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"AURELIA"-CRUISE REPORTS

ON THE BENTHIC FAUNA OF THE SOUTHERN NORTH SEA

Report 10:

The effect of different numbersof tickler chains on beam-trawl catches

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CONENTS

(The "Aurelia"-cruise reports on the benthic fauna of the southern North Sea are edited by G.J. van Noort).

I. INTRODUCTION

The categorie of animals which are, more or less selectively caught with a 5.5-m beam trawl as used in the 'AURELIA' cruises 1-8 (v. NOORT et al, 1979 a,b,c,d, 1981,1982,1983,1984,) belongs to epibenthic predators, swimming near or crawling on the bottom. They comprise small demersal fishes, shrimps, crabs, asteroids, ophiuroids and gastropods, mainly feeding on the benthic infauna. Quantitative knowledge on this community, however, is scarce. A principal drawback in these studies is our poor knowledge on the effiency of the fishing gear. Obviously, the effiency will - for different species - show an extreme variety. The hermit crab Eupagurus bernhardus, for instance, may be caught reasonably well, whereas burrowing animals hardly occur in the trawl catches as compared to the numbers found in Van Veen bottom-grab samples. Likewise, the occurence of large fish will poorly be recorded by the beam trawl.

The possibilities of escape from the trawl are threefold:

a. through the meshes by juveniles and small species

b. underneath the ground rope by species occasionally burrowing

c. lateral escape as well as well as escape over the beam by fast swimmers.

In the present report the ground-rope effect is discussed. In 1977 a number of experimental hauls were carried out with different numbers of tickler chains, varying from 0 to 6. These experiments took place in three sandy areas and in one muddy area (Fig. 1.).

II. MATERIAL AND METHODS

The surveys were made with a 5.5-m beam trawl (Fig.2) which is an adapted copy of the 6-m beam trawl used by the Netherlands Institute for Fishery Investigations, IJmuiden in the "Demersal Young Fish Survey" programme. The mesh size of the net decreases from 17.5 x 17.5 mm^2 at the front to 5 x 5 mm^2 at the cod end (or from 35 mm to 10 mm if streched). The ground rope is equipped with 17 bobbins of 7 cm diameter and 10 cm lenghth. In front of the ground rope different numbers of tickler chains (with links of 5.5 x 3.5 x 1.2 cm) were fitted.

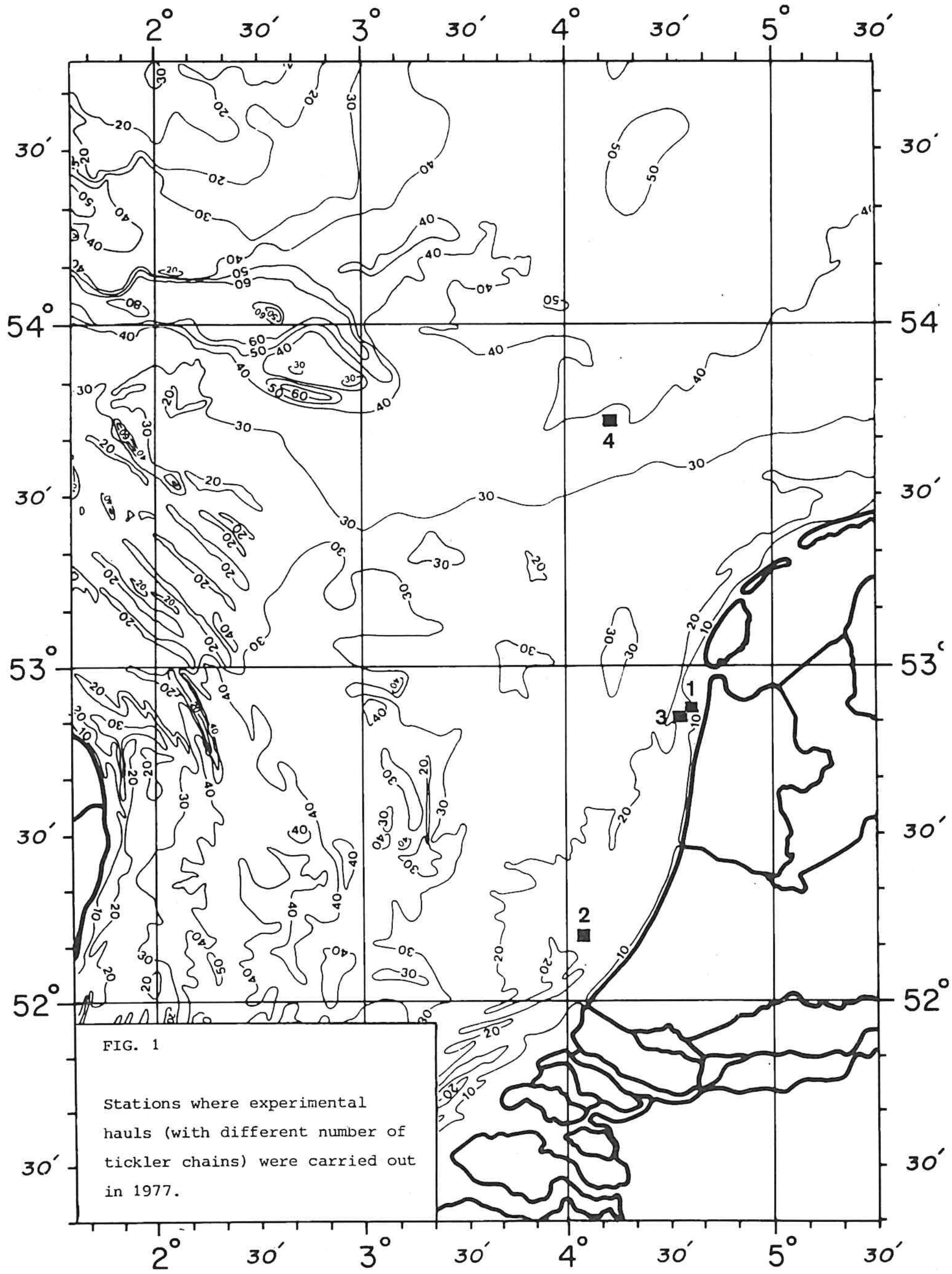


FIG. 1

Stations where experimental hauls (with different number of tickler chains) were carried out in 1977.

TABLE I. Date, time and location of experimental series of hauls carried out in 1977.

SERIES	DATE	TIME	LOCATION		
			POSITION	No. in fig. 1	SEDIMENT
1	Jan. 24th	10.15-12.12			
2	Jan. 24th	13.10-14.51	$52^{\circ}51.5'$-$52^{\circ}53.0'$N	1	SAND
3	Jan. 25th	10.05-11.47	$4^{\circ}35.0'$- $4^{\circ}38.0'$E		
4	Jan. 25th	11.56-13.56			
5	Oct. 11th	8.43-13.05	$52^{\circ}11.0'$-$52^{\circ}12.5'$N	2	SAND
6	Oct. 11th	13.20-15.33	$4^{\circ}03.5'$- $4^{\circ}06.0'$E		
7	Oct. 13th	9.56-11.48	$52^{\circ}51.5'$-$52^{\circ}53.0'$N $4^{\circ}35.0'$- $4^{\circ}38.0'$E	1	SAND
8	Oct. 13th	13.16-14.59	$52^{\circ}49.5'$-$52^{\circ}51.5'$N $4^{\circ}32.5'$- $4^{\circ}35.0'$E	3	SAND
9	Oct. 17th	15.27-16.37			
	Oct. 18th	8.30- 9.28	$53^{\circ}42.5'$-$53^{\circ}43.5'$N	4	MUD
10	Oct. 18th	10.54-15.27	$4^{\circ}11.0'$- $4^{\circ}14.0'$E		
11	Oct. 19th	8.27-10.55			

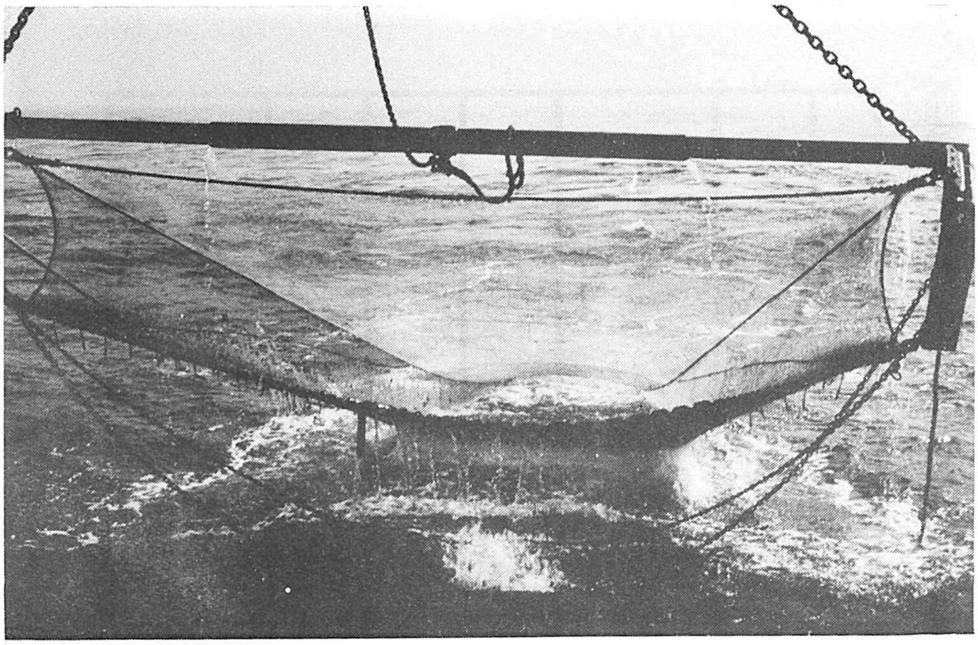


Fig. 2. 5½ m beam trawl with two tickler chains.

The hauls were of 5 minutes duration, and the distances covered by the fishing net were estimated with the aid of a Decca Track Plotter. The numbers of animals counted were converted into numbers of animals caught per 10,000 m^2. The experimental series consisted of 7 hauls with 0-6 tickler chains, fitted in a randomly chosen sequence. Four series were performed in January 1977 and seven series in October 1977. The location, dates, times and the character of the sediment are mentioned in Table I. The positions are shown in Fig. 1.

III. RESULTS

All catches of the separate species are summarized in the addendum, expressed in numbers caught per 10,000 m^2.

For further considerations the numbers of specimens per 10,000 m^2, caught during the separate hauls of one series, were converted into the percentage of the total catch of the complete series of seven hauls. In that way the relative effect of tickler chains on populations with different densities could be compared. Eight series were made in three different sandy stations and three series in one muddy station (Fig. 1).

Unfortunately the variability of the catches was extremely high. For a surveyable review of the results, therefore, the counts of the three sandy stations were averaged as much as possible, but nevertheless the conclusions are - for a considerable part - not based on significant data. For a separate treatment of size classes the figures are far from sufficient.

The results are summarized in Figs. 3-10. In these diagrams the variability is - with vertical bars - expressed in 95% confidence limits computed after an arcsine transformation of the percentages mentioned above (SOKAL & ROHLF, 1969).

At first view there is a conspiceous difference between the series carried out in sandy and muddy areas. In the sandy stations there is, in general, a positive effect of tickler chains, whereas in the muddy station tickler chains seem to have few, or even an adverse effect on the catches. In the following considerations, therefore, the sand and mud series will be treated separately.

For the comparison between the species the tickler-chain effect has been expressed in linear regression parameters of the arcsine-transformed data, irrespective of the possible shape of the diverse specific curves. A test on linearity, however, showed that in only five (obvious) cases linearity had to be rejected. The linear regression parameter b (slope), therefore, provides us with a comparable measure of the effectiveness of tickler chains on different types of animal. In Tables II (sand stations) and III (mud station) the animals are arranged in decreasing order of the effect of the chains as measured by the parameter b (slope). Values of b, significantly different from zero, are marked with an asterix in tables II and III.

The arcsine-transformed percentages have also been treated with an analysis of variance. The results of the anova are in general consistent with those of the regression analysis. With Buglossidium luteum, Merlangius merlangus and Pleuronectes platessa in the sand stations anova yielded no significant differences among means, whereas regression analysis showed a significant regression. This is also the case with Limanda limanda in the mud stations. This difference is due to the fact that regression analysis is more powerful than anova in testing the same null hypothesis, i.e. equality of means (SOKAL & ROHLF, 1969). In addition to anova a Student-Newman-Keuls test has been applied on the transformed means to locate non-significant ranges of means (SOKAL & ROHLF, 1969). In Figs. 3-10 non-significant ranges according to the S-N-K test are underlined.

IV. DISCUSSION SAND STATIONS

In Table II (sand stations) the animals show a fairly conceivable sequence. If, for instance, the fishes *Solea solea* and *Buglossidium luteum* (which are known to cling strongly to the bottom) are compared with the pelagically living horse mackerel *Trachurus trachurus*, their places in Table II are understandable. The same holds true for the comparison of burrowing invertebrates such as *Crangon allmanni* and the swimming crab, *Macropipus holsatus* with a not burrowing animal such as the hermit crab *Eupagurus bernhardus*.

For studies on efficiency of fishing gears it is of interest if, with the addition of still more tickler chains, the catches do not persist in growing. In other words, if the curves (Figs. 3-10) show (or show not) an assymptotic course, indicating a 100% ground-rope efficiency at a certain number of chains. For the sole, *Solea solea* and solenette *Buglossidium luteum* (Fig. 3) this is, apparently, not the case, even with the maximum number of 6 chains. Neither such an assymptotic course is found in invertebrates such as *Crangon allmanni* (Fig. 8), the swimming crab *Macropipus holsatus* (Fig. 7), and *Ophiura texturata* (Fig. 10). An obvious assymptotic course, on the other hand, is found in the curves of the dab *Limanda limanda* (Fig. 4) and the starfish *Asterias rubens* (Fig. 9). Also in other species like the dragonet *Callionymus lyra* (Fig. 5), the whiting *Merlangius merlangus* (Fig. 5), the gobies *Pomatoschistus* (Fig. 6), the shrimp *Pontophilus trispinosus* (Fig. 8) and the brittle-star *Ophiura albida* (Fig. 9) there is, apparently, a certain amount of chains beyond which no further increase of catches takes place.

The tickler-chain effect on the catches of the whiting (Fig. 5) is strange, and difficult to explain. For fishes which are supposed to swim more or less pelagically, an effect as found in the horse mackerel *Trachurus trachurus* (Fig. 10) should have been expected.

V. DISCUSSION MUD STATION

As shown in Table III the tickler chains have very few effect on the catches in the mud station. For a number of species, specially fishes, the chains seem even to have an adverse effect. For these mobile animals the disturbances in the mud caused by the chains might have resulted into the negative regression, occuring in all fish species except in the scald-fish *Arnoglossus laterna* (Fig. 6) and the sole *Solea solea* (Fig. 3). Also *Crangon allmanni* (Fig. 8),just as well a mobile animal, shows a negative regression with increasing number of tickler chains.

A positive effect of tickler chains is found in *Astropecten irregularis* (Fig.10, *Ophiura albida* (Fig. 9) and *Turritella communis* (Fig. 10) These are all sedentary animals from which *Astropecten* and *Turritella* are burrowing. Very strange,however, is the drop of the catches with 6 chains in all three of the cases.

The highest density of *Turritella*, recorded with the beam trawl with 5 tickler chains, amounts to 4.4 (2-7) specimens per m^2. With the van Veen bottom sampler, however, the density, recorded at about the same station, ranges from 25 to 50 specimens per m^2. The efficiency of a beam trawl with 5 tickler chains for animals, as *Turritella*, living just below the water-sediment boundary,is, apparently about 13%.

VI. REFERENCES

Creutzberg, F., 1979. "Aurelia"-cruise reports on the benthic fauna of the southern North Sea. Introductory Report. Int. Versl. NIOZ, Texel, 1979-4: 1-31.

Noort, G.J. van, F. van Leeuwen & F. Creutzberg, 1979a. "Aurelia"-cruise reports on the benthic fauna of the southern North Sea. Report 1: trawl survey April-May 1972. Int. Versl. NIOZ, 1979-5: 1-104.

Noort, G.J. van, F. van Leeuwen & F. Creutzberg, 1979b. "Aurelia"-cruise reports on the benthic fauna of the southern North Sea. Report 2: trawl survey June-July 1972. Int. Versl. NIOZ, 1979-6: 1-107.

Noort, G.J. van, F. van Leeuwen & F. Creutzberg, 1979c. "Aurelia"-cruise reports on the benthic fauna of the southern North Sea. Report 3: trawl survey October-November 1972. Int. Versl. NIOZ, 1979-7: 1-115.

Noort, G.J. van, F. van Leeuwen & F. Creutzberg, 1979d. "Aurelia"-cruise reports on the benthic fauna of the southern North Sea. Report 4: trawl survey January-February 1973. Int. Versl. NIOZ, 1979-8: 1-99.

Noort, G.J. van & F. Creutzberg, 1981. "Aurelia"-cruise reports on the benthic fauna of the southern North Sea. Report 5: trawl survey October-November 1974. Int. Versl. NIOZ, 1981-1: 1-116.

Noort, G.J. van, F. Creutzberg & R. Dapper, 1982. "Aurelia"-cruise reports on the benthic fauna of the southern North Sea. Report 6: trawl survey September-November 1975. Int. Versl. NIOZ, 1982-7: 1-68.

Noort, G.J. van, F. Creutzberg & R. Dapper, 1983. "Aurelia"-cruise reports on the benthic fauna of the southern North Sea. Report 7: trawl survey February-March 1976. Int. Versl. NIOZ, 1983-3: 1-76.

Noort, G.J. van, F. Creutzberg & R. Dapper, 1984. "Aurelia"-cruise reports on the benthic fauna of the southern North Sea. Report 8: trawl survey October 1976. Int. Versl. NIOZ, 1984-1: 1-72.

Sokal, R.R. and F.J. Rohlf, 1969. Biometry. The principles and practice of statistics in biological research. 776 pp. Freeman and Company, San Francisco.

TABLE II. List of animals from the sandy stations in decreasing order of the effect of the chains as measured by the parameter b (slope). Values of b significantly differing from zero are marked with an asterix.

NAME OF THE SPECIES	b (slope)	r (corr.coeff.)	N (no. obs.)
Crangon allmanni	0.0963*	0.8111	21
Solea solea	0.0963*	0.9002	28
Macropipus holsatus	0.0801*	0.7071	56
Ophiura albida	0.0759*	0.9121	14
Ophiura texturata	0.0711*	0.7722	56
Buglossidium luteum	0.0699*	0.7929	14
Asterias rubens	0.0496*	0.7143	42
Merlangius merlangus	0.0395*	0.4472	28
Crangon crangon	0.0380*	0.6508	56
Limanda limanda	0.0365*	0.6011	42
Callionymus lyra	0.0320	0.4431	28
Pomatoschistus sp.	0.0297*	0.5686	41
Pleuronectes platessa	0.0237*	0.3238	56
Pontophilus trispinosus	0.0228	0.2629	28
Trachurus trachurus	0.0101	0.1615	14
Eupagurus bernhardus	0.0066	0.0916	56

TABLE III. List of animals from the muddy station in decreasing order of the effect of the chains as measured by the parameter b (slope). Values of b significantly differing from zero are marked with an asterix.

NAME OF THE SPECIES	b (slope)	r (corr. coeff.)	N (no. obs.)
Astropecten irregularis	0.0210	0.3171	21
Eupagurus bernhardus	0.0196	0.2713	21
Ophiura albida	0.0177	0.3189	21
Arnoglossus laterna	0.0072	0.1359	21
Turritella communis	0.0058	0.1026	21
Macropipus holsatus	0.0011	0.0225	21
Solea solea	0.0010	0.0083	21
Buglossidium luteum	-0.0039	-0.0905	21
Callionymus lyra	-0.0105	-0.2122	21
Asterias rubens	-0.0108	-0.1596	21
Pleuronectus platessa	-0.0159	-0.1355	21
Pomatoschistus spp.	-0.0212	-0.2690	21
Limanda limanda	-0.0236*	-0.4793	21
Merlangius merlangus	-0.0302	-0.4054	21
Crangon almanni	-0.0323	-0.2718	21
Rhinonemus cimbrius	-0.0326	-0.2919	21

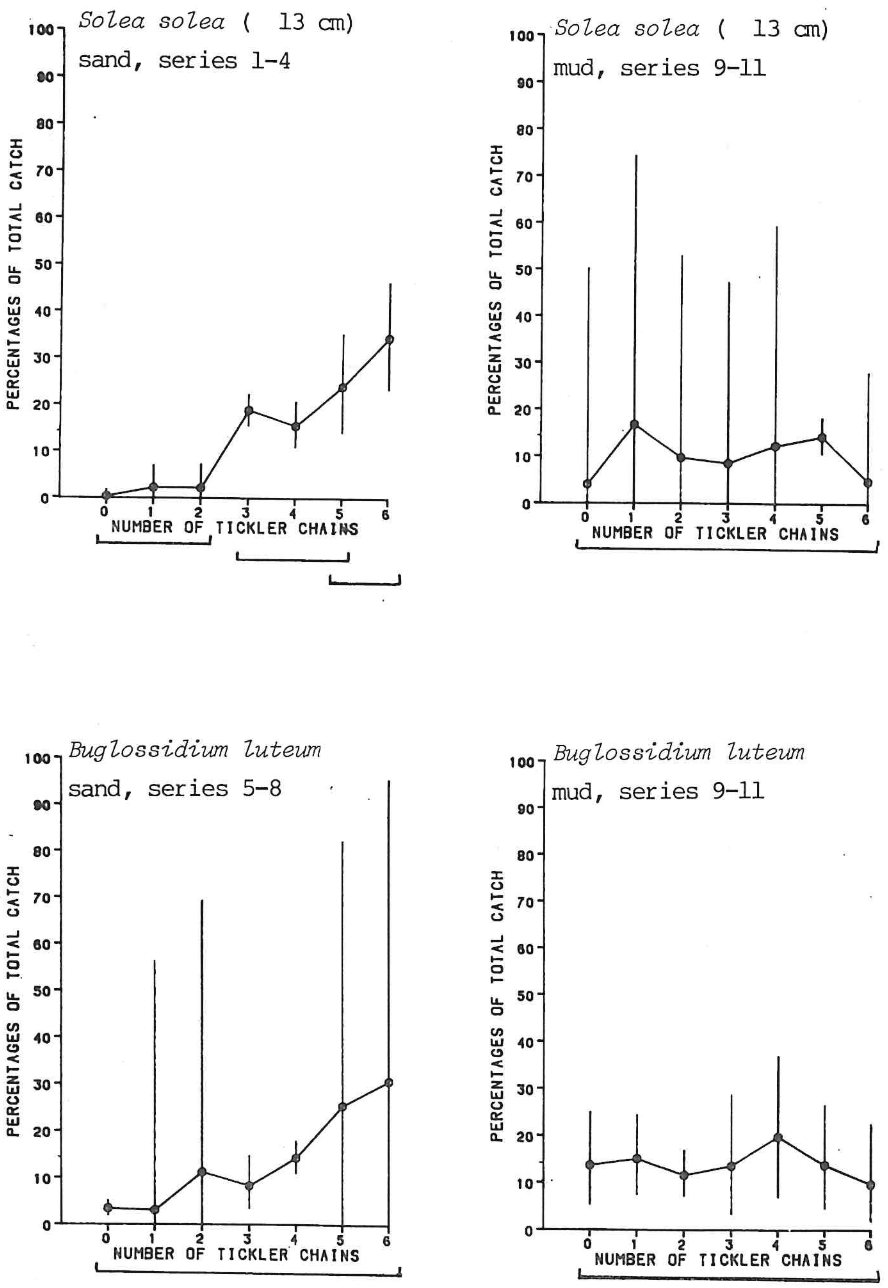


Fig.3 Relationships between the number of tickler chains and the number of animals caught, expressed in % of the total catch of a series, in sand and mud stations. Vertical bars are 95% confidence limits. Non-significant ranges according to the Student-Newman-Keuls test are underlined.

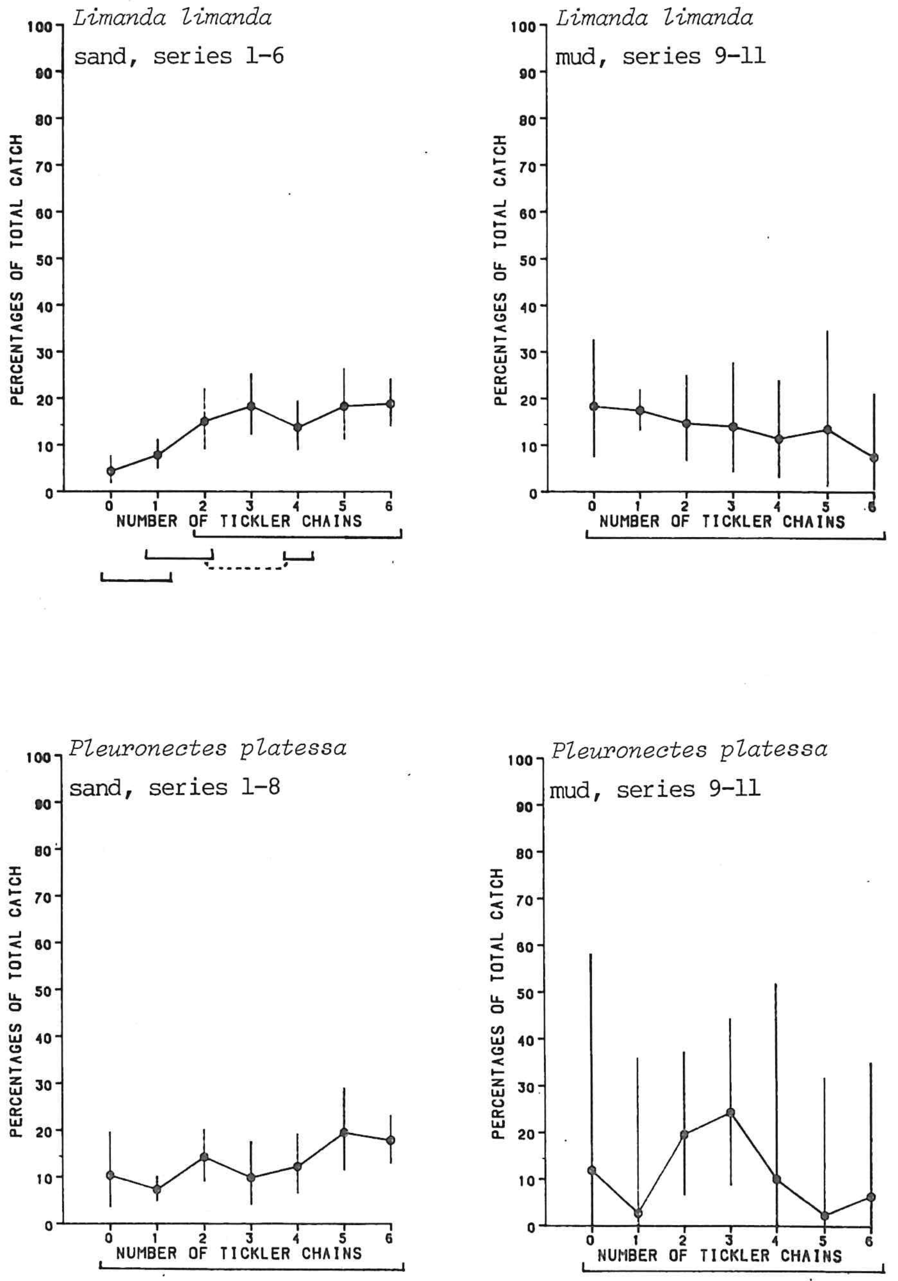
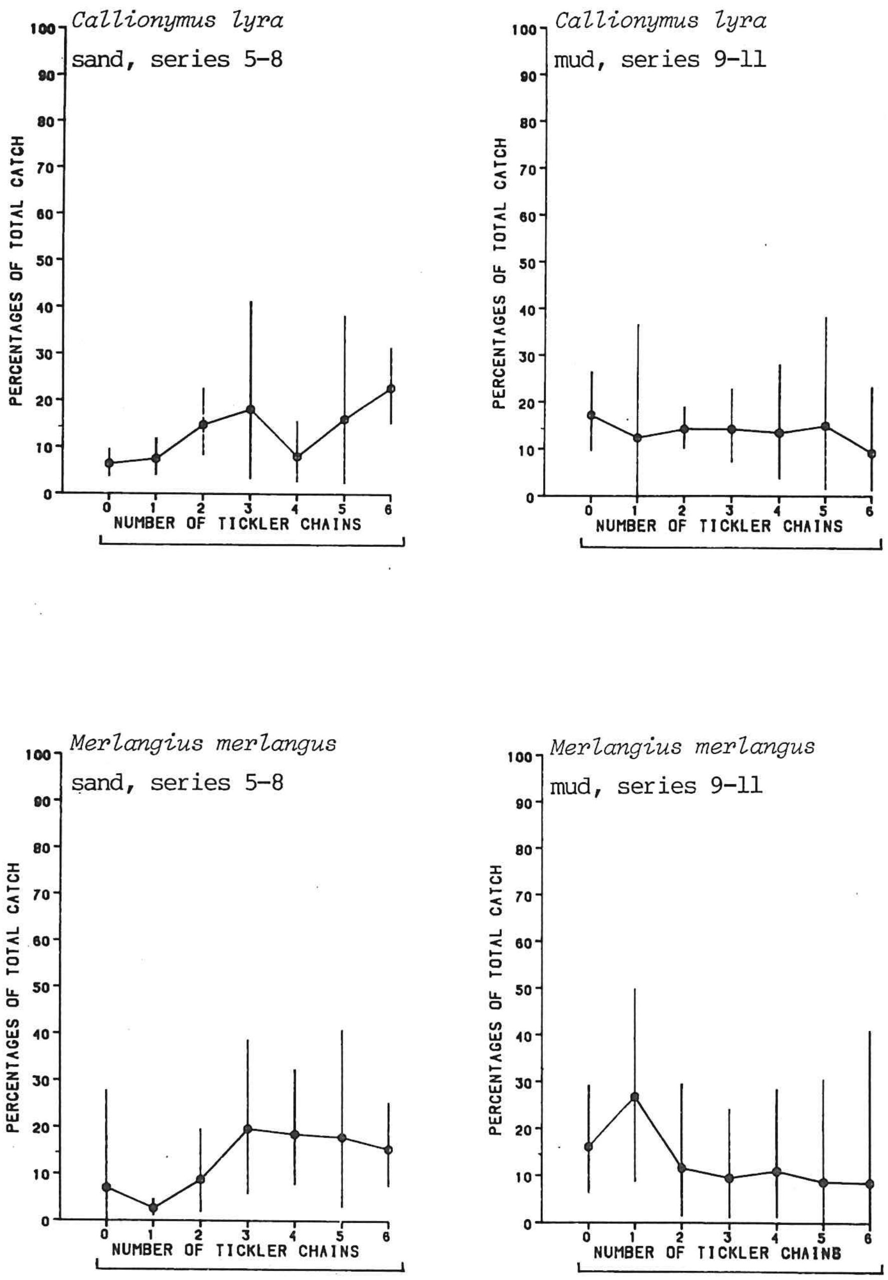


Fig.4 See legend of figure 3



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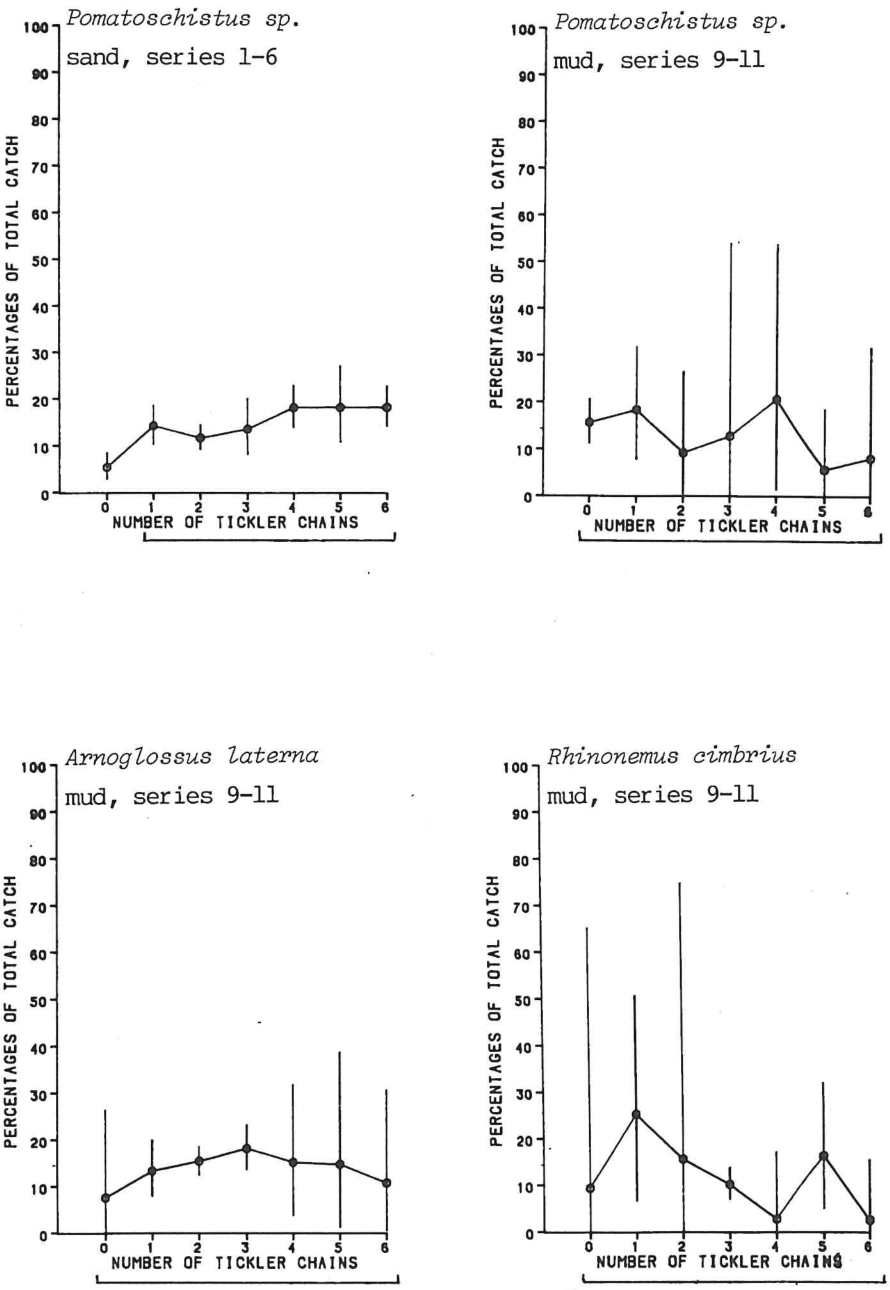

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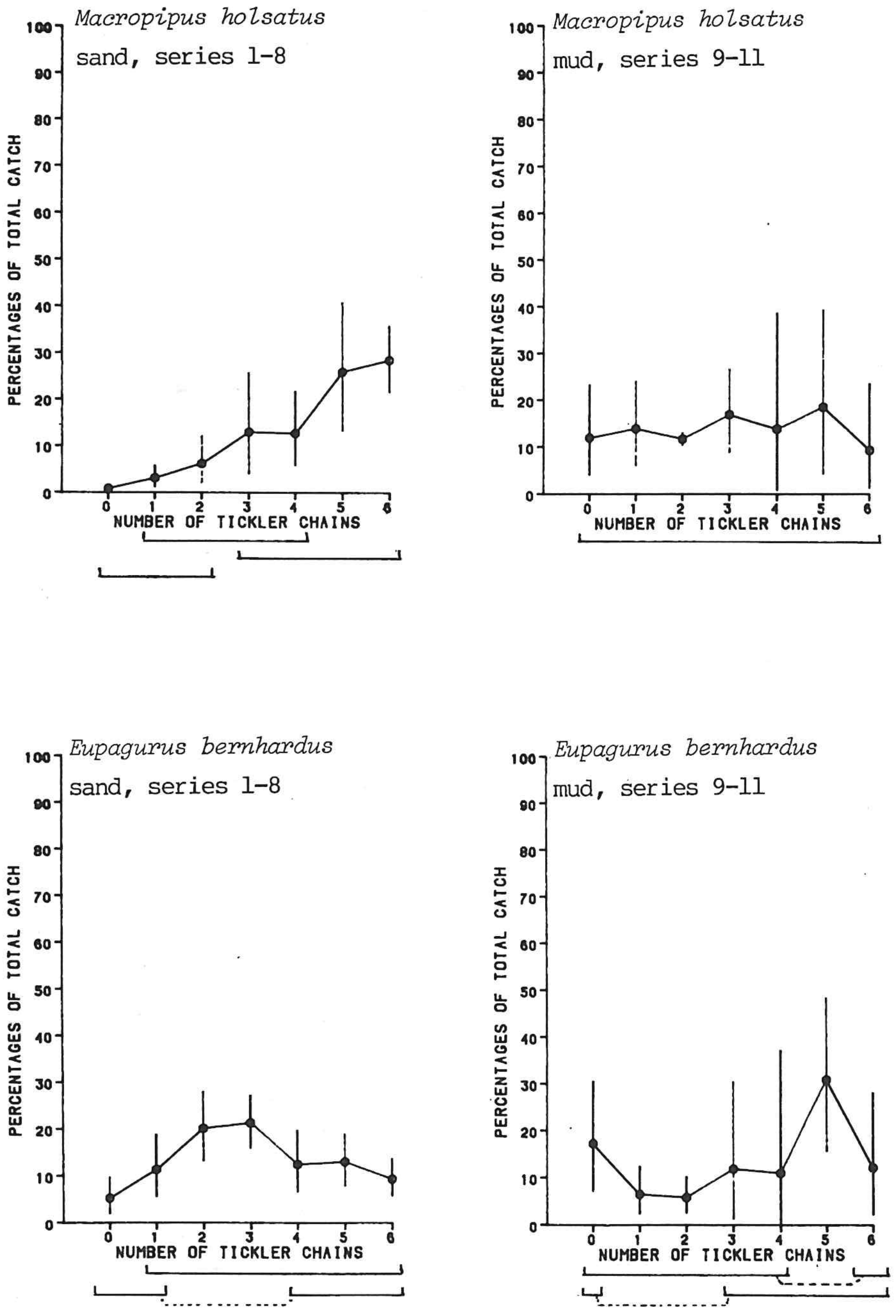

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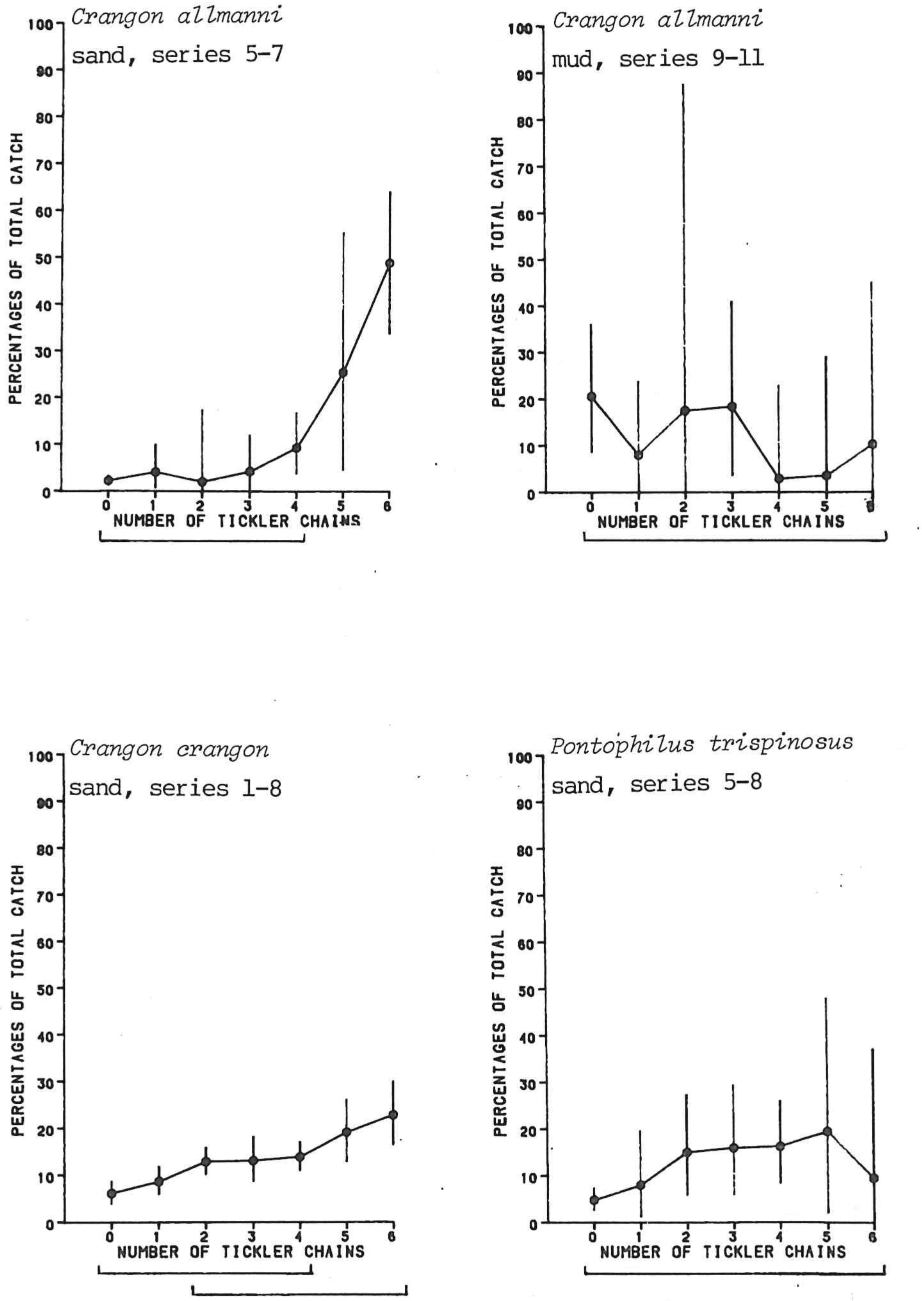

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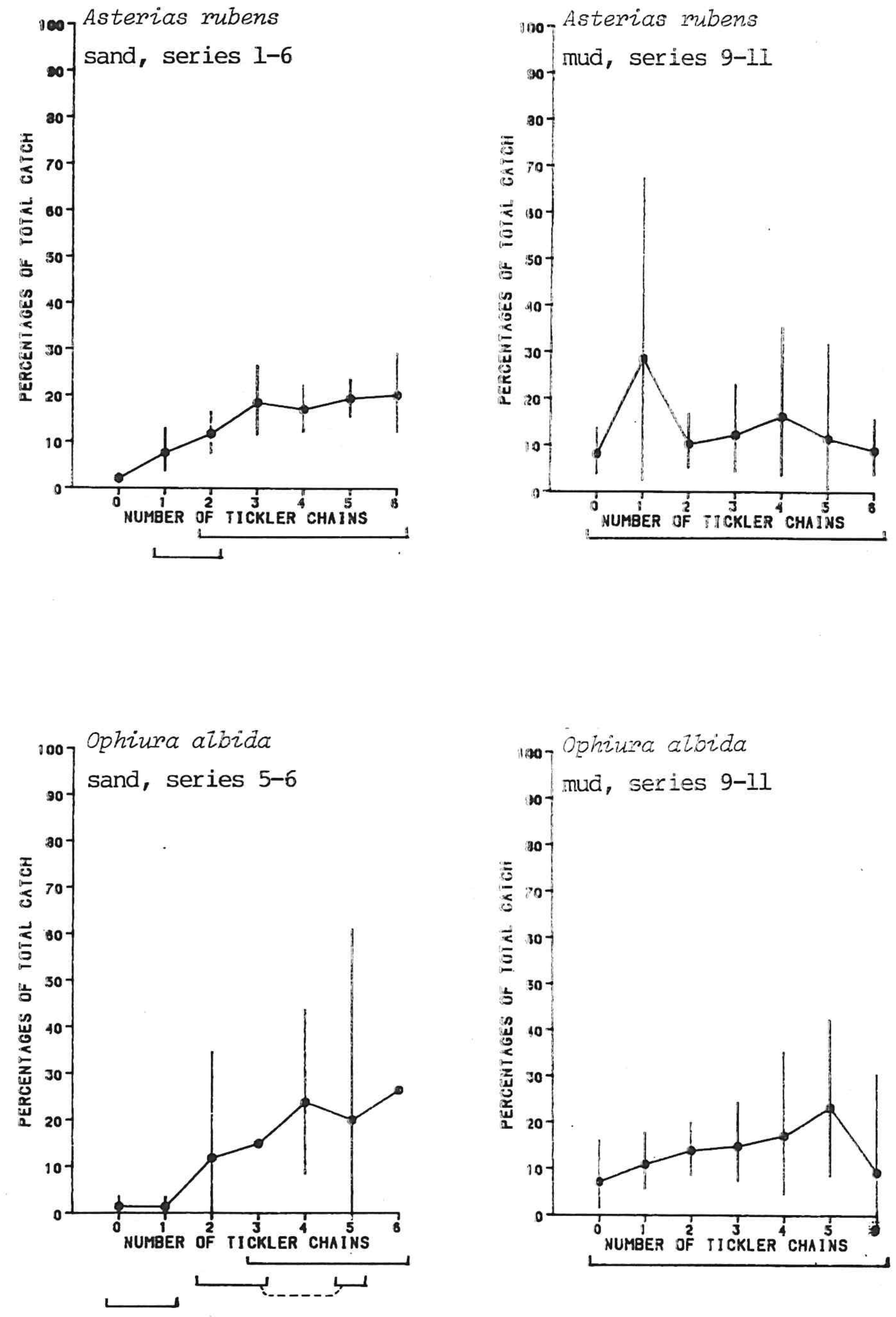

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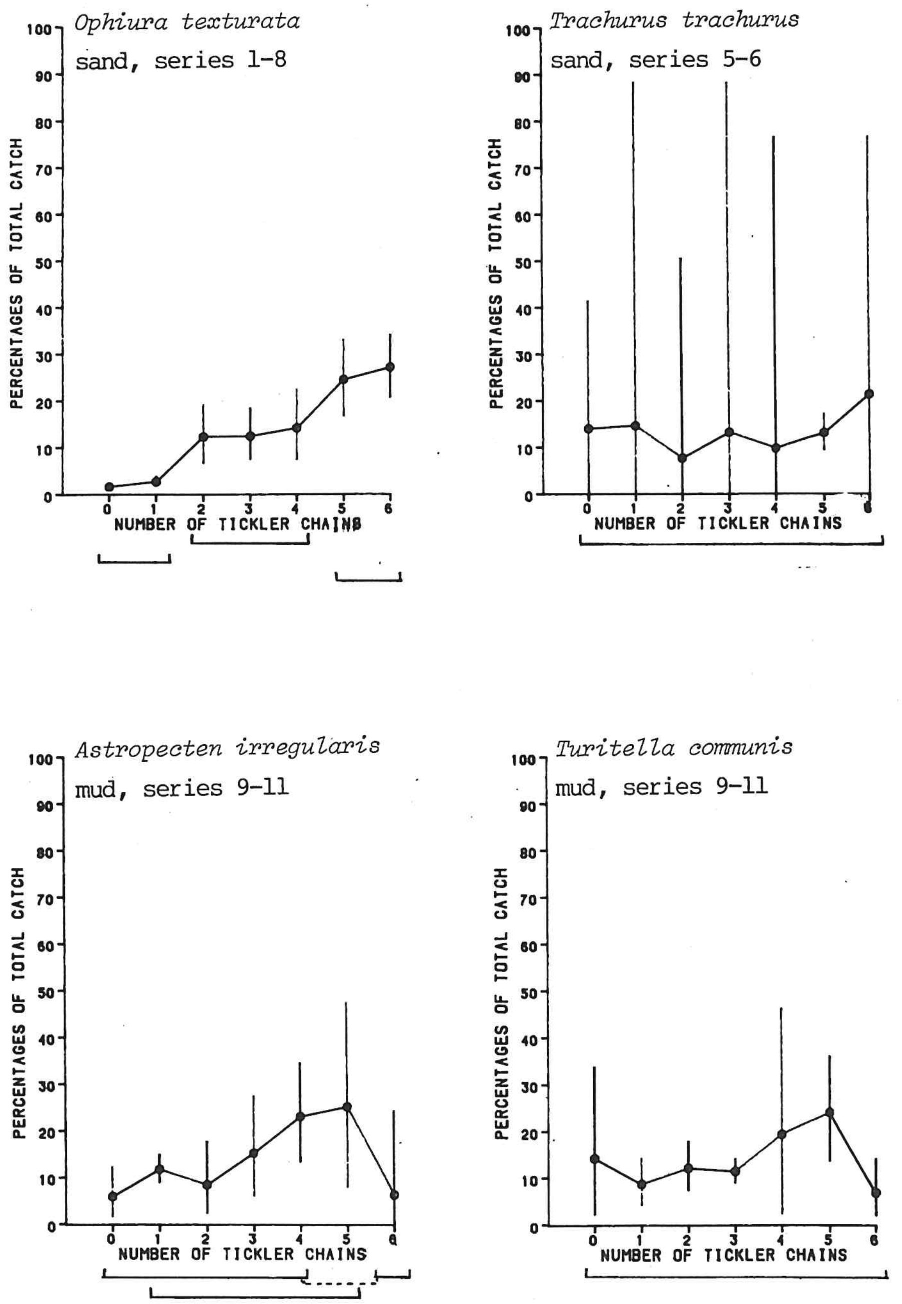

Fig.10 See legend of figure 3

ADDENDUM

Numbers caught per 10,000 m^2 with 0-6 tickler chains

SOLEA SOLEA (<13 CM) SERIES 1-4 SAND

0	1	2	3	4	5	6
.0	.0	8.8	40.0	39.2	23.7	77.8
2.3	5.6	8.0	30.9	25.2	52.1	37.6
3.3	14.8	.0	46.7	33.3	76.8	137.9
.0	6.2	4.1	37.0	28.4	51.7	55.2

SOLEA SOLEA (>13 CM) SERIES 9-11 MUD

0	1	2	3	4	5	6
.0	10.0	.0	3.0	7.0	4.4	1.8
3.5	.0	1.4	2.9	.0	1.5	1.6
.0	7.2	6.9	.0	5.8	2.8	.0

BUGLOSSIDIUM LUTEUM SERIES 5-6 SAND

0	1	2	3	4	5	6
18.3	2.7	32.3	53.3	85.8	101.5	285.0
8.4	17.7	41.9	17.0	31.5	78.2	34.2

BUGLOSSIDIUM LUTEUM SERIES 9-11 MUD

0	1	2	3	4	5	6
95.9	210.0	166.4	72.0	297.5	202.4	86.9
155.3	134.6	88.3	118.3	80.6	54.7	136.9
224.4	163.9	150.0	348.0	403.2	295.4	91.0

LIMANDA LIMANDA SERIES 1-6 SAND

0	1	2	3	4	5	6
66.1	46.4	219.5	203.1	121.0	166.1	190.6
13.9	135.1	93.8	247.0	117.6	507.2	192.3
53.0	155.8	182.7	411.0	122.1	203.4	236.6
49.4	58.7	186.3	327.0	385.5	209.4	220.8
22.9	51.9	88.4	117.0	149.5	157.5	277.5
71.7	75.9	178.0	48.8	72.6	66.7	102.6

LIMANDA LIMANDA SERIES 9-11 MUD

0	1	2	3	4	5	6
129.7	127.5	172.8	75.0	66.5	204.6	86.9
268.3	191.8	149.0	115.3	79.5	42.6	122.3
186.2	248.2	129.4	315.0	270.7	215.8	27.1

PLEURONECTES PLATESSA SERIES 1-8 SAND

0	1	2	3	4	5	6
====	====	====	====	====	====	====
12.4	12.7	20.5	53.3	19.4	20.3	46.7
4.6	33.8	16.1	17.2	8.4	85.3	24.3
13.2	14.8	31.5	46.7	44.4	90.4	61.2
13.2	6.2	28.4	30.9	47.4	19.0	29.4
9.2	8.2	8.5	13.8	36.8	24.5	33.8
2.1	5.1	24.4	.0	4.8	23.0	13.2
77.4	13.9	47.3	8.6	6.5	14.3	51.1
10.4	2.6	3.7	2.9	4.4	3.9	1.6

PLEURONECTES PLATESSA SERIES 9-11 MUD

0	1	2	3	4	5	6
====	====	====	====	====	====	====
.0	2.5	3.2	1.5	.0	2.2	1.8
3.5	.0	1.4	4.4	2.2	.0	1.6
2.6	.0	2.3	3.0	2.9	.0	.0

CALLIONYMUS LYRA SERIES 5-8 SAND

0	1	2	3	4	5	6
====	====	====	====	====	====	====
126.0	196.6	639.2	665.6	340.6	710.5	1083.8
160.4	273.2	481.6	260.8	307.3	264.5	344.5
12.6	12.7	21.8	86.4	17.2	4.8	34.1
59.6	41.3	65.5	34.6	15.5	277.8	205.9

CALLIONYMUS LYRA SERIES 9-11 MUD

0	1	2	3	4	5	6
====	====	====	====	====	====	====
90.2	20.5	102.4	73.5	77.0	165.0	85.1
180.0	195.8	113.2	87.6	57.1	39.5	99.4
137.7	125.3	113.2	195.0	216.0	161.9	29.5

MERLANGIUS MERLANGUS SERIES 5-8 SAND

0	1	2	3	4	5	6
====	====	====	====	====	====	====
4.6	10.9	5.1	12.0	53.9	143.5	86.3
.0	2.5	34.9	42.4	65.3	20.7	15.8
75.4	14.5	29.1	103.7	36.6	16.7	48.3
28.5	2.6	15.0	40.3	20.0	27.6	20.3
0	1	2	3	4	5	6

MERLANGIUS MERLANGUS SERIES 9-11 MUD

====	====	====	====	====	====	====
67.7	107.5	123.2	46.5	42.0	158.4	199.1
208.3	373.3	167.0	52.6	75.0	19.8	68.5
165.8	257.9	32.3	168.0	195.8	65.3	4.9

POMATOSCHISTUS SP. SERIES 1-6 SAND

0	1	2	3	4	5	6
====	====	====	====	====	====	====
1416.6	3222.4	3454.5	5194.8	2246.5	2088.0	4048.0
914.1	5976.2	3626.0	6914.9	5764.5	11380.7	6132.8
1741.9	6921.0	4417.3	7341.2	9934.5	7837.7	6258.7
1288.0	3287.8	3317.0	3998.2	5763.8	4569.6	7676.5
1020.0	676.0	765.0	929.0	1820.0	2756.0	----.-
427.0	1811.0	1248.0	297.0	1728.0	757.0	1473.0

POMATOSCHISTUS SP. SERIES 9-11 MUD

0	1	2	3	4	5	6
====	====	====	====	====	====	====
340.0	500.0	50.0	5.0	762.0	85.0	99.0
180.0	186.0	254.0	321.0	115.0	24.0	312.0
348.0	342.0	215.0	594.0	377.0	295.0	42.0

ARNOGLOSSUS LATERNA SERIES 9-11 MUD

0	1	2	3	4	5	6
====	====	====	====	====	====	====
9.4	65.0	49.6	55.5	84.0	81.4	21.7
63.5	36.7	52.4	62.8	23.5	13.7	78.2
28.1	65.1	94.7	114.0	97.7	122.1	34.4

RHINONEMUS CIMBRIUS SERIES 9-11 MUD

0	1	2	3	4	5	6
====	====	====	====	====	====	====
3.8	10.0	38.4	10.5	3.5	13.2	3.6
7.1	6.1	.0	1.5	.0	1.5	.0
.0	9.6	6.9	3.0	2.9	8.5	2.5

TRACHURUS TRACHURUS SERIES 5-6 SAND

0	1	2	3	4	5	6
====	====	====	====	====	====	====
9.0	14.0	2.0	2.0	2.0	7.0	15.0
6.0	3.0	7.0	15.0	10.0	7.0	8.0

MACROPIPUS HOLSATUS SERIES 1-8 SAND

0	1	2	3	4	5	6
====	====	====	====	====	====	====
.0	4.2	42.5	782.6	13.1	33.9	354.6
4.6	157.6	92.5	329.3	163.8	298.6	419.9
14.9	83.5	97.4	163.5	1480.0	734.5	860.9
23.0	123.6	54.7	49.4	230.7	350.9	967.8
11.0	8.0	34.0	139.0	417.0	1442.0	632.0
21.0	78.0	660.0	187.0	348.0	377.0	684.0
100.0	317.0	1117.0	784.0	1024.0	1905.0	1804.0
666.0	292.0	305.0	1161.0	555.0	9064.0	2299.0

MACROPIPUS HOLSATUS SERIES 9-11 MUD

0	1	2	3	4	5	6
====	====	====	====	====	====	====
124.0	208.0	210.0	299.0	567.0	425.0	100.0
180.0	214.0	126.0	132.0	110.0	85.0	191.0
214.0	181.0	196.0	372.0	92.0	449.0	106.0

EUPAGURUS BERNHARDUS SERIES 1-8 SAND

0	1	2	3	4	5	6
====	====	====	====	====	====	====
62.0	313.8	521.5	253.1	39.2	101.7	110.9
104.4	205.5	273.4	202.4	42.0	109.0	116.0
40.6	434.1	146.2	336.2	336.7	221.5	49.0
52.6	200.9	164.0	302.3	309.7	84.3	36.8
11.0	90.0	286.0	213.0	206.0	648.0	304.0
68.0	104.0	654.0	391.0	612.0	237.0	350.0
44.0	58.0	408.0	255.0	166.0	153.0	216.0
922.0	103.0	294.0	1630.0	228.0	518.0	273.0

EUPAGURUS BERNHARDUS SERIES 9-11 MUD

0	1	2	3	4	5	6
====	====	====	====	====	====	====
147.0	30.0	40.0	35.0	42.0	337.0	157.0
364.0	99.0	63.0	337.0	78.0	372.0	212.0
368.0	347.0	305.0	426.0	991.0	943.0	178.0

CRANGON ALLMANNI SERIES 5-7 SAND

0	1	2	3	4	5	6
====	====	====	====	====	====	====
62.0	137.0	37.0	52.0	421.0	1673.0	1485.0
53.0	172.0	244.0	186.0	126.0	273.0	1262.0
19.0	13.0	.0	32.0	84.0	167.0	364.0

CRANGON ALLMANNI SERIES 9-11 MUD

0	1	2	3	4	5	6
====	====	====	====	====	====	====
38.0	5.0	179.0	18.0	4.0	4.0	2.0
176.0	58.0	30.0	138.0	.0	.0	170.0
113.0	99.0	2.0	177.0	92.0	119.0	60.0

CRANGON CRANGON SERIES 1-8 SAND

0	1	2	3	4	5	6
====	====	====	====	====	====	====
6193.4	4045.0	12111.6	19544.8	5886.1	4147.5	12413.0
1040.4	15755.0	8729.3	12645.6	17435.3	27417.3	18207.6
5978.9	17091.5	12513.9	18039.0	20170.9	21000.8	20553.0
4730.6	9685.3	11619.5	15334.9	11791.6	14243.0	19469.9
1442.7	915.9	2580.6	1651.2	1416.1	4359.3	7425.0
854.6	1599.0	2687.3	1632.4	2777.0	1891.8	5365.2
1632.8	924.4	3756.5	1458.0	2795.0	4149.0	7180.0
3216.8	1795.7	1991.6	2488.3	5372.4	10835.0	2340.0

PONTOPHILUS TRISPINOSUS SERIES 5-8 SAND

0	1	2	3	4	5	6
====	====	====	====	====	====	====
238.0	197.0	712.0	370.0	588.0	2520.0	4.0
90.0	676.0	789.0	280.0	380.0	514.0	321.0
75.0	49.0	95.0	411.0	254.0	241.0	829.0
360.0	377.0	813.0	1374.0	1352.0	217.0	156.0

ASTERIAS RUBENS SERIES 1-6 SAND

0	1	2	3	4	5	6
====	====	====	====	====	====	====
243.7	394.3	1148.6	1984.7	480.7	1467.9	1031.8
113.7	1542.6	663.3	1756.2	1530.8	2810.8	1500.6
176.3	1667.7	986.6	2713.3	2094.2	1584.3	1277.0
353.7	707.6	1160.3	2319.9	1971.8	1485.1	1957.8
44.0	139.0	372.0	330.0	1088.0	872.0	2155.0
51.0	66.0	412.0	246.0	407.0	396.0	387.0

ASTERIAS RUBENS SERIES 9-11 MUD

0	1	2	3	4	5	6
====	====	====	====	====	====	====
60.0	228.0	166.0	119.0	273.0	191.0	136.0
159.0	940.0	123.0	143.0	116.0	50.0	180.0
140.0	200.0	134.0	258.0	282.0	253.0	71.0

OPHIURA ALBIDA SERIES 5-6 SAND

0	1	2	3	4	5	6
====	====	====	====	====	====	====
2917.0	1908.0	16218.0	26832.0	37375.0	45938.0	47250.0
717.0	1042.0	9693.0	9683.0	17525.0	9729.0	17253.0

OPHIURA ALBIDA SERIES 9-11 MUD

0	1	2	3	4	5	6
====	====	====	====	====	====	====
3760.0	6969.0	9936.0	5550.0	8271.0	18058.0	3200.0
3212.0	3566.0	3400.0	4021.0	2634.0	3408.0	5910.0
2270.0	4627.0	7207.0	12870.0	18432.0	16813.0	2288.0

OPHIURA TEXTURATA SERIES 1-8 SAND

0	1	2	3	4	5	6
====	====	====	====	====	====	====
16.5	101.8	758.9	268.4	179.9	271.2	1118.4
53.4	123.9	751.7	493.9	556.5	962.2	1464.1
117.5	241.2	349.2	1737.2	333.0	1805.7	954.7
162.9	160.7	623.7	1338.9	1826.5	1001.0	813.3
2638.0	4431.0	20732.0	33024.0	52920.0	66517.0	105000.0
1319.0	2196.0	26873.0	9461.0	63191.0	33835.0	33664.0
214.0	414.0	1689.0	632.0	545.0	1957.0	2113.0
202.0	93.0	112.0	484.0	488.0	4009.0	2379.0

ASTROPECTEN IRREGULARIS SERIES 9-11 MUD

0	1	2	3	4	5	6
====	====	====	====	====	====	====
113.0	313.0	108.0	555.0	763.0	713.0	94.0
115.0	155.0	121.0	197.0	188.0	156.0	200.0
113.0	263.0	312.0	231.0	645.0	966.0	57.0

TURRITELLA COMMUNIS SERIES 9-11 MUD

0	1	2	3	4	5	6
====	====	====	====	====	====	====
15792.0	18750.0	32832.0	27750.0	38813.0	67162.0	7530.0
26616.0	11725.0	11476.0	10486.0	8028.0	20626.0	10623.0
24965.0	13188.0	21344.0	24024.0	78151.0	44531.0	16472.0