Developing a threatened species index - Data Suitability Criteria

Project 3.1

Threatened Species Recovery Hub

National Environmental Science Programme

Images (L to R): Numbat_by_dilettantiquity_FlickrCC2-0_PerthZoo; Banksia cuneata in WA_by Jean & Fred_FlickrCC2_0; Trout-Cod_NSWGovt & Mary River Cod_DAF Dept Agr Fisheries; Swift Parrot_by_ASilcocks

Avoiding the crap-data-in, crap-index-out trap

1) hard rules for data exclusion
2) suitability criteria enabling threshold decisions based on data quality in context
3) utility criteria enhance the usability of data

'Deal breakers'

Criteria on when to exclude data outright

Assessment criteria	Assessment criteria Exclude data if this applies	Why to exclude these data?
Monitoring method provided?	No	• Produced trend/index is not legitimate. • Data violate statistical assumptions of robust statistical methods for trend analyses. • Lack of standardisation results in unequal detection probability.
Standardisation of method/effort	Data collection methods/effort not standardised, surveys not site-based, effort/method and spatial accuracy undefined.	
Overall temporal coverage	< 2 years	• A calculation of population change not possible with less than 2 data points. • Even with 2 data points, trends may be spurious.
Site turnover/consistency	Sites not defined or undefinable	• Illegitimate index due to a lack of discrete, i.e. spatially independent sites with repeated observations over time.
Spa<al accuracy	Undefined (no spatial metadata) or 'trip-based' - e.g. a list of birds seen on a trip from X to Z	• Spatial metadata required to identify independent sites
Unit of measurement	Unit of measurement undefined or inconsistent.	Data without information on the unit of measurement are fundamentally incomparable.

Assumptions of population trends

Among many, detectability of monitored taxon is comparable through time.

Best practice; standardised monitoring methods at independent and fixed sample areas (sites) through time ...

... but reality isn't always ideal.

How far should an assumption be pushed?

Suitability criteria

Criteria on which to assess data in context, consider and (at minimum) report with indices

Assessment criteria	Why is this important?	Levels of data suitability (from most to least suitable)	Sustainability rank
Standardisation of method/ effort	The better the standardisation of methods/effort the smaller the variation in the detectability of a monitored taxon over time. Under the assumption of a constant detectability, the local population size of a taxon is directly proportional to the expected long-term average value of the study area e.g. a state or a country. (Voříšek et al. 2008)	Pre-defined sites/plots surveyed repeatedly through time using standardised methods and effort across monitoring programme	A
		Pre-defined sites/plots surveyed repeatedly through time with methods and effort standardised within site units, but **not across programme** - i.e. different sites surveyed have different survey effort/methods	B
		Data collection using standardised methods and effort across monitoring programme, but **surveys not site-based** (i.e. surveys spatially ad-hoc). Post-hoc site grouping possible - e.g. a lot of fixed area/time searches conducted within a region but not at pre-defined sites.	C
		Data collection using standardised methods and effort across monitoring programme, but surveys not site-based (i.e. surveys spatially ad-hoc). **Post-hoc site grouping not possible**.	D
		Data collection methods/effort not standardised, but surveys site-based. Survey method/effort and spatial accuracy are defined.	E
		Data collection methods/effort not standardised, surveys not site-based, effort/method and spatial accuracy defined.	F
Overall temporal coverage or 'Percent completeness' (once above 3 years)	Because many populations exhibit naturally high variability (e.g. boom/bust species), samples from only a few time points may correlate with stochastic events and mask deterministic population change.	> 15 years	A
		11 - 15 years	B
		6 - 10 years	C
		2 - 5 years	D
Site turnover/ consistency	Biological monitoring datasets are oben characterised by high rates of spatial turnover - i.e. sites are surveyed for only part of the overall observation period. This exposes datasets to confounding – e.g. if a pattern of monitoring effort correspond with a species habitat dependency the resulting trends estimate may reflect a change in observer behaviour rather than a trend in the population itself.	Sites surveyed very consistently through time	A
		Survey balance largely consistent through time - e.g. some sites drop in and out of being monitored or only some sites surveyed over period of temporal coverage	B
		Survey balance high but some level of inconsistency which can be accommodated through repeated measures techniques	C
		Survey balance too biased/confounded for analyses	D
Monitoring frequency and timing	Important especially for taxa where seasonality has a strong effect on abundance	Monitoring frequency and timing appropriate for taxon	A
		Monitoring frequency or timing inappropriate for taxon for majority of data.	B
		Monitoring ad-hoc; no pattern to surveys for majority of data (incidental)	C
Spatial accuracy	Spatial metadata required for *post-hoc* site definition and spatial aggregation of abundance data	Coordinates are a specific location (e.g. GPS for exact location of species)	A
		within 500 m	B
		within 1 km	C
		> 1 km	D
		Generalised - e.g. midpoint of cell or park	E
% of taxon (population size or species range) covered by programme	A trend will only be robust and credible if based on a representative sample of data for the monitored taxon	> 76%	A
		51-75%	B
		26-50%	C
		1-25%	D
		> 1%	E

* *Voříšek P, Klvaňová A, Wotton S, Gregory RD. 2008. A best practice guide for wild bird monitoring schemes. JAVA Třeboň, Czech Republic.*
* *Bayraktarov E, Ehmke G, Driessen J, O'Connor J, Barnes M, Tulloch A, Woinarski J, Garnett S, Legge S, Lindenmayer D, McRae L, Possingham HP (Forthcoming) Is your data fit for multi-species trends? – Best practice on data processing and suitability assessment for the Australian threatened species index. Aimed at: Journal of Applied Ecology*

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