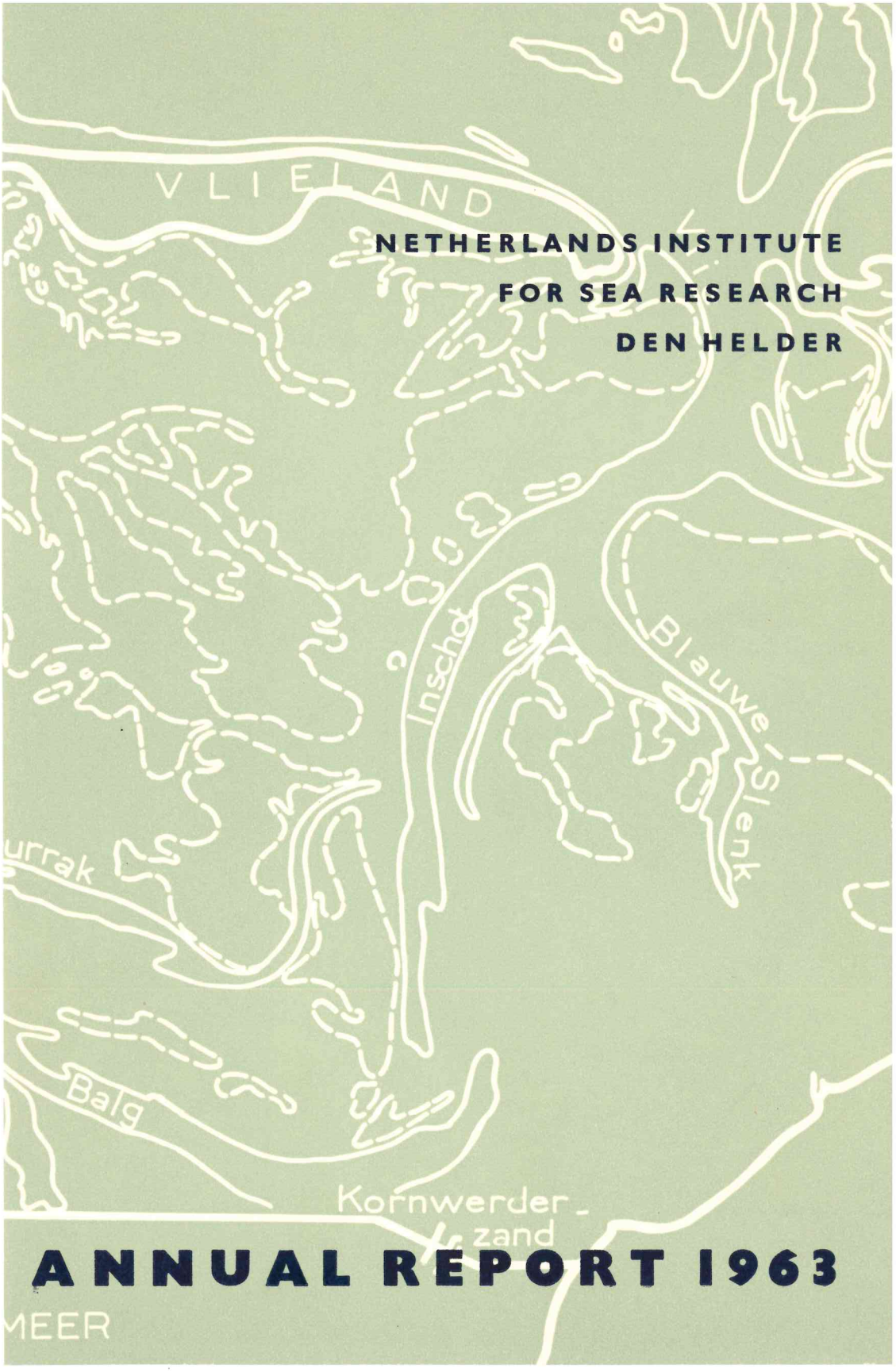

NETHERLANDS INSTITUTE
FOR SEA RESEARCH
DEN HELDER

ANNUAL REPORT 1963

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Marine research in the Netherlands is carried out by the following Institutions:

Netherlands Institute for Sea Research at Den Helder. Marina biological and hydrographical research. University extension work. Expenses paid by the State: Ministry of Education, Arts and Sciences.

Department for estuarine research (Delta-onderzoek) of the Hydrobiological Institution. Its task is to study the biological changes in the estuarine waters of the province of Zeeland, as well as their causes. These changes will be due to the closing of these waters in the near future. The Hydrobiological Institution itself (which is a fresh water station) is at Nieuwersluis (province of Utrecht), the Department for estuarine research is at Yerseke (province of Zeeland). The Institution (including its Department) is run by the Royal Netherlands Academy of Sciences at Amsterdam. The expenses are paid by the State: Ministry of Education, Arts and Sciences.

Government Institution for fisheries research at IJmuiden. Sea, coastal and inland fisheries. Fish preservation. Oyster research at Bergen-op-Zoom and, temporarily, at Wemeldinge for studies in connection with the closure of the estuaries in the province of Zeeland. Ministry of Agriculture and Fisheries.

Oceanographical Department of the Royal Netherlands Meteorological Institute at De Bilt (Utrecht). Physical oceanography and maritime meteorology. Ministry of Roads and Waterways.

Hydrographical Department of the Navy. Office at the Hague. Bathymetrical surveys. Study of tides. Chart construction. Ministry of Defense, Dept. of the Navy.

Research Department of the Rijkswaterstaat. Headoffice at the Hague, research departments scattered. Current, tides, sedimentation, erosion, reclaiming of land. Ministry of Roads and Waterways. The service of the Zuiderzee works, with office at the Hague, under whose direction reclamation of land in the Zuiderzee is organized, is under the junction of the same Ministry.

Geological Institute of the State University at Groningen. Marine geology.

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ANNUAL REPORT OF THE NETHERLANDS INSTITUTE FOR SEA RESEARCH FOR THE YEAR 1963

1. SCIENTIFIC PART

The research of Mr. DE BLOK, concerning the influence of moon or tides on the reproductive periodicity of marine animals, was again contined in 1963. Since previous data suggested that moonlight might be a factor causing fortnightly maxima in the extrusion of oyster-larvae the research was concentrated on this species. As was mentioned in last year's report the method is based on statistical data.Owing to the relatively short reproductive period the experiments yield only a limited number of data per year. Since only a small part of the population of Zeeland oysters survived the severe winter of 1962/63 the experiments were carried out with 150 Zeeland oysters and 150 oysters imported from Brittany. Neither of the groups gave a reasonable reproduction, possibly because the animals were in poor condition. Moreover, mortality was high, especially in the reproductive season.

Preliminary research on the shipworm *Teredo pedicellata* from the Mediterranean showed some reproduction to occur, but no clear connection with the artificial period of lunar illumination to which the animals were exposed was observed.

Mr. DE BLOK devoted much time to a close analysis of the data obtained in the last series of years. In some cases this led to the discovery of demonstrable influences on reproduction, which hitherto had been overlooked. These influences, however, did not result from any periodical factor intentionally offered in the experiment, but from quite accidental disturbances.

The only experiment in which an experimental factor showed any influence on the animals was that with *Teredo navalis* carried out in 1959.

Mr. CREUTZBERG continued his experimental work on migratory fishes in two ways.

In the 1962 Annual Report the change in height of the epithelium of the thyroid gland and the mortality of elvers kept at low temperatures led to the supposition that in the beginning of the migratory season more energy was demanded from the elvers in fresh than from elvers in salt water. This would explain why the animals, although attracted by the odour of inland water, do not enter this water for some time in spring, especially in periods of low temperatures. In 1963 it was found that in a later stage – May, June, July – elvers may have to spend

more energy in sea water than in fresh water. This might point to a change in osmoregulation during the migratory season. Lowering of the metabolism of these later animals, either by a decrease in temperature or by adding thioure to the sea water, showed the contrary: that mortality in these animals occurred in sea water and not in fresh water. These experiments, carried out by Mr. BISSELINK, support the assumption that some other physiological change takes place in the period April-May.

Mr. CREUTZBERG also started research on the seasonal movements of the shrimp *Crangon crangon*. This work was prompted by a publication by FLÜGEL, a pupil of SCHLIEPER, in which, on the ground of his experiments, he contradicted the findings of BROEKEMA that with a decrease in temperature the salt optimum for that species shifts from a lower to a higher value. It seemed worthwhile to study in some detail the behaviour of shrimps towards various salinities at different temperatures. This was done in two ways, *viz.* by keeping shrimps in a transparent, slanting tube with a salinity gradient from 7 to 30 o/oo, and by exposing them to increases and decreases of salinity while kept in running water, in both cases at two different temperatures. The results of both kinds of experiments were indistinct. The last named experiments showed that with a decrease in salinity the animals tended to let themselves be transported with the current. Such a transport, however, should have been more apparent with lower than with higher temperatures, as was the case with the swimming crabs studied by VENEMA in 1962. The transport, apparently, was not influenced by temperature. Furthermore, it appears that with an increase in salinity the animals burrowed into the sand, thus staying in the same place; this again, however, was the case both at low and high temperatures. It is possible that, as concerns the role of certain physiological changes in certain seasons, the experiments were not carried out at the right time of the year. The above experiments were carried out by Miss G. DIJKSTRA under the supervision of Mr. CREUTZBERG.

In addition to this experimental ecological work an investigation was carried out on the connection between the salt concentration of the blood and that of the surrounding water in shrimp kept at various temperatures. This work too was prompted by the contradictory results obtained by FLÜGEL and Miss BROEKEMA. To this end Mr. CREUTZBERG spent some time with Prof. SCHLIEPER at Kiel to learn his method of microdetermination of freezing-points. After construction of the necessary apparatus the observations were carried out at Den Helder at temperatures of 5 and 18 °C by Mr. BISSELINK. There are as yet not enough data to mention them.

"The role of tidal currents in the navigation of the elver", a paper

read by Mr. CREUTZBERG during the symposium on animal orientation held from 17 to 21 September 1962 at Garmisch-Partenkirchen, appeared in print in Volume 26, 1963, of "Ergebnisse der Biologie".

Mr. Fonds continued his research on the influence of temperature and salinity on the number of vertebrae of *Gobius minutus*, the common goby. His starting point in 1963 was one single batch of eggs, produced by one pair. These eggs could easily be separated into small groups by letting the animals spawn on plastic. Since mortality was even higher than in previous years practically no young fishes survived.

Mr. WESTENBERG with great assiduity continued his work on nomograms for the Fisher-Yates test for comparing two relative frequencies. This work is approaching completion. Anticipating his planned research on the history of the Wadden Sea he became acquainted with the existing literature on the so-called reading-chart books of the 16th century, thereby noticing that the tides in the Zuiderzee area occurred at the same positions of tffe moon in the 16th century as in the 17th and thereafter, whichseems to indicate that no great changes have taken place in this area since that time.

In February, March and April Mr. DRAL attended the lectures on cytology and histology given by Prof. GAILLARD at Leiden. During this period Miss BAARD prepared the analysis of some film-reels on the movements of the so-called lateral cilia of the mussel. They had been taken several years ago, but were never properly studied owing to lack of time. A graph of the various characteristics of ciliary activity could be made by measuring the separate shots. The data form a valuable addition to the stroboscopic observations.

The observations with stroboscopic illumination were continued. Special attention was paid to the influence of external factors, such as temperature and salinity, on ciliary activity. Additional experiments were carried out to observe the effect of the same factors on the water transport of the mussel. Since the experiments showed a distinct influence of environmental factors on water transport a similar influence on the beat frequency of the lateral cilia was expected. This expectation was not fullfilled, however. Especially in the experiments with changing salinity no reproducible effect on the beat frequency of the lateral cilia could be found, although the transport of water was clearly influenced. Therefore, the causes of water transport and of the beat frequency of the cilia must be different. Mr. DRAL supposes that the amplitude of the ciliar beat may perhapsplay a role since, as was demonstrated by GRAY, this is dependent on osmotic factors. It is still possible, however, that other mechanisms are partially responsible for the change in water transport and therefore research was started on the microscopic anatomy and function of the septa which can more or less close the opening

of the excurrent siphon. The more detailed structure of the gill muscles was also investigated.

As always, a considerable amount of time was spent on outdoor work. Just as in previous years this comprised macroplankton research carried out with the help of the Pilotage on the lightship Texel, research by Mr. CREUTZBERG and Mr. FONDS on periodicity in the occurrence of fish species in the Wadden Sea, and analysis of the catches of our fisherman, Mr. BEUMKES, at 't Horntje. In this context the data from the fishing fleet must also be mentioned.

The macroplankton work by Miss VAN DER BAAN entered the third year. Weather permitting, fishing was carried out over a consecutive period of six ebbs and six floods per week, making three days of fishing. This left some time for working out the data. From 16 February to 13 March no samples could be taken, the lightship being surrounded by icefloes. This was the only interruption. The work is gradually becoming of importance with a view to periodicity. Since three years have passed now, some data may be mentioned here.

Especially the jellyfishes are of interest because of their reproductive cycle. Data were especially obtained for *Cyanea lamarckii* and *Aurelia aurita*. They concern the period of production of ephyrae and of the maximum occurrence of the older animals. Ephyrae here means, not quite correctly, animals between 2 and 5 mm diameter; they are partly young jellyfishes.

In the years 1961, '62 and '63 the first ephyrae of *Cyanea* were recorded on 21, 20 and 16 November respectively, with water temperatures of 9.8°, 8.9° and 11.4 °C. The first ephyrae of *Aurelia* were caught on 4 and 9 March and 23 April respectively, with water temperatures of 6.6°, 3.6° and 5.7 °C. The *Cyanea*-data show that in principle strobilisation starts at a well defined time, determined perhaps by the annual cycle of illumination or water temperature. The *Aurelia*-data probably show that the severe winter of 1962/63 caused a pronounced retardation.

The latest ephyrae of *Cyanea* were in 1961 recorded on 1 March, in 1962 and 1963 in the first half of May, at water temperatures of 7.0°, 8.1° and 7.1 °C. respectively. From these data it may be concluded that the cold spring of 1962 and the severe frost of '62/63 may have caused obvious delays and that the influence of temperature must be great.

Apparently, ephyrae of *Cyanea* are produced over a long period, those of Aurelia over a short period, perhaps no more than a few weeks to a month.

The number of young *Cyanea* per unit of time may differ perceptibly with ebb and flood. The average over the ebb is about twice as high as that over the flood. This does not necessarily point to a greater

transport of *Cyanea* with the ebb, because there are only surface-data available. At night the catches are nearly three times higher than during the daytime. This means that the vertical distribution of these young animals is influenced by light. *Aurelia* in the surface water does not show any appreciable difference in numbers between ebb and flood or day and night. *Cyanea* is heavier than *Aurelia*. This makes all the difference between the two species.

The second *Cyanea* species, *Cyanea capillata*, is as a rule much less numerous on the Dutch shore than *lamarckii*, but in 1963 *capillata* was by far the most numerous of the two all along the coast near the beach. From Scheveningen to Den Helder the relation between both species in early August was in the order of 130 : 1. This may have been due to the cold winter, which, in a long period of low temperatures, may have given the chance of prolonged stolonisation or strobilisation. Near the lightship the relation between *capillata* and *lamarckii* was much the same in 1963 as in previous years, *capillata* being present in low numbers.

It appears probable that the two *Cyanea* species do not only differ in size, colour and tentacle number (M. E. THIEL in Abhandl. Naturwiss. Vereins Hamburg, **6**, p. 277–293, 1962), in time of giving off ephyrae or occurrence of mature animals, and in area of distribution, but that they also differ in their preference for either coastal water or open sea. In this connection it is worth mentioning that the jellyfish *Rhizostoma pulmo*, which may occur in great numbers near Den Helder also as a very young animal, is practically absent near the lightship. Although a jellyfish is transported passively by the currents, and although water of coastal origin is probably regularly passing by the lightship, the animals may have some means of opposing their transport in certain directions. Therefore, in 1963 research was started on the vertical distribution of jellyfishes during the different phases of the tide and on their horizontal distribution.

The very young jellyfishes of *Cyanea lamarckii* are completely colourless. Usually, the animals of a few centimeters diameter tend to become blue in January or February. In 1963, however, no blue colour did appear until summer was well advanced. ÖSTERGREN assumed that the blue pigment of *Cyanea palmstrüchi*, probably the same species as *Cyanea lamarckii*, appears with the increase in water temperature in spring. Therefore, the late appearance in 1963 might be due to the cold winter. As soon as this blue colour appears it is certain that the species is *lamarckii*, since amongst the thousands of *capillata* of this summer there was not a single one with any shade of blue. *Cyanea capillata* is found in all shades between dark brown and white.

As to the Crustaceans from the macroplankton of the lightship es-

pecially the shrimp and the Mysids are of interest. It was found in previous years that the shrimp, *Crangon crangon*, in the autumn is found more in the ebb than in the flood water, whereas the contrary is the case in spring. These conclusions were confirmed by the finds in 1963. Since the "current-compass" of the lightship is elliptical in form, and since the residual current near the bottom may be different from that near the surface, the animals are exposed to the movements of different water masses.

The Mysid *Mesopodopsis slabberi*, which used to be very numerous in the former Zuiderzee and probably still is in the Wadden Sea in summer, is to be found near the lightship especially in the winter months. *Gastrosaccus spinifer*, on the contrary, is found near the lightship almost throughout the year, with a striking maximum in September-October. *Schistomysis spiritus* and *S. kervillei* appear to occur mainly in winter near the lightship. Their numbers fluctuate greatly.

The Isopods *Eurydice spinigera* and *Idotea metallica*, formerly not known from our coast, are caught regularly, though never frequently (the former not in 1963). The Isopod *Prodajus ostendensis*, a parasite in the brood-pouches of *Gatrosaccus spinifer*, which had previously been found once off the Zeeland coast, off Hook of Holland and off lightship Texel, was found near the lightship several times.

One *Erichthus* larva of *Lysiosquilla eusebia* was found in 1963. The species was first mentioned in the annual report for 1962.

Mr. SCHRIEKEN spent a certain amount of time in the identification of the crab-larvae found in the macroplankton. In 1961 and '62 the commonest larva was a representative of the Portunidae, probably *Portunus holsatus*. It is remarkable that the next common species is a larva which answers the description of *Thia polita*, a small crab of southern distribution, which is never found in large numbers in the southern North Sea. These larvae occurred in 1961 from July till the end of October, in 1962 from August till mid-November. Only the 2nd, 3rd and 4th zoea-stages were found; the first zoea was not found up till now. This might indicate that the larvae are transported over a certain distance before they reach the lightship, and if we assume that the first stage lasts about a week and that passive transport may be about 5 km per day the animals would be born off Bergen (province of North-Holland) or somewhat farther to the South. There are, however, other possible reasons for the lack of the first zoea; Marie LEBOUR did not find it either near Plymouth. The megalopa-stage of *Thia* was not found. *Cancer pagurus* yielded only megalopa-larvae, no zoea-stages; however, in preserved material the zoea-larvae of *Cancer* are easily confused with those of the Portunidae, because the colour is gone. In a few cases the zoea of the masked crab, *Corystes cassivelaunus*, was found. Once the

first crab stage of *Carcinus maenas* was found, a species confined to the immediate vicinity of the shore.

The investigations of Mr. CREUTZBERG and Mr. FONDS on seasonal movements of fishes in the Wadden Sea were continued in 1963, but due to the replacement of the vessel "Max Weber" by the "Ephyra" fishing was not started before September. Before experiments on seasonal movements can be designed field observations have to furnish data on the periodical change of environmental factors accompanying such migrations, and to show whether the displacements are gradual or sudden, how far off-shore the movements go on, and whether the various year-classes may show differences.

Although the data for 1963 have not yet been worked out it may be said that the extension of the research in 1963, comprising observations in the open sea, enables to follow the animals from the Wadden Sea over a short distance into the North Sea. Young soles, *Solea solea*, gobies, *Gobius minutus*, and pipe fishes, *Syngnathus rostellatus*, were found in winter, after they had completely disappeared from the Wadden Sea, about 10 km off-shore. Dabs, *Pleuronectes limanda*, of one year old and older, have similar movements but the youngest dabs do not participate in these movements to any extent. The movements of young plaice are also far less extensive than was formerly assumed. A species like the swimming crab, *Portunus holsatus*, however, disappears completely from the area in question, also offshore. The data so far collected have been plotted in graphs.

In connection with this work also the observations made by Mr. SCHRIEKEN, dealing with the movements of the sand-smelt, *Atherina presbyter*, should be mentioned. This species enters the Wadden Sea in fair numbers around April, to leave the area again in August-September. In the beginning of the season the animals are only caught offshore, to move gradually inshore. Eventually they appear to concentrate in shallow areas east of the islands, where it is assumed they spawn. In aquaria the eggs were deposited on hydroids growing on eel-grass, *Zostera marina*.

Our fisherman, Mr. BEUMKES, continued his fishing in 1963 with three so-called "fyke-kommen" and one fyke. Two of the kommen occupied the same places as in 1962 (see figure in Annual Report for that year), but the third kom was placed on the sandflat northeast of the "stuifdijk", instead of near the ferry harbour. The „stuifdijk" kom was used from 6 IV to 18 XII, the second kom from 10 IV to 9 VIII, the kom northeast of the institute's harbour from 13 V to 28 XI. The fyke was used from 6 V to 8 VI. The complete data are given in Table I. The results will gain in importance as consecutive years can be compared. BEUMKES accurate notes will enable us to do so. The sandsmelt,

TABLE

Total catch of BEUMKES in numbers per month as well as

Species	*A*	*M*	*J*	*J*	*A*
Petromyzon marinus	–	1	–	–	–
Clupea harengus	36	59	4	1	1
Clupea sprattus	103	1066	659	2336 ± 35 kg	1717 ± 15 kg
Clupea pilchardus	1	36	–	–	–
Alosa fallax	333	334	195	118	59
Engraulis encrasicholus	1	115	18	7	–
Salmo trutta	21	58	16	23	17
Osmerus eperlanus	34	35	1	9	2
Anguilla anguilla	22	149	265	256	117
Belone belone	11	448	488	101	138
Gadus callarias	–	–	–	9	254
Gadus luscus	–	2	1	5	3
Gadus merlangus	5	75	110	73	17
Gadus virens	1	2	–	–	3
Onos mustelus	23	31	2	3	–
Raniceps raninus	1	–	–	–	–
Morone labrax	15	72	35	15	16
Caranx trachurus	–	169	632 ± 248 kg	894	1182
Spondyliosoma cantharus	–	1	–	1	–
Scomber scombrus	–	–	–	–	26
Zoarces viviparus	166	525	416	249	193
Mugil ramada	11	233	57	12	14
Atherina presbyter	–	403	92	65	148
Trigla lucerna	–	10	1	2	–
Trigla lineata	–	–	1	–	–
Cottus scorpius	219	477	351	247	190
Agonus cataphractus	–	5	3	3	–
Cyclopterus lumpus	5	–	–	–	–
Liparis liparis	–	–	–	–	–
Pleuronectes platessa	301	± 1340 59 kg	1096 102 kg	669 178 kg	632
Pleuronectes flesus	24 268 kg	24 612 kg	578 227 kg	363 308 kg	690 6 kg
Pleuronectes limanda	52	515	404	232	36
Scophthalmus rhombus	–	11	3	3	–
Scophthalmus maximus	2	–	–	–	–
Solea solea	2	30	10	14	7
Sepia officinalis	–	7	22	2	–
Loligo (vulgaris?)	–	–	5	–	–
Crangon crangon	37	3	–	–	–
Portunus holsatus	–	–	–	–	1
Carcinus maenas	23	340	233	620	640
Eriocheir sinensis	–	–	–	–	–
Rhizostoma pulmo	–	–	–	–	33
Cyanea lamarckii	–	–	–	2	–
Cyanea capillata	–	–	–	94	128
Aurelia aurita	–	–	1615	1600	–

t and last dates of catching of a few migrant species.

S	*O*	*N*	*D*	*Total*	*First catch*	*Last catch*
–	–	–	–	1		
6	63	53	12	235		
1552	100	102		7635		
± 103 kg	342 kg	255 kg	± 124 kg	± 750 kg		
1	–	–	–	38	27/4	
65	39	3	1	1147	16/4	2/12
–	–	–	–	141	29/4	
9	11	6	10	171		
14	105	160	± 74	± 434		
202	213	26	–	1250		
95	4	–	–	1285	25/4	2/10
293	398	144	14	1112	18/7	
3	–	–	26	40	17/5	
161	562	468	7	1478	8/4	
–	16	22	–	44	16/4	
3	22	104	19	207		
–	–	–	–	1		
11	4	11	2	181	8/4	6/12
375	14	–	–	3266	23/5	18/10
–	–	–	–	2		
2	–	–	–	28		
217	166	105	26	2063		
33	11	5	–	376		
50	1	–	–	759		
–	–	–	–	13		
–	–	–	–	1		
125	263	227	63	2162		
–	4	3	–	18		
14	29	112	1	161		
–	1	46	8	55		
541	229	120	10	4938		
				± 339 kg		
497	230	81	21	2508		
				± 1421 kg		
31	102	72	1	1445		
–	11	21	–	49		
–	–	–	–	2		
5	79	11	2	160	27/4	16/12
–	–	–	–	31	29/5	16/7
–	–	–	–	5		
–	120	168	–	328		
249	39	7	–	296		
645	1995	517	30	5043		
–	1	–	–	1		
1666	210	22	–	1931		
–	–	–	–	2		
144	3	–	–	369		
–	–	–	–	3215		

TABLE

Species	*First catch*	*Last catch*	*Locality*
MIGRANTS SUPPOSED TO HAVE ENTERED THE NORTH SEA THROUGH DOVER STRAIT			
Petromyzon marinus			Ferry harbour Den Helder; Westpoint Texel
Mustelus mustelus			Texel Hole area; near Noorderhaaks buoy
Raja montagui	5/4	11/12	Northwest of Terschelling, Black Bank, s of Botney Gut, sw of Westhole, near buoy S 2, east of ST 2, sw of ST 1, near buoys ST 3 and ST 4, Texel Hole
Raja blanda (*brachyura*)			Silver Pit; sw of West Hole
Raja naevus			Silver Pit; Texel Hole
Dasyatis pastinaca	1/7	8/10	Texel Hole, off de Koog (Texel), ferry harbour near Den Helder, Texelstroom
Spinachia spinachia			Off Petten
Atherina presbyter	14/5	29/8	Near harbour Den Helder; ferry harbour Den Helder; de Mok (S. Texel)
Trachinus draco			West of buoy PE 2; off Petten; near Zuiderhaaks buoy
Trachinus vipera			Entrance to Schulpengat (Kapen Zanddijk)
Solea lascaris			Near buoy ST 4; north of Terschelling; near Texel lightship
Trigla cuculus	29/5	24/10	Near Heligoland, near lightship Terschelling, near buoys ET 10, ST 2, 3 and 4, Black Bank, Tea Kettle Hole, Texel Hole area, off Callantsoog, near lightship Texel, near Noorderhaaks buoy, Westgat (Haaks Grounds), near Zuiderhaaks buoy
Trigla lineata	5/6	12/12	White Bank, n and nw of Terschelling, Black Bank, Tea Kettle Hole, near buoys St 2, 3 and 4, Texel Hole area, off Egmond–Callantsoog, near Noorderhaaks buoy
Zeus faber	13/6	22/10	Near Heligoland, near buoy ST 3, Black Bank, Texel Hole, near Zuiderhaaks buoy, entrance to Molengat (S. Texel)
Capros aper			Beach off Schoorl
Spondyliosoma cantharus	28/5	11/12	Near buoy ST 2, nw of IJmuiden, Texel Hole, off Petten, off Callantsoog, de Mok (Texel), south of naval harbour Den Helder
Loligo vulgaris	21/5	8/8	Texel Hole, near lightship Texel, off Petten, off Callantsoog, south of Zuiderhaaks buoy, buoy Westgat, nw of Texel
Loligo forbesi	6/6	11/12	Near lightship Terschelling, Black Bank, near buoys ST 2 and 4, buoys ET–ST, Texel Hole area, off Egmond–Callantsoog, near lightship Texel, off Texel, near Noorderhaaks buoy, near Zuiderhaaks buoy, Westgat (Haaks grounds), Molengat (idem)

Numbers per month											
J	*F*	*M*	*A*	*M*	*J*	*J*	*A*	*S*	*O*	*N*	*D*
–	–	–	–	–	2	–	–	–	–	–	–
–	–	–	–	1	–	–	1	–	–	–	–
–	–	–	44	7	7	7	12	2	–	1	8
–	–	–	2	–	–	–	–	–	–	–	–
–	–	–	2	–	–	–	–	–	–	–	1
–	–	–	–	–	–	1	2	2	2	–	–
–	–	–	–	1	–	–	–	–	–	–	–
–	–	–	–	34	–	–	38	–	–	–	–
–	1	–	–	–	2	–	–	–	–	–	–
–	–	–	–	–	–	–	1	–	–	–	–
–	–	–	–	–	–	4	–	–	–	–	–
–	–	–	–	4	50	343	156	5	4	–	–
–	–	–	–	–	35	44	9	5	8	7	7
–	–	–	–	–	2	–	1	2	2	–	–
–	–	–	–	–	–	–	–	–	–	1	–
–	–	–	–	5	3	1	–	–	7	–	1
–	–	–	–	4	3	1	1	–	–	–	–
–	–	–	–	–	21	976	1720	623	239	57	2

Species	*First catch*	*Last catch*	*Locality*
Sepia officinalis	20/5	31/8	Texel Hole area, near lightship Texel, off Egmond, off Bergen–Callantsoog, near Zuiderhaaks buoy, near Westgat buoy, near Noorderhaaks buoy, de Mok (S. Texel), Texelstroom, ferry harbour Den Helder, east of naval harbour Den Helder
Crepidula fornicata	25/10		Near buoy St 3: on *Cancer pagurus*
Squilla desmaresti	31/1		20 miles east of buoy ST 2
Pandalus montagui			Off Petten and Callantsoog
Portumnus latipes	10/5		On driftwood, east of buoy ST 2
Portunus depurator	24/10		Near buoy ST 2
"NORTHERN" SPECIES SUPPOSED TO BE LITTLE COMMON IN THE SOUTHERN PART OF THE NORTH SEA			
Raniceps raninus			Off Egmond, Petten and Callantsoog; harbour Den Helder
Onos cimbrius			Botney Gut; near buoy ST 3; off Callantsoog
Onos septentrionalis			Off Petten, Molengat (S. Texel)
Onos tricirratus			Off Egmond–Bergen, off Petten, de Mok (S. Texel)
Labrus berggylta			54° 30'N., 4°25'E.
Anarrhichas lupus			North of Botney Gut
Pleuronectes cynoglossus			East of buoy ST 2
Pleuronectes microcephalus			Off Petten, off Callantsoog, near Noorderhaaks buoy
Cottus bubalis			Off IJmuiden, off Egmond, off Petten, off Callantsoog, Westgat and Molengat (Haaksgrounds)
Pseudocucumis mixtus	12/4		Outside Brown Bank
Spatangus purpureus			Eider buoy, Silver Pit, near buoys ST 4 and S 2, surroundings Texel Hole (3 localities)
Eledone cirrhosa			Near buoys ST 2 and ST 3
Scaphander lignarius			Silverpit and 20 miles east of buoy ST 2
Tritonia hombergi	5/4		Silverpit
Aporrhais pespelecani	26/4		North of buoy ST 2 (near Cleaverbank)
Colus gracilis			Silverpit, Cleaverbank
Modiolus modiolus			Silverpit, north and southwest of buoy S 2 (near Cleaverbank), east of buoys ST 1 and 2
Dosinia exoleta	3/4		Southwest of buoy ST 4
Cardium crassum	26/4		North of buoy ST 2 (near Cleaverbank)
Hiatella arctica	12/4		On driftwood Silverpit
Callianassa thyrrena	16/4		52°10′ N., 2°15′ E.
Upogebia stellata	16/4		52°10′ N., 2°15′ E.
Crangon allmanni	17/5		Off Petten
Nephrops norvegicus			Northeast of buoy ST 2, near ST 3, east of ST 1–2, north of buoy P 1, Silver Pit, Botney Gut, Tea Kettle Hole, outside Texel Hole
Hyas coarctatus			North of buoy P 1, Silverpit and near buoy ST 3

Numbers per month											
F	*M*	*A*	*M*	*J*	*J*	*A*	*S*	*O*	*N*	*D*
–	–	–	–	32	88	37	2	–	–	–	–
–	–	–	–	–	–	–	–	–	1	–	–
1	–	–	–	–	–	–	–	–	–	–	–
–	–	–	3	–	–	–	–	–	–	–	1
–	–	–	–	1	–	–	–	–	–	–	–
–	–	–	–	–	–	–	–	–	12	–	–
–	–	–	3	8	–	–	–	–	–	–	2
–	–	–	2	–	–	–	–	–	17	–	4
–	–	–	–	2	–	–	–	–	–	–	1
–	–	–	–	3	1	–	–	–	–	–	–
1	–	–	–	–	–	–	–	–	–	–	–
–	–	–	–	1	–	–	–	–	–	–	–
–	1	–	–	–	–	–	–	–	–	–	–
–	–	–	–	–	–	3	4	2	–	–	–
–	–	–	4	5	1	–	–	–	–	–	1
–	–	–	5	–	–	–	–	–	–	–	–
–	–	–	14	–	2	–	2	1	–	5	–
–	–	–	–	–	–	–	–	–	–	3	–
11	–	–	9	–	–	–	–	–	–	–	–
–	–	–	1	–	–	–	–	–	–	–	–
–	–	–	4	–	–	–	–	–	–	–	–
–	–	–	9	–	–	–	–	–	–	–	–
–	6	–	7	–	–	–	–	–	–	–	–
–	–	–	1	–	–	–	–	–	–	–	–
–	–	–	2	–	–	–	–	–	–	–	–
–	–	–	6	–	–	–	–	–	–	–	–
–	–	–	2	–	–	–	–	–	–	–	–
–	–	–	2	–	–	–	–	–	–	–	–
–	–	–	–	1	–	–	–	–	–	–	–
–	4	–	278	48	–	1	4	–	1	–	6
–	–	–	12	1	–	–	–	–	–	–	3

Atherina presbyter, was caught in 1961, '62 and '63 for the first time on 25 March, 4 April and 4 May respectively, with water temperatures of about 5.9°, 4.9° and 8.7 °C respectively. Here there is obviously no direct connection with the temperatures on the dates of arrival, but there is a connection with the general pattern of spring, since the spring of 1961 was mild, that of 1962 was cold, while 1963 had a very cold winter. In those three years the garfish, *Belone belone*, was first caught on 18, 19 and 25 April respectively, with water temperatures of 7.2°, 6.8° and 7.7 °C. It looks as if this fish does not react to spring conditions as a whole, but that the direct temperature (or maybe the light) is the determining factor. The horsemackerel, *Caranx trachurus*, was first caught on 28 April, 29 May and 23 May, with water temperatures of 11.7°, 11.1° and 10.2 °C. It looks as if here water temperature is again the main factor.

On the list of fishes brought in by fishermen (compare Table II) the southern species are represented by a specimen of the boar-fish, *Capros aper*, related to the John Dory, *Zeus faber*. On 21 November the animal was found washed ashore on the beach near Schoorl, in a quite fresh condition; it was certainly alive when it reached the beach. There is one former record for the southern North Sea: on 29 August 1955 it was caught 50 km off the coast of Groningen. Five animals are known for the northern North Sea. All these animals possibly originate from the western part of the English Channel, where they are rather common and in some years even numerous near Plymouth. According to Cooper the occurrence of this species in the neighbourhood of land would be connected with an influx of Atlantic water.

It is worth mentioning that enormous quantities of the dogfish *Squalus acanthias* were caught in the southern North Sea from the beginning of April up to the beginning of May. In a few days several cutters caught some 4000–5000 specimens each and a few of them caught 500–1000 specimens in one single haul. As a rule the numbers of this species caught in April and May are rather small, *Squalus acanthias* having its maximum in this area in the period October-December. According to the fishermen the cause of their numerous occurrence were the large numbers of *Clupea sprattus* caught at the same time. This seems quite possible, since the autumn maximum of *Squalus acanthias* in the southern North Sea mostly coincides with the occurrence in this area of large quantities of herring.

Another three specimens of *Onos septentrionalis*, a rockling-species only recorded from the far North, were brought in. All three come from the area near Den Helder, two in May, one in December. – On 31 January a specimen of the Stomatopod *Squilla desmaresti* was caught at a depth of about 38 m NW of Vlieland (20 miles east of buoy ST 2). – Some

specimens of the sea-cucumber *Pseudocucumis mixtus* were caught in April near the Brown Bank, some 40 miles west of Den Helder. – In October 12 specimens of *Portunus depurator* were caught at a depth of about 40 m NW of Texel near buoy ST 2; this species had not been seen in the southern North Sea for several years. – For the other specimens the reader is referred to the list.

A specimen of the Cetacean *Orcinus orca* was washed ashore near De Koog, Texel, on October 10.

It should be mentioned here that since several years the Institute has opened its doors for people wishing to help wild birds found in damaged condition. Large numbers came especially during the period of severe cold, when, moreover, great numbers succombed along the shore. Most of such birds are in too bad condition to recover, but small numbers were set free after having been nursed.

Mr. DUURSMA, who in 1963 still was the only scientist of the radioactive department, was engaged in research on the kinetic phenomena of adsorption, absorption and exchange of certain kations in inorganic suspended matter. The kations studied were iron, manganese and zinc. The first two were chosen because there are several facts known about these elements in sea water; zinc was chosen because Zn 65 is one of the most important radioactive waste elements.

Adsorption velocity (mostly edge or corner ion exchange at the surface of the particles) is generally rather great, in the order of a few seconds to a few hundredths of seconds. Absorption (interlayer exchange in the particles) is much slower, it takes days or even months. In the experiments use is made of radioactive tracers. Adsorbed and absorbed amounts cannot be measured separately; the concentration in the particle at the end of a given time is always the sum of the amount of ad and absorption. The Mathematical Centre, Amsterdam, is studying the relations which may enable to determine the transport or diffusion coefficients both in the adsorption and the absorption area from the data on total concentrations which vary with time. The combination of mathematical speculations and experiments has resulted in special experimental techniques representing the mathematical relations in the simplest possible way.

In sediments diffusion of ions in the ground water is of importance along with adsorption and absorption. This holds too for the kations used in relation to the watery medium of the suspensions. In 1963 experiments on solubility of Fe, Mn and Zn were carried out at different pH values and different concentrations of dissolved organic matter. So far the role of natural chelate-forming organic compounds on adsorption, absorption and diffusion could only be demonstrated to a limited extent.

It should be mentioned that Mr. DUURSMA wrote the chapter "Dissolved organic constituents in the sea" in the book edited by J. F. RILEY, Liverpool: „Treatise on chemical Oceanography", which is to appear before long. In the Netherlands Journal of Sea Research Mr. DUURSMA published a contribution on the production of dissolved organic matter, as related to the primary gross production of organic matter in the sea. In this paper he discusses especially the difference between the results obtained by the C 14 method of STEEMANN NIELSEN and those obtained by the C determination method of Mr. DUURSMA himself.

After having spent a year in the United States Mr. POSTMA resumed his work at Den Helder in April and continued his research mentioned in the previous annual report, dealing with the current velocities needed to bring sediments into suspension. In this research, which is carried out by Miss C. BOSCH, the "caroussel" is used designed by Mr. CREUTZBERG for his elver experiments. In it the current velocity can be changed at will. The aim of the research is to learn more about the conditions under which silt is transported by tidal currents. The method is such that, both in fresh and in salt water, those velocities are determined which cause a sediment left at the bottom for some time to be stirred up again, at the same time measuring its water content. Even very fine mud, if it has not been disturbed for some weeks, needs velocities up to 90 cm per second to be brought in suspension again. Part of the results were already published in 1962 in a report of the Hydraulics Laboratory, Delft, on research in British Guyana in which Mr. POSTMA participated.

With the help of Mr. DUURSMA, Mr. ROMMETS and Miss BOSCH continued the investigation of the amount of dissolved organic matter in sea water. Part of the year was spent in surmounting technical difficulties which arose when the apparatus had to be adapted to a quicker method of analysis. The investigation comprised a number of samples from the Rio de Arosa on the Spanish West Coast, collected by Miss BOSCH in the framework of the research conducted by Mrs. BRONGERSMA-SANDERS from Leiden.

In consultation with Mr. DUURSMA and Mr. POSTMA, Mr. ROMMETS started a series of production measurements in the Wadden Sea area, in which the C 14 method is used. The aim is to learn the primary production per unit of time as dependent on the seasons, the tide, the turbidity of the water and the influx of fresh water. On behalf of this research, which is still in the initial stage, Mr. F. DE GROOT constructed a turbidity meter. It looks as if this instrument is also going to be of great value in the research on suspended matter in the Wadden Sea.

From July to the end of November Mr. S. DE GROOT, a biological student from Utrecht University, in consultation with Mr. POSTMA car-

ried out research on the oxygen balance in the western part of the Wadden Sea. This research was prompted by an observation made during the summer course of 1963, when oxygen percentages of 70 to 80 were measured in the open water of the Wadden Sea. With the assistance of Mr. ROMMETS, Mr. DE GROOT collected a number of water samples in the area between Den Helder and the island of Ameland. From these samples it appeared that in many places the oxygen content was 80–95 % of saturation. The under-saturation was probably caused partly by decomposition of organic matter, partly by consumption of oxygen by organisms. Since 1949, when the parasitic Copepod *Mytilicola intestinalis* made the Zeeland musselfishers transfer their business to the Wadden Sea, the number of mussels in this area has increased to at least several tens of times the original amount. It looks as if this amount has now reached the limit of what oxygen quantities permit. The shortage in oxygen, which of course arises from the difference between the consumption by plants and animals and the production by algae, is made up partly by oxygen coming in with water from the North Sea, partly by diffusion from the air, and to a small extent also by influx from the IJsselmeer. The supply from the North Sea and from the air are probably of the same order of magnitude. As to the IJsselmeer, during the period that measurements were made the northern part was always greatly oversaturated with oxygen. Thus the water discharged by the sluices caused a local over-saturation in the Wadden Sea, while exchange with the air proceeded very slowly.

Mr. POSTMA spent part of his time in preparing a manuscript based on research carried out in the United States. It deals with the exchange of oxygen and carbon dioxyde between the oceans and the atmosphere and is to appear in the Netherlands Journal of Sea Research. Furthermore, Mr. POSTMA prepared his lectures to be held at the University of Groningen, where on 26 November he inaugurated as an extraordinary professor in chemical and physical oceanography by a lecture on: "Sea-research: Oceanography and Oceanology".

Mr. TAN, who, as a biochemist, on 16 September joined the scientific staff of the Institute, spent most of his time in getting acquainted with marine problems. Together with Miss BOSCH he started research on sulphur compounds in Wadden Sea-sediments.

Mr. EISMA, employed by the Netherlands Organization for Pure Research, continued his work on the composition, origin and transport of sands of the Dutch coast off the province of North-Holland. Just as in 1962 the chemical-analytical work was carried out by Miss ENGELHART.

The preliminary picture of the distribution of the various types of sand on the sea bottom was further elaborated. To this end sand samples

were collected in the course of the year on the sea bottom up to 8 miles from the coast. At the same time the landward distribution of the various types of sand was studied by sampling the dune-sands. It appeared already in 1962 that the feldspar content forms a better characteristic for the sand than the heavy fraction with a specific weight over 2.88. So far, the determinations show that the residual current transport along the Dutch coast from the South makes a wide detour around the inlet of Texel and does not enter the Wadden Sea, except perhaps the grains with a diameter of less than 180 micron. Furthermore, it could be established that the Dutch coast is not built up only by sand transported in a direction at right angles to the coast, but also of sand transported parallel to the coast.

Besides to the feldspar-content much attention was paid to the iron-content of the sand. Its distribution was partly different from that of the feldspar-content. With equal feldspar-contents the iron-content in the film coating the sand grains may be twice as high in one case than in the other. A closer investigation of these iron deposits on the grains was started at the Reactor Centrum Nederland at Petten, where the elementary composition of the coating of the grains was studied by means of activation analysis. Preliminary results show that the film contains, besides iron, a certain amount of manganese as well as smaller quantities of other minerals. By comparison with a similar film on grains in continental sands Mr. EISMA hopes to find out in how far the iron coating may be of marine origin.

Much attention was paid to the determination of the origin of various types of sand. Since the feldspar-content shows the clearest differences this content was determined for Netherlands sands of different origins including a few samples from borings in the coastal area. These data have not yet been worked out.

In order to learn something more about the origin of shells in the sand some species were studied as to the connection between morphological characteristics of the shell and the environment of the living animals. The cockle did very well in this investigation, since the number of ridges on the shell and the average weight of the animal can be correlated quite satisfactory with the salinity of the water in which the species lives. A contribution on this subject was prepared for publication. Furthermore, Mr. EISMA wrote a paper on the influence of grain-shape on the sorting of sands on the beach and in the dunes.

2. NON-SCIENTIFIC PART

After the Government had agreed officially to the plans as laid down in the reports of the Office for Building Programs those plans and the work for the new institute on Texel reached a further stage.

As to the plans the architects Pot and Pot-Keegstra in Amsterdam made three projects, of which at the moment the third is under discussion. At present it is not certain whether it will be carried out without any further alterations. We hope that it will at least be possible in 1964 to start building a house for Mr. BEUMKES and a shed for keeping nets etc. near the Institute's harbour, and to build the sea-water reservoir and the settling tank. Thereafter, the experimental aquarium may be built, which will be provided with sea water by way of the harbour. Building of the institute itself will probably not be started before 1966.

In the meantime digging the harbour, which started in July, is now practically finished. The harbour itself is 100 m long and 80 m at the widest part. It is entered by a canal measuring 200 × 20 m. The sand thus obtained served to build a mound near the harbour and a platform for the new institute. Part of the sand was also deposited on the so-called foreland, which will be used by the Rijkswaterstaat to construct willow matting for dyke-building. We gratefully acknowledge the services rendered by this Organization. The building contractor of the harbour, the firm Wijnands from Werkendam, has proved to be a good organiser. The pontoon and bridge from the former ferry Gorinchem-Sleeuwijk will serve as a jetty.

It is of importance that housing facilities are provided in Texel to accommodate our personnel at the time the institute is ready. To this end the Ministry put *f* 100.000 at the disposal of the Institute. Much time was spent in 1963 in acquiring building plots.

Two second-hand surveyor's sheds were bought, 30 m long and 6 m wide in all, to accommodate students who might want to start research in the south of Texel.

1963 was the year of the new ships. The new research vessel "Ephyra" was launched and came in general use in June. The total cost amounted to *f* 312.000.—. The ship is equipped with a radio receiving and transmitting apparatus, an ordinary and a self-recording echo-sounder, radar, and, from 1 January 1964 on, also with Decca-apparatus which enables it to find its position also on the open sea. It has a crew of three, but 6 or 7 berths, and can therefore take 3 or 4 extra people. Its speed is about 9 miles or 16 km an hour, but, with one engine, it can also run 3.6 km per hour, and with the aid of a third propeller just over 1 km, which is of importance for plankton fishing. For

the Wadden Sea the ship is ideal, but for work on the North Sea, except at wind forces below 4, it is too cranky and its draft too small. With the right kind of weather the ship is used almost continually.

After 31 years of faithful service the Max Weber was sold for *f* 8600.—. It left Den Helder on 4 May 1963.

Following a proposal from February 1963 the State put money at the disposal of the Institute to build a boat for the supply of sea water to the aquaria. On second thought it was decided to buy a second-hand boat, the Curlew, from Hull, England, which was thoroughly revised. The ship, in use since Christmas 1963, measures 25 by 4.75 m, it has an engine of 154 HP and makes about 15 km per hour. It has an auxiliary engine of 16 HP for the dynamo and the pump. The pump yields 80 m^3 an hour. The ship has been equipped with radar, to make it more safe in foggy weather. It may take 135 m^3 of water, although for the time being it takes only 92 m^3 since the discharge is still in the stern instead of on deck. The possession of a watertender is of great value to the Institute, since building a sea water pipeline for the new institute at 't Horntje involved considerable risks, which can now be avoided. The total costs of the boat, radar excluded, amounted to *f* 104.000.—.

In 1963 a third vessel was added to our fleet, *viz.* the new motor-flat Griend, built at Den Helder. It is 9 m long and equipped with a diesel engine of 57 HP. It runs about 14 km per hour. It is of great assistance for transport to 't Horntje outside the ferry hours, to bring students and research-workers to the Wadden or to the Ephyra when it is at anchor, and as a second ship to the Ephyra for hydrographical or other observations. The cost amounted to *f* 20.000.—. Of course it gives some trouble to possess three boats (and BEUMKES' 7 m motorflat as a fourth), but the advantages are great.

Since the institute's building at Den Helder is getting more and more crowded a prefabricated wooden office building of 6.75 × 6.75 m with four rooms, accommodating 6 members of the staff, was constructed next to the main building and completed in February 1964.

There were quite a few changes in personnel.

The following people left the Institute:

Miss G. BUIK, adjunct analyst, 30 april
A. G. KEURIS, instrumentmaker, 30 April
Miss C. C. M. J. VINKEN, typist, 15 June
Mr. and Mrs. BOSCH, wardens in the students' hostel, 31 August
G. DE BOER, carpenter, 31 December
E. DIJKSTRA, acting manager, 31 December

The following people joined:

F. DE GROOT, electronic engineer
B. SCHRIEKEN, laboratory worker, entered our service again after a six month leave for other research; he returned on 1 April
N. MULLER, skipper, 1 April
L. VAN LOOSEN, mate, 13 May
M. MANSHANDEN, instrumentmaker, 1 June
J. POST, engineer, 21 June
J. H. BLAZER, fitter, back from military service, 1 August
S. C. A. TAN, chemist, 16 September
TH. J. EILANDER, help of the fisherman, 1 October
Mr. and Mrs. GOMES, wardens in the students' hostel, 1 October
S. J. DE GROOT, scientific assistant for three months, October-December
Miss M. D. F. VAN DEN BERG, adjunct analyst, 12 August.

The departure of Mr. DIJKSTRA, at the end of the year, deserves special mention. For nearly 9 years he was our manager, and as a former first navigation officer he took part in the designing of the Ephyra, the acquisition and restoration of the water-tender, the acquisition of the "Griend", the sale of the "Max Weber" and a great many other transactions.

In mid-April Mr. POSTMA returned from America after having spent a year in Scripps Institution, La Jolla, California. Before his return home he made a trip through the United States, where he visited the U.S. Army Engineer Waterways Experiment Station at Vicksburg, Texas, and the Chesapeake Bay Institute of the John Hopkins University at Baltimore. From 29 to 31 May Mr. POSTMA visited the 6th International Sedimentological Congress at Amsterdam. Furthermore, he attended the NATO adivsory conference in November at Bergen, Norway. Mr. POSTMA became an extraordinary professor of Groningen University, starting with the course of 1963/64.

In April Mr. DUURSMA was invited to attend a symposium on organic matter in the sea at Halifax, Nova Scotia, Canada. He also visited the Canadian Atomic Energy Project at Chalk River, Ontario, and the Oceanographical Institute at Woods Hole, where he gave a colloquium. Mr. CREUTZBERG attended the International Zoological Congress in Washington, U.S.A. Afterwards he attended a symposium on the biology of estuarine animals at Beaufort, North Carolina, and he visited the Laboratory of Marine Sciences at Miami, Florida, and the Caribbean Marine Biological Institute in Curaçao. He is to take over as a director of the latter institute for three years, starting in the middle of 1964, when Dr. I. KRISTENSEN will be leaving. Mr. FONDS attended the marine symposium on Heligoland at the end of September.

It should be mentioned also that in 1963 an arrangement was made according to which the Netherlands Institute for Sea Research will be more or less a guarantee for the directors of the Caribbean Marine Biological Institute in Curaçao. This arrangement will probably take effect in 1964.

In 1963 the Institute was visited by a small number of foreign scientists: Prof. Per BRINK, University of Lund, Sweden, with ten co-workers; Max BLUMER, Woods Hole, Mass.; Dr Carl EDELSTAM, University of Stockholm, Sweden, for setting free balloon-marked eels; Dr. E. C. HADERLIE, Office of Naval Research, London; Dr. G. H. HUGHES, University of Cambridge, England, together with Mr. C. M. BALLINTYN, University of Groningen, Netherlands, for nerve-physiological work on *Squalus acanthias*, *Galeus vulgaris* and *Scyllium canicula*; E. CORCORAN, Institute of Marine Sciences, University of Miami, Florida; H. Y. KAIGHIN, of the same institute; Prof. C. A. G. WIERSMA, California Institute of Technology, Pasadena.

The summer-courses, held in June, had 19 participants, of which 13 came from Groningen, 5 from Leiden and 1 from Utrecht. Besides, the Zoophysiological Laboratory from Amsterdam held its own courses from 8 to 11 and from 16 to 19 april, both times with 18 students; 14 undergraduates from Utrecht paid a visit of 2 days; students from Nijmegen worked at Den Helder under the direction of Miss GEELEN from 24 to 28 May and from 28 May to 1 June with 20 and 17 participants respectively, and again from 7 to 11 and from 11 to 16 September with 22 and 18 participants respectively. The Free University visited the institute from 10 to 12 and from 12 to 15 June with 18 and 16 students respectively, under the direction of Mr. LAMMENS.

Besides Mr. MEYS, who continued his work of 1962 for two months in 1963, only one graduate student worked at Den Helder: Mr. DE GROOT from Utrecht. In a way we were pleased to have only one student, considering the lack of space. But considering the present possibilities of the institute, the instruments at its disposal, the number of research workers present, the multitude of problems on widely divergent subjects, and the great number of students in the various universities it is obvious that there is something wrong and that either the institute does not appeal to students or the universities do not realize the opportunities for working here.

In consequence, the number of man-days spent by people not from Den Helder was low: about 1080 against 1761 in 1962 and an average of 1162 for the years between 1947 and 1963.

Just as in previous years a considerable number of new instruments were acquired, including a Coleman nitrogen analyzer and a carbon-hydrogen analyzer, a continuous salinity and temperature meter, an

oscillograph, two cryomates (cooling apparatus), a röntgen apparatus and some additional radioactive counting apparatus.

The library was again considerably extended. Since we have now two journals (Archives Néerlandaises de Zoologie and the Netherlands Journal of Sea Research) at our disposal for exchange purposes it is easy to obtain other journals in exchange. The library now receives 628 different periodicals, of which 25 on subscription. In 1963 part of the Discovery Reports were bought for *f* 1000.—. Moreover, about *f* 2200.— was spent on books, mostly marine biological literature, but the number of books on hydrography and marine geology increases. Binding took over *f* 1000.—. Owing to the increasing lack of space part of those books and periodicals which are not often consulted are at present stocked elsewhere.

Of the two numbers of the Netherlands Journal of Sea Research which were due in 1963 vol. 2, nr. 1 appeared in November, while vol. 2, nr. 2 will appear shortly. We hope the two numbers of 1964 will appear in time.

In 1963 *f* 7808.54 was spent on material for study, *f* 3584.31 on preserving liquids and packing material, making an expenditure of *f* 11392.85 in all. Of this amount *f* 600.— was spent on work for the macroplankton hauls on the lightship Texel and some hundreds on food for the aquarium. The assets were *f* 13486.63 + *f* 1402.11 = *f* 14888.74, leaving a saldo of *f* 3495.89.

The receipts of our fisherman BEUMKES on Texel amounted to *f* 545.—. Many animals were brought to Den Helder alive. About 650 kg of fish were frozen to serve as food for the aquarium and for the birds in winter. Moreover, about 500 kg of fish went to the seals of the Texel Museum. The total receipts of BEUMKES may be estimated at about *f* 1000.—, against an expenditure of nearly *f* 4000.— on nets and boat.

The car made some 9000 km, of which 1700 were due to the research of Mr. EISMA on the coastal sands of North Holland and another 800 to fetch water for experiments.

The exact amount for expenditure in 1963 is not yet known. On personnel about *f* 423.800.— was spent, on social charges *f* 31.500.—, on material exclusive investment about *f* 124.000.—. An additional *f* 100.000.— were spent on the building of the Ephyra, on which *f* 212.000.— had been spent in 1962. The costs of the watertender were *f* 104.000.— plus *f* 11.000.— for the Radar apparatus, those of the motorflat "Griend" amounted to *f* 20.000.—, of the new office-building with inventory to about *f* 20.000.—. About *f* 45.000.— was invested in instruments and workshop. The costs of the work on Texel amounted to several hundred thousands.

Den Helder, March 1963 J. VERWEY.

The Netherlands Zoological Society has issued the following publications, which are obtainable from the Director of the Netherlands Institute for Sea Research, Den Helder, against the following prices per volume, postage not included.

Tijdschrift van de Nederlandsche Dierkundige Vereeniging

Series I, vols 1—7, 1874—1885, out of print	
„ II, „ 1—20, 1887—1927, partly out of print . . .	8.50
„ III, „ 1—3, 1928—1933, partly out of print . . .	5.—
Supplement to vol. 1 (Ser. I), 1883—'84	6.—
Supplement to vol. 2 (Ser. I), 1888	6.—
Index to Tijdschrift, 1874—1909	1.20

Archives Néerlandaises de Zoologie, issued in cooperation with the Holland Society of Sciences at Haarlem

Vol. 1—7, 1934—1947	22.—
„ 8, 1947—1951	25.—
„ 9—15, 1952—1963	30.—

Supplements to vol. 3, 7, 10 and 13 come extra.

Netherlands Journal of Sea Research, specially devoted to the work of the Netherlands Institute for Sea Research.

Vol. 1—3, 1960—1966	20.—

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