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Fifty years of cetacean sightings from the Cornish coast, SW England

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There are very few data on changes in status of smaller cetaceans around UK coasts, including Cornwall. To fill this gap a quantitative retrospective survey of the dolphin Cetaceae sightings of 1000 people in Cornwall has been carried out. This included a simultaneous survey of other maritime sightings as control events, in order to provide some indication of possible errors arising from variations in observer effort or memory distortions. The events chosen for use as controls were coastal sightings of basking sharks *Cetorhinus maximus* and of waterspouts or funnel clouds.

The results indicate a profound reduction of sightings during the last 50 years, occurring throughout the period. The decline appears to affect larger groups particularly, with sightings of small groups of dolphins showing no change and sightings of single dolphins showing an increase. The survey suggests that the method is capable of yielding useful results. Its value could probably be tested and greatly increased by repetition elsewhere around UK coasts, creating the possibility of detecting varying temporal and spatial patterns of change, with possibly some discrimination of the species involved. Such variations might throw light on the major causes of changes that are of great conservation importance.

INTRODUCTION

The best researched source of data on the change in status of small cetaceans in the last 50 years is stranding records, but these data are seriously flawed by large and unmeasurable variations in observer effort over the years, and by the uncertain relationship between strandings and populations (Sheldrick, 1976). Prospective quantified-effort sightings studies have been established more recently, and the present study seeks to find a method of extracting quantifiable data from the very large resource of sightings made over lifetimes by the people resident in a maritime area, while these data are still available, in order to fill a gap which is likely to remain inaccessible to more precise research methods.

A tidal lake, Hooe Lake, on the lower part of the Plym estuary, was known by local people to be regularly used by dolphins before the war. Without entering the lake itself the dolphins were seen to drive mackerel into it at high tide, and then feed on them when they were forced out through the narrowing channel as the tide ebbed. This anecdote is supported by the naming on older navigational charts of the area outside Hooe Lake as 'Dolphin Pond'. More commonplace are reports of long schools of small cetaceans seen moving along close inshore in Mount's Bay in SW Cornwall. Such experiences are now rare. Talking to older people in Cornwall reveals a wealth of impressive anecdotal evidence which appears to reflect a much greater prevalence of smaller cetaceans around the coast within living memory than are seen now.

To quantify these data requires three elements: (1) selection of 'observers' independently of their experience of cetaceans; (2) knowledge of the period during which these observers were able to make sightings; (3) collection of quantitative parallel data on other coastal observations which can be used as 'controls' to assess or calibrate the method.

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METHOD

The questionnaire

Central to the method used is the retrospective establishment of an observer group of known size throughout the 50-year study period 1935–1985. A questionnaire was used to collect the data. The entire membership of pre-selected groups of people in Cornwall were asked to state the years during which they had been both regular visitors to the Cornish coast, and over the age of 10. Most questionnaires were administered at evening indoor meetings of a range of different local organisations. During the meeting the necessity for a 100% response could be adequately explained and checked. The forms could then be collected immediately and any difficulties dealt with individually. No questionnaires were given out for return at a later date. No meetings had any specific connection with cetaceans, and care was taken to give no indication of any view on possible changes in numbers. Care was also taken not to give any indication of the correct dates when certain popular friendly dolphins had been present in Cornish waters.

Sequential samples of persons attending a health centre, an agricultural show and other events were also used. These questionnaires were personally administered, and in these situations the public response was very helpful, with only three refusals.

Eighty-five percent of the questionnaires were administered by the author and the remainder by four other members of the Dolphin Group of the Cornwall Trust for Nature Conservation. Collection of data was stopped as soon as 1000 valid returns had been exceeded. Groups used are listed in Table 1.

The data collected included sightings from the Cornish coast of cetaceans, basking sharks and waterspouts or funnel clouds. A printed A4 form with line drawings of each type of event was used. Basking sharks were also described on the form as 'a very large shark swimming slowly very near the surface'. The observer's location and the date was request for each observation.

Waterspouts and funnel clouds are visible manifestations of a localised vortex of rising air. They are seen as a tapering tail of cloud extending down from the cloud base towards the sea. The visible tail usually shows clear lateral movements and melts away after a few minutes. This is a distinctive event selected as an aid to assessment of the accuracy of the method after a trial of a range of alternatives in a pilot questionnaire. There is no climatological evidence that there have been any substantial changes in incidence (Elsom, 1982; Pritchard, 1987).

Table 1. Sources of observers

No. of observers	Group
53	Women's Institute meeting, St Keverne
42	Mullion Old Cornwall Society meeting
8	Playgroup parents meeting, Hayle
69	Penwith National Trust members meeting
50	Visitors to coffee stall, CTNC,[a] Penzance
29	Madron Old Cornwall Society meeting
11	Staff Hayle Health Centre
98	'Rainforests' meeting, CTNC, Wadebridge
11	Visitors to Cornwall Biological Records Unit
15	'Wildfowl' meeting, CTNC, Probus
136	Patients attending Health Centre, Hayle
18	Conservation Forum meeting, Penzance
11	Branch AGM, CTNC, Liskeard
7	Botany class, Truro
9	Community Programme staff, Penryn
19	Shoppers, Market Jew St, Penzance
22	Mousehole Old Cornwall Society meeting
35	Horticultural Society meeting, Ludgvan
7	Residents, Dola Lane, Rosudgeon
63	Visitors to CTNC Country Fair, Truro
5	Fund-raisers meeting, CTNC, Truro
18	Bats lecture, CTNC, Penzance
13	Sub-Aqua Club meeting, Penzance
21	Horticultural Society meeting, Goldsithney
16	First Aid examinees, Hayle
27	Women's Institute meeting, St Just
17	St Just Old Cornwall Society meeting
21	AGM, CTNC, Truro
127	Visitors to agricultural show, Wadebridge
24	Housewives Register meeting, Devoran

[a] CTNC, Cornwall Trust for Nature Conservation.

Analysis

All observations from boats have been excluded. Fishermen in particular see dolphins more often than they can remember and a few such observers could swamp the reports from shore-based observers.

The data were aggregated into five-year periods centred on 1935, 1940, etc. The survey consequently used data from 1932 to 1987. Non-numerical reports of sightings were consistently interpreted according to a set of simple pre-determined rules, in accordance with the principles of content analysis (Krippendorff, 1981). Thus 'a few' was treated as three; 'some' as four; 'several' as five; 'a school' as eight; 'many' or 'lots' as 20; 'many times' as five times; 'frequently' (e.g. frequently in the 1930s) as once every third year during the specified period; 'in the fifties' as 1955. When questionnaires were personally administered it was possible to obtain numerical estimates from

the observer of 'not more than' and 'not less than' so many animals in a school, and the arithmetic mean was then used.

RESULTS

A total of 1002 valid reports were obtained; 62 forms were excluded where the number of years the observer had been visiting the Cornish coast was omitted. The total number of sightings reported on these excluded responses was 20% below the number that would have been expected in the valid sample.

Observer group

All data preceding 1933 were discarded as the number of observers represented in these periods is low. The average number of observers present throughout each five-year period is given in Table 2, with the numerical data for sightings.

Waterspouts

Sightings of 67 waterspouts were made during the study period. The 1985 period includes a report of eight seen on one occasion by one observer. The rate shows only small changes through the study period.

Cetaceans

In total 784 cetacean sightings were reported. Eight were identified as whales, including three as pilot whales *Globicephala melaena*; 63 sightings were described in non-numerical terms, and were interpreted as described above and included in the results, but their exclusion made little difference to the trends shown.

Small cetaceans

Sightings of small cetaceans showed marked trends. A steep decline dating from the earliest years of the study was apparent in groups of over 15, with a smaller decline in groups of five to 15. Groups of two to four showed no clear trend while there was a rise in sightings of solitary animals.

The reports of groups of over 15 animals amounted to 4136 individual dolphins, with groups of 5–15 animals amounting to 2152. The decline apparent in these groups exceeded 90% during the last 50 years. A small increase due to reports of common dolphins *Delphinus delphis* was seen in the 1985 period.

Groups of 2–4 dolphins amounted to only 166 animals reported. Single dolphin sightings reported amounted to 223, with a marked increase in the 1975 period, which was maintained subsequently. The frequency of sightings of solitary dolphins is now so high that in 1985 the chance of an observer making a sighting had only fallen to 30% of the 1935 rate, although the estimate of the total number of animals seen has fallen to less than 5%.

One hundred and thirty-one sightings were identified as 'porpoises' *Phocaena phocaena*, 12 as 'bottle-nosed dolphins' *Tursiops truncatus* plus others as particular animals known locally as 'Beaky' or 'Donald' and 'Percy', two as 'common dolphins' *Delphinus delphis*, many as 'dolphins', two (correctly) as killer whales *Orca orca*, and three as 'pilot whales' *Globicephala melaena*. It was clear that

Table 2. Number of observers and content of reports

	Year										
	1935	1940	1945	1950	1955	1960	1965	1970	1975	1980	1985
Observers—mean number present through 5-year period	165	234	302	401	492	573	657	747	833	910	974
Waterspouts/funnel clouds reported/1000 observers/year	2·4	0.9	1·3	1·5	2·4	1·8	1·8	1·6	1·7	1·8	4·1
Dolphins—solitary animals reported/1000 observers/year	0	0	0·7	0·5	0·8	1·4	1·8	3·0	16·8	13·0	14·2
Dolphins in groups of 2–4 reported/1000 observers/year	3·7	6·0	2·0	4·0	1·2	8·7	4·0	8·3	5·0	2·0	8·8
Dolphins in groups of 5–15 reported/1000 observers/year	546	215	118	113	129	60·0	54·5	25·7	20·6	19·3	14·2
Dolphins in groups of over 15 reported/1000 observers/year	838	419	424	260	205	194	107	25·7	0	0	59·5
Basking sharks in groups of 1–5 reported/1000 observers/year	65·6	22·2	82·1	133	212	152	147	137	154	45·5	57·3
Basking sharks in groups of over 5 reported/1000 observers/year	24·3	0	0	0	8·1	7·0	18·3	53·6	38·4	17·6	4·1

there was much confusion over the terms porpoise and dolphin. Unsolicited information from 10 observers referred to cetaceans leaping or playing, of which seven were single animals seen since 1972, two were groups of about eight animals, and one was a group of 45 seen in 1958.

Porthcurno, 3 km SE of Land's End, appears as the location of several reports of groups of dolphins of around eight in number. These animals were often seen leaping. These records almost cease in the late 1970s with only a single report from the 1980s.

Sightings were analysed separately for the north and south coasts. Between the first and second halves of the study period the number of animals reported from the north coast fell by 69% from 1931 to 595, and from the south coast by 51% from 2391 to 1165.

Basking sharks

The total number reported showed a plateau from 1950 to 1975. The total number of basking sharks reported in groups of more than five amounted to 12% of the total and showed a considerable increase from 1960 to 1970 with a decline thereafter.

DISCUSSION

Accuracy

The waterspout data were collected to assess the accuracy of the method and in this study they showed a surprisingly and encouragingly even pattern of prevalence. However, the method used has several inherent limitations, which merit discussion.

The observer population for the earliest periods can only have contained relatively young persons, while more recent periods include the same observers at more advanced ages. It is possible that older observers may be more or less effective recently than they were when younger, or young observers may be more or less effective, for various reasons, than they used to be. Either possibility might show as a trend in all categories of observation, which contrasts strongly with the waterspout data.

As a further check on this possible source of error a longitudinal study of observers' sighting rates was made. The 331 observers included by the end of the first 15 years of the study made 102 cetacean sightings in the last 20 years of the study, compared with an expected 116 for a group of the same size drawn from all observers included in the same period. This is consistent with a small inherent bias towards declining numbers of sightings by older observers, but is very much smaller than the trends shown in the results of this study.

Sampling errors could introduce distortion through an over-representation of observers in sighting-rich areas. Observers living in such areas when this study was carried out may have been in less favoured areas of Cornwall in earlier years. This would create a spurious increase in sightings. The converse could also apply. The internal evidence of varied patterns of change in different sizes of cetacean groups, of basking sharks and of waterspouts indicates that this form of error has not been large in this study.

Another form of sampling error could arise if more older people were polled in local meetings. This might include a group of people who had all gone to see a particularly spectacular school of dolphins. However, accounts given indicate that in the earlier years of the study large and small schools of small cetaceans were generally considered a commonplace event. Schools of cetaceans come and go quickly, and no mention was made by any observer of people going to see a school.

The use of non-numerical terms such as 'many' is unsatisfactory. The principal bias likely to have been introduced is under-estimation of the size of dolphin groups above five in number, as the rules adopted attributed the number 20 to all groups described as 'many', or 'lots', or any term that sounded larger. However, when numerical values were required in personally administered questionnaires it was clear that some of these terms described groups of many more than 20 animals, while few were smaller. The smaller terms, such as 'several' or 'a few' generally corresponded well with the values ascribed to them.

A number of effects of public attitude are possible.

(1) A 'nostalgia effect' of exaggeration of early and pleasant memories is a possibility but is not supported by examination of the results as different sized groups of dolphins fared very differently. Shark sightings are also of positive interest to the great majority of observers, but reports of solitary sharks do not show the same increase as solitary dolphins.

In the course of administering the questionnaire we formed the impression that the dominant bias was for older records to be omitted rather than exaggerated, and no impression was received that 'nostalgia' might be affecting dolphin reports and not shark reports. In general we were encouraged

to find that the 'nostalgia effect', if it actually existed at all, seemed unlikely to be a major source of error.

(2) A 'threatened species' effect might also exist. Persons administering the questionnaire took care to avoid raising any sort of expectation of what the results might be, or what issues might be related to the survey. Where any statement was requested it was limited to 'Some people say there are changes, up or down, in different species, locations or numbers. We are trying to get a clearer picture and we need your own experiences to do this'. It may be, however, that this does not neutralise the current climate of concern for the health of the oceans. It is difficult to see how it might explain the differing trends over the years in different sizes of dolphin groups.

(3) A 'public interest' effect in dolphins has increased sightings. In Cornwall only two friendly solitary bottle-nosed dolphins were known to stay in one area long enough to be visited. Public interest is now such that these friendly dolphins have attracted many visitors and consequently are the subject of an increased level of multiple reporting, which in itself does not generate errors in this study unless it is distributed unevenly. A very popular dolphin named 'Beaky' or 'Donald' was present in West Cornwall in 1976 to 1978. In the period 1982 to 1984 another dolphin, 'Percy', with a lower level of frequency of contact with people, was present in the area east of St Ives Bay on the north coast. These two animals were clearly responsible for some of the rise in sightings of single animals in the 1975–1985 periods.

These known animals allow an assessment of the error of observers' dating of sightings. Beaky was mentioned by name, by 31 observers, whose reports show a spread of dates with 61% falling within the 1975–79 period.

Confusion of the different groups of large marine animals is possible but experience in administering questionnaires indicates that in this distinctly maritime community there is a very widespread awareness of the conspicuously different behaviour of dolphins, seals and sharks. Grey seals *Halichoerus grypus* are familiar in this area and are often seen stationary in the water with their heads above the surface, while dolphins appear and disappear quickly, and sometimes leap, contrasting with sharks which forge steadily ahead with a large body visible just below the surface and a fin often breaking the surface.

Improvements to the method

This survey method could be improved by using a questionnaire administered solely on an individual basis. This would avoid spoilt forms and is easily combined with better randomisation of the observer group. It would also allow enquiry into any possible identification features of cetaceans that could be recalled such as how much of the body emerged from the water and the occurrence of leaping. These points would help distinguish harbour porpoises from common dolphins.

Cornwall is particularly suitable for a study of this type. In areas that are not a natural peninsula the type of error arising from the location of observers could be minimised by sampling observations from a restricted area such as one coastal town.

Changes in coastal sighting rates of small cetaceans

Taking into account the limitations of the method used, the following inferences from the study data are probably justified.

(1) There has been a profound—90%—decline in the number of smaller cetaceans seen from the Cornish coast;
(2) the decline has been greater for the larger groups of small cetaceans;
(3) the decline has been occurring throughout the study period;
(4) reports of single cetaceans have become more frequent since the early 1970s.

This survey reflects cetacean numbers in the narrow confines set by coastal sightings. The harbour porpoise is thought to spend most of its time in shallow water (Kinze, 1988). The observations of older birdwatchers in the area, and the paucity of references to leaping behaviour in this study, suggest that harbour porpoises were very much the predominant species to be seen from the coast in the earlier years of the study. It is therefore likely that there has been a substantial fall in the population of this species in the inshore waters of Cornwall. Common dolphins are still seen offshore by fishermen fairly often, and sometimes in very large groups.

On the basis of their behaviour and movement patterns, the cetaceans often seen leaping in the area of Porthcurno until the late 1970s were most likely to have been a resident local family group of bottle-nosed dolphins.

Several possible causes have been advanced

(Evans, 1987) for the dolphin decline reflected in this study. They are (a) increasing disturbance by boats; (b) destruction of cetaceans by fishing gear; (c) reduction of food supply by overfishing; (d) changes in distribution of prey; (e) habitat destruction; and (f) pollution. This type of study might be able to help discriminate between these causes, particularly if used in different localities around the coasts of Britain and Europe. A wider spread of such data would give deeper insight into the strengths and weaknesses of the method, while temporal and geographical variations in the patterns of change found could be significant indicators of the relative importance of the different factors. For example, monofilament gill nets may be particularly lethal to small cetaceans and are not used in inshore waters in Scotland. It would be particularly helpful, in this context, to seek better identification of the harbour porpoise.

CONCLUSION

This retrospective survey has documented and quantified the gradual disappearance of coastal dolphins from the experience of the people of Cornwall. Severe declines of harbour porpoise and bottlenosed dolphin populations seem most likely to account for this change. The novel method used has given surprisingly clear results and wider applications may be capable of yielding useful insight into recent trends in small cetacean populations.

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REFERENCES

Elsom, D. (1982). Spatial and temporal distributions of tornadoes in the UK 1960–1982. *Torro, Weather*, **39**, 317–23.

Evans, P. G. H. (1987). *The Natural History of Whales and Dolphins*. Christopher Helm, London.

Kinze, C. C. (1988). Studies on behaviour and ecology of the harbour porpoise. *Proc. Ann. Conf. Europ. Cetacean Soc.*, 2nd, 91–7.

Krippendorff, K. (1981). *Content Analysis—An Introduction to Its Methodology*. Sage, London.

Pritchard, R. J. (1987). The incidence of outbreaks of widespread thunderstorms in England and Wales: 1946–1985. *J. Meteorol.*, **12**(117)3/87, 83–6.

Sheldrick, M. C. (1976). Trends in the strandings of cetacea on the British coasts. *Mammal Rev.*, **6**, 15–23.