The Tropical Ecology, Assessment and Monitoring (TEAM) Network: an Early Warning System for nature

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TEAM Network - an early warning system for life on earth

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The problem: lack of standardized biodiversity data from the tropics - needed to anticipate changes

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Conclusions on the relevance of TEAM for anticipating decisions

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MISSION
Generate real time data to monitor long-term trends in tropical biodiversity through a global network of field stations, providing an early warning system on the status of biodiversity to effectively guide conservation action.
Why do we need TEAM?

Currently there are well established Early Warning Systems for earthquakes, catastrophic fires, tsunamis, hurricanes, volcanoes and many other natural systems.

However, we do not have an Early Warning System for life on Earth.
Why do we need TEAM?

Climate Change

If global average temperatures exceed 2-3 degrees above pre-industrial levels, 20-30% of plant and animal species will be at high risk of extinction and the structure and functioning of terrestrial ecosystems will change substantially (IPCC 2007).
Why do we need TEAM?

Forest Cover Loss

Most of the current deforestation is happening in tropical forests and is expected to continue in the future.
Why do we need TEAM?

Why should we care about diversity in tropical forests?

- More than 50% of species described on Earth live in tropical areas.
- Tropical forests play a crucial role in maintaining the global carbon and energy cycles.
- Compared to other natural systems we do not know how changes in tropical forests will affect life on Earth.

Source: Modified from Ballie et al. (2004) Global Species Assessment. IUCN
Threats to biodiversity call for global efforts

- Local (hunting, selective logging, small-scale disturbance)
- Regional (land use transformation, fragmentation, invasive species)
- Global (climate change, global land demands)
The CBD-Aichi Biodiversity Targets 2011-2020 need standardized data to measure indicators of progress.

**Strategic Goal C**: To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity.

We lack the data to measure progresses against AICHI targets and hence anticipate changes!!
Target 11: protected areas are effectively managed...

We only have secondary data on PA status in the tropics.

Figure 1 | Distribution of the 'reserve-health index' for 60 protected areas spanning the world’s major tropical forest regions. This relative index averages changes in 10 well-studied guilds of animals and plants, including disturbance-avoiding and disturbance-favouring groups, over the past 20 to 30 years.

Averting biodiversity collapse in tropical forest protected areas

(Laurance et al. [215] al. 2012, Nature)
Target 12: decline of species is prevented....

We lack standardized data to assess trends, especially in the tropics.
Target 12: decline of species is prevented....

We lack standardized data to assess trends, especially in the tropics.

Out of 30,000 long-term data sets available for forests and natural systems, only 15 came from tropical forests.
How TEAM Works

The TEAM Network implements standard protocols to monitor biodiversity through a network of tropical field sites. Information is collected in near-real time.

How does forest fragmentation affect the trophic structure of tropical terrestrial vertebrate communities?
How TEAM works

- **TEAM Monitoring Sites**
- Data are collected according to standardized protocols
- Mobile technology facilitates data collection in the field
- Data are transferred and stored in servers and databases
- Data are disseminated globally in near-real time using advanced technologies
- Data are used by NGOs, government agencies, scientists, educators, etc.

PHOTOS FROM LEFT TO RIGHT: © ROBIN MOORE, © 2011 BENJAMIN DRUMMOND, © 2011 BENJAMIN DRUMMOND, © ISTOCK, © ISTOCK, © ISTOCK
A network of currently 17 field stations in the tropics
TEAM Protocols

Terrestrial vertebrates: uses camera trapping to detect ground-dwelling mammals and birds and hence monitor abundance of populations and communities.

Vegetation: uses 1-ha plots to measure carbon stock and assess tree species composition..

Climate: automatic weather station: T, HR, rainfall, solar radiation

Zone of Interaction: uses remote sensing to define and monitor coupled human-natural system surrounding the monitoring sites where changes will directly affect biodiversity at the sites.
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MUSE – Science museum’s TEAM site: Udzungwa Mountains, Tanzania

A global biodiversity hotspot
Partnership MUSE – Udzungwa Mountains National Park (since 2002)

Udzungwa Ecological Monitoring Centre (UEMC) established in 2006

**ACCOMMODATION & FACILITIES**

UEMC welcomes visiting scientists and students and offers accommodation to a maximum of 36 people (12 in the researchers’ houses and 24 in the hostel). Researchers’ houses are fully furnished with electricity, running water, self-contained bedrooms, cooking facilities, desks and sitting room. Each house has two double rooms.

The hostel has been inaugurated at the beginning of 2010 and consists of a dormitory with 4 rooms each accommodating up to 6 people. Adjacent is a fully equipped dining and kitchen block.

A large seminar room (150 sq. m) is also available for seminars and workshops by any organization or individual.

Visiting researchers have access to maps and resources in the office, including a small library and the Udzungwa GIS Database (UGISD). Computer, printing facilities and high-speed Satellite Internet connection are also available on request.
Camera trapping sampling: 60 camera trap points (one each 2 km²) active every year for 30 days since 2009
Data (10-15k images per year) processed with dedicated software, and uploaded in TEAM web repository in near real time.
All TEAM data are publicly available at www.teamnetwork.org
1) **Example of results at the site level:** species checklist, relative abundance index and occupancy (probability of presence)

- 10,647 images of mammals in the baseline year (2009)
- 26 species (of a minimum of 30 known to occur)
Models predicting occupancy at the fine scale, useful to identify potential drivers of changes (Rovero et al. 2014)

Lowland, deciduous forest dweller

Edge-lover

Forest interior dweller
2) **Comparison between sites with contrasting protection**: effect of hunting and habitat degradation on mammals (Hegerl et al. 2015)

Useful to predict how local human pressure impact the fauna
Example of management decision that was contributed by these data: dissemination of the results helped increasing protection.
Government’s endorsement of recommendations: Kilombero Nature Reserve and Uzungwa Scarp proposed Nature Reserve, with the proposed Mngeta corridor linking these 2 PAs.
3) **Regional / global analysis**: species richness and the effect of forest fragmentation (Ahumada et al. 2011)

The first analysis ever of this sort, shows how fragmentation impacts community richness, intactness and composition.
4) **Temporal analysis at site level and the WPI**: detecting trends in threatened species and whole communities (5 yrs data from Costa Rica, Ahumada et al. 2013)

The essential analysis to anticipate changes and monitor Aichi targets
The Wildlife Picture Index to assess temporal trends

WPI is an index for assessing temporal changes of mammal communities derived from TEAM data.

Since 2013 WPI is one of the indicators of the CBD’s Aichi Targets, esp. number 11 and 12: assessing trends and preventing extinction.
Explore WPI

Year Range Selection
2007-2014

Site Selection
1 Selected

Species Group Selection
1 Selected

Global WPI
Click on WPI line to drilldown

Impact Analysis

Summary of Impacts

http://wpi.teamnetwork.org/wpi/dashboard
5) **The first global analysis** of temporal trends in WPI (Beaudrot, Ahumada et al. in revision)

- > 2.4M images forming the dataset
- 511 populations of 244 species
- 22% of populations declined, 17% increased, and 22% exhibited no change during the last 3-8 years
Conclusions

TEAM shows the value of standardized and timely data collection to anticipate changes in biodiversity and hence contribute decision-making (the integration of protocols enhances this function ...)

Added value of TEAM vs usual (individual) approach to research in terms of time (several years/decades vs 1-3 years), space (global vs local) and sampling effort (200 km² each site vs few km²)

TEAM potential for influencing decisions:
- Policy level: WPI as official indicator of Aichi target, participation into CBD and other global biodiversity fora
- Protection: new/upgraded status of PAs, species-specific conservation measures, site prioritization, etc.
- Trigger national monitoring systems (capacity building, replication at many sites of standardized monitoring – 1st example in the Alps...)
Challenges

Funding to biodiversity research and conservation remains dramatically limited (threat to long-term monitoring efforts)

In the TV protocol, uncertainty inherent with rarity of species (e.g. 39% of populations detected too infrequently for assessing trends in occupancy in the WPI global analysis)

Academic culture and funding not conducive to long-term efforts (emphasis on ‘newsy’ or provokative articles in scientific journals, etc.)

Gap between science and local/regional decision-making processes

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