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A study of the 1977 international catch statistics for the squid, Illex illecebrosus, fishery in ICNAF Subareas 3 and 4

by

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INTRODUCTION

Illex illecebrosus has historically been of importance to Canada only as a small inshore fishery in Newfoundland. Landings since 1975, however, have shown a tremendous upsurge in the fishery's economy and effort, while knowledge on the species has not kept pace. No reasons can be given for the landing fluctuations of the past, nor are accurate methods of stock assessment available. Hence, this paper views the 1977 international offshore fishing trends, in order to provide new guidelines for the management of the fishery.

This paper primarily deals with total catches as reported by each country that participated in the 1977 squid fishery. Particular attention is paid to the time period of attainment of allocations and the peak period of fishing activity. Based on the overall fishing during the season and the fishing activities of five countries, the feasibility and advantage of a time limitation to the fishery is reviewed.

MATERIALS AND METHODS

ICNAF historical catch data are studied in this report. These data were statistically incomplete as a result of the relative unimportance of the fishery before 1972 and the species separation between Loligo and Illex not being reported by all countries. However, ICNAF annual catch records since 1963 (Table 1) are given here for Subareas 3 and combined Subareas 3 and 4. 1963-1974

values for Subareas 5 and 6 were taken from Tibbetts (1975) and completed for 1975 and 1976 using ICNAF reports. Figure 1 represents the historic trends of the Illex fishery.

The FLASH computer information system was introduced in 1977 to monitor all fishing activities in Subareas 3 and 4 on a weekly basis. All vessels on ground were required to provide weekly information on the area fished, catch by species and effort. These data were stored in a computer for instantaneous withdrawal of fisheries information. In this report, the 1977 international fishery is studied using the FLASH catch data.

Ten countries reported fishing Illex in 1977. Catch data for Subareas 3 and 4 during the season are summarized in bi-weekly totals (Table 2) and depicted graphically (Figure 2). Total number of vessels reported on ground by each country (Table 3) are also depicted in Figure 2. Effort reports received by FLASH were not species defined and hence not studied here.

Cumulative catch during the season tallied in Table 2 and shown in Figure 3 indicated the overall Illex removal during the season. Bi-weekly catch records of the five countries most actively fishing Illex (Table 4) were studied in relation to each country's allocations. Figure 4 depicts actual catch and percentage removal from total allocation, of each country through the season. In the overall fishery, the percentage removal of the total allocation for the season is depicted in Figure 5, with the time of allocation fulfillment of the five most actively fishing countries denoted.

RESULTS AND DISCUSSION

Illex illecebrosus, until 1971, was of importance to Canada only as a small inshore fishery. Inshore landings (Subarea 3) ranged from 13 MT to 10,408 MT (Table 1) during the period 1963-1974, when the fishery was considered passive and based on the availability and market demands. Fluctuations show a four-year peak period during 1964-1967 (Figure 1); when it is presumed, availability increased. The next upward trend was in 1975. A sharp increase in 1976 is followed by an unprecedented high

of 29,678 MT in 1977. The 1975 trend (three years) may correspond to the recent economic importance of the resource and an increased effort along with the increased availability of Illex.

Offshore landings, specifically in Subarea 4, remained low during the last 15 years (Figure 1), until 1971 when 7,229 MT were landed (Table 1). The 1973 catch rose to 9,239 MT. Unfortunately, fishing effort data are not sufficient to estimate abundance. However, the increased landings in Subareas 5 and 6 during this period indicates a possible availability in Subareas 3 and 4. The upward trend for Subarea 4 begins in 1975 (Figure 1) and reaches an unprecedented high of 40,935.9 MT in 1977 in the international fishery alone. The Canadian offshore catch of 8,034.1 MT in Subarea 4 (Amaratunga, Roberge and Wood, 1978) brings the offshore total to 48,970.0 MT. Subareas 5 and 6 maintained corresponding large landings. Although economic importance and increased effort reflect these landings, it is very probable that there was an increase in availability (by many fold).

As seen in previous years, catch may fluctuate by many orders of magnitude from year to year. Since no accurate method of stock assessment is available at the present time, a prediction of next year's stock would be speculation. In this paper, an attempt is made to view 1977 offshore fishing trends, from the limited amount of information available (effort not known), to provide guidelines for possible fishing policies.

Offshore catches (Subareas 3 and 4) for 1977 were first recorded during the two-week period commencing April 17. Rapid increase in catch began at the end of May when 2,452.2 MT were reported for the two-week period (Table 2). The peak period is between mid-June and mid-August (8-9 weeks), when greater than 3,300 MT per two-week period were being fished (Figure 2). The greatest landings were 6,917.3 MT in the period July 25 to August 8. During the peak period (mid-June to mid-August), more than 60 percent of the total allocations (Figure 5) or more than 25,000 MT were fished. This also represented the period when USSR, Bulgaria, Cuba, and Poland had attained their allocations (Figure 5).

Other countries entered the fishery late or prolonged their fishing (Italy, Japan, Spain) (Table 3), resulting in the skew seen toward the end of the season (Figure 2). All five countries depicted in Figure 4 obtained their allocations in less than ten weeks. Bulgaria took only seven weeks, Cuba ten weeks, Japan ten weeks, and Poland nine weeks. USSR obtained higher than 100 percent of her allocation in a period of six weeks. It is demonstrated here that a directed squid fishery could have fulfilled all allocations in less than ten weeks.

Total stock expected to be removed in 1977 by the ten countries was 42,000 MT. The cumulative catch showed a 97.5 percent removal (40,935.9 MT) during the season April 17 to November 28 (Figure 3), a period of 32 weeks.

An estimation of the number of animals removed from the stock through the season was made (Table 5). The weighted mean was derived from the observed sex ratio (Amaratunga et al. STACRES, 1978a) and the corresponding mean weight of the animals. The estimated number of animals removed during the 1977 season from the offshore presents a major consideration in fishing efficiency. The number of animals per 100 MT in mid-June, 0.90×10^6 is approximately twice the number in mid-August (0.43×10^6).

Thus, in conclusion, we may consider the critical period for the fishery, from mid-June to mid-August. It is feasible to limit the fishery to an 8 to 10-week period, beginning in mid-June. Provision could be made to extend this season if required. Such a time limitation offers the following advantages: 1) Opportunity for pre-fishery and post-fishery assessments of stock - hence evaluating the possible extension of the season. 2) Early season fishing removes a larger number of squid while fishing during the critical period removes optimum-sized squid, hence higher efficiency. 3) Fishing would be done during the feeding season (predation) of squid, before sexual maturity onset when squid stop feeding and predation (Amaratunga, Durward, et al., 1978; Durward et al., 1978). 4) The season would encourage a directed fishery which could be better monitored and controlled by an effort policy.

SUMMARY

1. Illex catch during the last 15 years has fluctuated by many orders of magnitude from year to year.
2. 1977 catch in Subareas 3 and 4 has recorded unprecedented highs of: 29,678 MT for Newfoundland inshore fishery, 40,935.9 MT for International fishery in Subareas 3 and 4, 8,034.1 MT for Canadian offshore fishery in Subareas 3 and 4. Totalling to 78,648.0 MT.
3. Precision and accuracy of landing records and effort are not known for the fishery.
4. Peak fishing period for 1977 was from mid-June to mid-August, when more than 60 percent of the total allocations were removed.
5. Most countries obtained their allocations in five to ten weeks. Hence, it seems feasible and advantageous to time limit the fishery.
6. An estimation is made of the number of animals removed through the season.

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Table 1. Nominal Illex illecebrosus catches in the Northwest Atlantic from 1963 to 1977

Year	Annual Catch (MT) in ICNAF Subareas		
	3	3 & 4	5 & 6
1963	2,119	2,222	810
1964	10,408	10,777	358
1965	7,831	8,264	522
1966	5,017	5,218	570
1967	6,907	7,033	992
1968	13	156	3,390
1969	21	86	1,409
1970	111	977 (1,385)†	701 (2,045)**
1971	1,607	8,906	5,439 (3,581)**
1972	26	1,868	11,913 (14,241)**
1973	600	9,839 (9,877)†	13,696 (14,648)**
1974	17	402 (437)†	20,523 (16,505)**
1975	3,751	17,744 (17,757)†	10,948 (13,643)**
1976	11,257	41,767	24,936 (27,717)**
1977	29,678	70,613.9* (80,633)†	-

*Excludes Canadian Subarea 4 offshore catch.
†Brackets indicate revisions for ICNAF Subareas 2-4 and are not recorded in Figure 1.
**Brackets indicate revisions for ICNAF Subareas 5 &.6 and are not recorded in Figure 1.

Table 2. 1977 FLASH Catch Statistics for Squid (Illex Illecebrosus) Summarized by 14-Day Periods in Subareas 3 and 4.

Period beg. (1977)	Subarea	Catch (MT)	Cumulative Catch (MT)
17 April	3	-	-
	4	3.3	3.3
2 May	3	-	-
	4	32.8	36.1
16 May	3	-	-
	4	554.9	591.0
30 May	3	20.4	20.4
	4	2,431.8	3,022.8
13 June	3	-	20.4
	4	5,797.4	8,820.2
27 June	3	25.3	45.7
	4	6,214.3	15,034.5
11 July	3	51.4	97.1
	4	6,113.4	21,147.9
25 July	3	26.1	123.2
	4	6,891.2	28,039.10
8 August	3	-	123.2
	4	3,365.0	31,404.1
22 August	3	-	123.2
	4	2,968.0	34,372.1
5 September	3	0.5	123.7
	4	2,409.4	36,781.5
19 September	3	0.2	123.9
	4	1,229.4	38,010.9
3 October	3	0.1	124.0
	4	1,544.0	39,554.9
17 October	3	-	124.0
	4	639.0	40,193.9
31 October	3	-	124.0
	4	106.9	40,300.8
14 November	3	85.8	209.8
	4	279.0	40,579.8
28 November	3	13.0	222.8
	4	133.3	40,713.1

Table 3. Number of vessels reported fishing Illex in Subareas 3 and 4 during the 1977 season.

	Japan	Cuba	U.S.S.R.	Italy	Bulgaria	Romania	Spain	Poland	Fed. Rep. Germany	France	Total
17 April	1	-	3	-	-	-	-	-	-	-	4
2 May	-	2	6	-	-	-	-	-	-	-	8
16 May	1	3	9	-	-	-	-	-	-	-	13
30 May	1	3	11	1	-	-	-	-	-	-	16
13 June	1	4	16	1	2	-	-	-	-	-	24
27 June	1	5	24	3	2	1	1	-	-	-	37
11 July	-	5	31	3	5	1	3	2	-	-	50
25 July	3	5	19	2	5	1	9	4	-	-	48
8 August	3	4	9	1	-	-	8	5	1	-	31
22 August	3	2	8	2	-	-	8	1	6	1	31
5 September	9	-	1	2	-	1	4	1	5	1	24
19 September	9	-	-	-	-	2	8	-	3	-	22
3 October	8	-	-	-	-	2	7	-	3	-	20
17 October	6	-	-	-	-	1	1	3	1	-	12
31 October	-	-	-	1	-	-	-	-	-	-	1
14 November	-	-	1	2	-	-	1	1	-	-	5
28 November	-	-	-	2	-	-	1	-	-	-	3

Table 4. Biweekly catch of five countries that actively fished Illex in Subareas 3 & 4 in 1977.

Period Beginning	Catch (MT) by Country				
	Bulgaria	Cuba	Japan	Poland	Russia
April 17	-	-	0.3	-	3.0
May 2	-	21.7	-	-	11.1
May 16	-	35.2	3.7	-	516.0
May 30	-	134.6	81.9	-	2,180.9
June 13	210.0	550.0	20.1	-	4,873.0
June 27	445.0	284.0	14.6	-	5,027.7
July 11	483.0	483.6	-	495.2	3,709.7
July 25	1,791.0	1,017.2	168.7	912.3	1,830.7
August 8	-	662.6	272.2	1,330.8	86.5
August 22	-	100.4	281.9	481.0	170.4
September 5	-	-	547.6	143.5	8.2
September 19	-	-	557.4	-	-
October 3	-	-	853.9	-	-
October 17	-	-	341.2	2.3	-
October 31	-	-	-	-	-
November 14	-	-	-	85.8	1.0
November 28	-	-	-	-	-
Total Catch	2,929.0	3,289.3 (4,668.0)†	3,143.5	3,450.9 (2,939.0)†	18,418.2 (18,953.0)†

†Brackets indicate subsequent revisions.

Table 5. Estimation of the number of animals removed, by the international fishery in 1977 in Subareas 3 and 4, using the weighted mean per animal derived from the sex ratio (Amaratunga, et al., 1978).

Date	Percentage Males	Weighted Mean Wt. per Animal (g)	Catch (MT)	# Animals	# Animals/100 MT
Apr. 17		37	3.3	0.09×10^6	2.70×10^6
May 2	unsexed	48	32.8	0.68×10^6	2.08×10^6
May 16	Estimated	60	554.9	9.25×10^6	1.67×10^6
May 30	at 57.0%	74	2,452.2	33.14×10^6	1.35×10^6
June 13		111	5,797.4	52.23×10^6	0.90×10^6
June 27		157	6,239.6	39.74×10^6	0.64×10^6
July 11	64.0	186	6,164.8	33.14×10^6	0.54×10^6
July 25	59.0	186	6,917.3	37.19×10^6	0.54×10^6
Aug. 8	56.0	198	3,365.0	16.99×10^6	0.51×10^6
Aug. 22	56.0	231	2,968.0	12.85×10^6	0.43×10^6
Sept. 5	57.0	231	2,409.9	10.43×10^6	0.43×10^6
Oct.	57.0*	265*	2,290.0	8.64×10^6	0.38×10^6
Nov.	43.5†	317	364.8	1.14×10^6	0.32×10^6
			Total	255.51×10^6	

*Average figures.
†Subarea 5

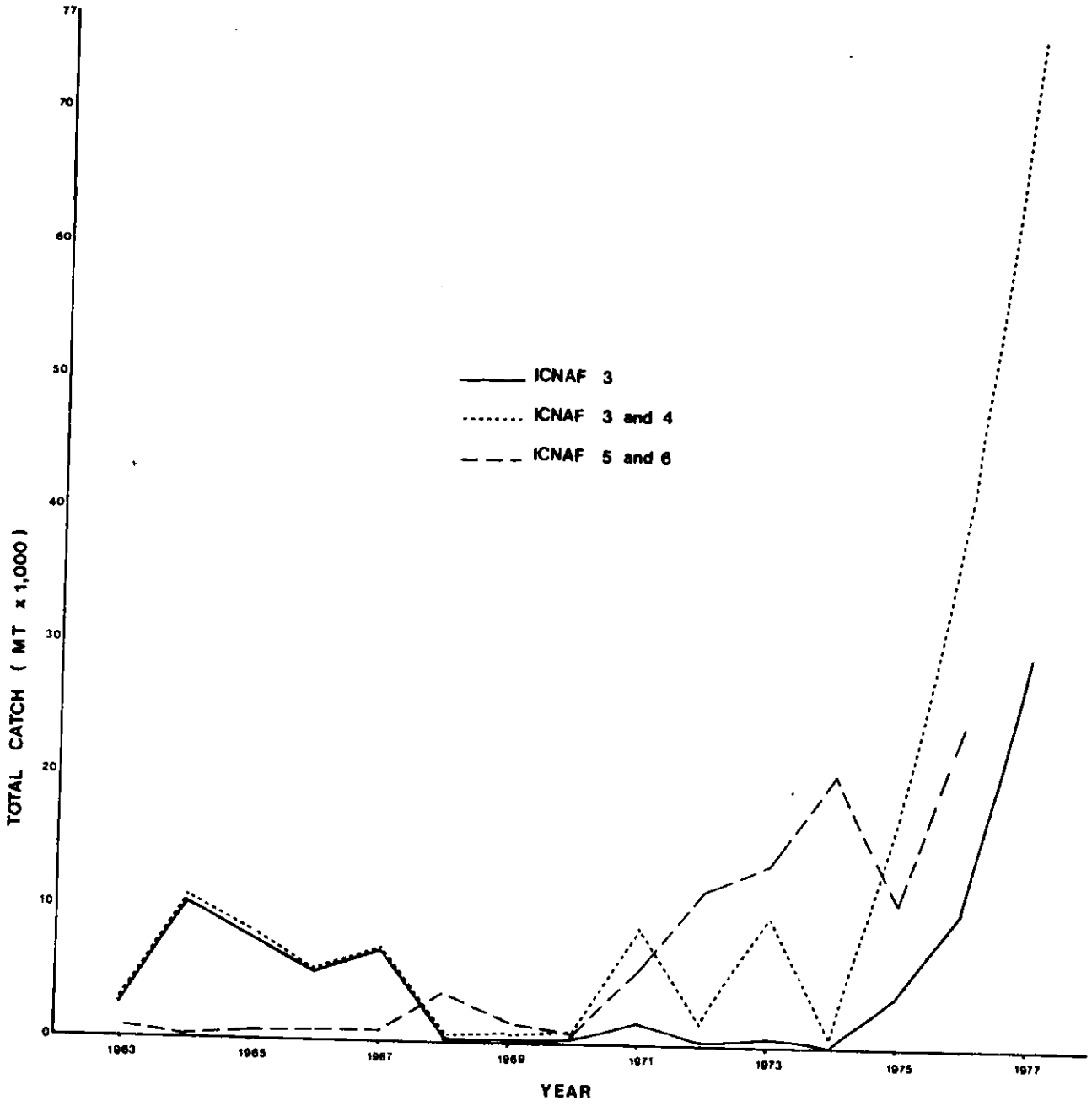

Figure 1. Annual total catches of Illex in the northwest Atlantic from 1963-1977. (N.B. Subareas 5 and 6 statistics for 1977 were not available.)

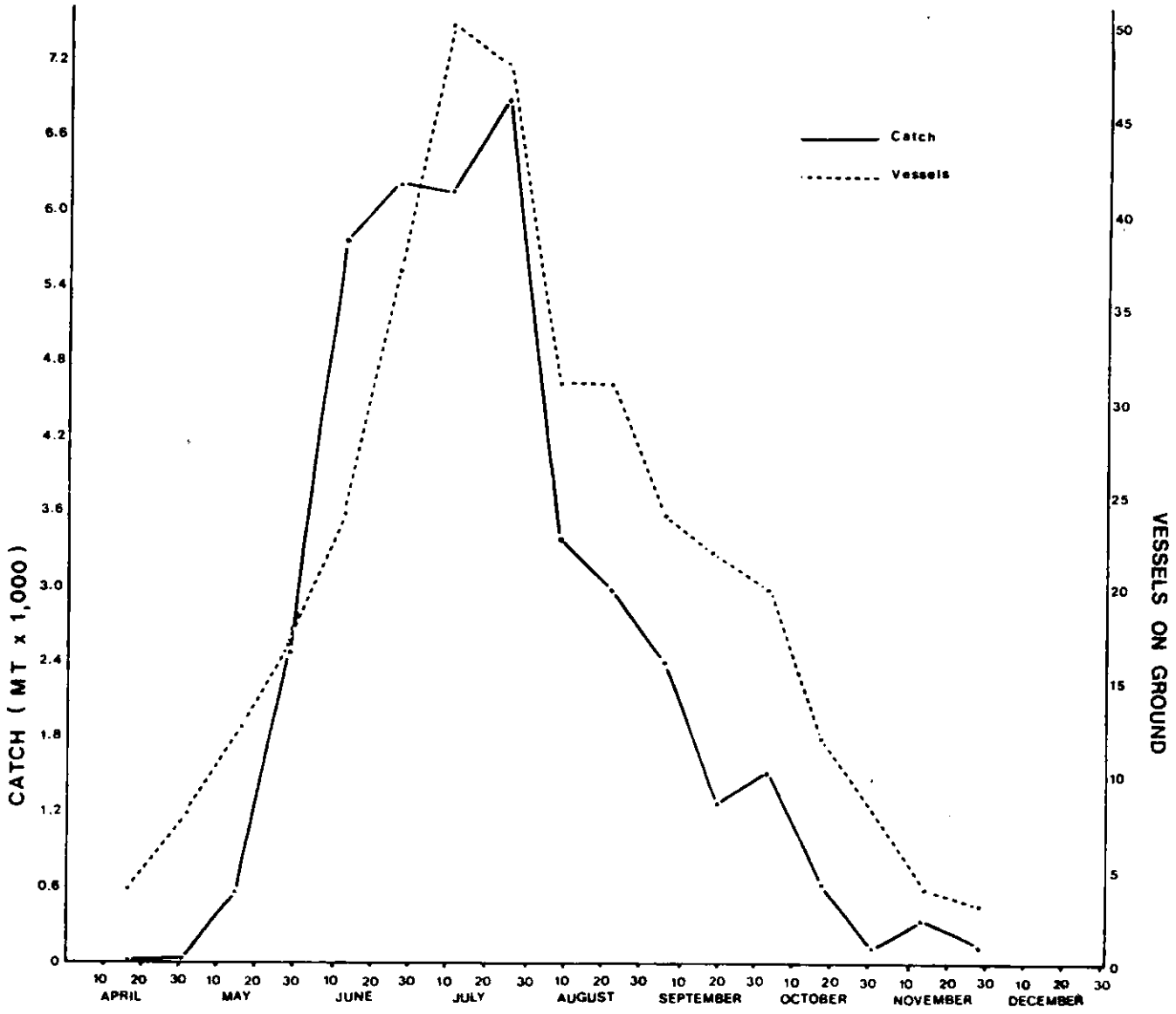

Figure 2. Total catch and number of vessels on ground in Subareas 3 and 4 from FLASH 1977 records for Illex fishery. (Regression: Total catch (Y) vs number of vessels on ground (X); $r^2 = 0.82$).

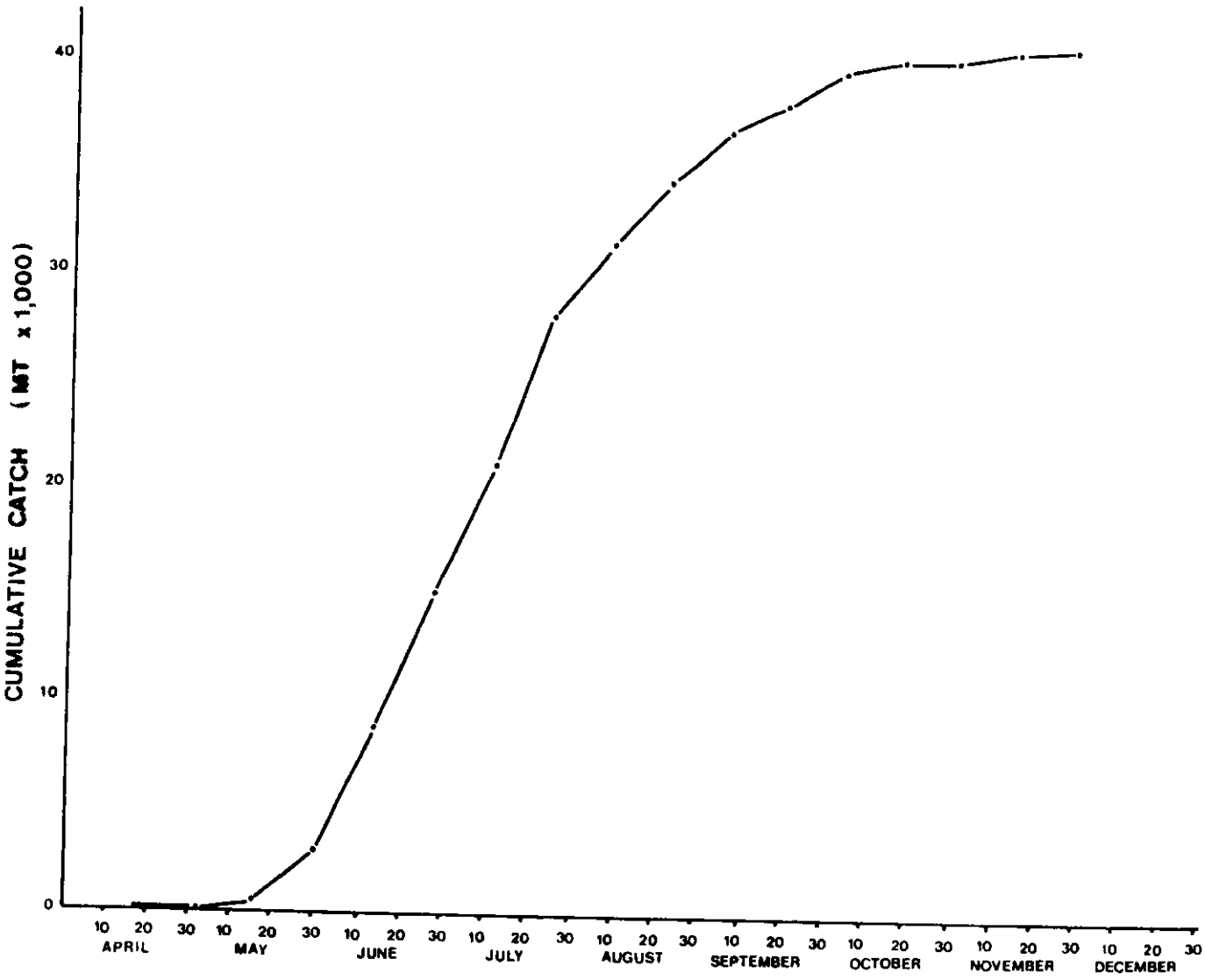

Figure 3. Cumulative catch of Illex in Subareas 3 and 4 from FLASH records for 1977.

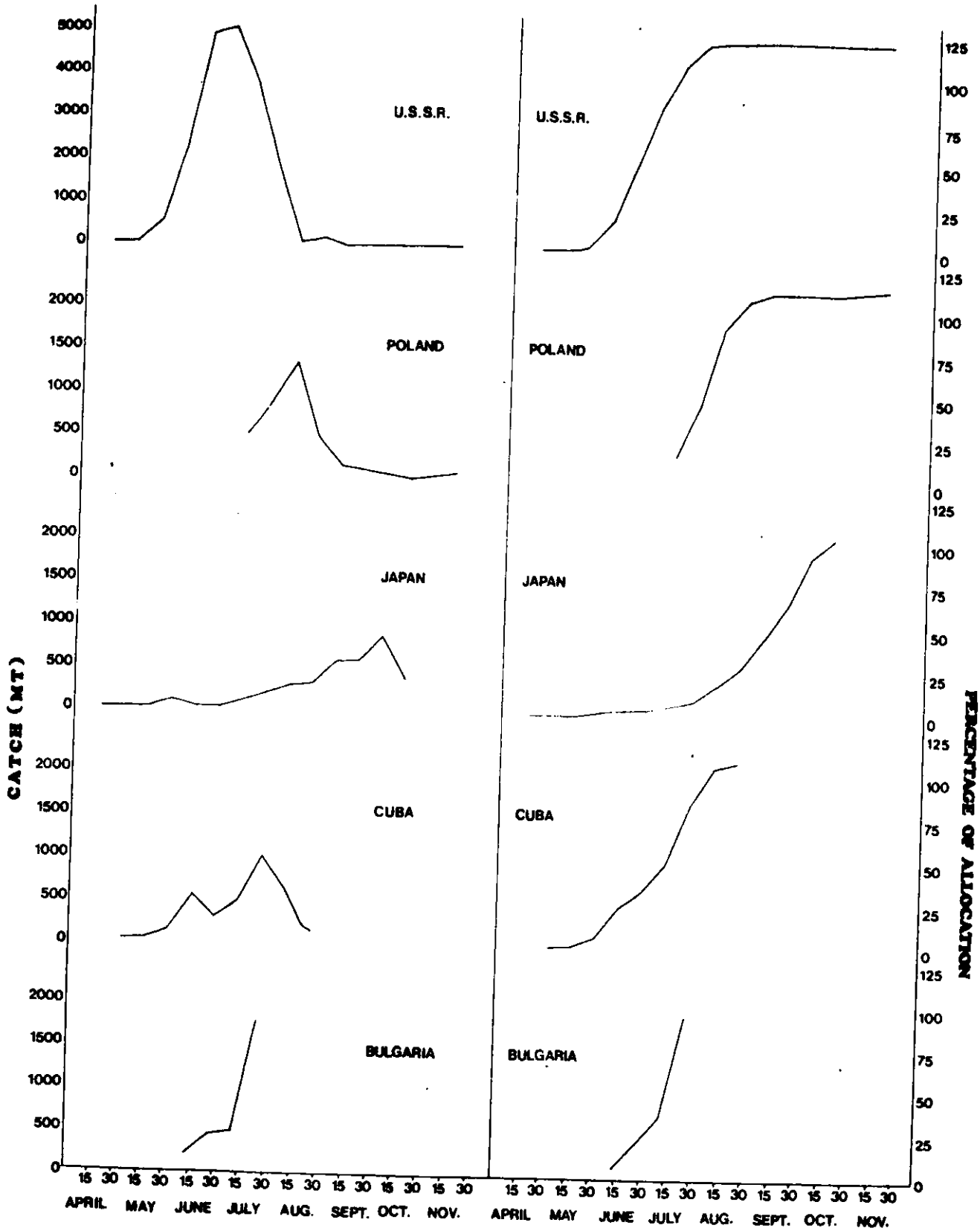

Figure 4. Seasonal representation of actual catch and percentage of allocation removed by five countries most actively fishing Illex in 1977.

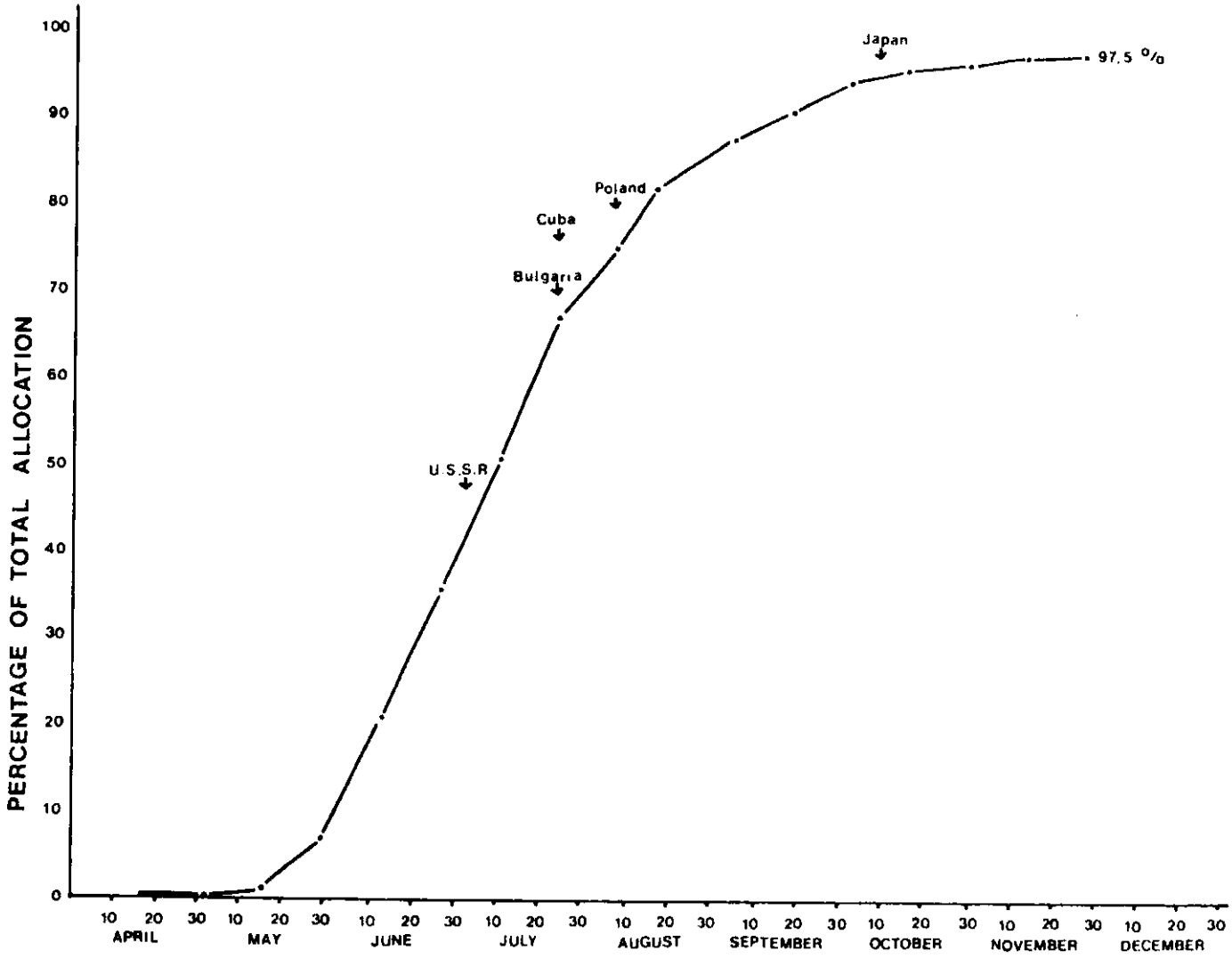

Figure 5. Overall removal of total allocation during the 1977 season with the time of allocation fulfillment of the five most actively fishing countries denoted.