Name of indicator	1.6 Abundance of Cyprinids
Type of Indicator	State indicator
Author(s)	Antti Lappalainen
Description of the indicator	This indicator measures the abundance of Cyprinids (group of freshwater fish species) in archipelago areas. The primary indicator is the average abundance (kg/gill-net/night) of Cyprinids (all togeteher) in coastal gill-net monitoring. A potential secondary indicator is the average catch (kg/trap net /day) of bream (*Abramis brama*) during the spring season in the commercial fishery targeted to Cyprinids and other coastal species. Abundance of roach (*Rutilus rutilus*) in gill-net monitoring, measured as individuals/gill-net/night, has already been used in the assessment of coastal fish communities (HELCOM 2006). The power analyses of Cyprinid gill-net data carried out in MARMONI-project have, however, revealed that the variation is lower and power higher if abundance is measured as weight than as numbers of individuals.
Relationship of the indicator to marine biodiversity	This indicator reflects the biodiversity of coastal fish communities. Cyprinids, such as roach and breams (*Abramis brama* and *Blicca bjoerkna*), have an important role in the food-webs of shallow archipelago areas in the northern Baltic Sea. They feed mainly on molluscs (e.g. Rask 1989). Predation by Cyprinids might even affect the structure of local blue mussel (*Mytilus edulis*) populations in the Gulf of Finland, where blue mussels live at the edge of their range (Lappalainen *et al*. 2005)
Relevance of the indicator to different policy instruments	This indicator can be applied for MSFD descriptor 1 (Biodiversity / 1.2. population size) and especially for MSFD descriptor 4 (Food webs / 4.3 abundance or distribution of key trophic groups/species). The indicator has been agreed as a Candicate indicator in the HELCOM CORESET of Biodiversity indicators (2.11. Abundance of fish key trpohic groups, HELCOM 2012).
Relevance to commission decision criteria and indicator	1.2.1. Population abundance and/or biomass
Method(s) for obtaining indicator values	The primary indicator is the average abundance (kg/gill-net/night) of Cyprinids (all togeteher) in coastal gill-net monitoring. In Finland, the recently started commercial fishery targeted for Cyprinids offers new valuable data source for estimating the abundance of Cyprinids, if this type of fishery continues in future. Here the average catch (kg/trap net /day) of bream (*Abramis brama*) during the spring season could be used as an indicator. Some attempts to estimate the biomasses of cyprinids by hydroacoustic surveys in the shallow archipelago areas have recently carried out in Finland, too, but these attempts have failed. Finland has the longest time series of catch data of small-scale commercial fishery in the Baltic Sea region. The data is available from year 1980 onwards. Our analysis has, however, revealed that this long data set can not be properly used here, the basic reason being the fact that the fishermen's interest for Cyprinids has not been stable. During the early years, there was demand and targeted fishery for bream, and as a consequence, the catches were high and well reported. During the 1990s and 2000s, fishermen mostly tried to avoid breams and other cyprinids and did not report them properly, but after 2009-2010, some commercial fishermen started effective fishery on cyprinids. According to some old samples, the growth of bream in the Finnish coast used to be higher 20-30 years ago than now. It is possible that scarcity of food might restrict the growth of cyprinids now because the densities are evidently high. Thus, the growth of bream (corrected by a temperature factor) might reflect the abundance and be used as an indicator in the future. A prerequisite is that the effects of the targeted commercial fishery for bream should be seen on the growth during the next few years.
Documentation of relationship between indicator and pressure	Large cyprinid fish, such as breams and roach, have become increasingly abundant e.g. in the archipelago waters of Finnish coast and the main reason for this development is coastal eutrophication (Lappalainen 2002). Bonsdorff *et. al*. (1997) has reported similar results from the Archipelago Sea. Results of gill-net monitoring data from the Archipelago Sea and Åland Sea also shows increase in the abundance of certain Cyprinids, the possible reason being the coastal eutrophication (Ådjers *et al*. 2006). In lakes, the increase in total catches and in cyprinid populations caused by strong eutrophication is a well documented phenomenon (e.g. Svärdson and Molin 1981, Persson *et al*. 1991) In addition to this, the high abundance of cyprinids probably tends to maintain the eutrophic conditions also in the archipelago area as has been reported from several eutrophic lakes.
Geographical relevance of indicator	1. Local

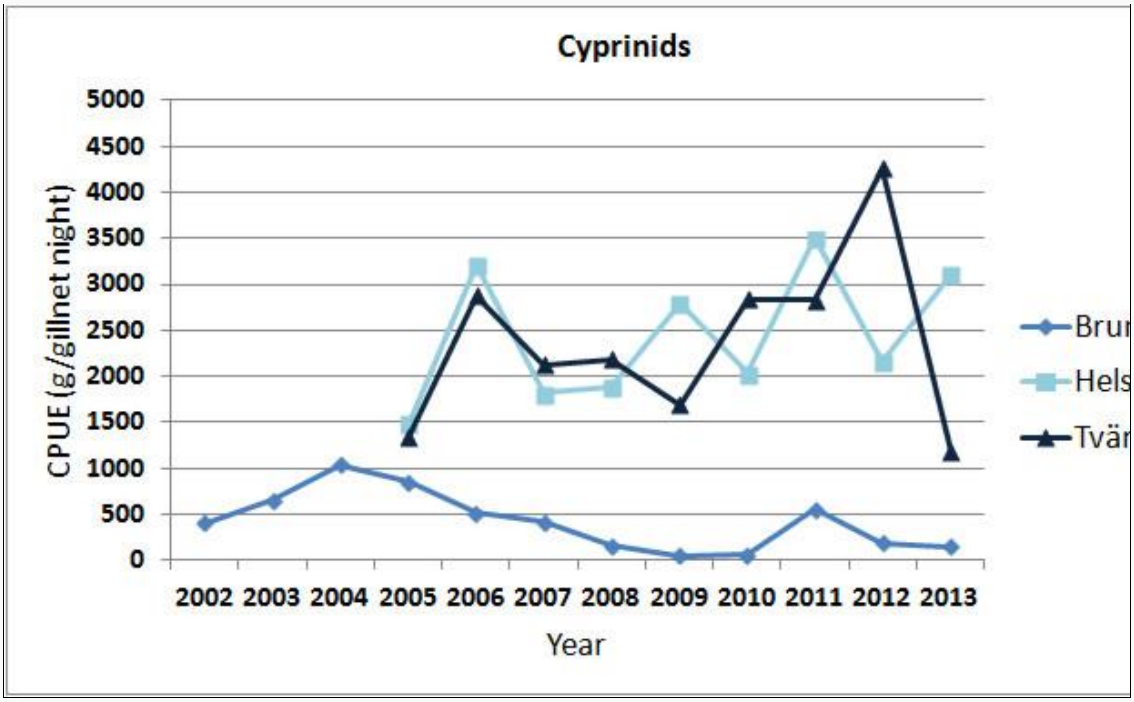
How Reference Conditions (target values/thresholds) for the indicator were obtained?	No proper long-term data sets of reference conditions are available from the Finnish coast. A few coastal gill-net surveys have been carried out in the 1970s and 1990s, but the gill-nets and sampling designs used were not similar as nowadays. The "Nordic" multi-mesh gill-nets have commonly been used in Finland and Sweden since the early 2000s, when several new monitoring areas where established. Gill-net series are still used in Estonia and there the possibilities to find suitable reference data could be better. There are, however, high and even contradictory variaton in abundance of cyprinids between monitoring areas. Thus, it might be problematic to extrapolate the results outside the monitoring areas.
Method for determining GES	The preliminary GES-target is a decreasing trend in the abuncance of Cyprinids in the archipelago areas, where increase in abundance has been observed (e.g. Finnish coast of the Gulf of Finland, Archipelago Sea, Archipelago of the Åland Sea).
References	Bonsdorff, E., Blomqvist, E.M., Mattila, J. and Norkko, A. 1997. Long-term changes and coastal eutrophication. Examples from the Åland Islands and the Archipelago Sea, northern Baltic Sea. Oceanol. Acta 20:319-329. HELCOM 2006. Assessment of coastal fish in the Baltic Sea. Baltic Sea Environment Proceedings No. 103 A. HELCOM 2012: Development of a set of core indicators: Interim report of the HELCOM CORESET project, part B: Descriptions of the indicators. – Baltic Sea Environmental Proceedings 129B: 1–219. Lappalainen. A. 2002. The effects of recent eutrophication on freshwater fish communities and fishery on the northern coast of the Gulf of Finland, Baltic Sea. PhD-Thesis, University of Helsinki. Lappalainen, A., Westerbom, M. and Heikinheimo, O. 2005. Roach (*Rutilus rutilus*) as an important predator on blue mussel (*Mytilus edulis*) populations in a brackish water environment, the northern Baltic Sea. Marine Biology 147:323-330. Persson, L., Diehl, S., Johansson, L., Andersson, G. and Hamrin, S. 1991. Shifts in fish communities along the productivity gradient in temperate lakes – patterns and the importance of the size-streuctured interactions. J. Fish Biol. 38:281-293. Rask, M. 1989. A note of the diet of roach, *Rutilus rutilus, L.*, and other cyprinids at Tvärminne, northern Baltic Sea. Aqua Fennica 19:19-27. Svärdson, G. and Molin, G. 1981. The impact of eutrophication and climate change on a warmwater fish community. Rep. Inst. Freshw. Res., Drottningholm 59:142-151. Ådjers, K., Appelberg, M., Eschbaum, R., Lappalainen, A., Minde, A., Rpecka, R. and Thoresson, G. 2006. Trends in coastal fish stocks of the Baltic Sea. Boreal Environment Research 11:13-25.
Illustrative material for indicator documentation	

	Figure 1. Catch per unit effort (CPUE) cyprinids in the Archipelago Sea (Brunskär) and in the Gulf of Finland (Helsinki, Tvärminne).