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SURVEYS OF BIRD CONCENTRATION AREAS AS A TOOL IN AVIATION
SAFETY WORK - WITH AN EXAMPLE FROM SWEDEN

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SURVEYS OF BIRD CONCENTRATION AREAS AS A TOOL IN AVIATION SAFETY WORK
- WITH AN EXAMPLE FROM SWEDEN

If given the choice, any pilot would prefer to fly his aircraft through areas with a low number of birds in order to diminish the risk of bird collisions.

To facilitate such a choice great efforts have been made to map bird concentration areas. The bird density, when measured on a country-wide basis, varies considerably; consequently, what is meant by a "concentration area" must vary too. Accordingly, an area with a certain number of birds may be considered a "concentration area" in one region but not in another. This circumstance makes it difficult to lay down international rules for what, by definition, should be meant by a bird concentration area.

Scientific and practical problems

Different "standards" have been used when collecting and furnishing data on where high bird concentrations are to be expected. In this context I will restrict the discussion to concentrations of resident birds, thus excluding different methods of forecasting or measuring the intensity of birds on migration. Furthermore, since Blokpoel (1976) has reviewed the situation up to about 1974, I will concentrate the present discussion to the work done since then.

We know that many bird species occur in large flocks and that many birds congregate at certain places (often considered as good bird localities), either for the reason that they are especially rich in food or are suitable as breeding places for colonial nesters or as roosting areas for social species. Such sites are typical concentration areas. But before distributing information about these areas, e.g. on maps, the following questions must be considered.

1. How many birds have to be present in a defined area to be considered a "concentration" and how shall birds of different size and behaviour be judged from the flight safety point of view?
2. How is an "area" to be delimited? Is it, for example, possible to set up limits for a minimum number of birds per unit (area or volume), or is it enough to define "area" in the subjective manner used by ornithologists?

3. For how long have the birds to use a "concentration area"? An example:

It is known that geese usually rest at a suitable feeding site for a period of about five days during their migration, which takes place within the course of a month. Is that enough to justify the decision to regard this area as hazardous for low flying aircraft during the whole month?

4. Some aggregations of birds, e.g. roosting assemblages, only exist for part of the day. Shall such daily patterns be included in the information given?

5. At what accuracy level is the information most suitable for the user?

It is obvious that the information may be too detailed, but, of course, also too rough to be useful. Furthermore, it is very likely that the demands differ depending on the user; for instance, different requirements as to exactness can be expected in military and in civil aviation.

Attempts to construct standards for bird concentration maps

For many years it has been on the working agenda of the international cooperation on bird hazards to aircraft (especially within Bird Strike Committee Europe, Bird Movement Working Group), to produce standardized bird concentration maps. There has, however, been great difficulties to come to an agreement on the answers to many of the questions raised above. How to define "concentration" was for many years left to the individual countries to decide, and this of course made it hard to compare and co-ordinate the results.

At a meeting with the BSCCE Bird Movement Working Group in December 1974 criteria for drawing up "Birdstrike Risk Maps" were agreed upon. It is worth noting that a new term is introduced here, as we are no longer discussing "concentration areas/sites" but "risk maps", which means maps indicating the risk (roughly equivalent to the bird density) of bird strikes. The criteria are presented in the following table (from Heirman 1975).

| Total number of birds/1000 km ² | | | Bird category [*] | | |
|--|---------------|-------------|----------------------------|---|---|
| Heavy risk | moderate risk | light risk | A | B | C |
| > 100 000 | > 60 000 | > 60 000 | + | + | + |
| or > 50 000 | or > 30 000 | or < 30 000 | | + | + |
| or > 25 000 | or > 15 000 | or < 15 000 | | | + |

^{*} A: 80-260 g, B: 261-1000 g, and C: > 1000 g.

In a paper given at the BSCE meeting in Stockholm 1975, Heirman (1975) presented an attempt to draw up bird risk maps for Belgium, based on these criteria. Several problems arose: The number of homing pigeons in Belgium was larger than the total estimated number of breeding birds (larger than 80 g); the season with the highest number of birds present differed in different parts of the country; if the homing pigeons were included about 80 % of the Belgian territory should be considered having "heavy risk" (during the whole year).

These serious drawbacks of the proposed rules for the preparation of bird risk maps was also pointed out by Holm-Joensen (1975). When he applied them to Denmark, it appeared that the whole country including most of the surrounding waters should be considered having a high bird strike risk. It is obvious that such coarse information is of little value. Furthermore, it ought to be stressed that information on the density of different birds in different areas is not available for most countries in Europe. Two other serious objections against the proposed methods may be raised, namely that they do not take into account the seasonal fluctuations in bird numbers, which makes the situation look worse than it really is, and that this type of maps does not tell the reader where the really black spots are.

Work on concentration maps in Sweden

The following requirements were set up as a general goal for the work on making bird concentration maps for Sweden: The maps shall give information on where and when concentrations of birds may be expected (birds on migration excluded). The information shall be designed to suit military as well as civilian purposes. The following restrictions were then introduced:

1. "Area" is subjectively defined in the way that most ornithologists define a bird "site". This implies that the area can be clearly defined on a large-scale map. On this definition breeding colonies of gulls and auks, roosting sites for jackdaws and gulls, feeding points such as garbage dumps and roosting/wintering areas for water birds are included.
2. An area should only be taken into consideration if it contains at least 1 000 large birds or at least 10 000 small birds for at least a fortnight. The difference between large and small birds was set at 100 g.
3. Information should be given on which time of the year and of the day the birds are present in the area. Approximate number of birds involved should be given.
4. Relevant information of the behaviour of the birds at a given locality should be given in the text accompanying the maps.

Apart from published data, the bulk of information has been provided by local or regional ornithological societies in answer to an inquiry. The knowledge about the occurrence of birds in most parts of Sweden is good enough to fulfil the demands for accuracy necessary for the present purpose. One easily recognized weakness of course is that there are yearly and seasonal changes in the birds' abundance, and this implies the necessity of keeping the information up to date by regular revisions of the maps.

With the described limitations, about 200 areas in Sweden have been recognized as concentration areas. Most of these areas of course are located in the southern part of the country. As a first step the concentration areas will be presented on large-scale maps (1:500 000), accompanied by written information about the time periods, the number of birds, the species involved and some comments on the behaviour of the birds. The information given on the maps is intended to be used directly for different purposes in the planning of military flying and to be converted into maps suitable for presentation in civil AIP.

One example of how the maps will look is given in Figure 1, showing the island of Gotland in the Baltic. This island measures 3 000 km² and is rather rich in birds during large parts of the year. An overview map of each area will include the whole year, but special maps for different time periods of the year can be extracted, see Figure 2 for an example. Each map is accompanied by comments as mentioned above.

References

- Blokpoel, H. 1976. Bird Hazards to Aircraft.
- Heirman, J. 1975. A Belgian Birdstrike Risk Map based on numbers of birds to the unit of area. (Proceedings) 10th meeting Bird Strike Committee Europe. Stockholm 1975.
- Joensen, A.H. 1975. European Bird Hazard Map (Denmark). (Proceedings) 10th meeting Bird Strike Committee Europe. Stockholm 1975.

Whole year

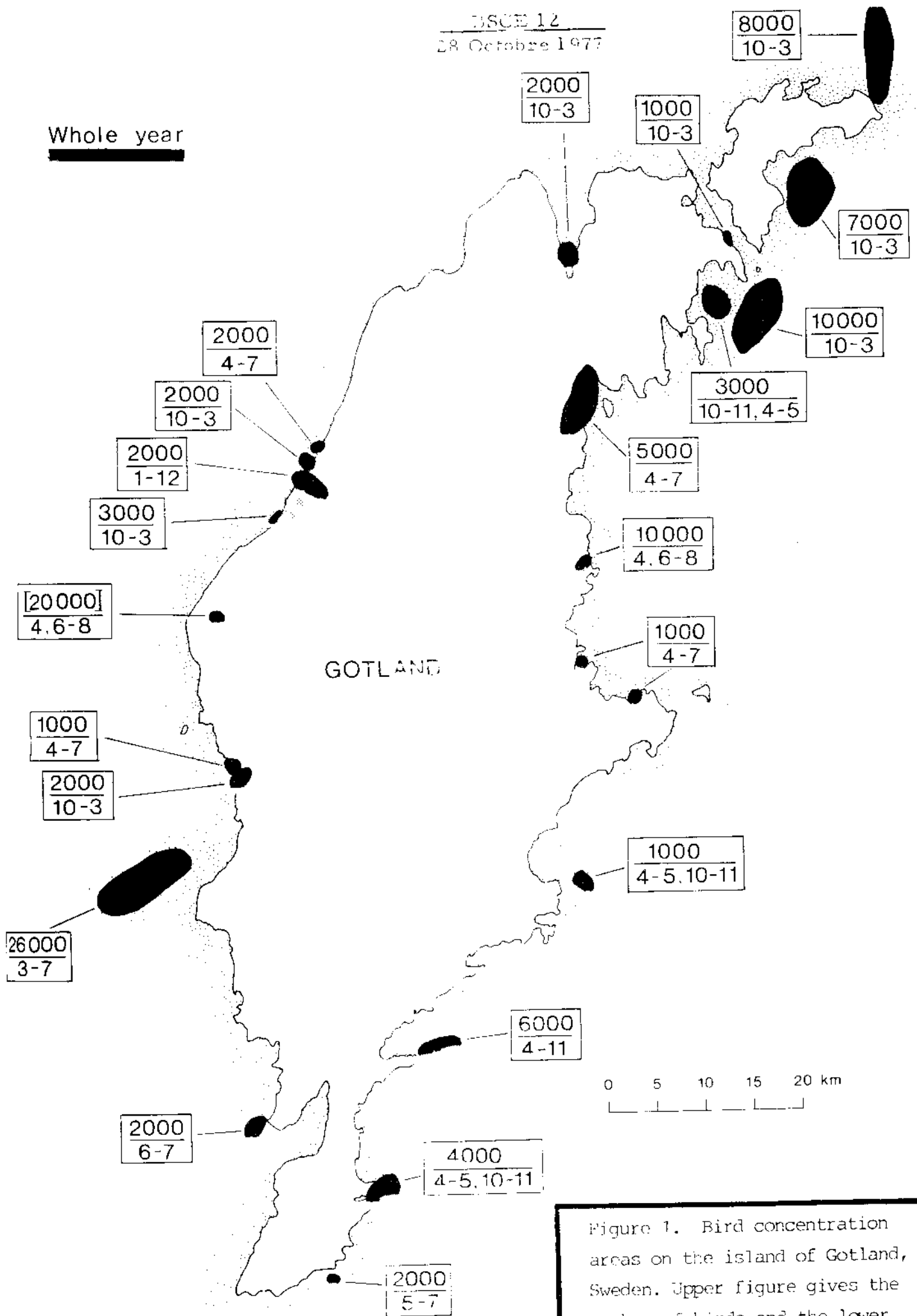


Figure 1. Bird concentration areas on the island of Gotland, Sweden. Upper figure gives the number of birds and the lower the time period (months numbered from 1 to 12).

September

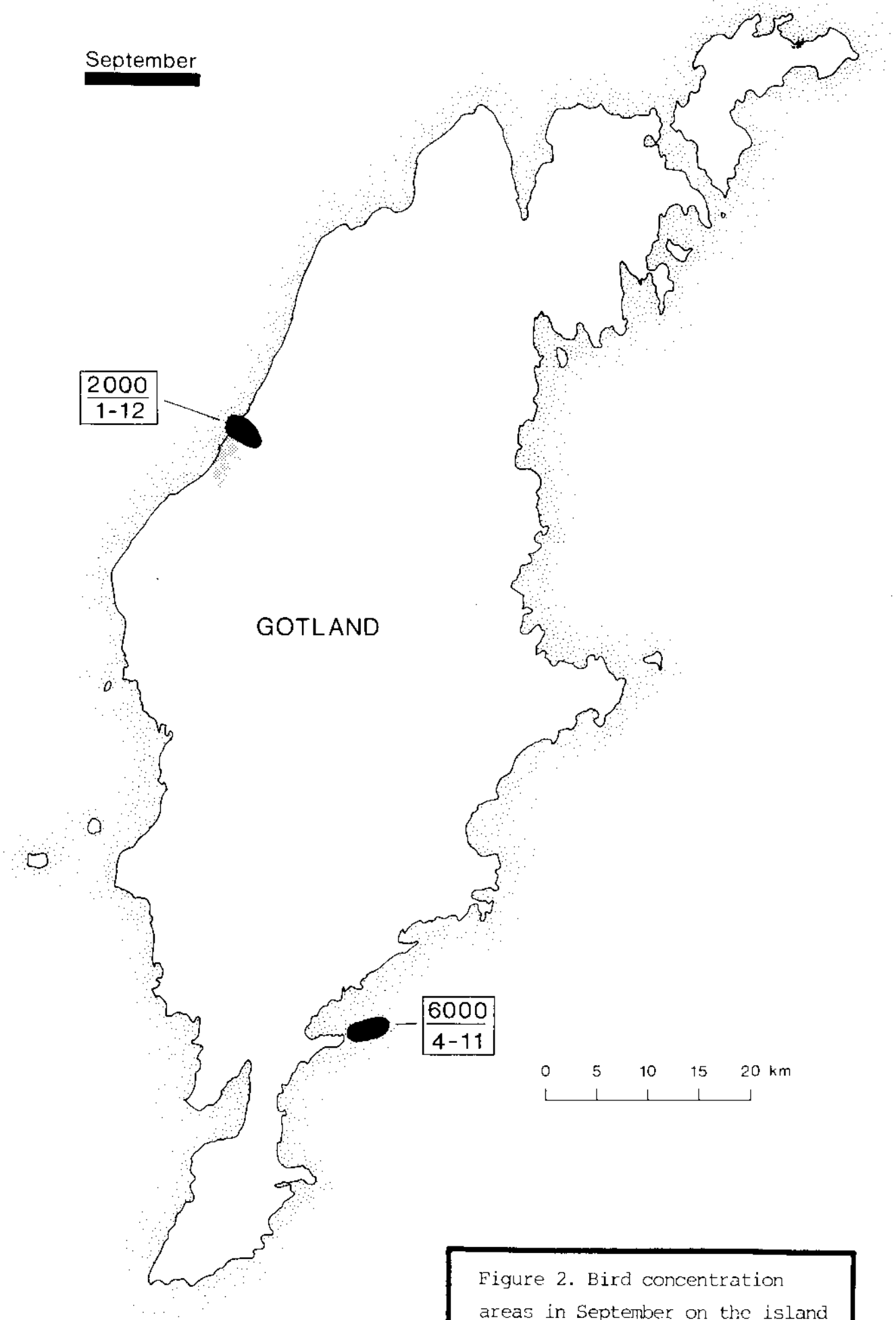


Figure 2. Bird concentration areas in September on the island of Gotland, Sweden. Explanation as in Figure 1.