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Trends in forest condition, threats and conservation action as derived from participatory monitoring in coastal Kenya

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Abstract

The coastal forests of Kenya are conservation priorities hosting high levels of biodiversity. Monitoring of biodiversity in these forests is therefore necessary to understand and reverse negative trends in good time. Using the Important Bird Area (IBA) monitoring framework, a participatory approach, state (habitat condition), pressure (threats) and response (conservation action) indicators of twelve coastal Kenya forest IBAs were assessed from 2004 to 2011. Trends for these indicators were assessed at six sites for which sufficient data existed: Arabuko-Sokoke, Dakatcha Woodlands, Gede Ruins, Lower Tana River, Shimba Hills and Taita Hills, and baselines were described for remaining six. Changes were always small, but state deteriorated in Gede, Lower Tana and Shimba Hills, remained the same (unfavourable) in Arabuko-Sokoke and Dakatcha, and improved in Taita Hills. Pressure reduced in Arabuko-Sokoke, Dakatcha and Taita Hills, deteriorated in Lower Tana and Shimba Hills and remained the same (medium) in Gede. Response improved in Dakatcha, remained the same (medium) in Shimba Hills, and deteriorated in the rest. As there was an apparent overall deterioration in the forests assessed, improved management of the protected sites and increased conservation action through community engagement around protected areas and within the nonprotected IBAs are recommended.

Key words: biodiversity, forest, Kenya, monitoring, participatory

Résumé

Les forêts côtières du Kenya jouissent d'une biodiversité considérable qui en fait des priorités en matière de conservation. Il est dès lors nécessaire d'assurer le suivi de la biodiversité dans ces forêts pour comprendre, voire inverser en temps utile les tendances négatives. En utilisant le cadre de suivi des Zones importantes pour la conservation des oiseaux (ZICO) qui est une approche participative, les indicateurs d'état (conditions de l'habitat), de pression (menaces) et de réponse (mesure de conservation) ont été évalués de 2004 à 2011 pour 12 ZICO de forêts côtières du Kenya. Les tendances de ces indicateurs ont été évaluées sur six sites pour lesquels il y avait suffisamment de données: Arabuko-Sokoke, Dakatcha Woodlands, Ruines de Gedi, Lower Tana River, Shimba Hills et Taita Hills, et des bases de référence ont été décrites pour les six autres. Les changements étaient toujours légers mais l'état s'est détérioré à Gedi, Lower Tana et Shimba Hills, il est resté le même (défavorable) à Arabuko-Sokoke et à Dakatcha et il s'est amélioré à Taita Hills. La pression s'est réduite à Arabuko-Sokoke, Dakatcha et Taita Hills, s'est accentuée à Lower Tana et Shimba Hills et est restée stable (moyenne) à Gedi. La réponse s'est améliorée à Dakatcha, est restée la même (moyenne) dans les Shimba Hills et s'est détériorée ailleurs. Étant donné qu'il semble qu'il y ait une dégradation générale dans les forêts évaluées, une meilleure gestion des sites protégés et de plus fortes mesures de conservation sont recommandées, grâce à l'engagement communautaire autour des aires protégées et au sein des ZICO non protégées.

Introduction

Participatory monitoring or community-based monitoring is a process where concerned citizens, government and nongovernmental organisations, and academic and research institutions corroborate to track common environmental issues using simple, standardized protocols

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(Conrad & Hilchey, 2011). Biodiversity monitoring schemes face an array of conceptual, logistical and political problems, the most significant of these perhaps concerning sustainability. Locally based, participatory monitoring has been proposed as one solution to sustainability problems that face biodiversity monitoring schemes, especially in the tropics (Danielsen *et al.*, 2005). Monitoring should be more sustainable when it involves very simple, inexpensive methods, put into effect by local communities or government staff (Bennun *et al.*, 2005). In addition, national government agencies mandated to carry environmental monitoring have been facing funding and staffing challenges due to competing needs, thus would appreciate sustainable monitoring schemes. The coastal forests of Kenya present an excellent opportunity for demonstrating the use of participatory monitoring in the tropics. This is because the forests are biodiversity-rich, highly threatened and have active locally based community groups as well as site-based and visiting staff and volunteers who have been willingly contributing to the participatory Important Bird Area monitoring exercise.

Forests in the coastal region of Kenya contain high levels of biodiversity and are therefore recognized as priorities for conservation (Bennun & Njoroge, 1999; Myers *et al.*, 2000; CEPF, 2005). Indeed, over 226 species of plants, mammals, birds, reptiles, amphibians, insects and gastropods recognized as globally threatened in the 2013 IUCN Red List can be found in forest sites in the region (Gereau *et al.*, 2014). Thirteen forest sites in the coastal region of Kenya are recognized by BirdLife International as Important Bird Areas (IBAs), a network of key sites for bird conservation identified using a globally agreed set of criteria based on the presence of populations of birds that are globally threatened, restricted in range, congregatory or characteristic of a particular biome (Fishpool & Evans, 2001).

Given the high conservation value of these forest sites, it is necessary that efforts to conserve them are guided by scientifically robust data that capture spatial and temporal dynamics. Locally based, participatory monitoring approaches show promise in overcoming the problem of sustainability of biodiversity monitoring schemes in the biodiversity-rich tropics (Danielsen *et al.*, 2003). Monitoring of twelve of the thirteen Kenyan coastal forest IBAs has been going on since 2004 using BirdLife International's IBA monitoring framework, which follows a locally based and participatory approach (Bennun, 2002). The IBA monitoring framework is designed to be simple, robust and locally grounded. It institutionalizes monitoring in site management authorities and site support groups (community-based organisations of local people working for conservation and sustainable development). As we cannot monitor every relevant attribute of an IBA, the framework chooses indicators that are appropriate for the IBA conservation goal. It classifies indicators within a 'pressure–state–response' framework, an approach that has also been adopted by the Convention on Biological Diversity. Data are collected on at least one appropriate indicator each, for pressure, state and response (Bennun *et al.*, 2005). Pressure indicators identify and track the major threats to important bird populations at IBAs. State indicators refer to the condition of the site, with respect to its important bird populations. State indicators might be population counts of the birds themselves. They might also be measures of the extent and quality of the habitat required by these birds. Response indicators identify and track conservation actions: for example, changes in conservation designation, implementation of conservation projects and establishment of local conservation groups. The objective of this study is to determine the state, pressure and response in the forest IBAs in coastal Kenya, and assess their trends from 2004 to 2011. This will help in assessing how effectively the sites are conserved and detecting threats so they can be acted upon.

Methods

Study area

Data were collected from twelve of the thirteen Kenyan coastal forest sites recognized as IBAs (Fig. 1). For one the forest IBAs (Diani Forest), no data had been collected in the assessment years; thus, it was not included in this study. The area, habitat and protection status of each of the study sites is summarized in Table 1.

Data collection

The IBA monitoring framework differentiates basic and detailed monitoring (Bennun *et al.*, 2005). In this study, basic monitoring was undertaken. Data collection was performed using customized simple but structured data collection forms submitted from respective sites on an annual basis by individuals with recent personal knowledge of the sites. The forms contain clear guidelines on scoring and are simplified such that they can be used by

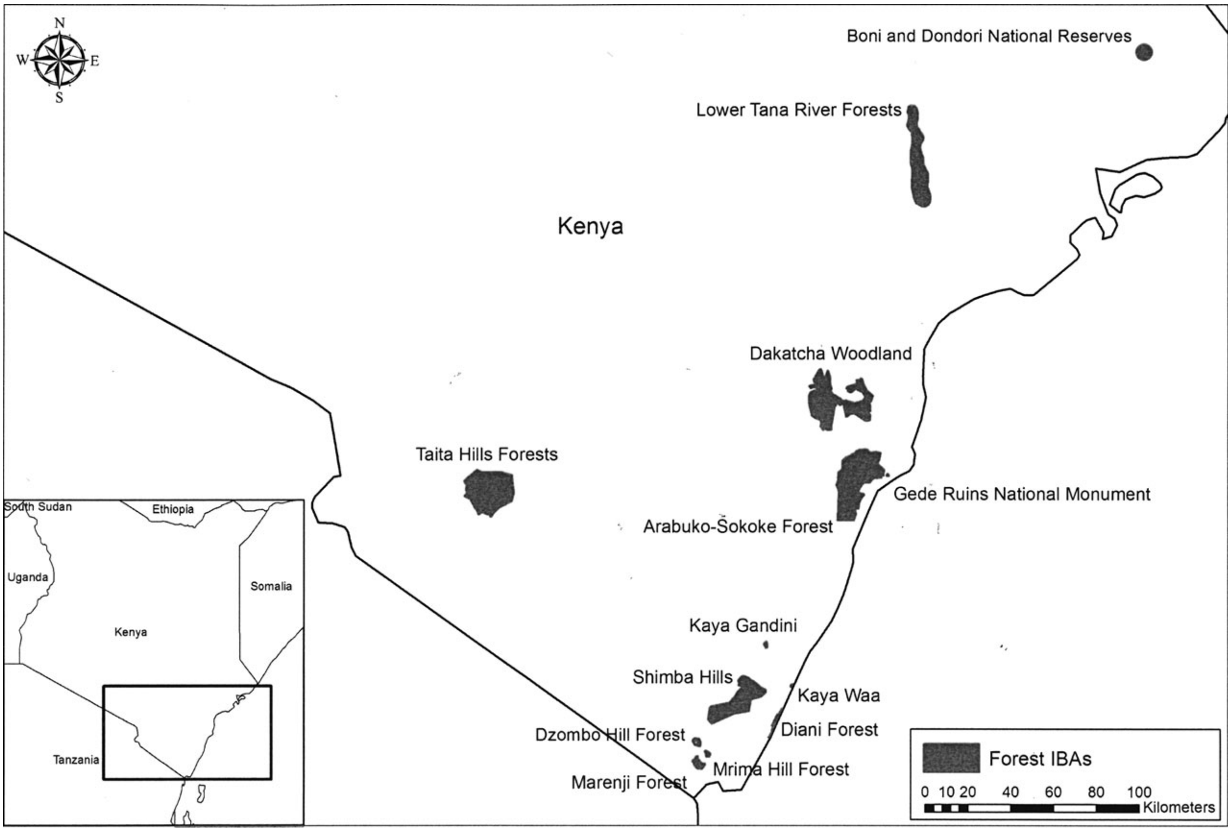

Fig 1 Map of the study area.

observers even with very basic training. These are available as part of the global IBA monitoring framework (BirdLife International, 2006). Between 2004 and 2011, the forms were distributed to observers, who included staff of agencies managing the forests (Kenya Wildlife Service, Kenya Forest Service and National Museums of Kenya) and staff of Nature Kenya visiting or based at the respective sites, and members of local conservation groups at the sites. All observers had received prior training from Nature Kenya on the use of the IBA monitoring protocol, including the scoring system described below. The observers used the forms to assess and assign state, pressure and response scores for respective sites.

State scores were based on the status of habitats used by the birds for which the site is recognized as an IBA and were assigned on a simple scale: 3 = good/favourable (overall >90% of optimum), 2 = moderate/near-favourable (70–90%), 1 = poor/unfavourable (40–70%) or 0 = very poor/very unfavourable (<40%). If an observer did not know the actual habitat area, they would give their best assessment of the current habitat area at the site, in relation to its potential optimum if the site was undisturbed.

Various threat types are clearly defined in the standard data collection form guided by the IUCN threat classification scheme (Birdlife International, 2006). The timing, scope and severity of each of the threat type at a site were scored as follows: timing: 3 = happening now, 2 = likely in short term (within 4 years), 1 = likely in long term (beyond 4 years) and 0 = past (and unlikely to return) and no longer limiting; scope: 3 = whole area/population (>90%), 2 = most of area/population (50–90%), 1 = some of area/population (10–50%) and 0 = small area/few individuals (<10%); severity: 3 = rapid deterioration (>30% over 10 years or three generations whichever is the longer), 2 = moderate deterioration (10–30% over 10 years or three generations), 1 = slow deterioration (1–10% over 10 years or three generations) and 0 = no or imperceptible deterioration (<1% over 10 years). The scores for threat timing, scope and severity were then

Table 1 Names, area, habitat and protection status for the 12 study sites

Site	Area (ha)	Main Habitats	Protection
Arabuko-Sokoke Forest	41,600	Forest (lowland forest – undifferentiated; woodland – monodominant) – 85%; savannah (bushland & thicket – evergreen) - 6%	National Reserve and Nature Reserve
Boni and Dodori National Reserves	249,600	Forest (lowland forest – dry evergreen; lowland forest – undifferentiated; woodland – mixed) – 90%; grassland (grassland – edaphic, wet) – 3%; wetlands – inland (freshwater lakes and pools) – minor	Forest Reserves
Dakatcha Woodlands	32,000	Forest (woodland – monodominant) – 100%	Not protected
Dzombo Hill Forest	295	Forest (lowland forest – undifferentiated); shrubland (scrub – forest)	Forest Reserve and National Monument
Gede Ruins National Monument	44	Forest (lowland forest – mondominant moist evergreen & semi-evergreen)	National Monument
Kaya Gandini	150	Forest (lowland forest – dry deciduous)	National Monument
Kaya Waa	20	Forest (lowland forest – dry deciduous)	National Monument
Lower Tana River Forests	3,700	Forest (lowland forest – riparian) – 100%	National Reserve
Marenji Forest	1,520	Forest (lowland forest – undifferentiated); shrubland (scrub – woodland)	Forest Reserve
Mrima Hill Forest	250	Forest (lowland forest – undifferentiated)	Forest Reserve and National Monument
Shimba Hills	21,740	Forest (lowland forest – undifferentiated) – 45%; shrubland (scrub – forest) – 35%; grassland – 16%	Forest Reserve and National Reserve
Taita Hills Forests	35,000	Forest (mid-altitude forest – transitional); artificial – terrestrial (forestry & agro-industrial plantations)	Forest Reserves – 11 Forest fragments/ reserves of varying sizes (1-220 ha)

summed to give an impact score. If the score for any of timing, scope or severity for a given threat was 0, then the impact score for that threat was given as 0, meaning that the impact score never had the value 1 or 2. The highest impact score of any threat was then used to assign an overall pressure score to the IBA on a scale of 0 to -3, as follows: 0 = 0 (low), 3–5 = −1 (medium), 6–7 = −2 (high) and 8–9 = −3 (very high). This scale allowed consistent presentation, with the scores for status and response. In each case, a higher score (less negative, or more positive) is good for conservation, and a lower score is bad for conservation.

Response was assessed by scoring conservation efforts at a site as follows: conservation designation: 3 = whole area of IBA (>90%) covered by appropriate conservation designation, 2 = most of IBA (50–90%) covered (including the most critical parts for the important bird species), 1 = some of IBA covered (10–49%) and 0 = little/none of IBA covered (<10%); management planning: 3 = a comprehensive and appropriate management plan exists that aims to maintain or improve the populations of qualifying species, 2 = a management plan exists, but it is out of date or not comprehensive, 1 = no management plan exists, but the management planning process has begun, and 0 = no management planning has taken place; and conservation action: 3 = the conservation measures needed for the site are being comprehensively and effectively implemented, 2 = substantive conservation measures are being implemented, but these are not comprehensive and are limited by resources and capacity, 1 = some limited conservation initiatives are in place, and 0 = very little or no conservation action is taking place. These scores were then combined to give an overall response score as: 3 = high, 2 = medium, 1 = low and 0 = negligible.

Data analysis

The indicator scores obtained for pressure (threats), state (condition) and response (actions) were used to obtain overall trend scores. Data received from more than one observer during the same year at a site were combined through averaging the respective scores. Trend scores for individual sites were calculated by comparing the IBA status scores between assessments, that is (IBA status score in assessment 2) – (IBA status score in assessment 1/ baseline). The first time the information was collected represented the 'baseline', against which subsequent comparisons were made. For each site and indicator type, the mean trend score was calculated from averaging trend scores for each repeat assessment year. The following threat, condition and response trend scores and their descriptions were used for consistency: +3 = large improvement, +2 = moderate improvement, +1 = small improvement, 0 = no change, −1 = small deterioration, −2 = moderate deterioration and −3 = large deterioration. Additional notes provided by observers were used to give qualitative descriptions for status, pressure and response at the sites.

Results

In Arabuko-Sokoke Forest, state scores remained 'unfavourable' from 2005 to 2011, and there was a small improvement in terms of pressure due to reduced threat, and a small deterioration in response due to reduced conservation action in the years 2007–2010 (Fig. 2a and b).

In Dakatcha Woodlands, state scores remained 'unfavourable' between 2005 and 2011 due to reduced forest habitat area and quality (Fig. 2c and d). There was however a small improvement in pressure and response. In Gede Ruins Forest, although assessments were only made in 2004, 2005 and 2009, on average there was a small deterioration in the state of the forest (Fig. 2e and f). Pressure however showed no change and remained low, and response showed a small deterioration. In Lower Tana River Forests on average there was minimal deterioration in state, pressure and response from 2004 to 2011 (Fig. 2g and h). In Shimba Hills Forest on average there was small deterioration in pressure and state, but no change in response between 2004 and 2011 (Fig. 2i and j). In Taita Hills Forests on average there were small improvements in state and pressure (reduced threat), but a small deterioration in response from 2004 to 2011 (Fig. 2k and l). A summary of observer notes backing up some of scoring is provided (Table 2).

For the six other forest sites, minimal data were collected, either covering <3 years or not assessing all the three indicators (state, pressure and response), and thus, trends were not assessed. The information collected for these sites is presented in Table 3.

Discussion

The monitoring data presented here are important for enabling timely detection of threats and determining the effectiveness of conservation actions (Bennun *et al.*, 2005). There is however concern whether the results from participatory monitoring, such as the ones used in this study, can be scientifically validated, more so results derived from basic IBA monitoring (Bennun *et al.*, 2005; Uychiaoco *et al.*, 2005). We therefore acknowledge that there could be a potential problem of inconsistent evaluation with the results presented here, especially due to collection of data by many observers. However, opportunities should be sought for assessing changes inferred from the basic IBA monitoring forms against those from detailed monitoring or independent data. Despite this weakness, experience from Kenya shows that participatory monitoring has many valuable benefits for biodiversity conservation beyond the data collected, including helping in building awareness, interest, involvement and capacity, both for those taking part and for other local residents (Bennun *et al.*, 2005). In addition, Danielsen *et al.* (2010) observe that involving local stakeholders in monitoring enhances management responses at local spatial scales and increases the speed of decision-making to tackle environmental challenges at operational levels of resource management. Therefore, despite likely weaknesses in scientific rigor, participatory monitoring approaches should be encouraged, and cases such the one presented by this study should provide basis for learning lessons that may help in refining such methods, while at the same time helping in highlighting conservation needs.

Generally, although results of this study are indicative of small but varying changes for respective coastal forest IBAs, there was an overall deterioration between 2004 and 2011. This is despite the fact that most of the sites are protected. Previous years' observations by Tabor *et al.* (2010) were that rates of forest loss were much higher (eight times) in unprotected areas than in protected sites in the coastal forest sites of Kenya and Tanzania between 1990 and 2000. Of note, from the observer notes is that in our study selective logging is the most commonly cited threat across various sites and monitoring years. Selective logging is not easy to detect with remote monitoring methods, such as satellite imagery as it only thins the

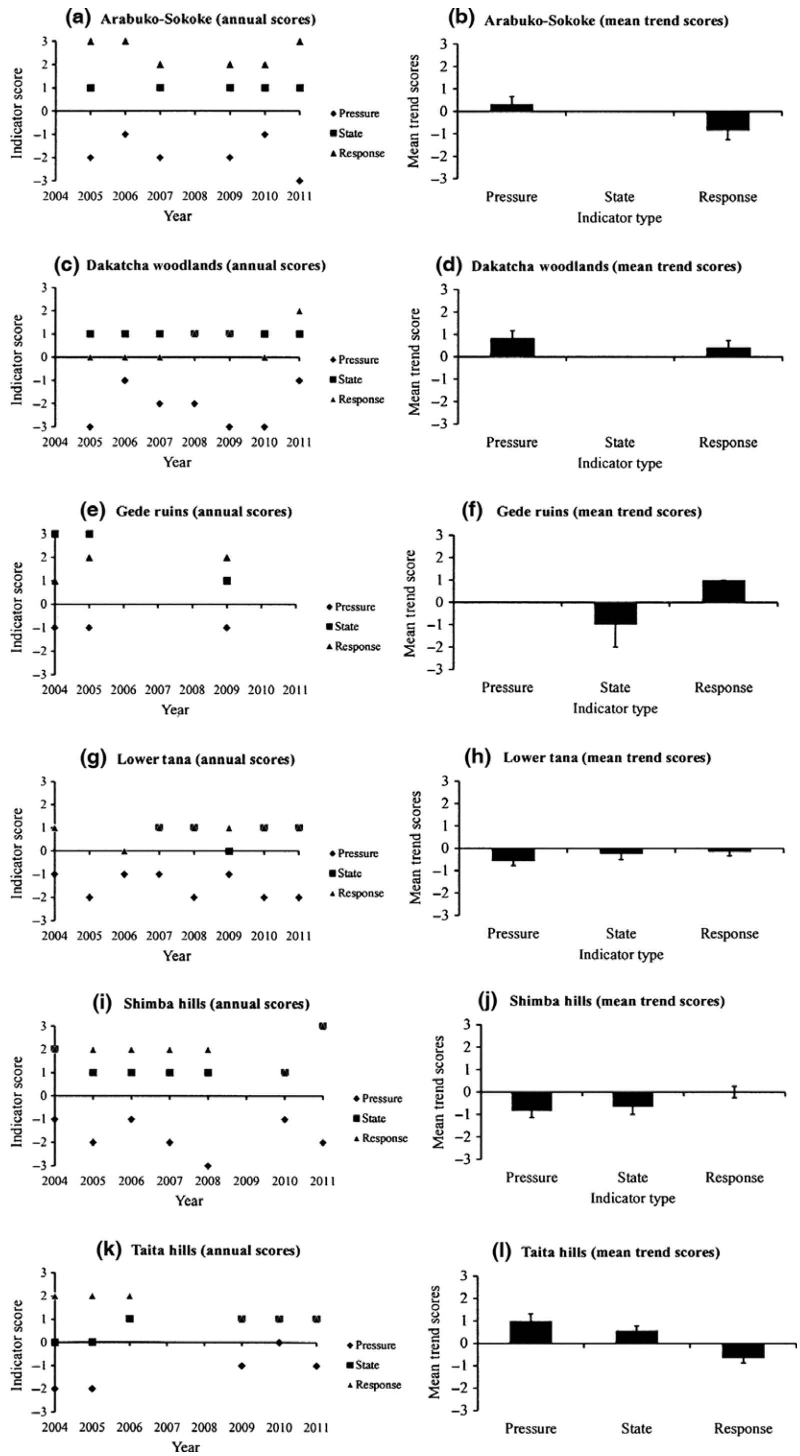

Fig 2 Annual and mean trend scores for pressure, state and response indicators in the six respective sites for which trend was assessed.

Table 2 Summary of notes provided by observers for six sites for which trends for state, pressure and response indicators were assessed, and the number of observers for respective years assessed

Site	State	Pressure	Response	No. of observers/year
Arabuko-Sokoke	2007 – Habitat looked intact but with few disturbances especially along the electrical fence. 2011 – Habitat in good condition with illegal wood cutting and game hunting having reduced compared to 2010.	2010 and 2011 – There were isolated tree logging (for timber, carving, firewood and building poles) and mammal poaching (for bushmeat) 2011 – Many wood carving camps and elephants hitting down and uprooting some trees, probably associated with the prolonged dry spell.	2005 – Efforts of the Kenya Forest Service (KFS) and Kenya Wildlife Service (KWS) in law enforcement; and banning of nonresidential cultivation in the forest; illegal activities reduced in forest 2005–2006 – Improved forest patrols and diversified eco-tourism activities.	2005 – 2 2006 – 1 2007 – 2 2009 – 3 2010 – 2 2011 – 2
Dakatcha Woodlands		-Threats mainly from charcoal burning, selective logging for building materials and carving, clearance to pave the way for agriculture and grazing -Human population around the site was also on the rise 2011 – Charcoal burning decreased by 60%.	-Site lacks any legal protection -2005 – Mida District Environment Management Committee and KFS informed of plight and KFS officials consulted for assistance in the policing and reinforcement of the government ban on logging	2005 – 1 2006 – 1 2007 – 1 2008 – 1 2009 – 3 2010 – 1 2011 – 1
Gede Ruins Forest	2004–2005 – Forest habitat condition largely intact and developing into a mature forest	Forest disturbance due to increasing tourism activities and population pressure as the only concerns.	2004 – The Arabuko-Sokoke Forest Guards Association (ASFGA) and the Coastal Forest Conservation Unit (CFCU) were promoting conservation awareness, education and need for sustainable resource	2004 – 1 2005 – 1 2009 – 2
Lower Tana River Forests		2005 – Threats mainly from fire, collection of firewood, forest grazing and selective logging 2009 – Implementation of government irrigation projects for growing of sugarcane, maize, *Jatropha curcas* and other oil crops 2010 – Agriculture, fire, logging and influx of livestock from the Northern Frontier District due to persisting drought		2004 – 1 2005 – 1 2006 – 1 2007 – 3 2008 – 1 2009 – 1 2010 – 1 2011 – 2

(continued)

Table 2 *(continued)*

Site	State	Pressure	Response	No. of observers/year
Shimba Hills Forest	2006 – Reserve was largely intact except for illegal small-scale wood harvesting.	2004 – Parts of the eastern boundary were under encroachment by farmers and elephants were degrading most parts of the forest. 2005 – Electric fence was restricted dispersal of large mammals including elephants, whose intensive foraging activity led to substantial changes in forest structure, and thus reduction in the quality of the forest habitat; clearing and burning of vegetation to create farmlands intensified around the reserve after erection of the fence 2006 – Subsistence poaching of small game 2010 – Selective logging.	2004 – Frequent security and management patrols; good collaboration between community-based group ranches and the KWS 2005 – Policing by forest guards and KWS rangers; electric fencing around reserve; complete ban on firewood collection in the reserve 2006 – Elephants translocated and reduced from c. 700 to c. 472	2004 – 1 2005 – 1 2006 – 1 2007 – 2 2008 – 1 2010 – 1 2011 – 1
Taita Hills Forests	2011 – Ngangao forest fragment in good condition and Sagalla forest fragment in moderate condition.	2004–2005 – Pressure high and linked to agricultural activities, firewood collection, charcoal burning, selective logging and cattle over grazing; logging affected some forest fragments (Yale, Mwachora and Fururu). 2009 – Human intrusion and disturbance in Mbololo and cutting of trees for poles and fuel wood in Macha 2011 – Drought led to forest fires; fire only affected exotic tree plantations in Ngangao fragment and 30% of Sagalla forest fragment	2004 – Forest department step up surveillance and arrested of violators involved in selective logging 2005 – Forest department gazette forest fragments for example Ngangao, Mbololo and Mwambirwa 2006 – A community-based organization in named Sigha Sigha started planting a target of 90,000 indigenous trees 2009 – Forest department removed pines trees and replaced them with indigenous trees in Mbololo Forest fragments; >500 seedlings planted in Macha fragment.	2004 – 1 2005 – 1 2006 – 1 2009 – 1 2010 – 4 2011 – 1

forest canopy (Asner *et al.*, 2005). The IBA monitoring framework could have therefore been useful in detecting this and other threats, which are not easily detected by remote monitoring.

Despite site protection, the key threats in Arabuko-Sokoke Forest seem to be due to removal of trees for timber, firewood, wood carving and building poles, as well as poaching of animals for bushmeat. As noted by Oyugi,

Table 3 Pressure, state and response for six other forest IBAs for which there were no sufficient data to assess trends

Site	Year	Pressure	State	Response	Observer notes
Boni and Dodori	2011	Very high	Very unfavourable	Low	Fires used to clear land for shifting cultivation
Dzombo	2004	Medium		Low	Active local conservation group (MRIMADZO)
Hill Forest	2005	Low		Low	Championing for positive conservation attitude among local community
Kaya	2004	High		Negligible	In 2005, ban on logging, non-residential cultivation and
Gandini	2005	High		Medium	squatter encroachment on state land might have
	2007[a]	High	Very unfavourable	Low	reduced the number of illegal activities in the forest. In 2007, extent of forest cover was reducing substantially and attributed to settlement encroachment, logging and firewood collection; also high levels of poverty leading to over-dependence on forest products.
Kaya	2004	Medium		Negligible	Similar types of threats as those in Kaya Gandini, in
Waa	2005	Medium		Low	addition to infrastructural development
Marenji	2004	Medium		Low	Forest had recovered from the destruction of the 1980s,
Forest	2005	Medium		Medium	but logging for timber, carving and building poles had now resumed, often carried out at night. Forest guards faced logistical difficulties in implementing patrols.
Mrima	2004	Medium		Low	Forest was regenerating in 2004. There was education of
Hill	2005	High		Medium	locals and visitors by the local conservation group
Forest	2010	Medium	Unfavourable	Low	named MRIMADZO, coupled with community policing. The general quality of the forest appeared to be gradually improving.

[a]Except at Kaya Gandini in 2007 when data were received from three observers, data for all the rest of the sites and years were received from one observer per year.

Brown & Whelan (2008), illegal logging has persisted in the forest over many decades despite its protection status. However, active management and restoration may not be necessary for regeneration of most of the common tree species in Arabuko-Sokoke if logging activities were ceased (Oyugi, Brown & Whelan, 2008). It has long been recognized that mammal populations in Arabuko-Sokoke Forest provide an important source of protein and income for local communities (Fitzgibbon, Mogaka & Fanshawe, 1995). There is therefore need to develop cheap protein alternatives to bushmeat for communities living around the forest.

In Dakatcha Woodlands, destruction of woodland especially for charcoal burning has been of concern and is consistent with studies by Ruuska (2012) who found the demand for wood fuels (charcoal and fuelwood) to be one of the key drivers of deforestation and land degradation. This threat could be have been accelerated by the unprotected status of the site, but it is positive to note from the results that conservation action led by the civil society is to some extent helping in reducing the pressure from this threat. In the Lower Tana River Forests, apart from fire, logging and grazing the recent most significant threat seem to be associated with irrigation-dependent large-scale agricultural developments. Indeed, separately Hamerlynck *et al.* (2012) had also observed threats due to expansion of large-scale irrigation for food and for biofuel production.

Shimba Hills Forest presents a case where there is active response by the KWS. The outcomes of the response however have had mixed effects on the forest habitat. Of particular note is fencing off of the reserve which led destruction of habitat by elephants and other mammals but reduced poaching. Fencing and active patrolling have also reduced forest destruction by humans, and the authorities have translocated elephants to reduce their negative impacts on vegetation. However, two major concerns are apparent: observed persistent logging and the intense pressure arising from various threats on forest outside the nature reserve.

Results of the Taita Hills Forests assessment apparently demonstrate a generally improving situation in terms of reducing pressure and improving forest condition. However, major challenges remain in conserving forest habitat at this site. The forests remain highly fragmented and forest birds are unable to disperse between remnant habitats (Githiru & Lens, 2007). On the other hand, late-successional rainforest plant species are under-represented in the woody plant communities of the Taita Hills (Aerts *et al.*, 2011), and exotic forest plantations accounted for most of the forest cover increase there between 1985 and 2010 (Gereau *et al.*, 2014). Conservation efforts in the Taita Hills Forests should therefore not only focus on maintaining forest quantity (size), but also on forest quality (species composition) and connectivity.

Based on the observed continued deterioration in most of the studied forest sites, we recommend enhanced protection measures in the sites protected KFS, KWS and National Museums of Kenya, as well as increased community engagement in areas surrounding the protected sites and within the unprotected Dakatcha Woodlands, for example through support people in nature-based alternative livelihood activities that could help reduce pressure. In cases where forest restoration efforts are required, for example in the Taita Hills, careful choice of trees and restoration methods should be made so as to retain preferred forest habitat structure for birds and other biodiversity. In the other six IBAs for which trends were not assessed, the existing data are important baseline for follow-up assessments that will happen in future. As regards the use of participatory monitoring approach in this study, BirdLife International's framework for monitoring IBAs in Africa is designed to be simple, robust and locally grounded (Bennun *et al.*, 2005). It is therefore consistent with the recommendation by Holck (2008) that for such approaches to succeed they need to be simplified to apply for local use and government officials should be involved in the process to enable reactions to pursue the monitoring. However, studies show that community collected data have a higher variation in comparison with the data collected by educated biologists, which leads to less precision (Holck, 2008). Therefore, we recommend opportunities be sought for testing the accuracy of this simplified method through comparing data sets from this approach with those from biologists.

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