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Seasonal variation in the biomass of the main commercial species from surveys on Saint Pierre Bank, 1971-72

by

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Four groundfish surveys were carried out in 1971 and 1972 with the R/V *Cryos* on Saint Pierre Bank (ICNAF Subdiv. 3Ps). These cruises occured in summer (11-25 July 1971), in autumn (9-14 November 1971), in winter (7-22 February 1972) and in spring (4-12 May 1972). One of the purposes was to study the seasonal variation in the biomass of the main commercial species inhabiting this bank.

When these surveys were conducted, we did not apply the stratified random sampling method worked out by Grosslein (1969) since the stratification scheme for Subdiv. 3Ps, adopted by ICNAF after the proposal of Pinhorn (1972), was not yet available.

So, the data presented in this paper are based on 33 standard trawl stations of 30 minutes duration occupied, during the four seasons, at predetermined positions (Fig. 1). The bottom trawl used had the following specifications: 31.20 m headline mounted on 30.80 m; 17.70 m groundrope with steel bobbins; 140 mm mesh in the wings and body and 50 mm in the codend.

The yields obtained in kg per half-hour were expressed in kg per m^2 of the surface area covered. They were then regrouped within 5 strata determined according to the known distribution of the major groundfish species and proposed by Pinhorn (1972) i.e. less than 50 m, 50-100 m, 100-200 m, 200-350 m and greater than 350 m.

Results

Results are given in Tables 1, 2, 3 and 4.

1. Seasonal variation in the biomass by species:

a) Cod

The biomass, minimum in autumn (13.69×10^{-4} kg/m^2) increases in winter (27.72) to reach a maximum in spring (31.20). In spring, summer and autumn, the greatest biomasses are found from less than 50 m to 200 m while in winter, they are located from 100 m to more than 350 m in depth.

b) Redfish

The biomass, maximum in summer (125.30) sharply decreases in autumn (62.93) to be minimum in winter (41.99) and increases again in spring (52.62). In spring and summer, the biomass is greater between 200 and 350 m while in autumn and winter, it is maximum in the stratum deeper than 350 m.

c) Flatfishes

The total biomass is maximum in autumn (54.29) principally because of the importance of the American plaice (39.74). It maintains in winter and spring at about 31.00, at this time when witch flounder become the most important species, to be finally minimum in summer (13.22).

d) Skates

The biomass, maximum in spring (34.90), progressively decreases in summer (22.94), autumn (18.54) and winter (15.20). The biomass of skates, greater in shallow waters less than 50 m deep in summer, become more important between 50 and 200 m at the other seasons.

e) Dogfish

Almost at the zero level in spring and summer (0.02 to 5.52), the biomass increases suddenly from 200 to 350 m in autumn (136.94) to reach its maximum from 100 to 200 m in winter (236.10).

f) Other Fish

Among the other fishes, silver hake and pollock have a biomass near zero. The haddock shows a maximum biomass in spring (10.46) which decreases progressively; the hakes have a maximum biomass in winter (14.18), still important in spring (12.57) but decreasing in summer (3.43) and in autumn (5.42). The wolffish group and goosefish show a maximum biomass in spring (respectively 6.07 and 2.69).

2. Seasonal variation in the biomass by stratum.

The total biomass by stratum shown also variations according to the season. Generally, it is greater in the shallow strata in spring and summer and in the deeper strata in autumn and winter.

For example, in the depth less than 50 m, the biomass is maximum in summer (33.28) mainly because of the importance of cod and skates, and then decreases in autumn (9.17) and winter (6.59) to increase again in spring (19.90). On the other hand, in the stratum deeper than 350 m, the total biomass reaches its maximum in winter (68.28) and its minimum in spring (10.54) while it maintains at about 34,00 in summer and autumn.

The seasonal variation in the total biomass within each stratum must be directly connected with the prevailing hydrographic conditions and with their influences on the distribution and migration patterns of the main species.

3. Seasonal variation in the total biomass.

The total biomass for all species in all strata is very similar in spring and summer (about 189.00). In autumn and in winter it sharply increases (293.24 to 369.31) mainly due to the importance taken by the dogfish during these two seasons (136.94 and 236.10).

Conclusion

This study shows that seasonal variations can affect the biomass estimates of the main commercial species on Saint Pierre Bank (Subdiv. 3Ps). In this particular case, the biomass estimates may therefore considerably change, depending on the season when the sampling survey is carried out, the lowest estimates being observed in spring and summer surveys. More generally speaking, it will be necessary to take such variations into account and be careful using the figures obtained, particularly when biomass estimates will be employed as a basis in stock assessments.

References

Grosslein, M.D. 1969. Groundfish survey methods. US Bureau of Commercial Fisheries, Biological Laboratory, Woods Hole, Lab. reference No. 69-1.

Pinhorn, A.T. 1972. Proposed stratification scheme for ICNAF Subdivision 3Ps. ICNAF Res.Doc. 72/60, Serial No. 2776.

Table 1. Biomass for the main groundfish species on Saint Pierre Bank (Subdiv. 3Ps) in summer 1971. (results in 10^{-4} kg/m^2). * = present

SPECIES	DEPTH (w)					TOTAL
	« 50	50 - 100	100 - 200	200 - 350	> 350	
Squalus acanthias	-	-	-	0.02	-	0.02
Raja spp.	13.29	2.94	4.24	1.33	1.14	22.94
Merluccius bilinearis	-	-	-	0.15	-	0.15
Pollachius virens	-	-	-	-	-	-
Melanogrammus aeglefinus	5.08	-	0.29	-	-	5.37
Gadus morhua	13.48	3.91	0.85	-	*	18.24
Urophycis spp.	-	0.12	0.05	3.03	0.23	3.43
Anarhichadidae	0.18	-	*	-	-	0.18
Sebastes mentella	-	*	3.48	92.44	29.38	125.30
Glyptocephalus cynoglossus	-	0.09	0.79	1.77	2.44	5.09
Hippoglossoides platessoids	0.79	3.32	0.82	1.24	0.67	6.84
Hippoglossus hippoglossus	0.23	-	-	-	-	0.23
Limanda ferruginea	0.23	0.52	0.05	-	-	0.80
Reinhardtius hippoglossoides	-	-	*	-	0.26	0.26
Lophius americanus	-	-	0.12	0.62	0.20	0.94
TOTAL	33.28	10.90	10.69	100.60	34.32	189.79

Table 2. Biomass for the main groundfish species on Saint Pierre Bank (Subdiv. 3Ps) in autumn 1971. (results in 10^{-4} kg/m^2) * = present

SPECIES	DEPTH (w)					TOTAL
	« 50	50 - 100	100 - 200	200 - 350	> 350	
Squalus acanthias	-	-	7.08	129.86	-	136.94
Raja spp.	1.89	7.23	4.24	3.33	1.85	18.54
Merluccius bilinearis	-	-	*	-	-	-
Pollachius virens	-	-	-	-	-	-
Melanogrammus aeglefinus	-	-	0.15	0.11	-	0.26
Gadus morhua	4.55	5.52	3.21	0.32	0.09	13.69
Urophycis spp.	-	-	2.02	2.64	0.76	5.42
Anarhichadidae	*	0.15	*	-	0.26	0.41
Sebastes mentella	-	*	14.58	20.91	27.44	62.93
Glyptocephalus cynoglossus	-	*	1.85	8.80	2.27	12.92
Hippoglossoides platessoids	1.97	19.03	16.18	1.83	0.73	39.74
Hippoglossus hippoglossus	-	-	0.26	0.06	-	0.32
Limanda ferruginea	0.16	0.20	*	0.02	-	0.98
Reinhardtius hippoglossoides	-	-	0.15	*	0.18	0.33
Lophius americanus	-	-	-	0.55	0.21	0.76
TOTAL	9.17	32.13	49.72	168.43	33.79	293.24

Table 3. Biomass for the main groundfish species on Saint Pierre Bank (Subdiv. 3Ps) in winter 1972. (results in 10^{-4} kg/m^2) * = present

SPECIES	DEPTH (w)					TOTAL
	« 50	50 - 100	100 - 200	200 - 350	> 350	
Squalus acanthias	-	0.21	212.12	3.68	20.09	236.10
Raja spp.	2.35	2.71	4.85	3.44	1.85	15.20
Merluccius bilinearis	-	-	-	0.08	-	0.08
Pollachius virens	*	*	-	*	*	-
Melanogrammus aeglefinus	-	-	0.64	1.00	-	1.64
Gadus morhua	2.27	2.56	10.45	2.17	10.27	27.72
Urophycis spp.	-	-	1.27	11.73	1.18	14.18
Anarhichadidae	-	-	0.36	-	-	0.36
Sebastes mentella	-	-	1.00	10.29	30.70	41.99
Glyptocephalus cynoglossus	-	-	2.00	11.97	3.15	17.12
Hippoglossoides platessoids	0.23	1.36	6.00	1.82	0.86	10.27
Hippoglossus hippoglossus	-	-	0.70	-	-	0.70
Limanda ferruginea	1.74	0.20	-	-	-	1.94
Reinhardtius hippoglossoides	-	-	*	-	*	-
Lophius americanus	-	*	0.97	0.86	0.18	2.01
TOTAL	6.59	7.04	240.36	47.04	68.28	369.31

Table 4. Biomass for the main groundfish species on Saint Pierre Bank (Subdiv. 3Ps) in spring 1972. (results in 10^{-4} kg/m^2) * = present

SPECIES	DEPTH (w)					TOTAL
	« 50	50 - 100	100 - 200	200 - 350	> 350	
Squalus acanthias	-	*	0.85	4.41	0.26	5.52
Raja spp.	3.64	3.89	24.44	1.41	1.52	34.90
Merluccius bilinearis	-	-	0.06	0.44	-	0.50
Pollachius virens	-	-	*	-	-	-
Melanogrammus aeglefinus	0.05	0.62	9.30	0.35	0.14	10.46
Gadus morhua	9.09	8.55	13.20	0.36	*	31.20
Urophycis spp.	-	-	1.48	10.32	0.77	12.57
Anarhichadidae	4.74	0.33	0.94	-	0.06	6.07
Sebastes mentella	-	-	14.21	33.36	5.05	52.62
Glyptocephalus cynoglossus	-	0.64	10.73	2.06	2.06	15.49
Hippoglossoides platessoids	2.27	8.85	1.29	0.36	0.20	12.97
Hippoglossus hippoglossus	-	-	0.09	0.08	-	0.17
Limanda ferruginea	0.11	3.42	*	-	*	3.53
Reinhardtius hippoglossoides	-	-	*	*	0.12	0.12
Lophius americanus	-	0.12	1.79	0.42	0.36	2.69
TOTAL	19.90	26.42	78.38	53.57	10.54	188.81

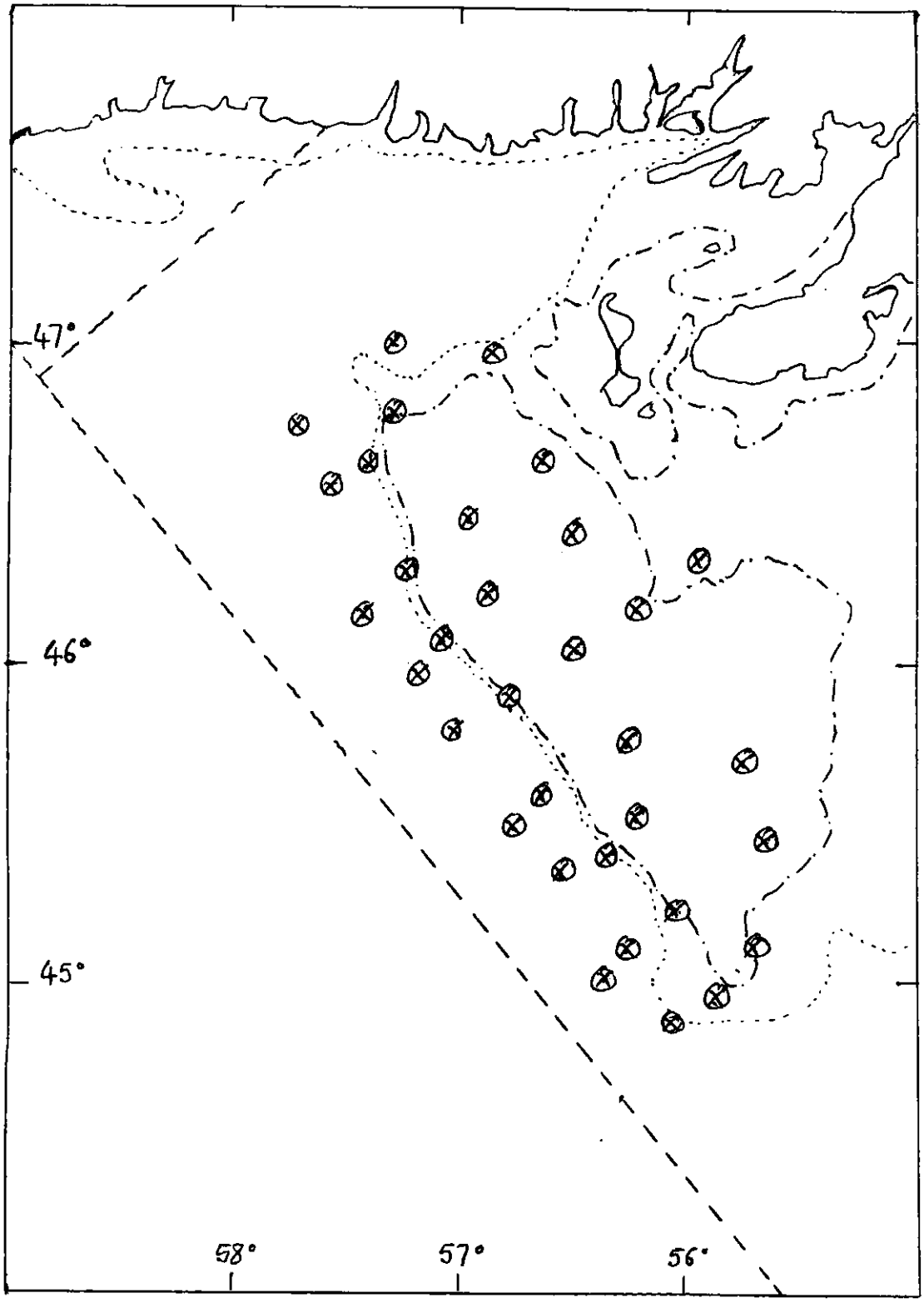

Fig. 1. Positions of the standard trawl stations occupied by the R/V *Cryos* during four seasonal cruises, 1971-72.