Name of indicator	1.8 Habitat-related functional diversity 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 functional biodiversity of 0-group (juvenile) fish species in terms of habitat preference and is based on the diversity of species that have a preference for high temperatures and a strong affinity for vegetation. The classification of preference follows Sandström *et al.* (2005, Table 1). A high value of the indicator should reflect a high diversity of species within the defined functional group as well as warm and vegetated areas functioning as nursery areas for both pike (*Esox lucius*), perch (*Perca fluviatilis*) and many cyprinids. The indicator will primarily 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 within a habitat based functional group and this diversity should in turn also indicate to what extent the habitat functions as spawning and nursery areas, i.e. fish production, if the number of species is complemented with densities (cpue). The indicator is to some extent comparable to metrics used in gillnet monitoring (HELCOM 2012) where it is used to reflect fishing pressure and eutrophication. However, the juvenile stages are less directly responding to fishing pressure and are likely more related to eutrophication and coastal development. A comparison between detonation (juvenile) and gillnet monitoring is recommended for the future.
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 fish 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 fish species with a preference for warm and vegetated areas *sensu* Sandström *et al.* (2005). The index is primarily intended to be calculated on coastal bay-basis but other geographical scales will also be evaluated. In addition to the biodiversity index evaluations using densities (cpue) is also recommended.
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 (Sandström *et al*. 2005, Bergström *et al.* 2013) but relationships between the indicator and pressures still have to be tested and determined.
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.

References	
	Bergström, U., Sundblad, G., Downie, A.-L., Snickars, M., Boström, C., and Lindegarth, M. 2013. Evaluating eutrophication management scenarios in the Baltic Sea using species distribution modelling. Journal of Applied Ecology, 50: 680-690. HELCOM, 2012. Development of a set of core indicators: Interim report of the HELCOM CORESET project. PART B: Descriptions of the indicators. Baltic Sea Environment Proceedings No. 129 B. Sandström, A., Eriksson, B. K., Karås, P., Isæus, M., and Schreiber, H. 2005. Boating and navigation activities influence the recruitment of fish in a Baltic Sea archipelago area. Ambio, 34: 125-130. Snickars, M., Sandström, A., Lappalainen, A., and Mattila, J. 2007. Evaluation of low impact pressure waves as a quantitative sampling method for small fish in shallow water. Journal of Experimental Marine Biology and Ecology, 343: 138-147 Sundblad, G., Bergström, U., and Sandström, A. 2011. Ecological coherence of marine protected area networks: a spatial assessment using species distribution models. Journal of Applied Ecology 48: 112-120.