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Occurrence of (*Pandalus montagui*) in Trawl Survey Samples from NAFO Subareas 0+1

by

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Abstract

Stratified-random surveys have been carried out since 1988 in NAFO Subarea 1 and Division 0A as a component of the assessment of the stock of *Pandalus borealis* off West Greenland. *Pandalus montagui* has occurred frequently as by-catch in a large part of the surveyed area. This paper updates the earlier reported time series with data from surveys in 2001-2003.

Biomass estimates are calculated, and large variations from year to year are indicated. However, as the survey design was applied for investigating the stock of *P. borealis* it was not optimal for *P. montagui*. Hence the resulting biomasses are considered to be somewhat underestimated.

Introduction

Since 1988, Greenland Institute of Natural Resources has conducted annual stratified-random trawl surveys in the distribution area of *Pandalus borealis* in Davis Strait. Occurrence of other species in the catches has been recorded, and this paper presents update of data on biomass estimates of *Pandalus montagui* (Kanneworff, 2000).

Material and Methods

The basic survey design has been constructed with reference to the distribution of the stock of *Pandalus borealis*, as has the allocation of stations to the various strata (Kanneworff and Wieland, 2003). For the sampling period 1988 to 1997 trawl stations were allocated to strata proportionally to the area of the strata, but from 1998 station allocation have been weighted towards strata with observed high *P. borealis* variance (Carlsson and Kanneworff, 2000). The total area for the stratified-random survey is about 133 000 km², covering depths between 150 and 600 m, extending from Cape Farewell to 72°30'N. Since 1991, some 30 stations per year in depths below 150 meters were also taken to obtain information on occurrence and possible changes in fish populations. In 2002 and 2003 these low water stations have been located mainly in depths between 100 and 150 m. In total, 200-275 stations have been occupied annually.

Through all the years the surveys have been conducted with a 722 GRT trawler, using a 3000/20-mesh *Skjervøy* bottom trawl with a twin cod-end. Mesh size in the cod-end was changed from 44 mm to 20 mm (stretched) in 1993 and the small meshed codend was used thereafter. Trawl geometry was measured with *Scanmar* acoustic sensors mounted on the trawl doors, and a *Furuno* trawleye on the headrope.

In order to minimise the influence of daily vertical migrations of shrimp, trawling was carried out between 0900 and 1900 UTC only. Length of the trawl track was measured by the distance between the (GPS) positions at the beginning and the end of the tow. Swept area was calculated for each haul as the length of the trawl track multiplied by the mean width (i.e. wingspread) of the trawl as calculated from the measured door distance.

Results and Discussion

Biomass calculations are based on catch per swept area unit, averaged over each stratum, assumed to represent mean densities. For each region (see Kanneworff and Wieland, 2003) total biomass estimates are given in Table 1. Due to uncertainties about the extent of the distribution areas of this species biomass in the shallow water region (F) is not calculated.

The regions D (Disko area) and S (Julianehåb Bay, from 2003 named W8 and W9) were not included in the survey area until 1991 and 1994, respectively. Also, the southern parts of region W (W6 and W7) were first included completely in 1993. Further, shallow water areas (region F) were not covered before 1991. Considering the observed distribution of the stock in the later years the stock size of the years before the complete coverage of all areas are obviously underestimated (Table 1), provided that no drastic change in the distribution of the stock has taken place.

P. montagui is recorded from all depths within the survey area, but occurs more often in shallower water than *P. borealis*. While more than 50% on average of the biomass of *P. montagui* are recorded in depths less than 200 m (Table 2), only 10% or less of the *P. borealis* biomass are found is these depths (Kanneworff and Wieland, 2003). In some years, a considerable proportion of the observed *P. montagui* biomass has been recorded in the 200-300 m layer, probably occurring mainly in the upper part.

Due to low historical variances of *P. borealis* in depths shallower than 200 meters these areas were covered with a lower number of stations per area unit than in larger depths since 1988. The present sampling scheme is thus less suitable for a good description of the stock of *P. montagui*. Calculated density (kg/km²) is indicated to be higher in the two recent years in region F (Fig. 2), however, these densities are possibly not comparable with the rest of the series, as the sampling took place in more restricted areas. It is p.t. not possible to estimate a reliable total biomass for this region.

The total estimated biomass (for depths between 150 and 600 m) has been quite variable through the time series with large estimates in 1995, 1998 and 2002. The figures can only give an indication of the order of magnitude of the biomass due to the very wide confidence limits (Table 1). Compared to the estimated size of the *P. borealis* stock (Fig. 1) the *P. montagui* biomass is possibly less than one percent of the large stock of northern shrimp.

Conclusion

The main distribution area of *Pandalus montagui* in the West Greenland area is observed to be in depths less than about 250 m around the shallow banks. Large variations both in the depth distribution and in the estimated biomasses from year to year are observed, but due to wide confidence limits for the estimates no clear trends can be seen. Compared to the biomass estimates of *P. borealis* the biomass of *Pandalus montagui* is possibly less than 1% of the former.

References

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Table 1. Estimates of *Pandalus montagui* biomass (tons) in Regions for 1988-2003. The overall standard deviations and error coefficients of variation are also given.

Year	Region					All		
	C	D	N	W	S	Biomass	SD	ECV
1988	0	-	0	48	-	48	367	65
1989	0	-	0	116	-	116	394	34
1990	0	-	0	8	-	8	59	68
1991	0	11	0	132	-	143	1125	56
1992	0	61	0	2050	-	2111	12317	44
1993	0	6	0	1561	-	1567	8679	46
1994	0	22	0	587	2050	2659	9370	28
1995	0	0	0	18820	9	18829	99064	41
1996	1	4	1	2906	0	2912	8881	25
1997	0	4	0	3343	0	3347	20713	48
1998	0	1	0	14314	473	14788	135957	63
1999	0	31	0	5000	0	5031	46342	61
2000	0	86	0	2034	565	2685	14333	38
2001	0	165	40	648	1898	2751	13802	34
2002	0	4	0	4832	6652	11488	54029	32
2003	0	88	0	1376	-	1464	7965	42

Table 2. Distribution (in percent) of *P. montagui* biomass in depth strata, 1988-2003. The figures represent regions C and W only, as the other regions have no depth strata defined.

Year	Depth strata			
	150-200	200-300	300-400	400-600
1988	86.7	7.7	5.0	0.5
1989	44.6	55.2	0.1	0.1
1990	23.6	76.4	0.0	0.0
1991	12.4	82.7	4.9	0.0
1992	5.4	94.2	0.4	0.0
1993	0.4	78.4	1.6	19.6
1994	81.6	11.2	0.0	7.2
1995	85.8	4.7	9.5	0.0
1996	42.0	57.7	0.3	0.0
1997	68.7	31.1	0.0	0.1
1998	84.9	13.6	1.4	0.0
1999	83.4	16.0	0.5	0.0
2000	62.2	34.6	3.0	0.2
2001	31.9	64.1	3.5	0.5
2002	78.4	21.1	0.5	0.0
2003	23.9	70.9	0.0	5.2

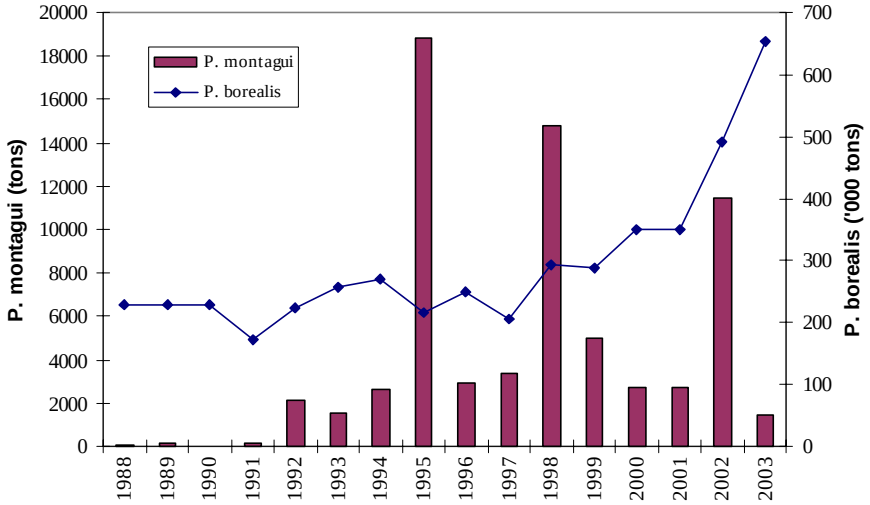

Fig. 1. Estimated biomass of *Pandalus montagui* and *P. borealis* 1988-2003 in areas with depths between 150 and 600 m.

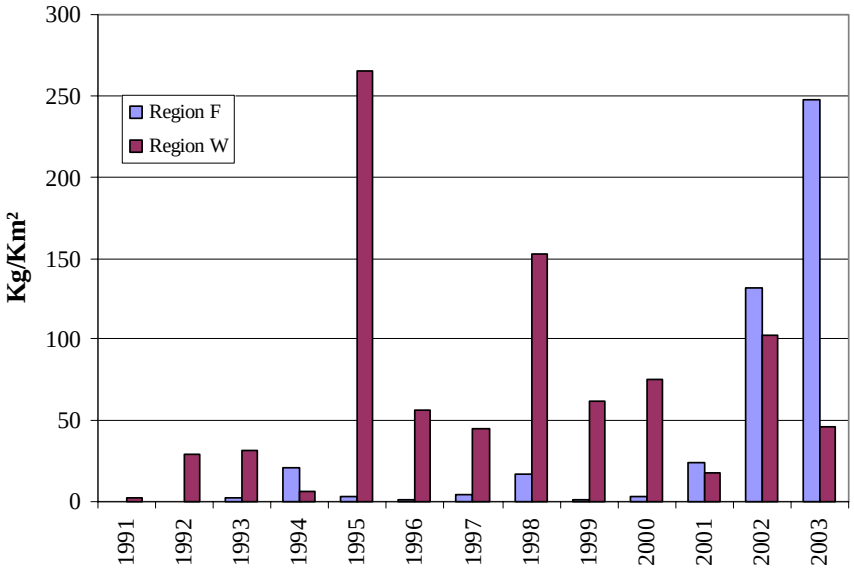

Fig. 2. Density (kg/km²) of Pandalus montagui 1991-2003 in region F (depths less than 150 m) and region W (depths 150-600 m).