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GROWTH, PRODUCTION AND FOOD CONSUMPTION OF A FISH COMMUNITY IN THE SHALLOW SUBTIDAL OF A SANDY BEACH

by
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In 1985 monthly fishing was done in the undeep (4-5m below Mean Sea Level) sublittoral of a sandy beach between Knokke (Belgium) and Cadzand (the Netherlands) in the mouth of the Western Scheldt estuary.

A 1.90 m beam trawl with a 5 mm mesh (10 mm stretched), pulled by a small boat, was used to sample the demersal ichtyofauna. Hauls were done over a distance of 700 m, indicated by two series of posts on the beach. One haul took 10 to 15 minutes, depending on the trawling direction and the current. As a rule 7 trawls were done so a surface of approximately 10000 m2 was investigated. Fishing started 1 hour before low tide in the morning, the last trawl ending two hours later.

In September 24-hour fishing was done at two-hour intervals.

Fish smaller than 120 mm were immediately anaesthesized in a solution of benzocain (ethyl-4-amino benzoate) in seawater to prevent regurgitation of the stomach content. Less than 15 minutes after capture, both fish and crustaceans were preserved in a 7% solution of neutralized formaline in seawater.

Thirty species of fish were caught. The most important species being :

Clupea harengus (herring)
Sprattus sprattus (sprat)
Gasterosteus aculeatus (3-spined stickleback)
Pungitius pungitius (10-spined stickleback)
Syngnathus rostellatus (Nilsson's pipefish)
Agonus cataphractus (hooknose)
Liparis liparis (see-snail)
Ammodytes tobianus (sandeel)
Pomatoschistus microps (common goby)
Pomatoschistus lozanoi (Lozano's goby)
Pomatoschistus minutus (sand goby)
Pleuronectes platessa (plaice)
Limanda limanda (dab)
Solea solea (sole)

Gasterosteus aculeatus, *Pungitius pungitius* and *Pomatoschistus microps* were only present in the winter-months. These species are migrants from the nearby more brackish inlet of the nature-reserve "Zwin" and the Western Scheldt estuary.

For juveniles of the commercially important species *Pleuronectes platessa*, *Solea solea*, *Limanda limanda*, *Clupea harengus and Sprattus sprattus*, the area fulfils an important role as a nursery.

DENSITY

Absolute densities were calculated for the most abundant species, using netefficiencies from Kuipers (1975), Doornbos & Twisk (1984) and Doornbos (unpublished data) for this type of fishing gear.
Dab and sole did not reach high densities yearround. *Pomatoschistus minutus and P.lozanoi* together reach a yearly average density of 1 individual per 2 m2. Density of *P.lozanoi* is 4 times higher than *P.minutus* density.

species	average density. (numbers/m2/year)
Pomatoschistus minutus	0.1
P.lozanoi	0.4
Pleuronectes platessa	0.1
Clupea harengus	0.3
	density (numbers/m2)
Limanda limanda (December)	0.1
Solea solea (September)	0.1

BIOMASS

Biomasses were calculated using standard length - ashfree dryweight (AFDW) regression-equations. *Clupea harengus* was excluded from further calculations because this pelagic species cannot be sampled quantitatively with a beam trawl. Moreover it was found that different cohorts moved in and out of the area yearround.
P.platessa reaches the highest value : 0.8 g AFDW / m2/year. *P.minutus* and *P.lozanoi* together reach a value that is half that of plaice.

species	biomass (g AFDW/m2/year)
P.minutus	0.19
P.lozanoi	0.20
Pleuronectes platessa	0.77

PRODUCTION

The growth rate method (Crisp, 1984), proved to be the only method applicable to the dataset. The instantaneous growth rate "G" was calculated by exponential interpolation of the data of the growth curve (figure 1, curve was fitted by eye), the latter being obtained by "de visu" cohort separation. The yearly production of 0+ juveniles of plaice "born" in the winter 1984-1985 is estimated to be : 0.06 g AFDW/m2/year

CONSUMPTION

Daily food consumption

In September fishing was done during a 24-hour period. At two-hour intervals 2 to 4 hauls were done. The results are grouped in 12 trawls (TR 1-12).

P.lozanoi was the most abundant species. From every trawl 12 to 15 *P.lozanoi* of the 25-29 mm lenghtclass were randomly chosen for stomach analysis. All prey-items were identified if possible up to species-level and dry weigth (DW) of the entire stomach content was determined.

The daily food consumption was calculated using two different methods :

method of Eggers (1977) : 2.61 % of body weight (AFDW)
method of Elliot & Persson (1978) : 3.06 % of id.

Annual food consumption

The annual food consumption in g AFDW/m2 was calculated for different daily consumption rates, estimating the duration of the feeding season to be 300 days.
The total annual consumption for the two gobies and plaice together is estimated to be 10 g AFDW/m2. The latter being responsible for 65 % of this value. Expressed in units of energy, both goby-species yearly consume 84000 kJ/m2.

species	2%	3%	4%
P.minutus	1.11	1.67	2.22
P.lozanoi	1.22	1.84	2.45
Pleuronectes platessa	4.62	6.93	9.24

CIRCADIAN RHYTHMS.

Foraging

For *P.lozanoi* of 25-29 mm the fullness index (F.I.) was calculated.

F.I. = 100 x DW stomach content / AFDW fish

Using an arcsin-transformation, the mean F.I. (with standard errors) for the 12 trawls are plotted together with the tidal curve for Cadzand for 25-26 september 1985 (figure 2).

P.lozanoi feeds mainly at night around high tide, a second smaller peak was found also around high tide during the day.

Density

Supposing an increase in density is correlated with an increase in (foraging-) activity, we conclude that gobies, sole and plaice are night-active animals (figures 3,4,5).

Food preferences

Renkonen cluster-analysis on the data of the stomach content of *P.lozanoi* from the twelve trawls also shows a qualitative change in the feeding preferences of this species (figure 6). At night most fish prey upon copepod nauplii and adult Calanoidea. Predation on Harpacticoidea is important only at low tide. Most Amphipods were found in the stomachs of fishes caught during the day. For larger prey-items such as shrimps and mysids, and for Cumacea and cypris-larvae of barnacles, no significant change in mean numbers per stomach was observed during the 24-hour period.

Acknowledgement :

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This poster is extracted from :

CATTRIJSSE, A. (1986), Experimenteel en veldonderzoek naar de 24-uurskonsumptie en het voegingsritme bij *Pomatoschistus* spec. (Pisces-Gobiidae). unpublished M.Sc. thesis State University of Gent, Marine Biological Section - 80 pp.

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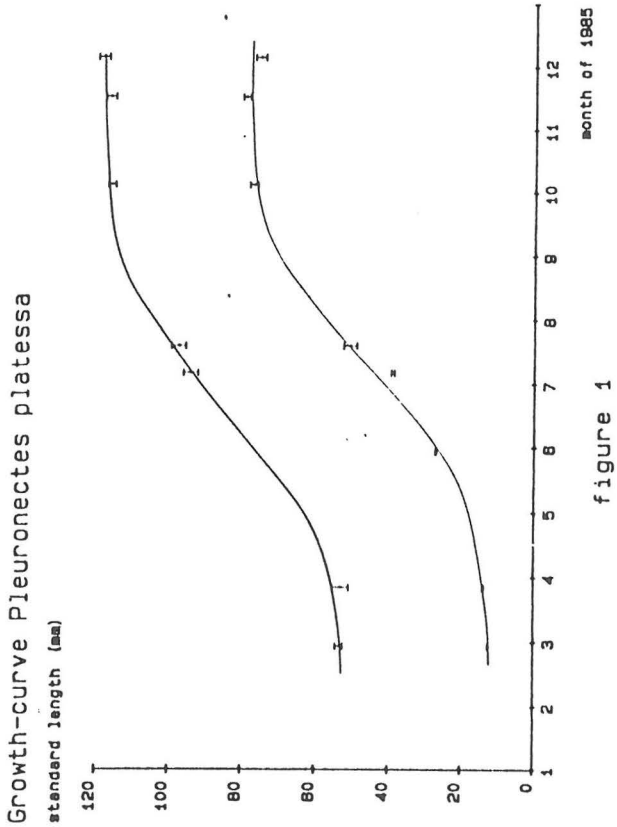
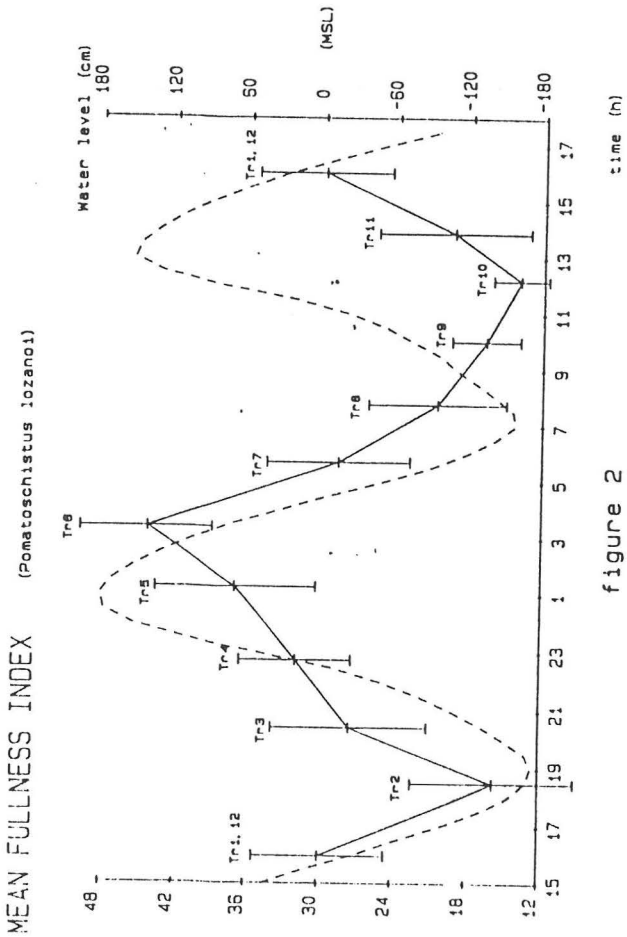


figure 1



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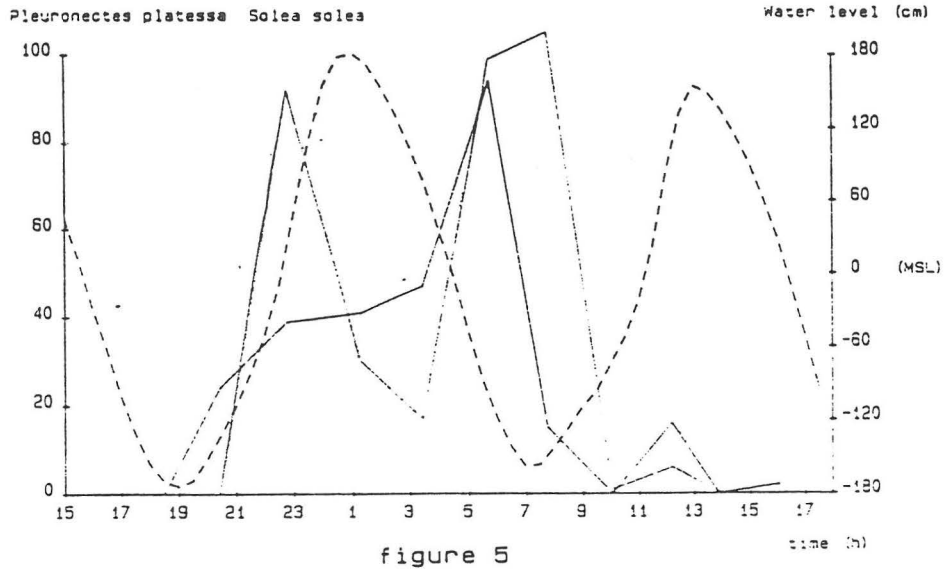

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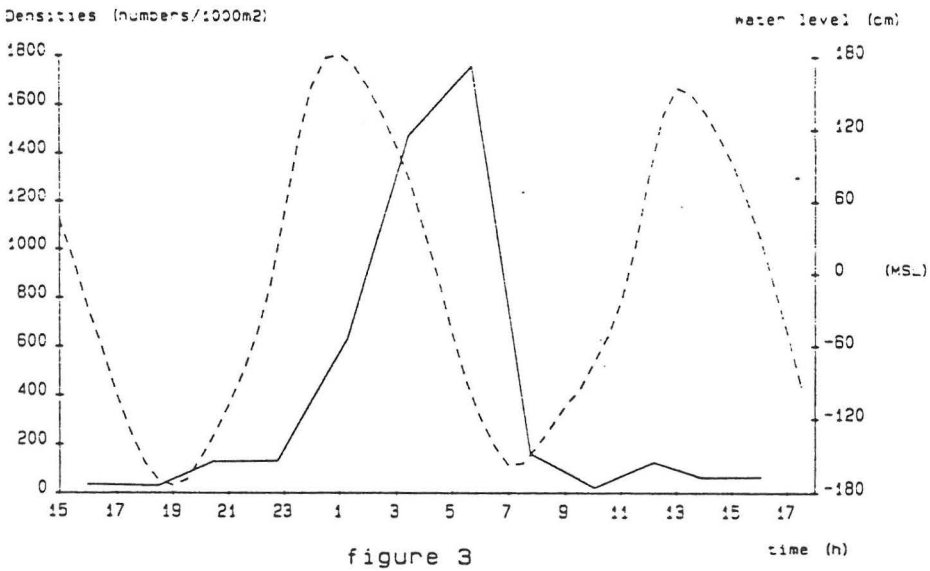

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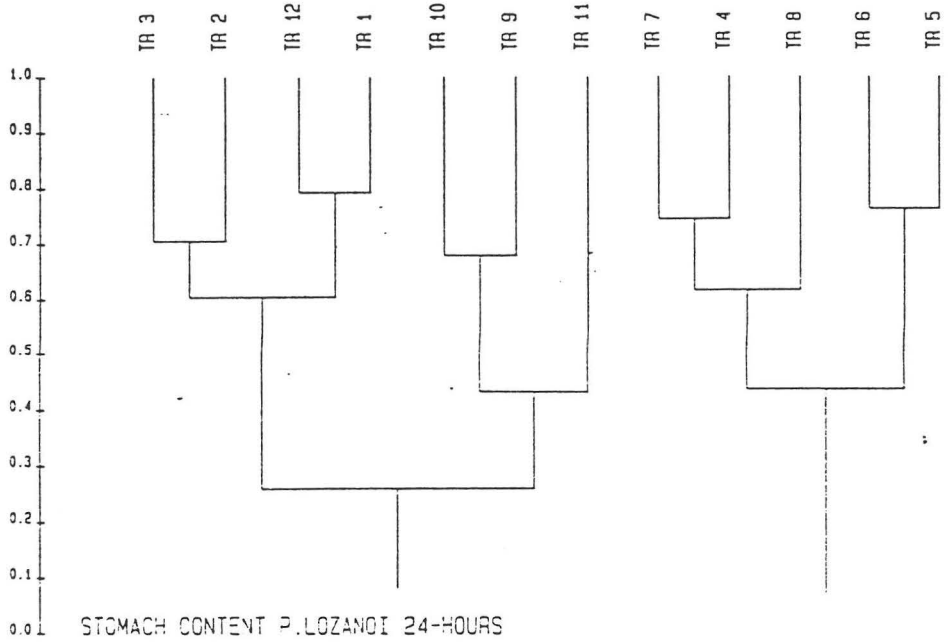

figure 6

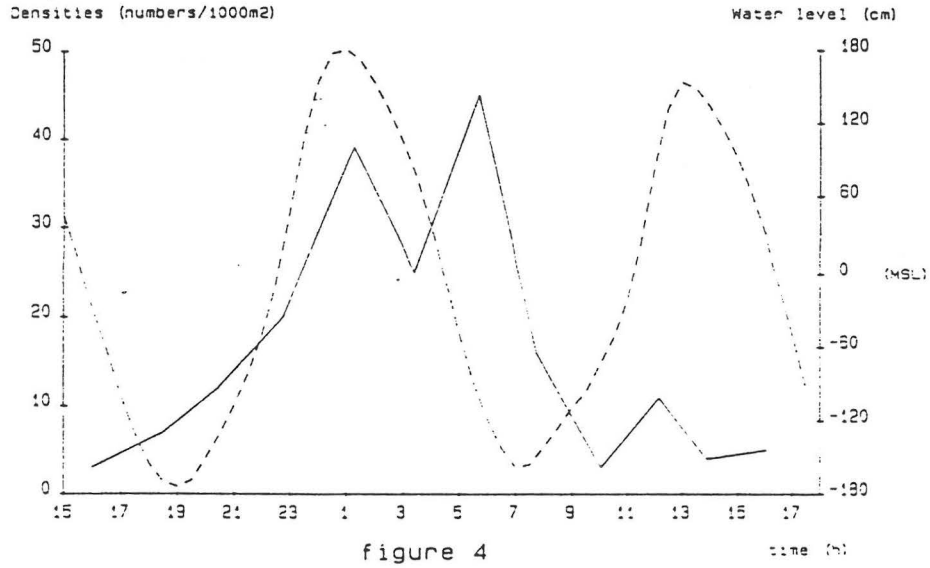

figure 4