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Location of offshore fishing effort in NAFO Subdivision 3Ps in 1990, 1991 and 1992 from Canadian surveillance data

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Résumé

Suite à certains rapports que la morue du 3Ps avait parfois été trouvée au-delà des emplacements de pêche habituels en 1992, il devint important de vérifier jusqu'à quel point la distribution de la morue au moment des relevés de 1992 aurait pu biaiser les estimations d'abondance faites à partir de ces relevés. Les observations faites par le programme de surveillance canadien dans le 3Ps ont été utilisées afin de localiser l'effort de pêche hauturière en 1992 au moment où les relevés scientifiques ont été faits par la France et le Canada. Cette analyse indique qu'il y a eu, en 1992, une augmentation importante de l'activité des navires hauturiers canadiens et français à l'extérieur de la région couverte par ces relevés, vraisemblablement suite à un changement dans la distribution de la morue. Cette augmentation eut lieu principalement en février, mais fut également marquée en mars. Cependant, bien que ce phénomène ait pu contribuer à la baisse des estimés obtenus à partir de ces relevés, il ne peut l'expliquer dans son entier. L'analyse des données de surveillance indique également que la flottille de pêche aux poissons de fond a occupé des eaux plus profondes au cours des six premiers mois de 1992 comparativement aux deux années précédentes.

Abstract

In response to certain reports indicating that cod in 3Ps had been found beyond the traditional fishing grounds in 1992, it became important to verify to what degree the distribution of cod at the time of the 1992 research surveys could have biased the indices of abundance obtained from these surveys. Sightings from Canadian surveillance operations in 3Ps were used to analyze the distribution of offshore fishing effort in 1992 at the time of the Canadian and French surveys. It is concluded that there has been a significant increase in the activity of Canadian and French offshore vessels outside the survey area at the time of the 1992 surveys, probably as a result of a shift in cod distribution. The main increase occurred during the month of February with a notable increase also occurring during the month of March. While this shift in cod distribution may have contributed to the decline in the 1992 survey abundance estimates, it is not sufficient to explain the entire decline. The analysis of surveillance sightings also indicates that the groundfish fleet fished at greater depths in the first six months of 1992 in comparison to the previous two years.

Introduction

Anecdotal reports during 1992 suggested that 3Ps cod had often been found in deep water outside the coverage of the winter surveys. Confirmation of these reports could help explain the drastic decline in survey indices between 1991 and 1992. In order to narrow the range of stock size estimates determined at the September meeting of CAFSAC, additional information was requested on the commercial fishery in 1992. Sightings from Canadian surveillance operations in 3Ps are used here to provide insight on the location of the offshore fishing effort in 1992 at the time of the Canadian and French surveys.

In particular, sighting data obtained by Canadian surveillance operations were used to address the following questions:

1. Is there evidence that cod were in deep water outside the area covered by the Canadian and French surveys in 1992?
2. Is there evidence that cod were outside 3Ps, in neighbouring areas, at the time of the 1992 Canadian and French surveys?
3. Is there evidence that the commercial fishing vessels operating in 3Ps have moved to deeper waters of 3Ps in recent years?

Material and methods.

Surveillance sightings of Canadian and French offshore vessels gathered from Canadian surveillance aircraft and patrol vessels were used as an indicator of the location of cod during the first quarter of 1990, 1991, and 1992. Typically, surveillance officers obtain information on the actual location of each fishing vessel (latitude, longitude), its activity (e.g. in transit, fishing, etc.), its identification, nationality, etc. For this analysis, only the sightings where the vessels were identified as actively "fishing" were included.

The coverage of air surveillance in 3Ps was as follows in 1990, 1991 and 1992, between the beginning of January and the end of March:

1990: 48.3 hours;
1991: 40.8 hours;
1992: 59.6 hours.

It is important to note that air surveillance is probably not evenly distributed throughout 3Ps and that there is a tendency to cover areas of high fishing activity. Air surveillance was also complemented by sea patrols which were present in 3Ps for the following number of days during the first quarter of 1990, 1991, and 1992.

1990: 6.5 days;
1991: 14.3 days;
1992: 18.9 days.

Surveillance sightings provide a good overview of offshore fishing activity. However, they do not provide information on the nature of the catch. Given that French offshore trawlers only fished for cod in 1990, 1991 and 1992, the sightings of French vessels provide indirect evidence of the location of commercial cod aggregations. Canadian offshore trawlers, on the other hand, could target a number of species, including American plaice, witch, cod, and redfish. Consequently, the sightings of Canadian offshore vessels can only

provide an overview of fishing activity for groundfish. However, Canadian sightings located in the current area of interest (e.g. stratum 709) are likely fishing cod and possibly redfish given that these waters are too deep for flounder.

3Ps fishing activity relative to 1992 RV survey area.

The Canadian offshore vessel sightings identified as "fishing" during the first quarter of 1990, 1991 and 1992 are superimposed onto the RV survey area (defined here as all 3Ps strata except 709 and 710) in Figure 1. Similarly, the sightings of French trawlers are depicted in Figure 2. Given the scale of the maps and the distribution of the clusters of sightings, it is rather difficult to detect any significant and clearcut shifts in fishing activity patterns from year to year. However, detailed analyses of the geo-referenced data can be conducted to assess the proportion of sightings which fall inside and outside the RV survey area. Such analyses were conducted for the first three months of each year (Table 1). The relative proportion of the sightings outside the 3Ps survey area during the first quarter of each year was 7.1% in 1990, 5.7% in 1991, and 18.9% in 1992. The main increase in sightings outside the survey area occurred in 1992, during the month of February, where 23.5% of the sightings were outside the RV survey area as compared to 3.9% in February of 1991 and 8.7% in February of 1990. During the month of March 1992, 15% of the sightings were outside the RV survey area; this was also a considerable increase over the 7.4% of March 1991 and the 5.7% of March 1990. From these results, it is clear that there was a considerable increase in the proportion of sightings beyond the current survey area at the time of the 1992 survey. These sightings were mainly located in stratum 709, which covers the deeper slope waters just beyond the current survey area.

In conclusion, this data source does suggest a significant increase in the proportion of offshore vessel sightings located outside the RV survey area during the first quarter of 1992. The main shift in fishing activity occurred during the month of February with a less pronounced increase occurring during the month of March.

Fishing activity outside 3Ps, in neighbouring areas.

In an effort to determine whether fishing activity increased in the areas neighbouring 3Ps, surveillance sightings were obtained for NAFO Subdivisions 3Pn and 3O. The sightings of Canadian offshore vessels categorised as fishing in the first quarter of 1990, 1991 and 1992 are illustrated in Figure 3.

There is evidence of intense fishing activity around the 3Ps-3O boundary both in 1991 and 1992 and around the 3Pn-3Ps line, in 1991. However, there is no evidence that in 1992 the fishing activity in these areas was substantially different from that of previous years.

In conclusion, there is no evidence from the sightings data that fishing activity spilled over into the neighbouring NAFO areas. Certainly the fishing effort at the edge of 3Ps-3Pn and 3Ps-3O is not drastically different than that observed in previous years and is consistent with the general understanding of offshore stock mixing in slope waters.

Fishing activity by depth intervals.

During the 1991 and 1992 winter research surveys, cod was found in the deeper strata of 3Ps. The proportion of the total Canadian and French vessel sightings located within various bathymetric contour intervals during the first semester of 1990, 1991 and 1992 is given in Table 2 and is illustrated in Figure 4. While there were more sightings within the 400-1000 metre contour interval in the first semester of 1992 relative to previous years, it is not clear whether this can be attributed solely to a shift in fishing patterns for

cod or whether a shift in fishing effort for other species (e.g. redfish in deeper waters of the Laurentian Channel) was responsible. While the sightings data are useful in demonstrating that there was an overall shift in the amount fishing effort taking place in the deeper waters of 3Ps during the first quarter of 1992, it is not possible to accurately cross-reference this shift in effort to specific species using the sightings data.

For completeness, the percentage of the sightings located within various bathymetric intervals during the second semester of 1990 and 1991 is also given in Table 3. As the second semester of 1992 is still in progress, no information could be provided for that year at this time.

Conclusions

In summary,

1. There was a significant increase in the proportion of Canadian and French offshore vessel sightings located outside the RV survey area (mainly in stratum 709) during the first quarter of 1992. The main increase occurred during the month of February, with a notable increase also occurring during the month of March.
2. Based on the distribution of fishing effort during the first quarter of 1992, there is no evidence that cod aggregations extended beyond the 3Ps boundary into other NAFO divisions/subdivisions in a manner drastically different than that observed in previous years.
3. While there was more fishing activity beyond 400 metres in 1992 than in the two previous years, it is possible that this shift was not solely due to a change in the distribution of cod aggregations. For example, the sightings located in the deeper waters of the Laurentian Channel during the first quarter of 1992 may have represented a shift in fishing effort directed at redfish. However, as large sets of cod were also obtained in this area in the 1990, 1991 and 1992 winter surveys, and as commercial fleets reported substantial catches of cod in deep waters of the Laurentian Channel during 1992, these sightings were likely the reflection, at least in part, of fishing on deep water aggregations of cod. In any case, the surveillance sightings data indicate that the groundfish fleet fished at greater depths in the first six months of 1992 than during the same period in 1990 and 1991.

The sightings suggest that there was only limited fishing activity outside the area covered by the surveys in the first quarter of 1990 (7.1%) and 1991 (5.7%). However, during the first quarter of 1992, this proportion increased to 18.9%, with the highest proportion occurring during February (23.5%). This is consistent with the information obtained from logbooks and discussions with vessels captains. This change in fishing vessel activity likely reflected some shift of cod distribution outside the survey area at the time of the 1992 research surveys. However, while this could have contributed to the decline in the 1992 Canadian and French survey abundance estimates, it is not sufficient to explain the entire decline. There was still a significant proportion of the fishing activity within the area covered by the surveys (76.5%) in February 1992 and a preliminary review of the 1992 French offshore catch rates suggested that these were comparable to those from previous years.

Table 1. Number of sightings inside and outside the 3Ps RV survey area during the months of January, February, and March of 1990, 1991, and 1992

YEAR	FLEET	IN	OUT	% OUTSIDE
Jan 90	CDA/FRA	33	2	5.7
Feb 90	CDA/FRA	63	6	8.7
Mar 90	CDA/FRA	116	7	5.7
Quarter 1/90	CDA/FRA	212	15	7.1
Jan 91	CDA/FRA	105	4	3.7
Feb 91	CDA/FRA	171	7	3.9
Mar 91	CDA/FRA	214	17	7.4
Quarter 1/91	CDA/FRA	490	28	5.7
Jan 92	CDA/FRA	65	0	0.0
Feb 92	CDA/FRA	114	35	23.5
Mar 92	CDA/FRA	91	16	15.0
Quarter 1/92	CDA/FRA	270	51	18.9

Table 2. Percent of total Canadian and French vessel sightings in 3Ps located within various bathymetric intervals during the FIRST SEMESTER of 1990, 1991, and 1992

DEPTH	1990	1991	1992
0 - 100M	7.7	13.5	10.3
100 - 200M	26.6	22.4	24.6
200 - 400M	47.6	49.4	30.4
400 - 1000M	15.6	13.5	32.8
OVER 1000M	2.6	1.1	1.9

Table 3. Percent of total Canadian and French vessel sightings in 3Ps located within various bathymetric intervals during the SECOND SEMESTER of 1990 AND 1991.

DEPTH	1990	1991
0 - 100M	73.0	43.8
100 - 200M	14.5	26.7
200 - 400M	8.6	26.7
400 - 1000M	2.6	2.5
OVER 1000M	1.3	0.4

FIGURE 1. The distribution of Canadian offshore vessels sighted while fishing in NAFO Subdivision 3Ps in the first quarter of 1990, 1991 and 1992, respectively, is displayed in relation to the area covered by the research surveys.

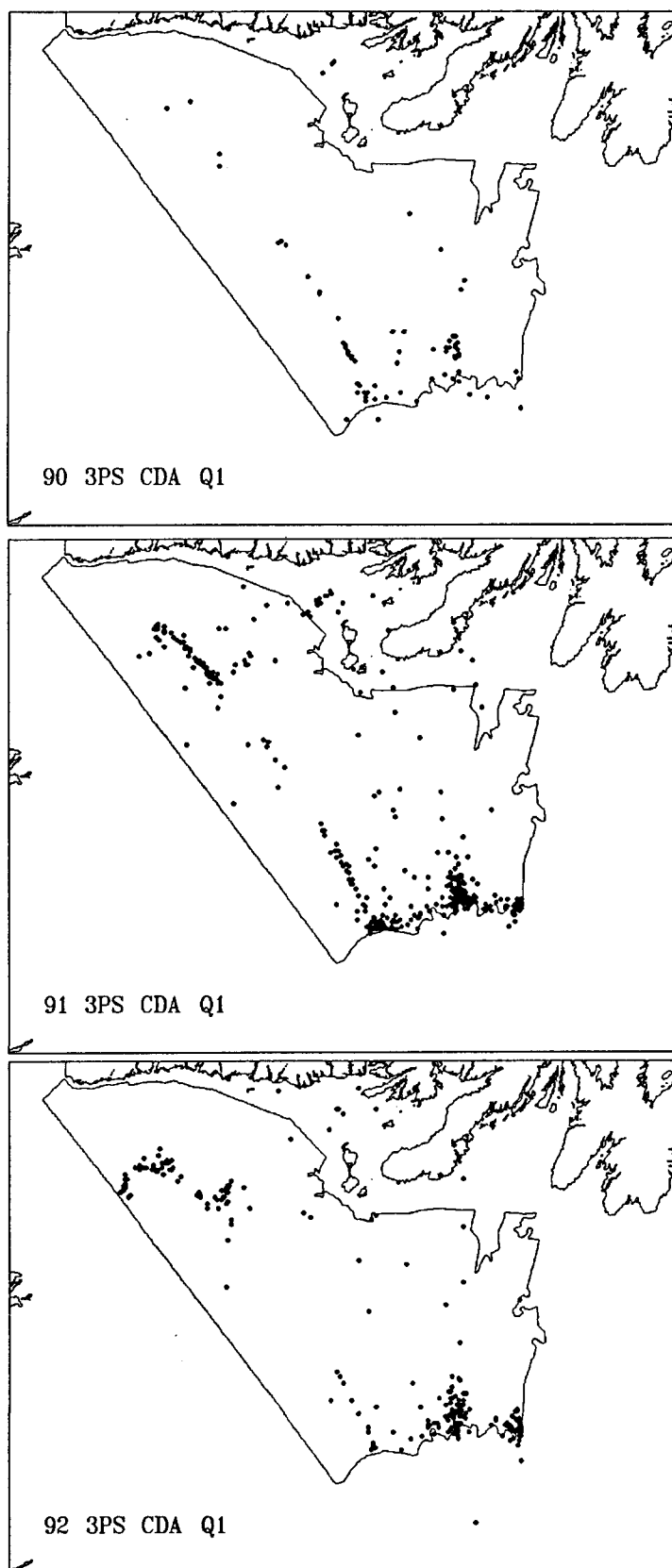


FIGURE 2. The distribution of French offshore vessels sighted while fishing in NAFO Subdivision 3Ps in the first quarter of 1990, 1991 and 1992, respectively, is displayed in relation to the area covered by the research surveys.

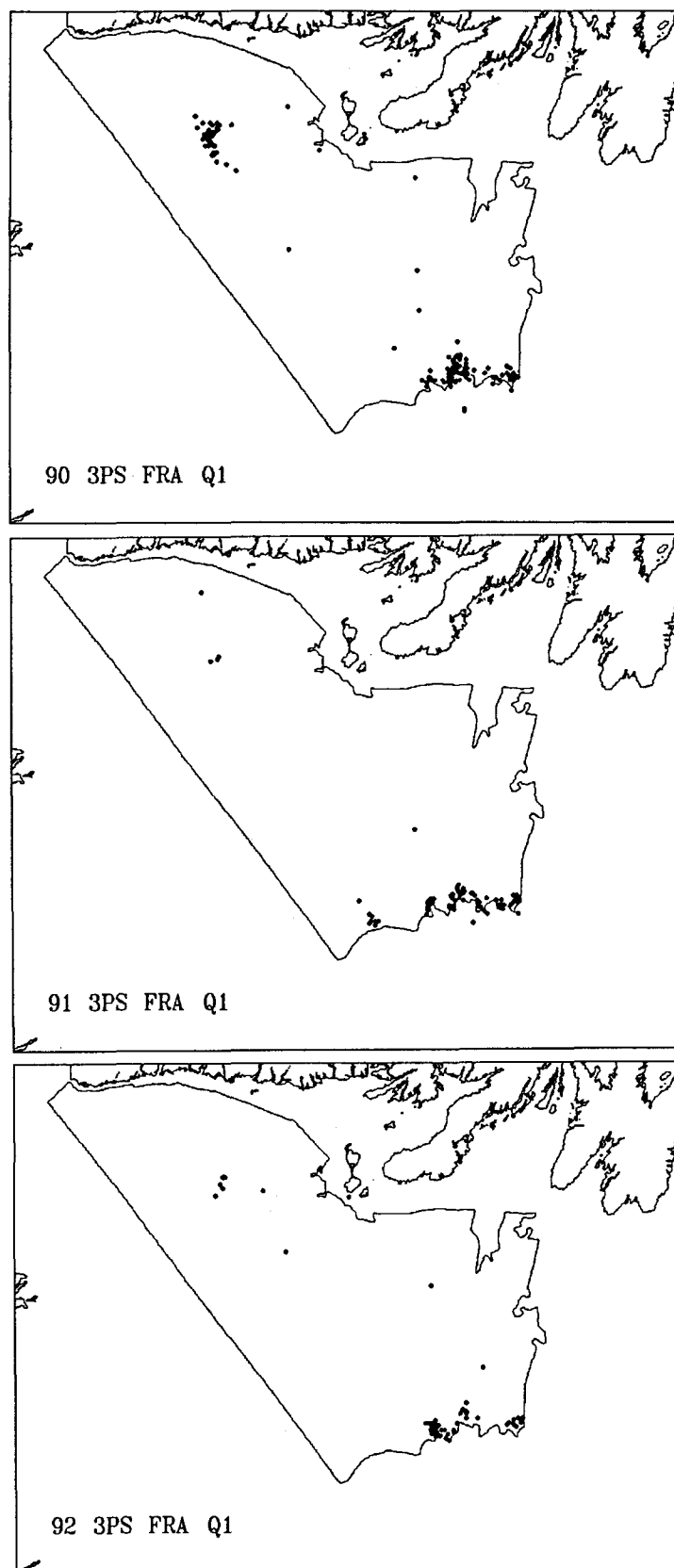


FIGURE 3. The distribution of Canadian offshore vessels sighted while fishing in NAFO Divisions 3P and 3O in the first quarter of 1990, 1991 and 1992, respectively, is displayed in relation to the area covered by the research surveys.

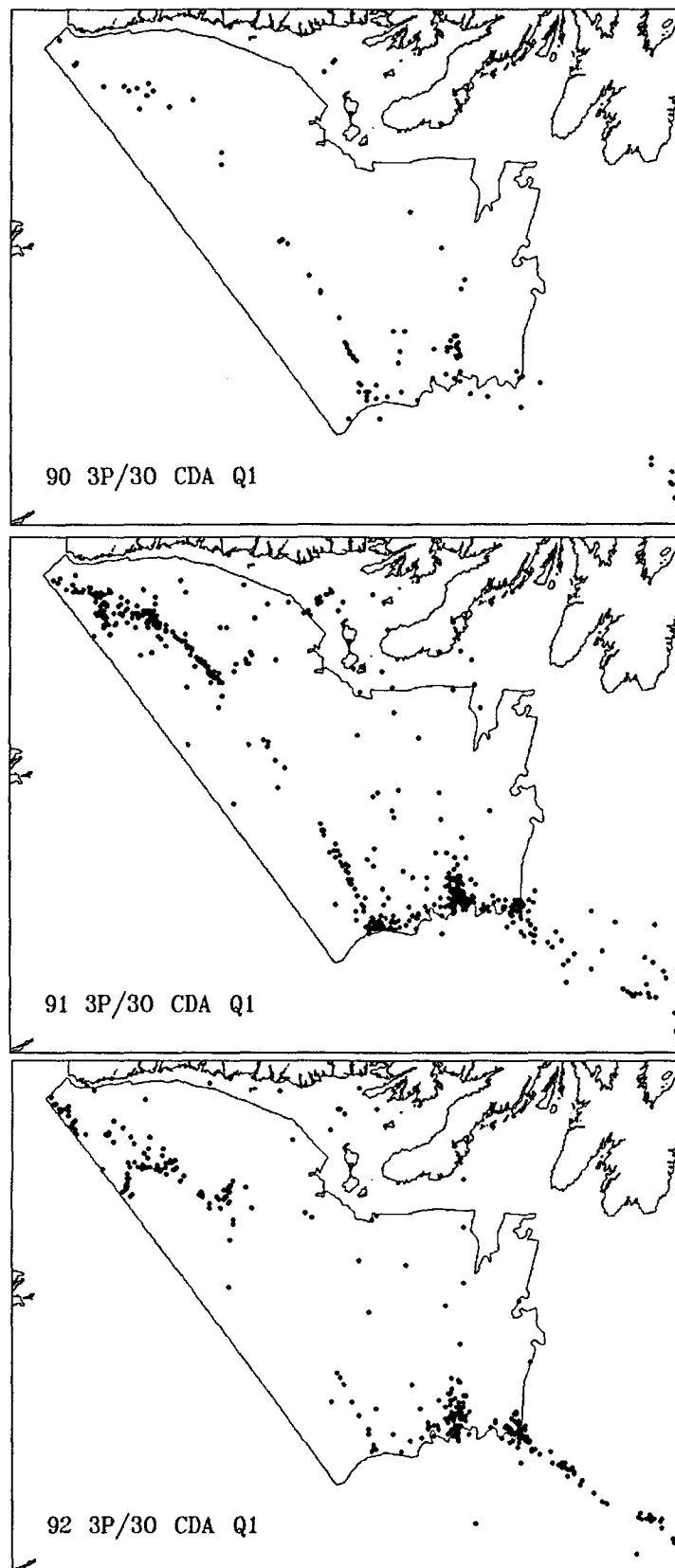


FIGURE 4. The distribution of Canadian and French offshore vessels sighted while fishing in NAFO Subdivision 3Ps in the first half of 1990, 1991 and 1992, respectively, is displayed in relation to bathymetric contours.

