Name of indicator	1.7 Trophic diversity index of juvenile fish
Type of Indicator	State indicator
Author(s)	Martin Ogonowski, Göran Sundblad, AquaBiota Water Research
Description of the indicator	This indicator reflects the diversity of juvenile fish weighted by the mean community trophic level of adults. A high value of the indicator should reflect an overall high diversity in terms of juvenile fish and favorable nursery habitats for key predatory fish species such as pike (*Esox lucius*), perch (*Perca fluviatilis*) and pikeperch (*Sander lucioperca*), which are important for the maintenance of food web integrity (Eriksson *et al.* 2009). The indicator will currently be of relevance for Swedish waters as the method of using underwater detonations is restricted to a national level.
Relationship of the indicator to marine biodiversity	The indicator directly indicates the biodiversity of juvenile fish species in relation to the mean trophic level of the community and this diversity should in turn also indicate the fish production potential of the habitats. The indicator is directly comparable to metrics used in gillnet monitoring (Helcom 2012, D1.7.1), where it is used to reflect the general trophic structure at the community level. Low values may indicate domination of species favoured by eutrophic conditions and vice versa. Unlike Helcom (2012) fishing is expected to be of less direct relevance (indirectly via potential reduction of SSB), and a comparison of the two methods should be made.
Relevance of the indicator to different policy instruments	MSFD descriptors: Mainly relevant for MSFD descriptor 1 "Biological diversity is maintained", and also 3 "Populations of all commercially exploited fish and shellfish are within safe biological limits" and descriptor 5 "Eutrophication". HELCOM BSAP: Relevant for BSAP segment 1: „Towards a Baltic Sea unaffected by eutrophication" and 4: "Towards favourable conservations status of Baltic Sea biodiversity" by providing data on important fish communities and nursery habitats. Habitats Directive: The indicator may be used to indicate structure and function of a selected set of Natura 2000 habitat types which may serve as important nursery habitats (Sundblad *et al*. 2011).
Relevance to commission decision criteria and indicator	1.6.1. Condition of the typical species and communities 1.6.2. Relative abundance and/or biomass, as appropriate
Method(s) for obtaining indicator values	The distribution and abundance of 0-group fish is sampled by the use of small (1g or 10 g explosive) underwater detonations (e.g. Sundblad *et al*. 2011). This active sampling method, which is non-destructive with respect to other biota than fish, is used by Scandinavian fisheries researchers to obtain point abundance samples in heterogeneous environments where other methods such as beach seines, small trawls and drop-samplers are difficult to use (Snickars *et al*. 2007). The method captures all species with gas-filled cavities within approximately a 5 m radius of the detonation and yields representative length distributions of fish between 3 and 20 cm total length. Indicator values will be calculated as the Shannon-Wiener index of 0-group fish (juveniles) weighted by the mean community trophic level of adults (trophic level set by Fishbase www.fishbase.org). The index is primarily intended to be calculated on coastal bay-basis but other geographical scales should also be evaluated.
Documentation of relationship between indicator and pressure	Eutrophication and habitat loss, due to e.g. dredging, constructions or boating activities, are suggested to be the main anthropogenic pressures for this indicator but relationships between the indicator and pressures still have to be tested and determined (Sandström *et al*. 2005, Bergström *et al*. 2013). A comparison of the indicator obtained with underwater detonations and with gillnet monitoring is also recommended.
Geographical relevance of indicator	3. National waters
How Reference Conditions (target values/thresholds) for the indicator were obtained?	Reference conditions need to be established. Reference conditions could be examined by spatial modelling in relation to both environmental and pressure variables in order to delineate natural and anthropogenic influence on the indicator. Also, comparing across different regional settings could help separate low from high estimates suggesting suitable targets. Simultaneously high and low indicator values may be further investigated in relation to other organisms and trophic levels, primarily macrovegetation and gillnet monitoring.
Method for determining GES	GES-levels have not yet been established. In order to reach recommendations on levels, similar analyses as for Reference Conditions should be applied. Including, where available, the use of time series.

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