Agenda Item 7 Relations with other Bodies

**Document 7-04**

# HELCOM Indicator Fact Sheet: Decline of the harbour porpoise (*Phocoena phocoena*) in the southwestern Baltic Sea

**Action Requested**

- Take note
- Comment

Submitted by AC Chair

**_NOTE:_**
**IN THE INTERESTS OF ECONOMY, DELEGATES ARE KINDLY REMINDED TO BRING THEIR OWN COPIES OF DOCUMENTS TO THE MEETING**

# Decline of the harbour porpoise (*Phocoena phocoena*) in the southwestern Baltic Sea

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## Key message

The Baltic harbour porpoise density and distribution has declined considerably during the last several decades, leading to a critically endangered status of the harbour porpoise in the Baltic Proper. Several human activities such as bycatch, noise and chemical pollution, overfishing, and habitat destruction negatively influence the status of the harbour porpoise. Without the reduction of these anthropogenic impacts to tolerable levels, the targets for the Jastarnia Plan of ASCOBANS and the BSAP of HELCOM appear unlikely to be reached.

## Results and assessment

### Relevance of the indicator for describing developments in the environment

Recent studies suggest that three genetically and morphologically distinct populations of harbour porpoises (*Phocoena phocoena*) occur in the HELCOM area: the North Sea population also inhabits the Skagerrak and the northern part of the Kattegat, the Baltic Proper population extends from Finland to about the German island of Rügen, and the population of the Inner Danish Waters lives between Kattegat and Rügen (e.g. Berggren et al. 1999, Huggenberger et al. 2002, Teilmann et al. 2008, Tiedemann et al. 2001 & in press). The harbour porpoise is the only cetacean species regularly occurring and reproducing in the Baltic Sea. As a top predator, it is an indicator species for past and present environmental conditions of the Baltic Sea. Research on boundaries and distribution of the separate populations is still ongoing.

Up to the early 20th century, the harbour porpoise was common and widely distributed throughout the Baltic Sea and numbers were sufficient to support an annual drive fishery in Danish waters (Tomilin 1957, cited in Koschinski 2002). Concurrent with a declining population, the northeastern distribution limits gradually receded west and southward over the past decades (Koschinski 2002). The recent abundance of this species in the Baltic Proper is low.

## Policy relevance and policy references

International bodies such as the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS), the International Whaling Commission (IWC), the International Union for Conservation of Nature (IUCN) and the Helsinki Commission (HELCOM) have recognised the need for an action plan to promote the recovery of the

Baltic harbour porpoise. In 2002, the ASCOBANS recovery plan (a.k.a. Jastarnia Plan) was created with an interim goal of restoring the population of harbour porpoises in the Baltic Sea to at least 80% of its carrying-capacity level (ASCOBANS 2002). The objectives of the recovery plan are to implement precautionary management measures e.g. to reduce the bycatch rate to two or fewer porpoises per year.

HELCOM's Baltic Sea Action Plan (BSAP) is aimed at an improved conservation status of the Baltic harbour porpoise by 2015. Its goal is a significant reduction of harbour porpoise bycatch rates to close to zero by 2015. In co-operation with ASCOBANS, a coordinated reporting system and a database on Baltic harbour porpoise sightings, bycatches and strandings is to be developed to increase the knowledge on and protection of this species by 2010.

The European Union has adopted some measures to protect the harbour porpoise within the Habitats Directive (1992) (European Commission, 1992) and in EC Regulation No.812/2004 (European Commission, 2004). The former requires the introduction of marine protected areas as well as conservation measures in the entire porpoise distribution range and the latter for the elimination of drift netting. For set netting, however, only the introduction of pingers and observers in a tiny portion of the fishing fleet (vessels above 12 m and 15 m of hull length, respectively) is required. Regarding the effectiveness of this EC Regulation, strong doubts exist both among fishermen and among conservationists (see Stralsund Recommendations 2007; ECS Resolution [European Cetacean Society 2008], and the recommendations of the Jastarnia Group).

## Assessment

The harbour porpoise population inhabiting the Baltic Proper has been classified by the IUCN as "critically endangered" (Hammond et al. 2008), justified by the consideration that the current population size is likely to be fewer than 250 mature individuals and continues to decline. Although neither the original population size nor the carrying capacity of the Baltic Proper have been quantified, it appears likely that the population size decreased considerably in the 20th century due to anthropogenic impact. A drastic decline occurred in the extremely severe winter of 1940 when nearly the whole Baltic Sea was frozen over (Schulze 1996). Nonetheless, harbour porpoises can still be found throughout the entire Baltic Proper as shown by opportunistic sightings and bycatch.

Several types of human activities negatively influence the state of the harbour porpoise negatively. In recent decades, the most important anthropogenic threats to harbour porpoises are the incidental bycatch, prey depletion, noise pollution and chemical toxins. Previously, harbour porpoises have been severely hunted in the Baltic region (Lockyer & Kinze 2003).

Incidental bycatch in fishing gear is the most serious and lethal threat to harbour porpoises (which is why driftnets have been prohibited already). In general, bycatch rates depend on the fishing methods and the fishing effort employed, whereas the reported number of bycaught porpoises depends largely on the awareness and cooperation of fishermen. Already the minimum estimates of bycatches (see Table 1) exceed the mortality limits for the population of the Baltic Proper by far, indicating that these bycatches will prevent recovery (Berggren et al. 2002).

In April 2009, for example, the German government presented several documents at the 16th Advisory Committee meeting of ASCOBANS addressing the current situation of harbour porpoises in the southwestern Baltic Sea:

Over the last decade, an increase in strandings of dead harbour porpoises has been observed along the German part of the western Baltic Sea (Herr et al. 2009, Koschinski & Pfander 2009). On the other hand, there is no indication of a population increase in the western Baltic that could explain the increase in stranding occurrence. From 2003 to 2006, aerial surveys were conducted in the waters of the southwestern Baltic Sea resulting in abundance estimates for the local porpoise population (Scheidat et al. 2008).

Minimum bycatch estimates for this region were estimated using three different approaches. Scheidat et al. (2008) used the estimate of 82 animals per year, based on a paper from Rubsch & Kock (2004). Koschinski & Pfander (2009) used an overall estimate of proportion of bycaught animals in strandings based on data from the years 1987 to 2008 (only from the northern Schleswig-Holstein coast). Using these data, the proportion of bycaught porpoises was estimated to be 86.5%, resulting in an estimate of bycatch of 51 animals in 2005, 82 animals in 2006 and 150 animals in 2007. Herr et al. (2009) used data from 2000 to 2007 along the entire German Baltic Sea coast to estimate that 47% of porpoises stranded were bycaught, resulting in an estimated total bycatch of 69 animals for 2007. When these four different bycatch estimates (51, 82, 150 and 69 animals) are applied to the local abundance estimates to calculate bycatch rates, all resulting rates are above 1%, with most of the rates above 1.7% or considerably higher.

Prey depletion due to over-fishing and habitat destruction is known to lead to starvation and the deterioration of health (e.g. MacLeod et al. 2007).

Noise pollution from industrial and military sources may lead to habitat exclusion, hearing loss or death. Before-After-Control-Impact (BACI) studies during wind park constructions in the Danish Baltic Sea showed a lasting reduction in acoustic porpoise detections mirroring a drastic reduction in their abundance in the area (Carstensen et al. 2006). Furthermore, noise simulations show that operating turbines may have a masking effect at short ranges in the open sea (Lucke et al. 2007).

Conventional ammunition removal by blasting, e.g. in Kiel Bight between 2006 and 2009, is a particular hazard for cetaceans as high sound pressure levels and explosion-related shock waves can lead to severe injury and hearing impairment in marine mammals at considerable distances from detonation sites (Koschinski & Kock 2009). Alternative techniques to render old ammunition harmless are available and in order to minimize harm to marine mammals detonations in the marine environment can be avoided in most cases. If underwater detonations cannot be avoided, suitable mitigation measures need to be introduced. Test detonations demonstrated that it was possible to reduce the danger area by over 98 % when using a double bubble curtain.

Chemical toxins such as persistent organic pollutants and heavy metals may lead to reduced fertility, reduced immune response and illness. Porpoises from the Baltic Sea have been shown to have accumulated PCB levels 0.4 to 2.5 times higher than those from the Kattegat and Skagerrak (Berggren et al. 1999). PCB-related reproductive failure is well known from Baltic grey seals (e.g. Bergmann 1999). A strong increase in infectious disease mortality was shown in British harbour porpoises to correlate with PCB levels above 17 mg/kg lipid (Jepson et al. 2005). Beineke et al. (2005) also found indications for contaminant-induced immunosuppression in stranded harbour porpoises on the German Baltic coast.

During 2009-11 samples from the Swedish west coast and the Baltic are being analysed for a wide range of pollutants and heavy metals, by the Museum of natural History in Stockholm.

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## Additional information

On-line resources for reporting of sighted or stranded harbour porpoises:

- The Baltic Sea Porpoise project: http://www.balticseaporpoise.org/
- National Environmental Research Institute / Aarhus University: http://www.dmu.dk/Dyr_planter/Dyr/Havpattedyr/Marsvin/Satelitsporing+af+marsvin/
- Track | IT – Satellitsporing af marsvin: http://harbourporpoise.trackit.cubitech.dk/main
- Danish Society for Marine Mammals / Fisheries and Maritime Museum, Denmark: http://www.hvaler.dk/
- Finnish Ministry of the Environment: http://www.pyoriainen.fi/ & http://www.environment.fi/default.asp?contentid=190711&lan=fi&clan=en
- The Swedish Museum of Natural History: http://www2.nrm.se/tumlare/

- The Swedish Species Gateway: http://www.artportalen.se/
- Society for the Conservation of Marine Mammals, Germany: http://www.gsm-ev.de/
- German Oceanographic Museum, Stralsund: http://www.meeresmuseum.de/wissenschaft/tierfunde.htm

## Data

### Abundance and distribution

For a survey area mainly covering the Skagerrak to the Belt Sea and the Arkona Sea, respectively, the mean abundance of harbour porpoises was estimated to be about 36 000 animals in July 1994 (SCANS-I; Hammond et al. 2002) and about 23 000 individuals in July 2005 (SCANS-II 2008). This "38-51% decline was however, not statistically significant, but should give reason for concern" (Teilmann et al. 2008, p.8).

In the southern Baltic Proper, a mean abundance of 599 porpoise groups was estimated in June 1995 (Hiby & Lovell 1996, cited in Berggren et al. 2004). This survey was repeated in 2002 resulting in a mean estimate of 93 porpoise groups (Berggren et al. 2004). These survey results confirm the extremely low and probably decreasing population abundance in the Baltic Proper. Long-term PAM (passive acoustic monitoring) studies have provided a detailed picture of porpoise occurrence patterns in some subareas (e.g., Carstensen et al. 2006, Gillespie et al. 2005, Verfuß et al. 2007).

Harbour porpoises perform surprisingly long movements as could be shown by an ongoing Danish satellite-tracking project (Teilmann et al. 2008). Since 1997 more than 60 individuals have been tagged and followed from the Inner Danish Waters and Kattegat/Skagerrak to as far as the Scottish coast and the Shetlands.

### Sightings and strandings

Although porpoise density in the Baltic Proper is extremely low, it is important to point out that bycatch and occasional opportunistic sightings of harbour porpoises prove the continued presence of this species in nearly all parts of the Baltic Sea. Opportunistic sightings and strandings of harbour porpoises have been reported in almost all countries surrounding the Baltic Sea. A number of data banks collect information about incidental sightings and strandings of harbour porpoises in the Baltic Sea (see also the online resources mentioned above).

Carlén (2005) reported 146 live sightings of harbour porpoises in Swedish waters between May 2003 and September 2004, with three of those located along the Swedish east coast of the Baltic Proper. In Finnish waters, a total of 23 harbour porpoise observations were reported during 2001-2007 (Finnish Environmental Administration 2008). In Polish waters, a total of 10 sightings were reported for 1990-1999 (Skóra & Kuklik 2003). Sighting rates in Danish and German waters are higher in summer than in winter (Kinze et al. 2003, Siebert et al. 2006).

Annual totals of 110, 139 and 107 strandings were reported for the Danish coasts (mostly in the HELCOM area) for the years 2000 to 2002, respectively (Kinze et al. 2003). Along the German Baltic coast, 11 to 158 stranded (inc. bycaught) individuals were reported annually for the years 1990-2007. Skóra & Kuklik (2003) recorded seven strandings for the Polish coast during the years 1990-1999. Such information constitutes minimum numbers as not all sightings and strandings are being reported.

## Technical information

### Data source, geographical and temporal coverage

The data sources (surveys) are listed and described (inc. their geographical and temporal coverage) in Table 1.

### Methodology and frequency of data collection

The harbour porpoise density and abundance in the western Baltic Sea and the Kattegat have been estimated in a number of studies during the last 15 years, primarily by conducting visual surveys from ships or aircraft but also by using acoustic survey methods (for details see Table 1, Figure 1). Reported sightings and stranding provide additional information on the distribution of the harbour porpoise.

## Quality information

### Strength and weakness (at data level)

Harbour porpoises are highly mobile. Surveys in southern parts of the Belt Sea and Arkona Basin (summarised in Table 1 and Figure 1) recorded a high inter-annual variability (Scheidat et al. 2008) and annually recurring seasonal changes with low porpoise densities during winter and high densities during summer and autumn (Verfuß et al. 2007). Furthermore, a decrease in harbour porpoise densities from the Kattegat and Belt Sea eastward is obvious (e.g. Gillespie et al. 2005, Scheidat et al. 2008, Verfuß et al. 2007). In low density areas, acoustic survey methods appear to provide a better indication of porpoise densities and trends.

### Reliability, accuracy, robustness, uncertainty (at data level)

Neither the two population estimates from the Inner Danish Waters (1994 and 2005) nor the two estimates for the Baltic Proper population (1995 and 2002) are significantly different from each other due to the wide confidence intervals of all surveys. Moreover, the boundaries of the survey areas changed (as portrayed in Fig. 1).

### Further work required (for data level and indicator level)

Currently this fact sheet focuses on the harbour porpoise in the southwestern Baltic Sea with the goal to update the information on harbour porpoises in the remaining Baltic Sea as soon as further information becomes available. It has been suggested that outstanding research should concentrate on the Baltic-wide distribution and abundance using static acoustic monitoring (e.g., the proposed SAMBAH project 2010-2014 under Swedish coordination) as well as information on the magnitude of the current bycatch.

A number of mitigation measures have been suggested for the threats harming the harbour porpoise population:

Bycatch reduction close to zero calls for the elimination of any contact of porpoises with the responsible gear. This can be done by a reduction of fishing effort to ecologically sustainable levels or by using fishing gear less prone to bycatch. The use of deterrent devices in set nets, so-called pingers, may either be not very efficient or lead to exclusion from key habitats, should they work effectively. Therefore, ASCOBANS (2002) recommends their use only for up to three years to buy time for the development of less problematic mitigation measures. Onboard monitoring and reporting of data are prerequisites to obtaining reliable bycatch numbers and to evaluating the efficiency of any mitigation measure.

A reduction of fishing effort in the responsible fisheries (at least at certain critical times) currently appears to be the only available mitigation measure to avoid prey depletion due to over-fishing.

Noise pollution may be reduced by limiting the maximum speed of vessels, as sound pressure levels increase with increasing vessel speed. Furthermore, fast ferries as well as jet skis should be prohibited in key porpoise areas. The latter measures would also help to avoid the danger of collisions also known as ship strikes. The identification of key areas, however, is inherently difficult in low density areas requiring either intensive research efforts or the rigorous application of the precautionary principle.

Information on the harbour porpoise population status is mainly available for the Western Baltic Sea and the western part of the Southern Baltic Proper. For the Baltic harbour porpoise population, information is scarce and increased monitoring and research is therefore strongly recommended. A long-term passive acoustic monitoring in the entire Baltic Proper with stationary devices is recommended to survey harbour porpoise densities and their trends. Continuation of post-mortem investigations will supply information on the impact of chemical toxins on this top predator. The monitoring of bycatch and the development of mitigation measures continues to be essential.

**Table 1**. Results of dedicated aerial and shipboard surveys (visual and acoustic), as well as stationary acoustic monitoring for harbour porpoises in the Baltic Sea. Study areas of the different investigations are given in Figure 1. CV: coefficient of variation, CI: confidence interval; SE: standard error. (Click here to view table in enlarged PDF version.)

| SOURCE | PLATFORM, METHOD | DATE | AREA (see Fig. 1) | Animal (A) / Pod (P) ABUNDANCE Mean (CV) | CI | A/P | DENSITY Mean (SE) | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | I (inc. I') | 36 046 (0.34) | | | 0.725 | |
| Hammond et al. 2002 | ship, visual | July 1994 | I' | 5 262 (0.25) | | A | 0.644 | animals/km |
| | | | X | 588 (0.48) | | | 0.101 | |
| Siebert et al. 2006 | plane, visual | October 1995 | B | 980 | 360-2 880 | A | | |
| | | | C | 601 | 233-2 684 | | | |
| | | July 1996 | B | 1 830 | 960-3 840 | | | |
| | | | C | 0 | - | | | |
| Hiby & Lovell 1996[a] | plane, visual | June 1995 | tracklines | 599 (0.57) | 200-3 300 | P | | |
| Gillespie et al. 2005 | ship, visual | June-August 2002 | 1 | | | | 8.2 | sighted gro |
| | | | 2 | | | | 1.03 | |
| | | | 3 | | | | 0 | |
| | | | 4 | | | | 0 | |
| | | August-September 2001 | 5 | | | | 0.34 | |
| | ship, acoustic | June-August 2002 | 1 | | | | 16.8 (3.71) | detections/ |
| | | | 2 | | | | 10.5 (1.96) | |
| | | | 3 | | | | 3.2 (0.75) | |
| | | | 4 | | | | 0.1 (0.08) | |
| | | August-September 2001 | 5 | | | | 0 | |
| Berggren et al. 2004 | plane, visual | July 2002 | tracklines | 93 | 10-460 | P | | |
| Scheidat et al. 2008[b] | plane, visual | March 2003 | E+F+G | 467 (0.97) | 0-1 632 | A | | |
| | | May 2005 | | 4610 (0.35) | 2 259-9 098 | | | |
| Verfuß et al. 2007[c] | stationary, acoustic | July-September 2004 | I | | | | 97 % | days with d |
| | | | II | | | | 78 % | |
| | | | III | | | | 1% | |
| | | Januar-March 2005 | I | | | | 60 % | |
| | | | II | | | | 6% | |
| | | | III | | | | 1% | |
| SCANS-II 2008 | plane, ship, visual | July 2005 | S | 23 227 (0.36) | | A | 0.340 | animals/km |

[a] The area covered by Hiby & Lovell (1996), cited in Berggren et al. (2004), is comparable to that covered by Berggren et al. (2004) excluding Polish coastal wat

[b] Only the minimum and maximum values are shown of surveys conducted in 2003-2006

[c] Only representative values are provided here to show seasonal and geographical variation during the study period (2002–2005)

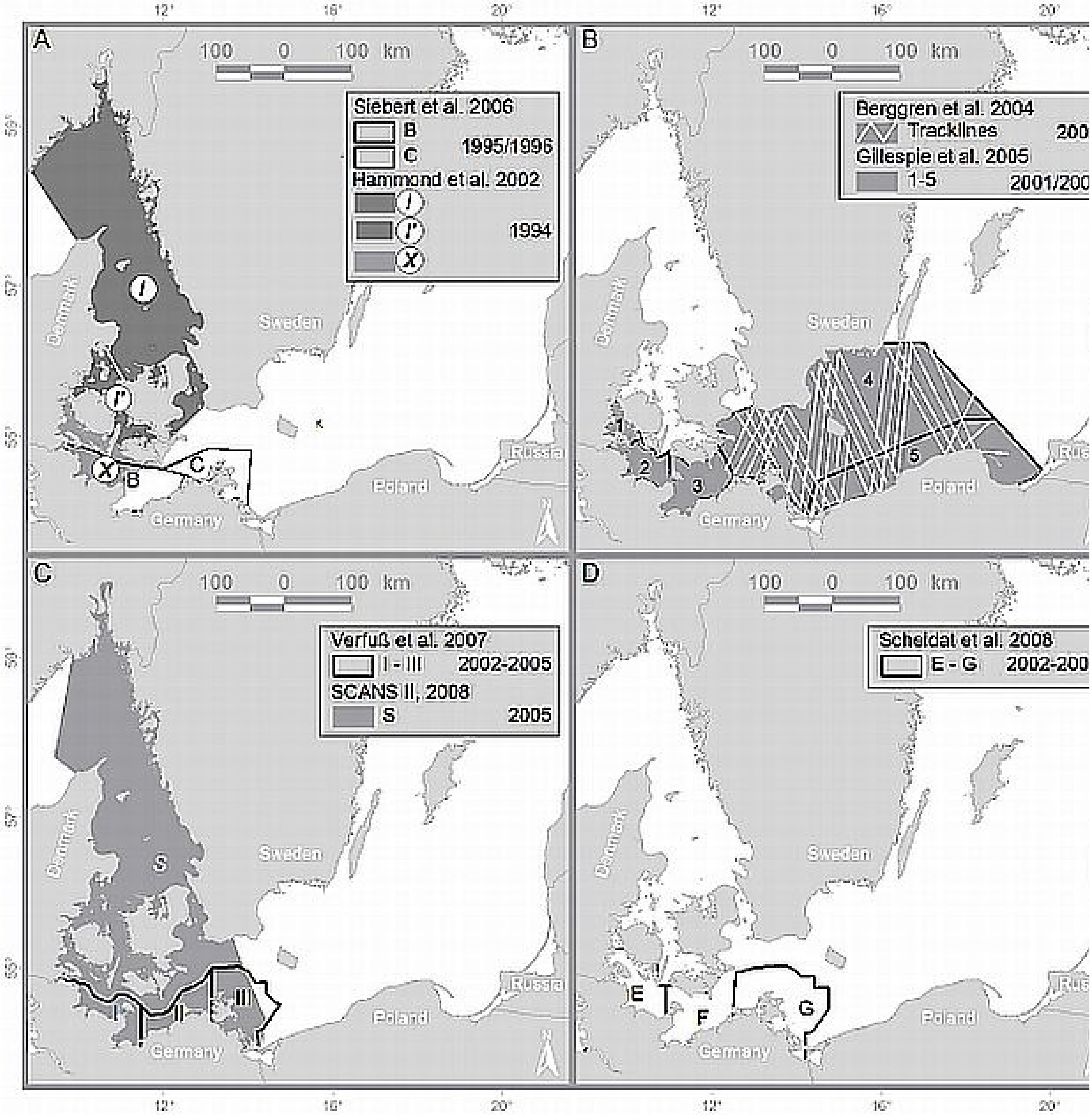


**Figure 1**. Survey areas for the studies listed in Table 1. The area of Hiby & Lovell (1996), (not shown), cited in Berggren et al. (2004), matches the survey area of Berggren et al. (2004) shown in (B) excluding a narrow area along the Polish coast. Survey area I' of Hammond et al. (2002) (in A) is part of survey area I.

**For reference purposes, please cite this indicator fact sheet as follows:**
[Author's name(s)], [Year]. [Indicator Fact Sheet title]. HELCOM Indicator Fact Sheets 2009. Online. [Date Viewed], http://www.helcom.fi/environment2/ifs/en_GB/cover/.

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