Atlas of the Southern Spitsbergen Marine Fauna

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supplement - Seabirds distribution in the Barents and Greenland Seas, during the summer seasons, 1991-1995.

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Introduction

Marine waters are differentiated considerably, both vertically and horizontally, with regard to the physical and chemical parameters. Those areas where different water masses meet, i.e. fronts, are of special ecological importance. On a short time-scale, a front may physically concentrate zooplankton at or near the surface. On a longer scale, it may concentrate nutrients, and thus enhance biological productivity in the area. Primary productivity, the abundance of chlorophyll and several other biological indices are usually higher in such areas. As a consequence, most of the zooplankton species, small pelagic shoaling fish and representatives of higher trophic levels, including seabirds are patchy in their distribution. Recent studies have shown that seabirds are virtually absent from large areas and concentrate at those food abundant.

Because of the non uniform distribution and mobility, many pelagic crustacean and surface-shoaling fish populations are extremely difficult and expensive to sample and monitor directly using traditional fishing gear or scientific equipment. As highly mobile, abundant and conspicuous (easy to observe) predators feeding principally on that type of prey, seabirds can be used as an effective sampling tool providing information on marine foods, reflecting changes in densities, spatial and temporal distribution of prey populations. Of course, like other marine sampling devices, seabirds reflect availability of prey rather than its absolute abundance. However, in most circumstances, food availability is correlated with absolute food abundance.

The use of seabirds as monitors of prey stocks is only possible at a very crude level and require detailed research into the relationships between the particular prey species and seabird populations. Avian data can be used to assess local productivity and trophic changes in marine ecosystems. They provide inexpensive, catch independent information complementing the traditional catch data. Integration of the marine ornithology into multi-disciplinary, oceanographic research programs should result in better understanding of the marine ecosystems.

Seabird counting is a relatively simple method which doesn't need any complicated equipment but good field experience of the observers. Standard methods of counting and data recording make comparison of the results obtained by different observers in different areas and seasons possible.

This report presents data collected in the areas close to three Arctic archipelagos - Svalbard, Franz Joseph Land and Novaya Zemlia. Our earlier faunistic studies concentrated in the region of southern Spitsbergen. Now we are fully aware that several ecologically important birds and mammals occurring there, undertake long seasonal (breeding) and even diurnal (foraging) migrations over vast areas of the Greenland and Barents seas. Population ranges of polar bears, walruses, fulmars and may be also some gull and auk species contain the whole area considered in this report.

A general assumption of this paper was to elaborate and present data in such a way they could be used by both oceanographers and ornithologists for their own purposes (compilations, syntheses, etc.).

Lech Stempniewicz *Jan Marcin Węsławski*

Study area

Study area comprising eastern part of the Greenland Sea and almost entire Barents Sea, was divided into 42 squares 60 NM high and 60 NM wide (Fig. 1).

Sea ice is restricted during summer to the northernmost parts of the area. Minimal ice extent is observed in late July and August(Fig.2).

Complicated hydrological situation and high interannual variability, makes necessery to simplify the general hydrological set up for the purpose of seabirds distribution presentation. Using the simplified water masses map (compiled by Koszteyn et al 1995) one can define five basic types of water masses (Fig. 3). The Polar Water (PW) originates in Central Arctic Basin, Arctic Water (ArW) is a mixture of Polar Water and North Atlantic Water (NAW) found over the deep Greenland Sea. Similar mixing over Barents Sea shelf results in Barents Sea Water (BsW). The belt of nearshore waters of Northern Scandinavia and southernmost Barens Sea is defined as Coastal Water (CW).

Table 1. Water masses characteristic, compilation from Koszteyn et al (1995)

Name	Abbrev.	Temperature range (^oC)	Salinity (ppt)
North Atlantic Water	NAW	> 3	> 35
Coastal Water	CW	> 2	< 34.7
Polar Water	PW	< 0	34.3 - 34.8
Arctic Water	ArW	-1.8 - + 5	34.7 - 34.9
Barents Sea Water	BsW	-1.5 - + 2	34.7 - 35

Materials

Ornithological studies were carried out during eight scientific arctic cruises in the summer seasons 1991-1995. Data were collected during four cruises of s/y "Oceania" to Spitsbergen in June-August 1991-1995 (AREX 91-95). Moreover, the observers worked during the arctic cruises of r/v "Pomor" (Spitsbergen-Franz Joseph Land, August-September 1991-1993), and of the r/v "Dalnye Zelentzy" and "Ivan Kireev" (Novaya Zemlya- Franz Joseph Land, August-September 1992-1993).

All these cruises were the part of the international scientific project "RUS/NOR/POL - Coastal marine ecosystems of Franz Joseph Land and Svalbard", coordinated by Murmansk Marine Biology Institute, Norwegian Polar Institute and Institute of Oceanology PAS. Data compilation and form of their presentation were discussed during the international workshop of the "Murmansk Coordinative Committee" held in Hel Marine Station, University of Gdańsk in autumn 1993.

Methods

Seabird counting was based on standard methods described by Tasker et al. (1984). Those parts of the paper concerning particular cruises contain details of the methods used. In general, all data collected were calculated for 0.5 hour periods of observations. Tables and maps present seabird densities (number of birds per 5 square nautical miles) recorded on the route of the ship. Distribution of the four most common seabird species (fulmar *Fulmarus glacialis*, kittiwake *Rissa tridactyla*, guillemots *Uria spp*. and little auk *Alle alle* (or Auks in some cruises) - assigned as "main group" is presented both in tables and maps. Distribution of other species is presented in tables and in some instances also on maps, depending on their number during the particular cruise. The source data, stored on the discettes in EXCEL for PC are available from the editors upon request.

The following abbreviations of the seabird species are used in the paper:

Main group:

AALL - *Alle alle*, little auk;

FGLA - *Fulmarus glacialis*, fulmar;

RTRI - *Rissa tridactyla*, kittiwake;

USPE - *Uria spp.*, guillemots.

Other species:

CGRY - *Cepphus grylle*, black guilemots;

FARC - *Fratercula arctica*, puffin;

GSTE - *Gavia stellata*, red-throated diver;

LHYP - *Larus hyperboreus*, glaucous gull;

PEBU - *Pagophila eburnea*, ivory gull;

SLON - *Stercorarius longicaudatus*, long-tailed skua;

SPAR - *Stercorarius parasiticus*, arctic skua;

SPOM - *Stercorarius pomarinus*, pomarine skua;

SSPE - *Stercorarius spp.*, skuas (except of great skua);

STPA - *Sterna paradisaea*, arctic tern;

SMOL - *Somateria mollissima*, common eider;

ULOM - *Uria lomvia*, Brunnich's guillemot;

UAAL - *Uria aalge*, common guillemot.

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Fig. 1. Observer effort (nr of hours) in each square 1991 - 1995 and squares numbers reffered to table nr 1

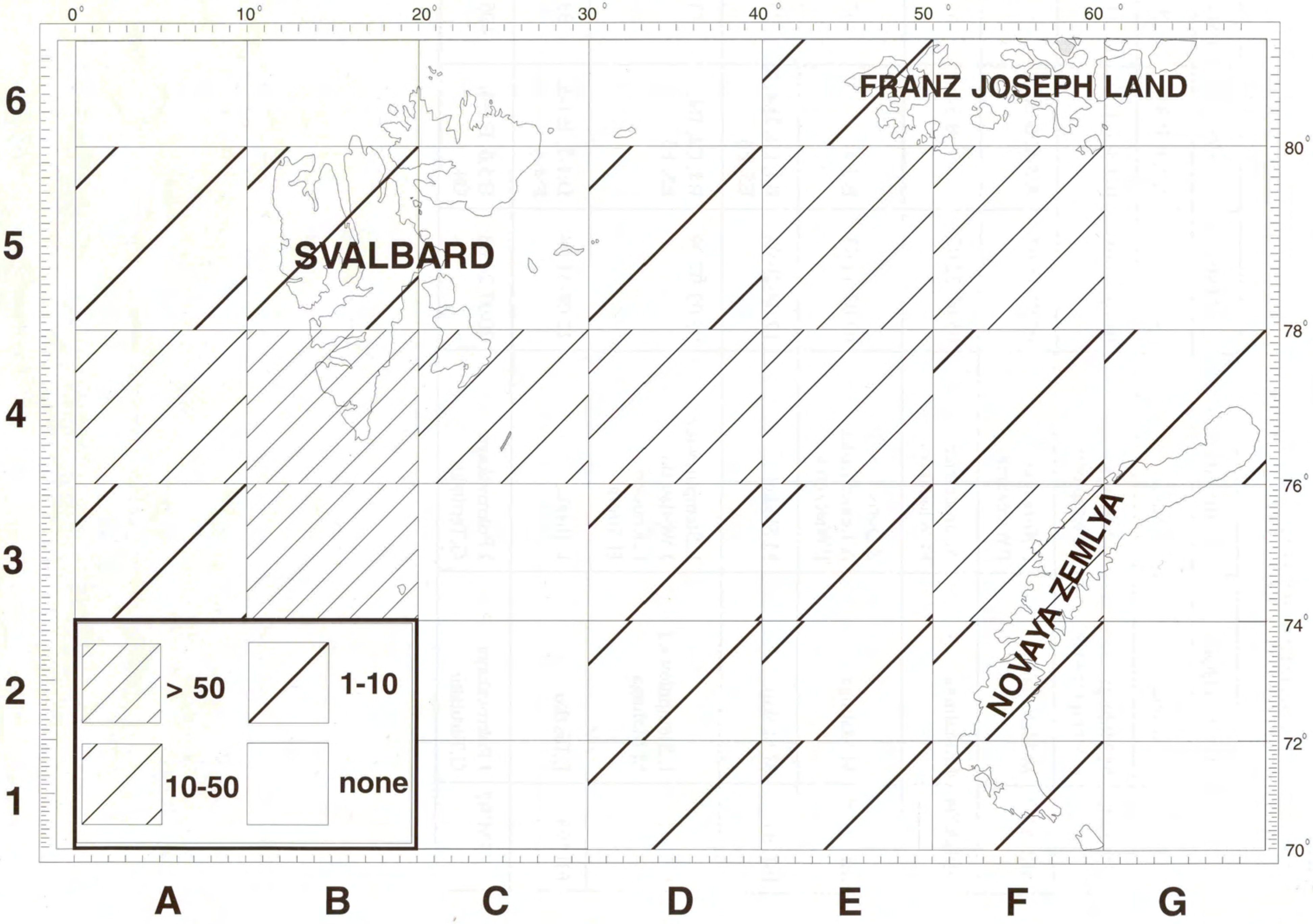

Table 1.
List of all cruises presented in publication

CRUISE	AUTHOR	OBSERVERS	TIME	AREA	PAGE
AREX'91	T. Postma	T.Postma	24.06-10.07	A:3,4; B:3-5	29
AREX'92	M.Malinga L.Stempniewicz	M.Malinga L.Stempniewicz	05.08-17.08	B:3-5; C4	41
AREX'93	M.Malinga	L.Kotwicki P.Wieczorek	07.07-16.07	A:3-5; B:3,4	53
AREX'94	M.Malinga	A.Jarocewicz M.Włodarska	05.07-22.07	A:3,4; B:3-5	61
AREX'95	M.Malinga	Z.Duris A.Legieżyńska P.Wieczorek	07.07-14.07	B:3,4	67
FJL'91	M.Skakuj	M.Skakuj	17.08-20.08	B4, C4, D:4, 5, E5, F5	73
FJL'92	L.Stempniewicz M.Malinga	L.Stempniewicz J.Węsławski L.Knutsen H.Strom	05.09-07.09	B4, C4, D4, E5, F5	83
FJL'93	L.Iliszko	L.Iliszko	12.08-31.08	D:1-3, E:1-5, F:4-6	93
NZEM'92	I.Pokrovskaya G.Tertitskii	I.Pokrovskaya G.Tertitskii	20.07-24.08	E:5,6, F:1-6, G4	105