private sector entrepreneurship and investment in biodiversity, ecosystem services and nature conservation. *Int J Biodivers Sci Manage.* 7:301–318.
- Liquete C, Cid N, Lanzanova D, Grizzetti B, Reynaud A. 2016. Perspectives on the link between ecosystem services and biodiversity: the assessment of the nursery function. *Ecol Ind.* 63:249–257.
- Löf M, Brunet J, Filyushkina A, Lindbladh M, Skovsgaard JP, Felton A. 2016. Management of oak forests: striking a balance between timber production, biodiversity and cultural services. *Int J Biodivers Sci Manage.* 12:59–73.
- Lyamuya RD, Masenga EH, Fyumagwa RD, Mwitwa MN, Røskaft E. 2016. Pastoralist herding efficiency in dealing with carnivore-livestock conflicts in the eastern Serengeti, Tanzania. *Int J Biodivers Sci Manage.* 12:202–211.
- Mallari NAD, Collar NJ, McGowan PJK, Marsden SJ. 2016. Philippine protected areas are not meeting the biodiversity coverage and management effectiveness requirements of Aichi Target 11. *Ambio.* 45:313–322.
- Mutanga CN, Muboko N, Gandiwa E, Vengesayi S. 2016. Beyond a single perspective to conservation relationships: exploring factors influencing protected area staff and local community relationships in Zimbabwe. *Int J Biodivers Sci Manage.* 12:212–226.
- Mwavu EN, Ariango E, Ssegawa P, Kalema VN, Bateganya F, Waiswa D, Byakagaba P. 2016. Agrobiodiversity of homegardens in a commercial sugarcane cultivation land matrix in Uganda. *Int J Biodivers Sci Manage.* 12:191–201.
- Obayelu OA, Akintunde OO, Obayelu AE. 2015. Determinants of on-farm cassava biodiversity in Ogun State, Nigeria. *Int J Biodivers Sci Manage.* 11:298–308.
- Potdar A, Gautam R, Singh A, Unnikrishnan S, Naik N. 2016. Business reporting on biodiversity and enhancement of conservation initiatives. *Int J Biodivers Sci Manage.* 12:227–236.
- Schröter M, van Oudenhoven APE, de Groot R. 2015. The management relevance of biodiversity science: recommendations for conservation. *Int J Biodivers Sci Manage.* 11:283–285.
- Sheridan P, Hays C. 2003. Are mangroves nursery habitat for transient fishes and decapods? *Wetlands.* 23:449–458.
- Van Oudenhoven APE, Siahainenia AJ, Sualia I, Tonnejck FH, Van Der Ploeg S, De Groot RS, Alkemade R, Leemans R. 2015. Effects of different management regimes on mangrove ecosystem services in Java, Indonesia. *Ocean Coast Manag.* 116:353–367.
- Whitfield AK, Pattrick P. 2015. Habitat type and nursery function for coastal marine fish species, with emphasis on the Eastern Cape region, South Africa. *Estuar Coast Shelf Sci.* 160:49–59.
- Zhang Y-B, Wang Y-Z, Phillips N, Ma K-P, Li J-S, Wang W. 2016. Integrated maps of biodiversity in the Qinling Mountains of China for expanding protected areas. *Biol Conserv.*