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Catch, Effort and Biological Data of Shrimp (*Pandalus borealis*) in the French Fishery off East Greenland in 1983

by

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I. Introduction

The French Fishery off East Greenland was conducted during the spring of 1983 by two stern trawlers (OTB 2, class 6). The fishing logbook of Finlande III was provided by the Captain and three samples of shrimp were collected on board, frozen and examined at the Boulogne laboratory.

Information on the location of the fishery, catches (effort, c.p.u.e.) and on the biological characteristics of shrimp (length distribution, composition by sex, maturity stages and reproduction) are presented in this paper.

II. Catch and fishing effort

Finlande III fished off East Greenland from April 15th to May 10th and from May 24th to June 13th. 137 m. tons of shrimp were caught against 265 m. tons from April 13th to June 14th in 1982. The gear used, as previous gears, was a "Kalut" otter trawl.

1. Location of the fishery

The fishery was located on the Dohrn Bank, on the western side of the mid-line between Greenland and Iceland.

In April and beginning of May, the fishing area was restricted in the south of the Dohrn Bank : south of 66°00 N from 30°00 to 31°30 W (units JS and JT) on depth 350-450 m (fig. 1a, 1B, 2a and 2b).

In the end of May and beginning of June, the fishery moved northward (fig. 2a, 2b, 3a and 3b) between 66°00 and 67°00 N (units KD, KE and KG) on depths from 300 to 400 m.

During this spring, the ice cover was very important preventing the trawlers from fishing north of 66°00 N before the end of May, and roughly all the tows were made in the pack.

A total of 30 units (representing an area of 4 200 km2) was fished in 1983 against 20 units (2 800 km2) in 1982.

2. Catch and c.p.u.e.

Catches, effort and average c.p.u.e. obtained by Finlande III are given monthly in the following table :

Fishing period	April 15 - 30	May 1-10/24-31	June 1 - 13	Total
No. of tows	83	74	76	233
Catch (tons)	41	62	33	137
Fishing effort (hours)	248	245	206	699
c.p.u.e. (kg/h) 1983	165	254	162	195
c.p.u.e. (kg/h) 1982*	216	264	185	234

* from DUPOUY et al., 1983

In May the average c.p.u.e. is 254 kg/h but very different values were obtained in the beginning and at the end of this month. In the beginning (May 1st to 10th) the fishing effort represents 108 hours and the c.p.u.e. 142 kg/h only. At the end of the month (24-31) (Finlande III did not fish between May 10th and May 24th), 137 hours were fished and the c.p.u.e. represents 343 kg/h.

The total c.p.u.e., 195 kg/h indicates a decrease of 17 % compared with the 1982 c.p.u.e. (234 kg/h). This decrease should be partly due to the important ice cover : the catch rate obtained in April 1983 is 24 % lower than in April 1982 while May and June have rather similar results.

3. Discards and by-catches

Because the large size of the shrimps, no discard was noticed. Almost the all catch was sorted in extra-large individuals (50 to 70 shrimps per kg).

By catches were composed mostly of red fishes (6 000 kg) and capelin ; 150 kg of cod were also caught.

III. Observations on samples

1. Methods

As previous year, the shrimp of each sample were sorted by reference to sexual characteristics and also to the stage of the sternal spines (DUPOUY et al., 1983).

Characteristics of the three samples are presented in Table I, and biological data in figure 4 to 6.

2. Results

a) Sexual composition and evolution

The total catch is composed of 15 % males, 9 % transitionals and 76 % females. In spring 1982, we had respectively : 17, 7 and 76 % (DUPOUY et al., 1983).

Males represent 20-23 % of the total of the samples in May and June and only 1 % in April.

Males seem to be very scarce south of 66°00 N as DUPOUY et al., 1983 reported for the previous year.

So the relative number of females decreases both when latitude grows and from April to June.

Transitionals seem to take the same pattern as males.

b) Period and duration of hatching

Taking account of the shrimp involved in the 1982-1983 breeding season only (i.e. females ovigerous, females with eggs partially hatched and females with setae on the pleopods) we get informations upon the hatching period in spring 1983.

Date	April 25th	May 31th	June 12th
Females with eggs not hatched	100	83	0
Females with eggs partially hatched	0	17	0
Females with eggs totally hatched	0	0	100

Because of the very few number of samples, the results remains not very precise, but it can be observed that hatching period have started just before May 31 and ended before June 12th. This is in good agreement with DUPOUY et al., 1983 who found an hatching period from mid-May to mid-June for the previous year.

c) Proportion of individuals with or without spines

Mc CRARY (1971) reported that all males and most transitionnals possess sharp sternal spines (spines I). Females which have previously spawned do not possess spines (spines III). Individuals with blunted spines are newly transformed females or occasionnaly transitionals during late stage transition.

So, just before the spawning season, all the females involved in it possess no spines.

Table below shows the evolution of the loss of spines in transitionals and females.

Date	% of transitionals		% of females		
	Spines I	Spines II	Spines II	Spines III	Ovigerous
April 25	0	100	4	96	97
May 31	57	43	12	88	87
June 12	63	37	33	77	77

Newly transformed females appear in May and June while percentage of transitionals spines II decreases. Transitionals with sharp spines (spines I) appear in May and June because of oldest males transformations. Almost all the females which are ovigerous possessed no sternal spine.

d) Maturity stages of transitionals and females

Most of the transitionals and females without eggs had head roe. So they were able to spawn in July 1983 and would be berried (ovigerous) next spring.

Among the females which were berried in spring 1983, 87 % had no roe and 11 % had roe. This percentage of berried females with head roe is lower than in 1982 (38 %) but remain quite important. The berried females with no roe develop roe after the eggs are hatched and before spawning in late July (HORSTED, 1978). But some of those berried females with no roe do not develop roe and, according to this author, take "a year of rest" from spawning.

A female which has already spawned a previous year possess no sternal spines. So, among the females without eggs in spring, those with no spines are the females which have taken "a year of rest".

In spring 1983 they represent 3.4 % of the total females (1.4 % in 1982) most of them were with head roe.

e) Length distribution and modal groups

All the individuals were ranged from 20 to 34 mm with the bulk between 26 and 32 mm (fig. 7). The mean length was, before sorting, 28.2 mm (which is nearly the same than in spring 1982 : 28.3 mm, DUPOUY et al., 1983).

The males sizes range from 20 to 28 mm. They are composed of at least two modal groups : 20-26 mm and 24-28 mm (see fig. 5, 6 and 8).

Transitionals are distributed from 25 to 29 mm. Females with spines II belong to the same modal group as transitionals. This group extends from 25 to 33 mm with a mean close to 28.9 mm. The relative number of those females increase from April to June because of the recruitment of transitionals.

Females with no spines range from 25 to 34 mm with a mean of 28.9 mm (fig. 8). According to HORSTED, 1978, there is an accumulation of age groups around

a very prominent mode due to a very slow growth from the time of first spawning. That is why the mean of berried females is quite the same as the transitionals and females with spines II. Only the few females which take "a year of rest" seem capable of growing to any significant extent (32 to 34 mm).

IV. Discussion and conclusion

1. The important ice cover in spring of 1982 in the fishing area prevented Finlande III and probably all the trawlers of the fishery from fishing in optimal conditions.

2. The overage c.p.u.e. of Finlande III indicates a decrease of 17 % compared to the same period in 1982

The mean size (28.2 mm) is nearly the same than in 1982 (28.3 mm), but the overage weight (15.05 g) is lower (15.7 g in 1982). This is due to a more important proportion of individuals ranging from 25 to 30 mm (64 %) in 1983 than in 1982 (58 %) and also to a lower proportion of individuals larger than 30 mm.

So the abundance index, expressed in number of shrimp caught per hour of trawling shows a 13 % decrease (12 972 against 14 838 individuals).

3. The hatching period took place between mid-May and mid-June. Berried females were present on the whole fishing area but with an increasing proportion on the southern part of Dohrn Bank as previous year (DUPOUY et al., 1983).

4. Some females (3.4 %) which have already spawned in a previous year was not berried in spring 1983 (1.4 % in 1982). Those females which have not spawned in the summer of 1982 could use this year of rest for more important growth (HORSTED, 1978).

Acknowledgments

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HORSTED (S.A.), 1978.- The Life Cycle of Shrimp, Pandalus borealis Kr., in Greenland Waters in Relation to the Potential Yield.- Int. Comm. Northw. Atlant. Fish., Sel. Pap. n° 4 : 51-60.

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Table 1.- Characteristics of samples collected on board Finlande III off East Greenland in 1983.

Sample n°	Date	Average position		Depth range (m)	Time of trawling (GMT)	N° of shrimp examined	Composition by sex in percentage in number		
		Lat N	Long W				Males	Transitionals	Females
1	April 25	65°41'	30°09'	390 - 410	06 : 10 - 10 : 40	105	1	3.8	95.2
2	May 31	66°35'	30°15'	380 - 390	06 : 35 - 09 : 40	114	20.2	6.1	73.7
3	June 12	66°33'	30°43'	324 - 330	14 : 00 - 16 : 40	127	22.8	15.7	61.5
						346	15.3	9	75.7

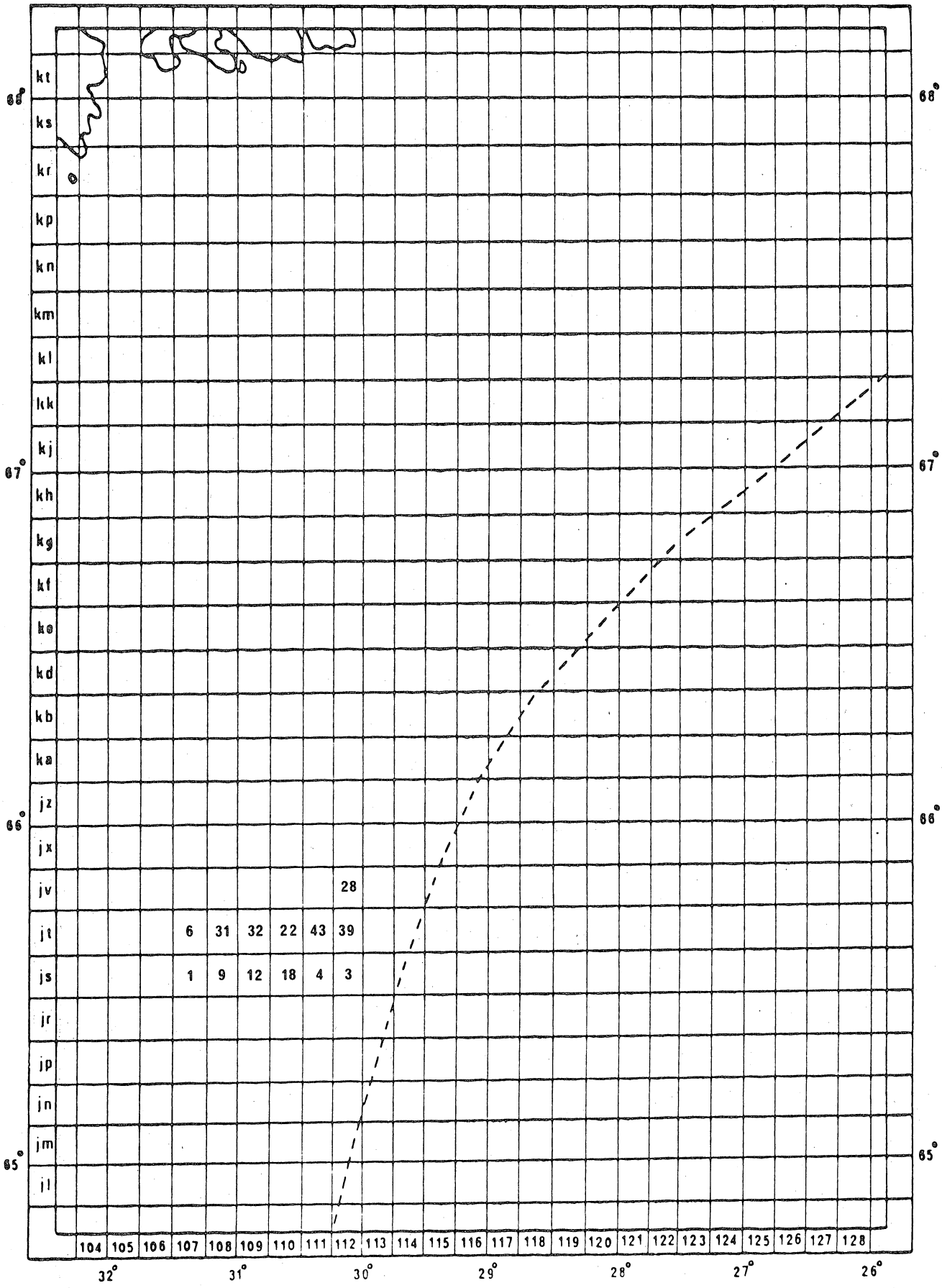

Fig. 1a - Distribution of the fishing effort (hours) of Finlande III at East Greenland in April 1983.

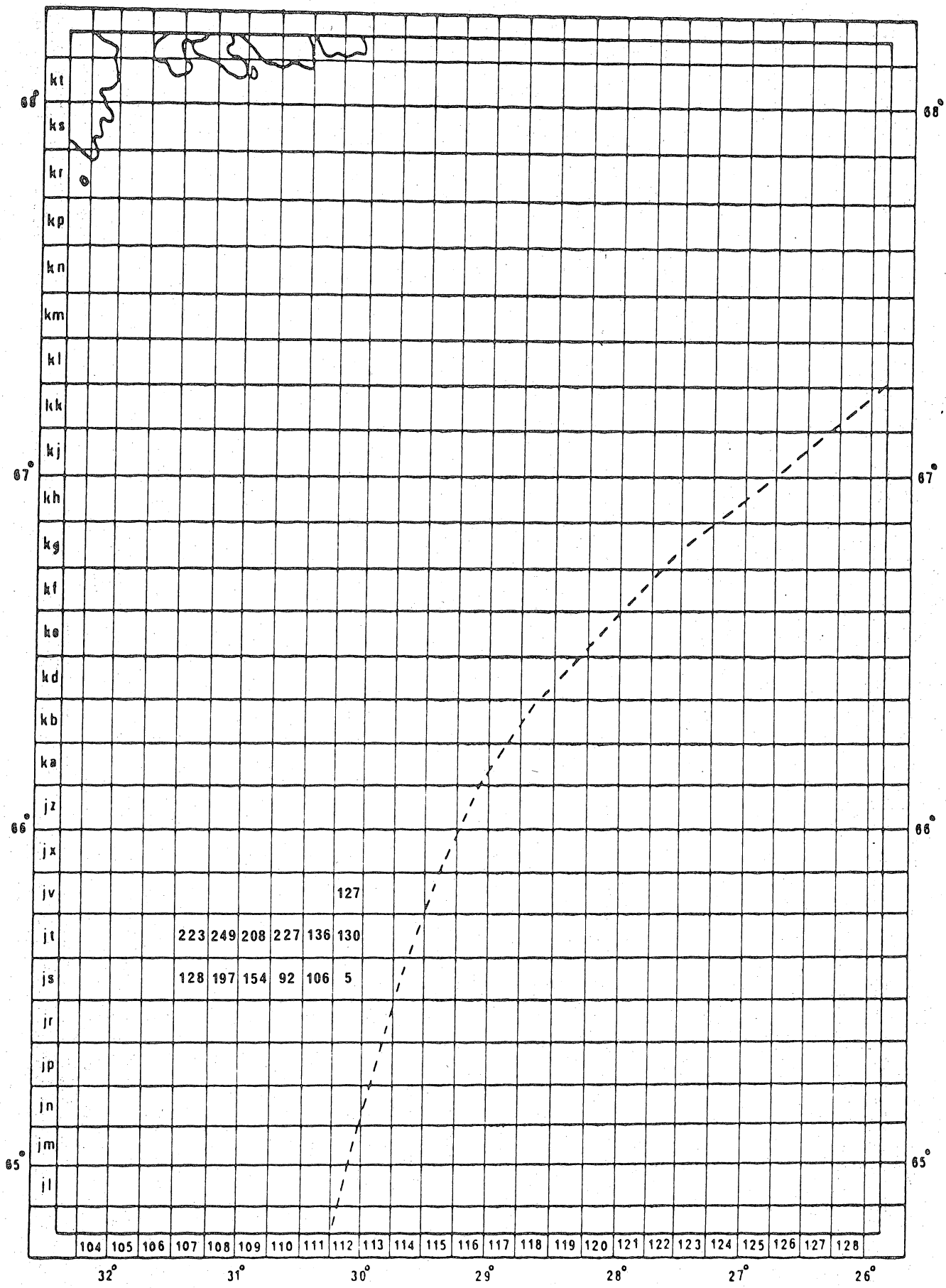

Fig. 1b - Distribution of the c.p.u.e. (kg/hour) of Finlande III at East Greenland in April 1983.

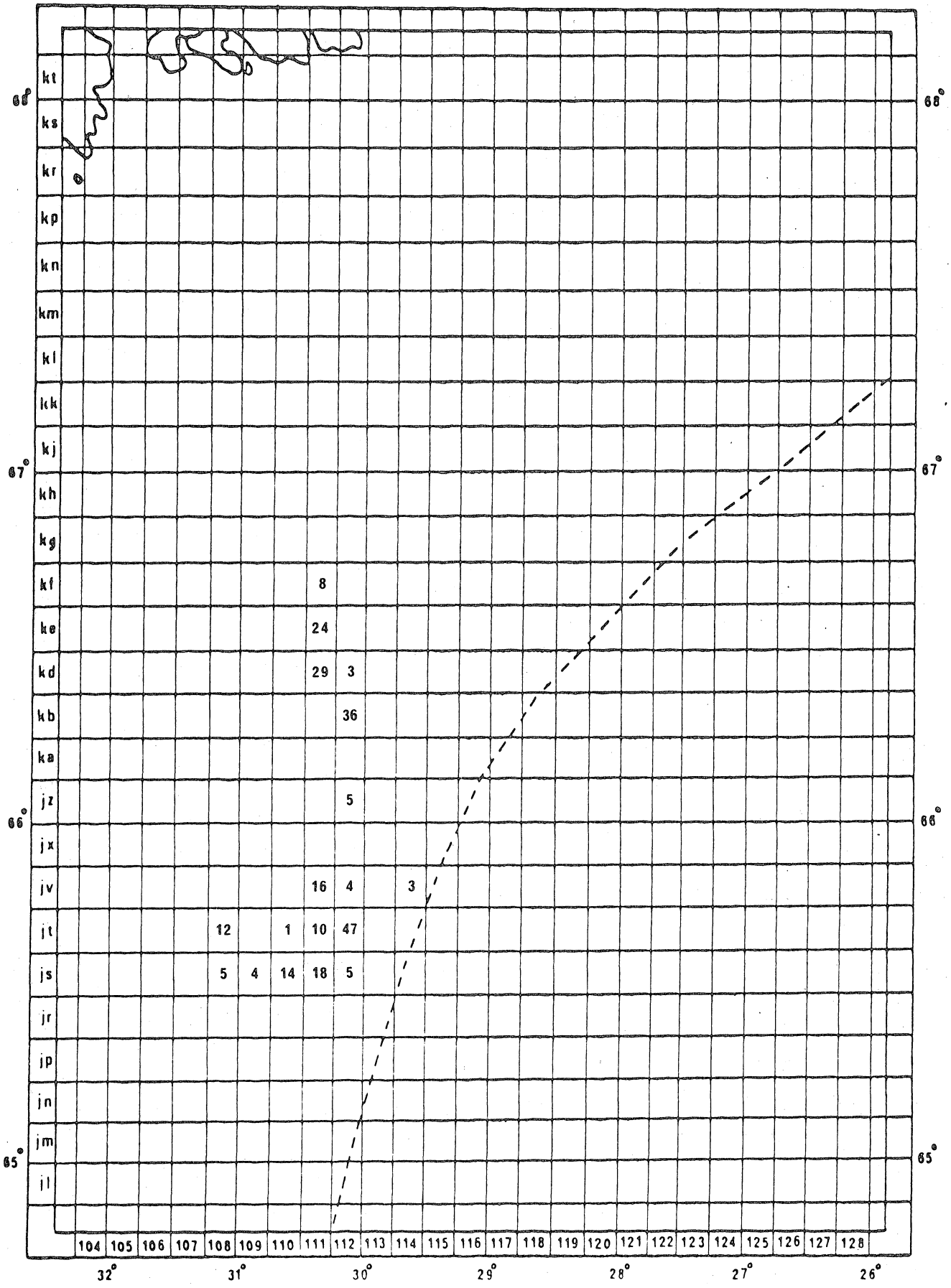

Fig. 2a - Distribution of the fishing effort (hours) of Finlande III at East Greenland in May 1983.

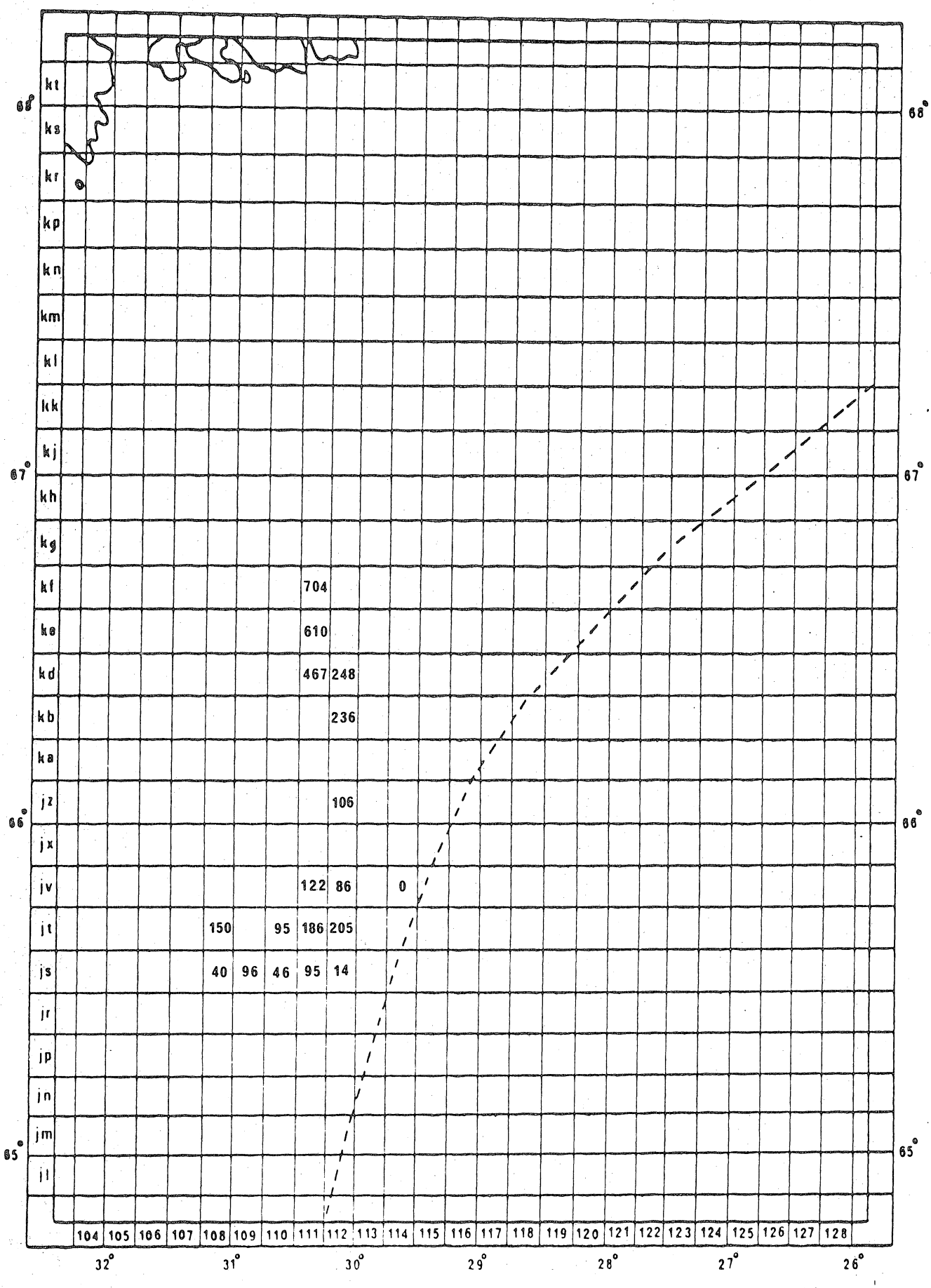

Fig. 2b – Distribution of the c.p.u.e. (kg/hour) of Finlande III at East Greenland in May 1983.

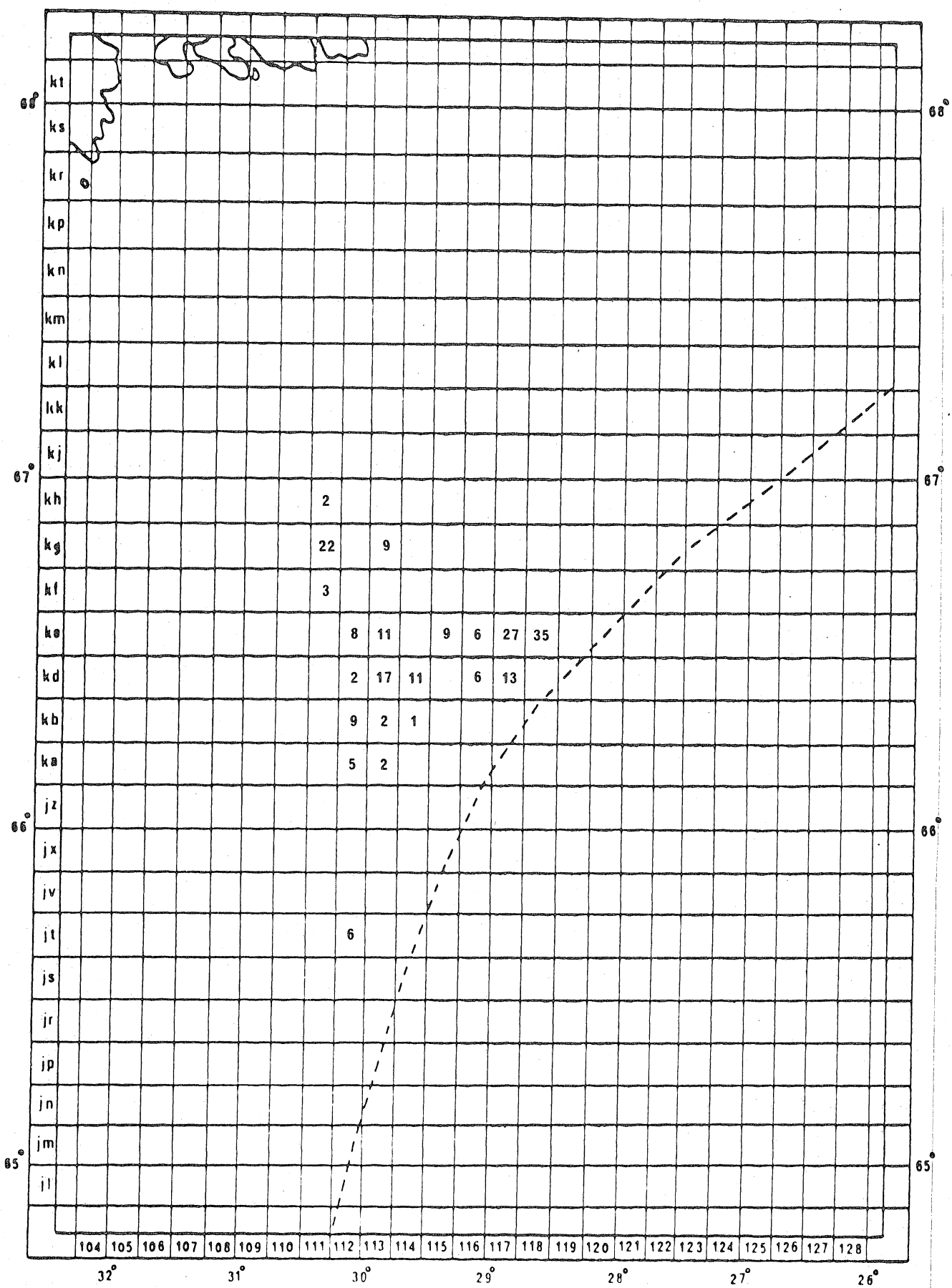

Fig. 3a - Distribution of the fishing effort (hours) of Finlande III at East Greenland in June 1983.

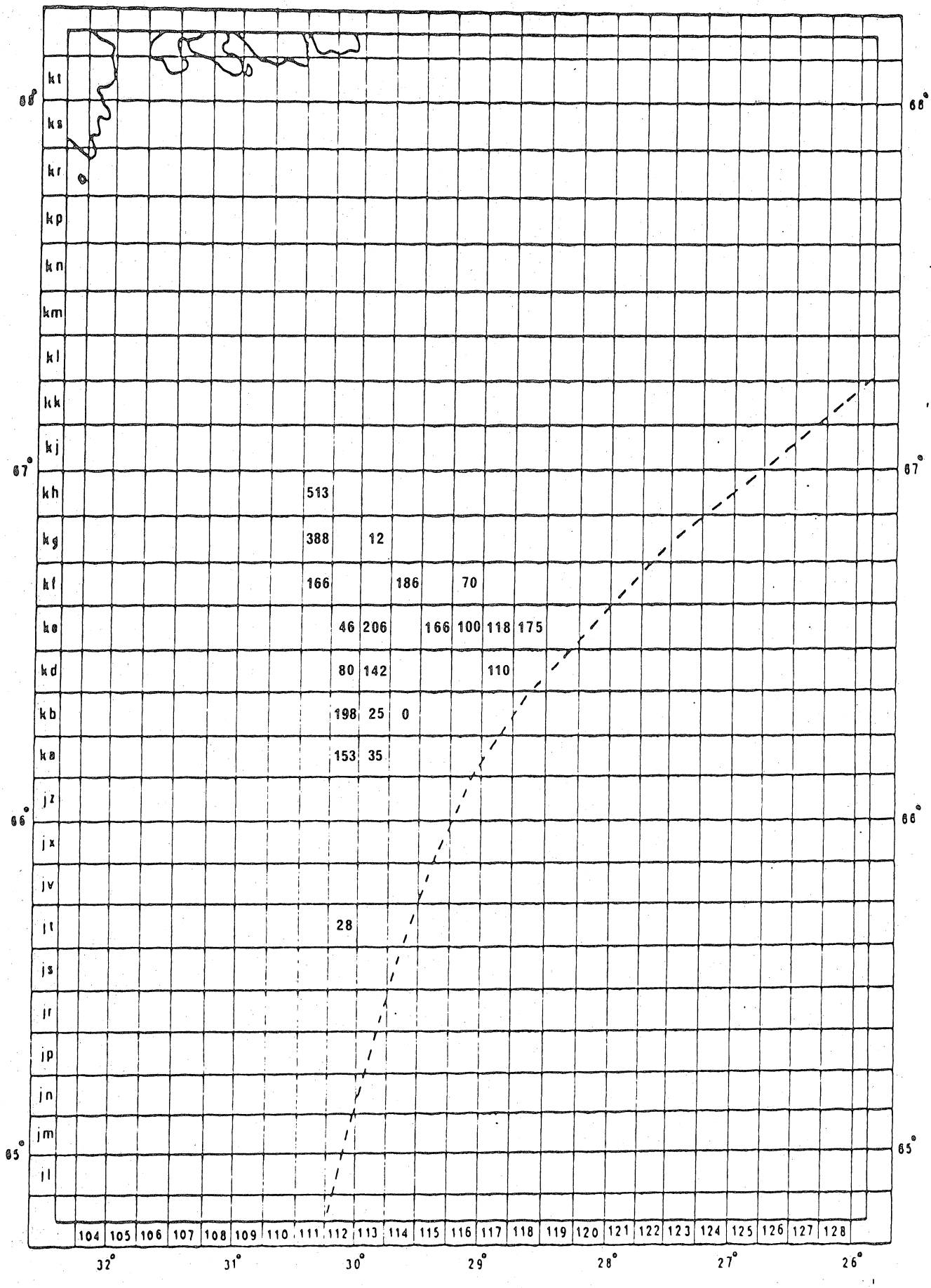

Fig. 3b - Distribution of the c.p.u.e. (kg/hour) of Finlandc III at East Greenland in June 1983.

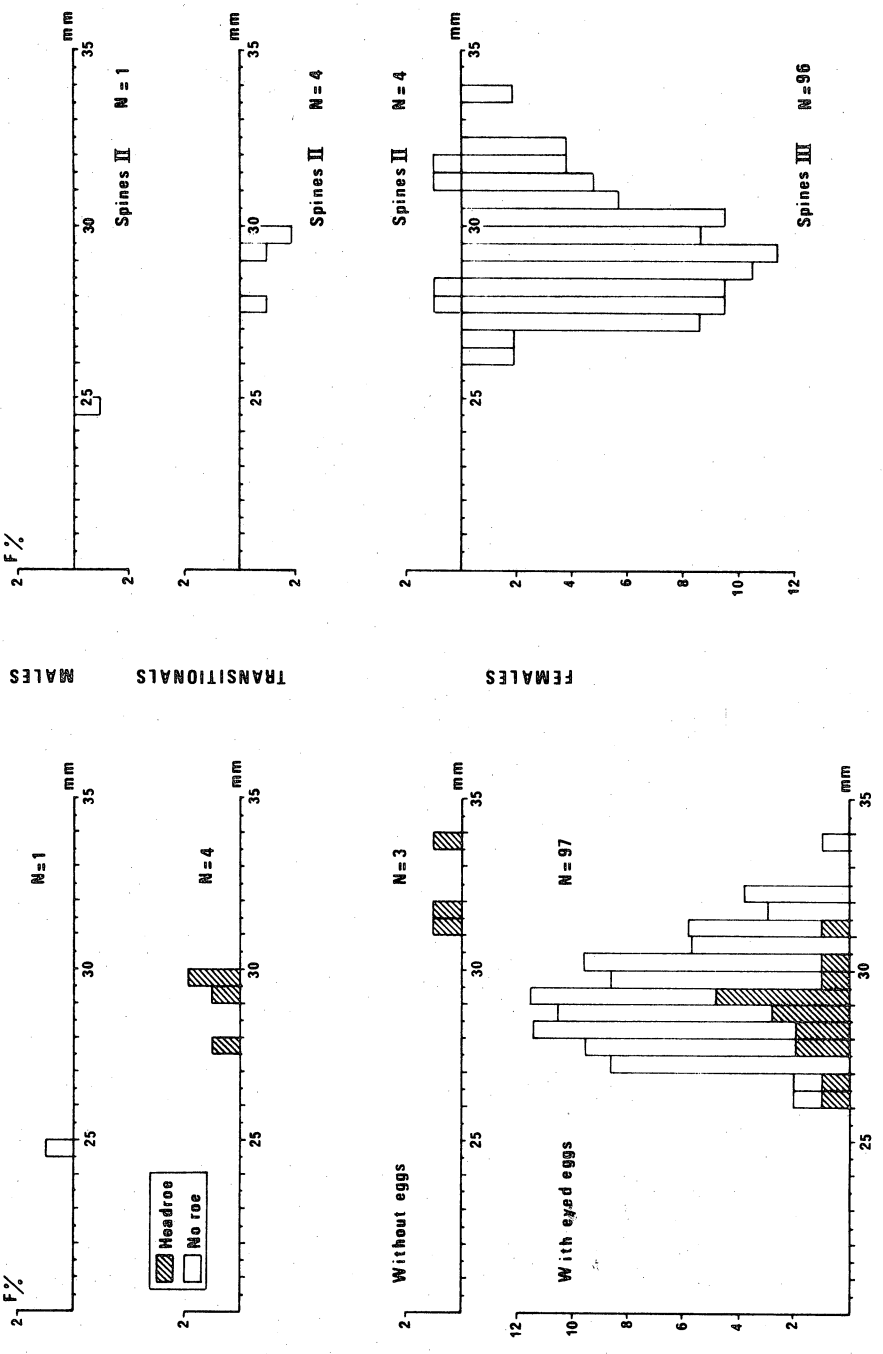

Fig. 4 - Length distribution of sexual components on April 25th related to maturity (left side) or to the spines characteristics (right side).

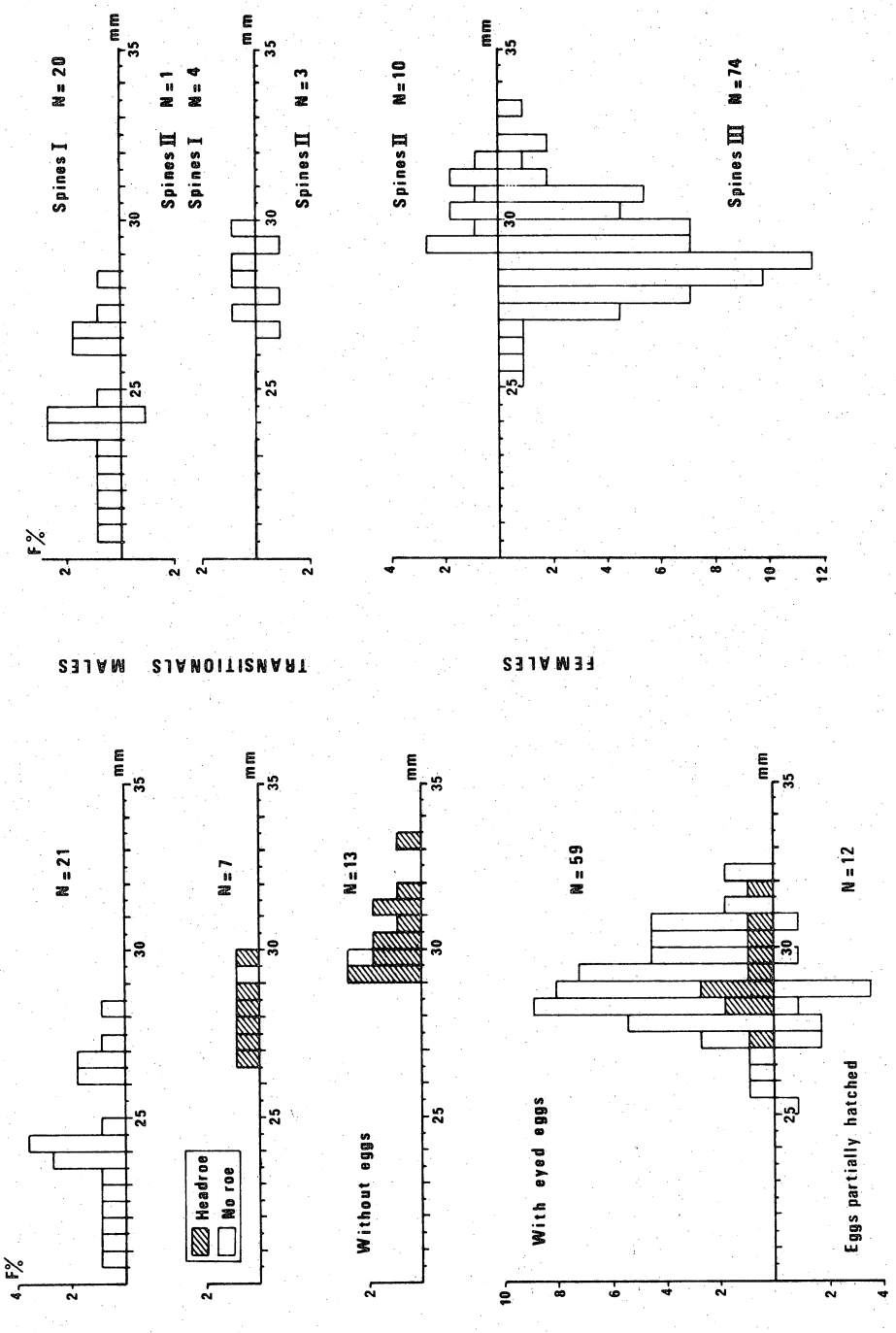

Fig. 5 - Length distribution of sexual components on May 31th related to maturity (left side) or to the spines characteristics (right side).

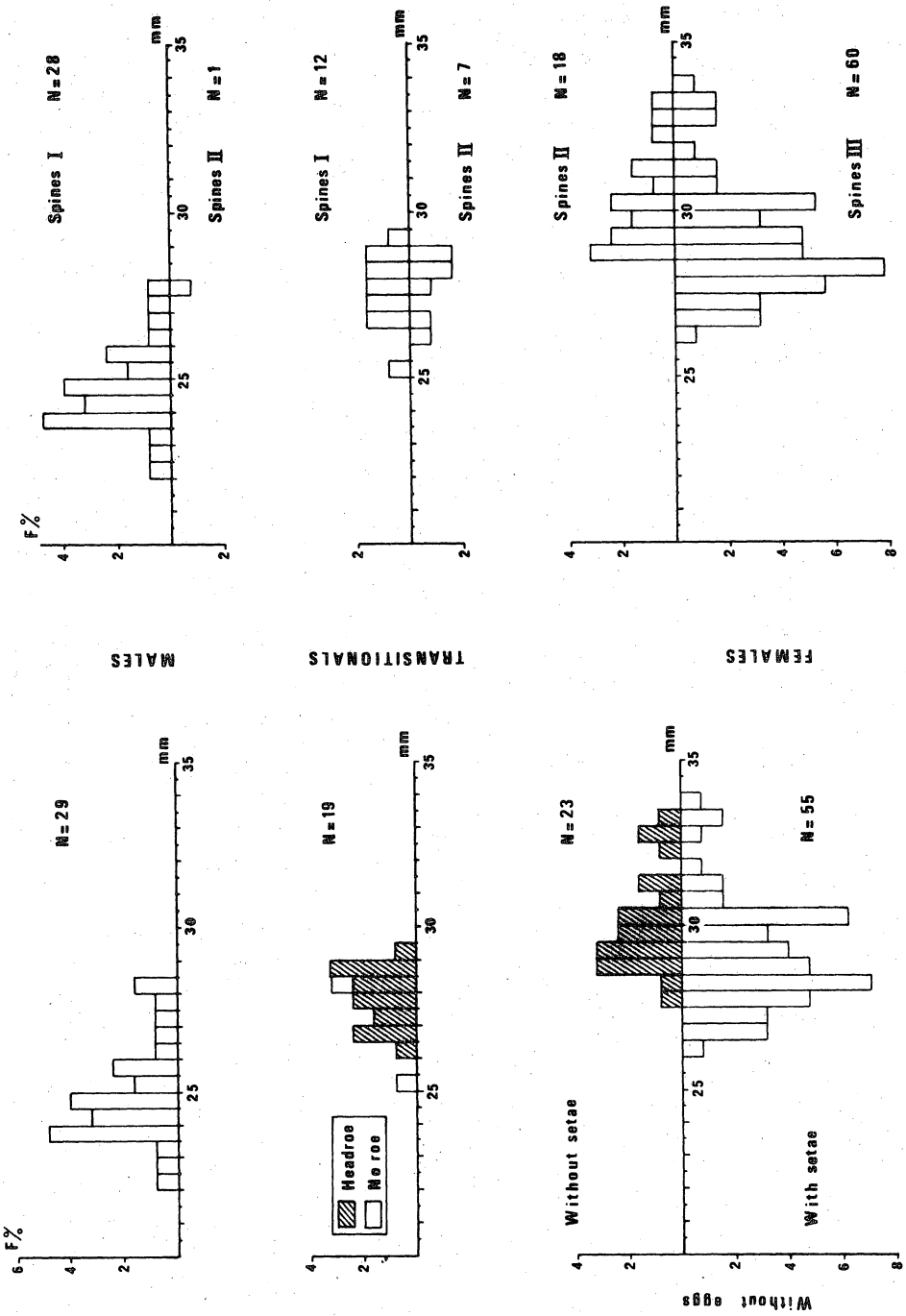

Fig. 6 - Length distribution of sexual components on June 12th related to maturity (left side) or to the spines characteristics (right side).

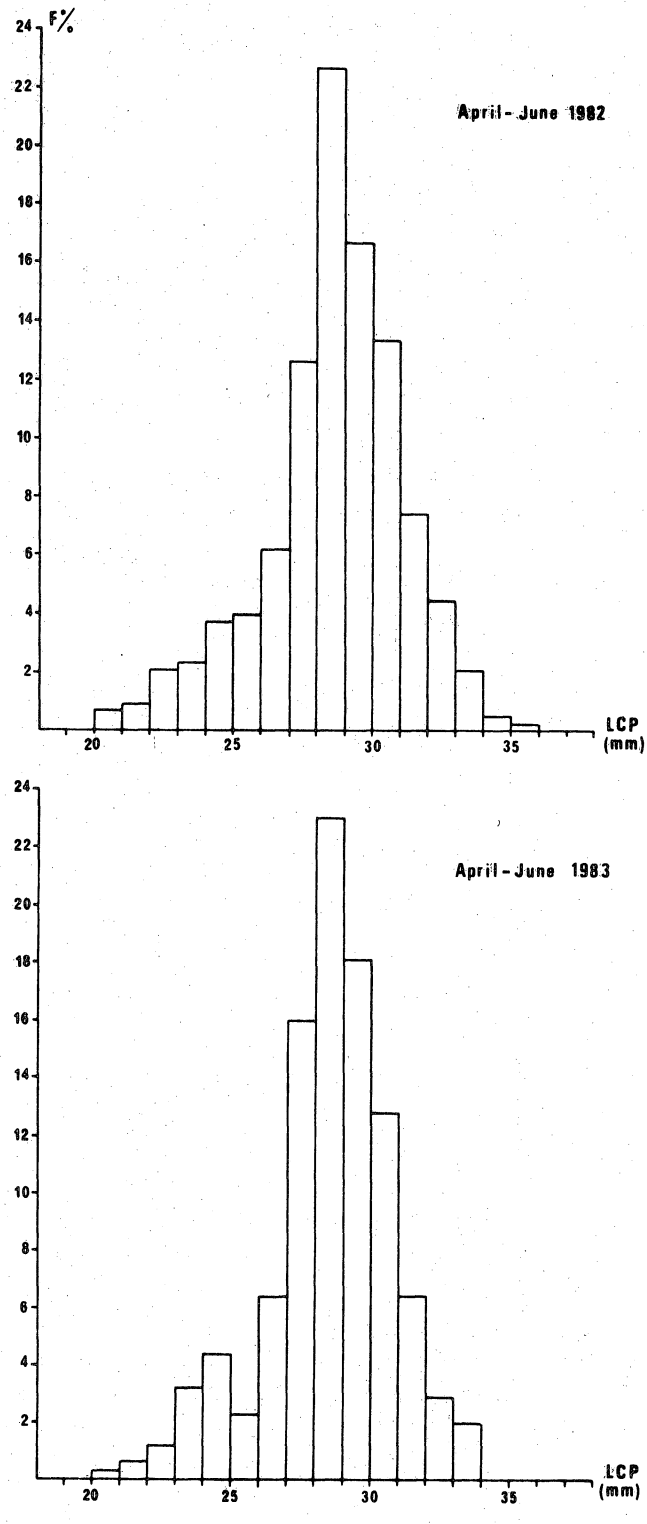

Fig. 7 - Comparison of length distributions obtained by Finlande III off East Greenland in 1982 and 1983.

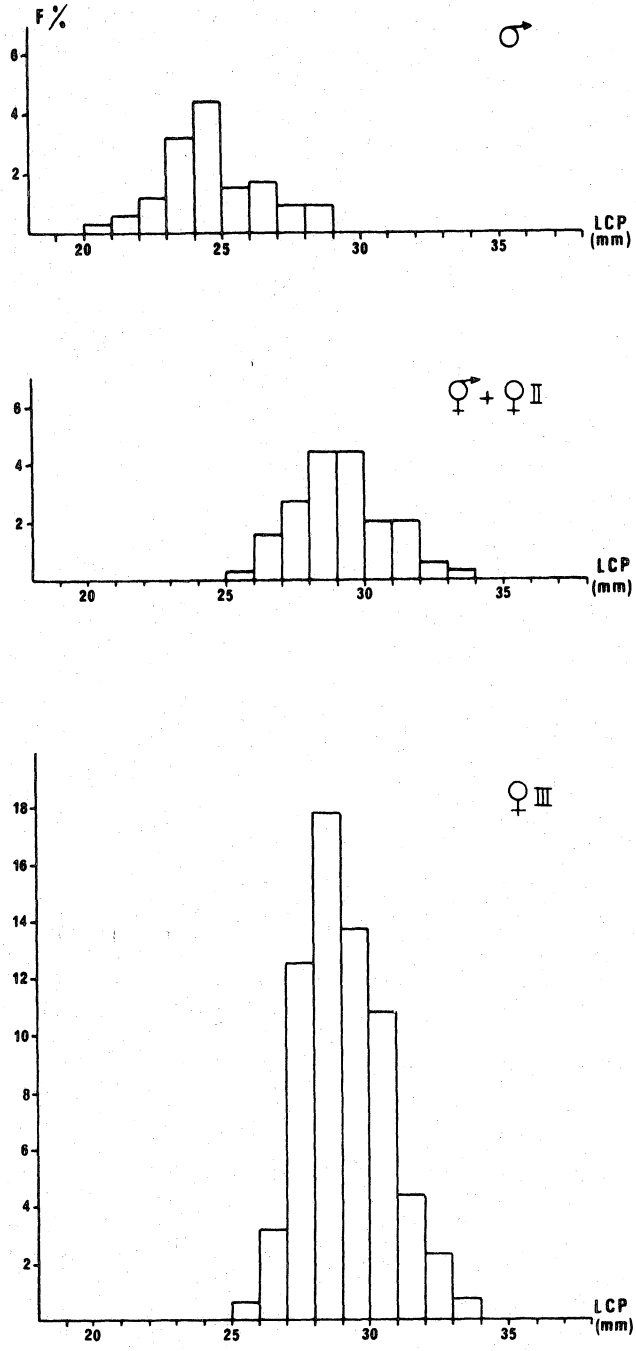

Fig. 8 - Length distributions of the males, transitionals and females with spines and females without spines (% of the total of the three samples).