Short report on the mass stranding of Cuvier's beaked whales that occurred on the 1st of April 2014 in south Crete, Greece during naval exercises

An atypical mass stranding of up to ten Cuvier's beaked whales (*Ziphius cavirostris*) occurred on the 1st April 2014 along the coasts of S and SW Crete, Greece, Mediterranean Sea. The mass stranding comprised several stranding events of one, two and three whales that stranded in three different locations/areas: Kaloi Limenes, Keratokampos (Kastri area) and Kalikovrechtis, from west to east. The western stranding in Kaloi Limenes was separated by 69 km in straight line from the eastern stranding in Kalikovrechtis. All live strandings occurred on the 1st of April, but three strandings of single dead whales occurred also on April 2, 5 and 6. The live strandings of the 1st of April started at 10:50 local time (GMT +3) in Kaloi Limenes, at about 11:15 in Keratokampos and at 13:05 in Kalikovrechtis indicating a temporal sequence from west to east. In total eight stranding events involving 1, 1, 1, 1, 1, 1, 2 and 3 individuals were recorded. One of the stranded animals was pregnant carrying a 1.8 m long foetus. Photo-identification data showed that a minimum of six and a maximum of ten whales were involved in the mass stranding, since at least two single strandings concerned the same animal. Up to five single strandings might have concerned whales that had previously stranded and been re-floated or had drifted from one stranding location to another neighbouring one.

According to information published in the internet, which was later confirmed by officials of the Greek navy, a trilateral naval exercise named "Noble Dina 2014" was taking place during the mass stranding off the Cretan coasts. Warships from Greece, Israel and USA participated in the military manoeuvres, which included anti-submarine warfare (ASW) and use of military sonar. Further details regarding the naval exercise are still not available. However, according to the local port-police authorities, one US warship was observed on the 1st of April at about 3:00 (i.e. 8 hours before the first stranding) in Gavdos Island area, some 65 km west of the first stranding location in Kaloi Limenes.

Conclusions

1) The large spatial spread of various live whale strandings that occurred one after the other in time along the south and south-east coasts of Crete on April 1st classifies the event as atypical mass stranding of Cuvier's beaked whales (Frantzis 1998, Frantzis 2004).

2) The atypical characteristics of the mass stranding suggest that the cause should have a large synchronous spatial extent and a sudden onset. Such characteristics are shown by loud sound in the ocean like the one produced by military sonar, which is known to provoke atypical mass strandings of beaked whales (Fernandez *et al*. 2005). The proximity of warships conducting military manoeuvres with use of military sonar on April 1st indicates that this was the cause of the mass stranding.

3) This is the fourth time that Cuvier's beaked whales strand during naval exercises conducted in the area of the Hellenic Trench in Greece since 1998, raising the recorded mortalities to more than 45 whales (ACCOBAMS 2013). This number may be the "tip of the iceberg" (Peltier *et al*. 2012), since the effect at the population level is unknown. Unpublished data indicate a dramatic decline in single natural (i.e. not due to sonar use) strandings of Cuvier's beaked whales in the area after 1998. This decline may reflect a decline in the local population unit, suggesting that the impact of sonar is likely to be unsustainable.

4) The large spatial spread (69 km) of the whale strandings indicates that the use of military sonar can have a very important impact (including several mortalities) on local population units and especially on those that are isolated from larger populations, as is the case of the Mediterranean beaked whales (Dalebout *et al*. 2005).

5) The naval exercise and the use of military sonar occurred in an area that ACCOBAMS had mapped as an important habitat for Cuvier's beaked whales, where use of military sonar should not occur (ACCOBAMS 2013). Navies of countries members of this international agreement showed no respect to its recommendations causing severe harm to the marine environment. Both the scientific and conservation communities as well as EU and national authorities in the Mediterranean have to find ways to change this attitude before the ecological damage by military sonar becomes irreversible.

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