

Conservation assessments, threats, and the IUCN Red List categories and criteria

The recent paper by Dahanukar *et al.* (2004) is an interesting and important study of a unique ichthyofauna showing a high degree of endemism. In order to draw attention to the threat status of 288 fish taxa, it uses a version of the threat categories developed by the International Union for Conservation of Nature and Natural Resources (IUCN), although without referring to IUCN. Four levels of status are used: critically endangered (CR), endangered (EN), vulnerable (VU) and lower risk (LR). Data deficient (DD) is used where no information is available. There are two problems with this approach. First, and least important, is that these categories are from the original formulation of the IUCN threat categories (IUCN, 1994). Work for the 1996 Red List, and consultation, led to the redefining of these categories in 2001 (IUCN, 2001, 2004) and these newer categories should be used in preference (see <http://www.redlist.org> for copies of these documents). Second, and much more significant, is that the threat categories are used without defining criteria. Not only is this against the spirit of the system but it is actually not possible to state categories without knowing the criteria. The following is a brief tutorial on the usage of the IUCN threat status system with examples from subterranean fishes (Proudlove, 2001, in press).

CATEGORIES, CRITERIA AND THE STRUCTURE OF THE THREAT STATEMENT

The threat statement is in two parts, e.g. VU D2. The first part, VU, is the category of threat. The second, D2, the criteria, and sub-criteria which describe the threats.

The currently accepted categories are shown in Fig. 1. There are five main criteria (IUCN, 2004), each of which has several sub-criteria:

(1) Declining population (past, present and/or projected).

(2) Geographic range size, and fragmentation, decline or fluctuation.

(3) Small population size and fragmentation, decline or fluctuation.

(4) Very small population or very restricted distribution.

(5) Quantitative analysis of extinction risk (e.g. Population Viability Analysis).

Their purpose is to make assessment of threats as objective, repeatable and quantifiable as possible. To ensure transparency in the assessment the rationale for the assessment reached, and the documentation required to make the assessment, must be provided.

GENERATING THE THREAT STATEMENT

First, it is important to understand that the criteria are the tests against which a taxon is measured. Only when a taxon has been tested in this way can a category be applied. Biotic and abiotic factors are tested against the IUCN criteria, working sequentially downward from CR through EN to VU. If it is seen that the taxon is outside of VU, but only by a little, NT may be applied. A taxon which has been evaluated in this way and meets none of the criteria is LC. A taxon evaluated but with insufficient data to test against the criteria is DD. All other taxa are Not Evaluated (NE). The aim of the IUCN is for all taxa to be evaluated.

It has been suggested that the system does not apply well to aquatic systems, but the following examples clearly demonstrate effective application to subterranean fishes.

(1) *Clarias cavernicola* Trewavas, 1936 (Teleostei: Clariidae) is a subterranean fish found in only one cave in Namibia. Despite diligent searches in other caves no other populations are known. This population has an Extent of Occurrence (EOO) of < 100 km² (B1) and an Area of Occupancy (AOO) < 10 km² (B2). The water level within the cave has fallen by 20 m in the past 50 years as a result of groundwater pumping for human consumption. There is concern that an area used for feeding will

soon be above water. This constitutes a continuing decline in habitat quality [sub-criterion b(iii)]. We therefore determine that this species satisfies the criteria of B1ab(iii) + 2ab(iii) within CR. It is notable that another criterion (D), population estimated at < 150 mature individuals, is not sufficient for CR, which requires population < 50 mature individuals.

(2) *Ophisternon infernale* (Hubbs, 1938) (Teleostei: Synbranchidae) is known from a few caves on the Yucatan peninsula of Mexico. It shares these with a second species *Ogilbia pearsei* (Teleostei: Bythitidae) but is much rarer. Water quality in Yucatan is impacted by the disposal of waste water directly into groundwater. This seems to have been more detrimental to *Ophisternon infernale* (Medina-Gonzalez *et al.*, 2001) than to *Ogilbia pearsei* (Proudlove *et al.*, 2001). A population reduction of ≥ 50% over the past 10 years has been observed and the habitat quality is not improving (A2ac under EN). Additionally the EOO and AOO are both small, the number of known sites is ~ 5, and the habitat is declining [B1ab(iii) + 2ab(iii)]. Final assessment EN A2ac; B1ab(iii) + 2ab(iii).

(3) *Amblyopsis rosae* (Eigenmann, 1898) (Teleostei: Amblyopsidae) is historically known from 14 counties in four USA States. Recent surveys suggest substantial losses of former range, particularly in southwestern Missouri. These surveys also suggest that there is only one large population, in Cave Springs Cave, Arkansas. The reduction in range and the very small sub-population sizes, together with their fragmented nature, suggest a current category of VU C2a(i).

(4) *Milyeringa veritas* Whitley, 1945 (Teleostei: Gobiidae) is known from 21 locations, within an EOO of ~ 4800 km², in north-west Australia (VU B1). This area is arid and the water needs of the human population are such that the water table is declining and becoming more saline (VU B1b(iii)) (Humphreys, 2001). However the B criterion requires two sub-criteria and this species does not, currently, merit another. Twenty-one locations is twice as many as needed

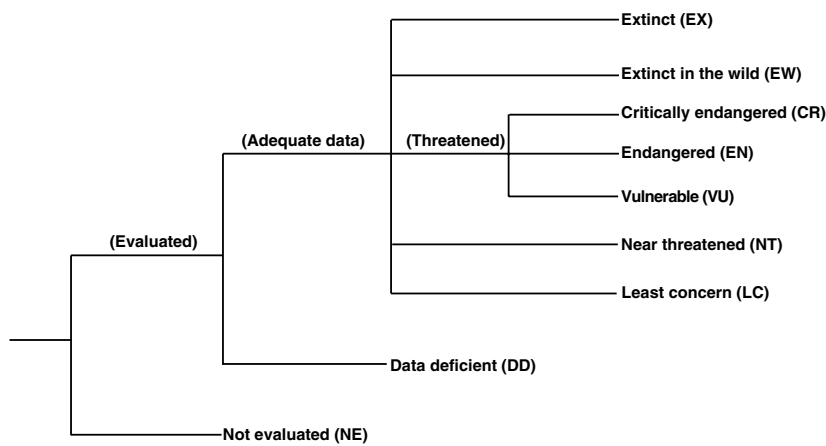


Figure 1 Categories used in IUCN Red List assessments. From IUCN (2001).

(~ 6–10) to qualify for sub-criterion B1a. The final assessment is therefore VU B1b(iii), insufficient for VU but close enough to be assessed as NT.

(5) *Lucifuga spelaeotes* Cohen and Robins, 1970 (Teleostei: Bythitidae) is found on six Bahamian Islands. The population at the type locality is extinct or severely reduced by pollution. However, all other known populations are in pristine locations and none of the IUCN criteria can be applied. Therefore this species has been evaluated and shown to be LC. No criteria are attached to LC.

(6) *Stygichthys typhlops* Brittan and Bohlke, 1965 (Teleostei: Characidae) is known from a single individual (the holotype) obtained from a man-made well in 1962. No other specimens have ever been caught and nothing is known about the biology, ecology or habitat of this animal. With this total lack of information this species is clearly DD.

(7) All described subterranean fishes (~ 100 species) have been assessed and there are no NE examples.

CONCLUSION

The IUCN categories and criteria are a powerful tool for estimating rather precisely the current conservation status of all taxa. It is however important to use them in the way they were designed. Using categories without

criteria is rather like doing a statistical analysis without reporting the probability level.

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BIOSKETCH

Graham Proudlove is interested in all aspects of subterranean biology with emphasis on fishes and British and Irish subterranean environments. A long gestating monograph on subterranean fishes of the world is in press. Recent work has concentrated on the distribution of British and Irish subterranean Crustacea. He is Biological Recorder for the British Cave Research Association (<http://www.bcra.org.uk/biology>) and a member of the managing board of the International Society for Subterranean Biology (<http://www.fi.cnr.it/sibios>)