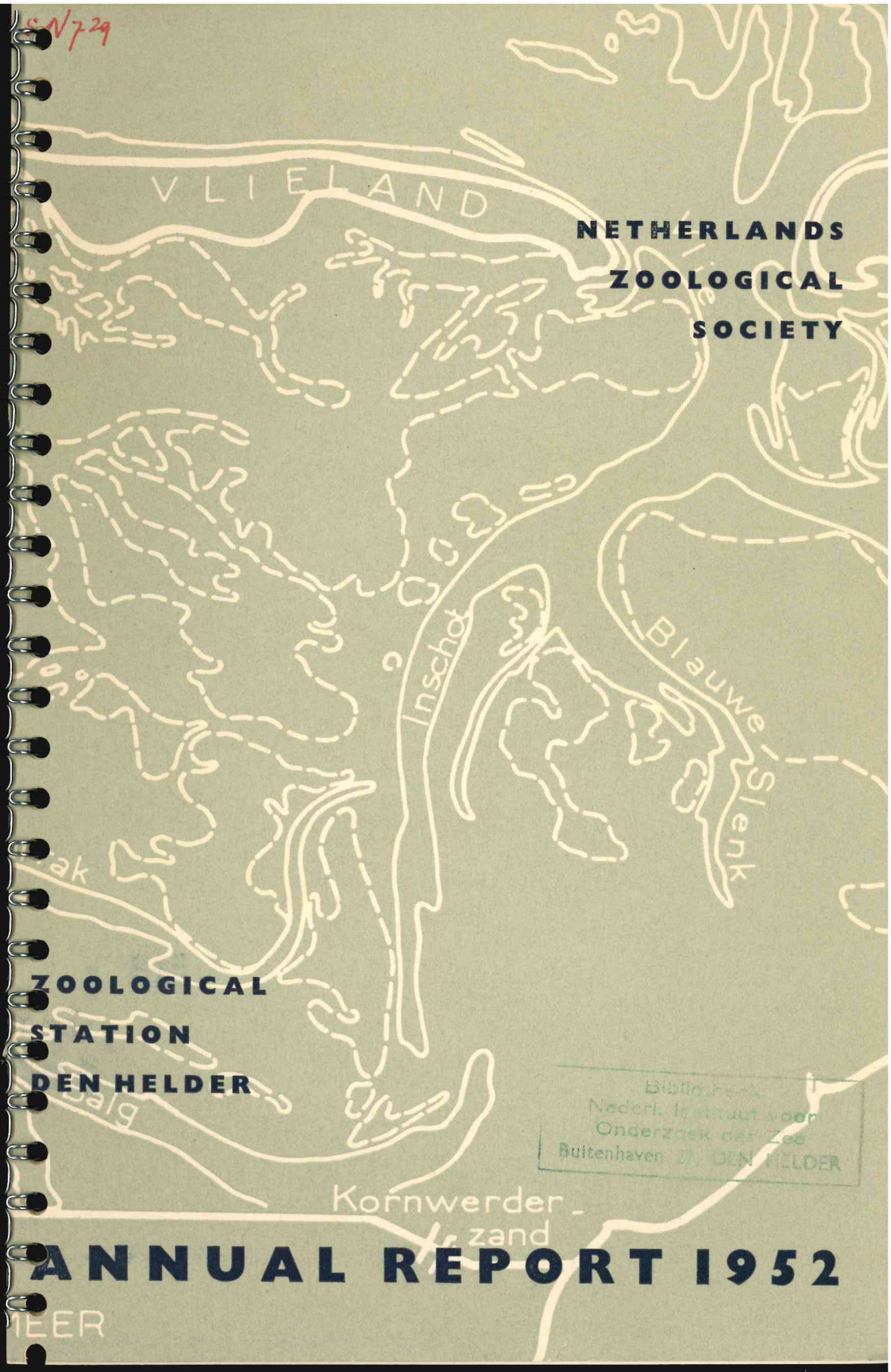

NETHERLANDS
ZOOLOGICAL
SOCIETY

ZOOLOGICAL
STATION
DEN HELDER

ANNUAL REPORT 1952


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

Zoological Station of the Netherlands Zoological Society at Den Helder. Marine biological and hydrographical research. University extension work. Expenses 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 Defense.

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 Traffics 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.

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staat. Headoffice at the Hague,
tides, sedimentation, erosion,
and Waterways. The service
at the Hague, under whose
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ANNUAL REPORT OF THE ZOOLOGICAL STATION OF THE NETHERLANDS ZOOLOGICAL SOCIETY FOR THE YEAR 1952

Our previous annual report[1] held out the prospect of a survey of the Station's activities during the 20 years that have elapsed since its reorganisation. We hope this survey will be accomplished in the course of 1953. A concise review has already been given at the Society's meeting of September 19th–20th, when the Society made an excursion to Den Helder.

During 1952 the spatfall of the mussel again predominated all other items of ecological research. The students working at the Station as well as the Station's personnel spent much of their time on this subject; especially our biological analyst Mr DRAL was almost constantly engaged in this work.

The young mussel spat, which has a size of 250–300μ at metamorphosis, settles preferably on algae and hydroids, and only after a certain lapse of time does it gradually shift over to the musselbanks. This fact, which was ascertained in foregoing years, was taken as a starting point for our research in 1952. In this connection we were especially interested in the nature of the stimulus on which this curious preference for algae and hydroids may depend. Following several initial trials, threads of different material and different diameters were fastened on wooden frames in the sea, and, in contrast with these, plastic panels with grooves of varying width were also hung out.

[1] The Annual Reports for the period 1876–1928 have been published (in Dutch) in „Tijdschrift van de Nederlandsche Dierkundige Vereeniging" for those years. The Reports for 1952 and onward will appear in "Archives Néerlandaises de Zoologie". Those covering the intervening years were not published, but a review of the Station's activities during the years 1931–1951 will be given as a separate publication in this journal.

In this way the densities of spatfall on different substrata could be compared well.

The investigations were carried out by Miss GEELEN (Utrecht) and Mr DE BLOK (Leiden). They found that the spat prefer threads to grooves. The threads should be thin and not too smooth. Embroidery silk turned out to be one of the best threads. The numbers of spat per unit of length on silk thread even surpassed those on algae and hydroids. Our former supposition that the more or less plastic properties of hydroids and algae would favour the settling was not confirmed. It seems to be the filiform condition of the material, which is essential. The checking of the test substrata has to be carried out under the microscope and this makes the job time consuming and tedious. The results, however, are well worth the trouble.

Once the use of artificial silk had yielded suitable quantitative data, the influence of such factors as light and current could be included in the scope of the experiments. This possibility was made use of by Mr ROOTH (Leiden), who tried to trace the effect of the tidal phase on spatfall, whereas the settling of spat at different depths was studied by Mr DE BLOK, in cooperation with Miss GEELEN. The results seem to fit in with the observations made by Mr LUCAS (Leiden) and Mr ANTHEUNISSE (Utrecht) on the behaviour of the larvae in the plankton, as well as with data on normal spatfall, obtained by Mr LUCAS, Mr DE BLOK, Miss COOL (Leiden) and Miss GEELEN, by the Station's personnel and the students attending the summer courses. In this way the complex picture of a seemingly simple phenomenon as spatfall is being completed step by step. It is hoped that the investigations will be continued by other workers in 1953. The results will be published in this journal.

One of the most striking features revealed by the findings of DE BLOK and GEELEN is the general restlessness of the young animals. The algae and hydroids harbour spat of different sizes up to 1000–1200μ. This size, however, is not attained in a sessile state. Individual shifting takes place at a rate of some 20% a day. The question arises whether the young of other Lamellibranchs are equally on the move before reaching their final place.

The investigations on the pumping of mussels entered a new phase through the work of Dr TAMMES, who was assisted by Mr DRAL. They inserted a plastic tube in the exhalent siphon of live mussels and then immobilized tube and shells in a plaster cast, letting the inhalent opening free. The discharged water could thus be isolated for analysis when the animals were given different suspensions. The size distribution of the suspended particles was examined in the water on both sides of the mussel. It was found that comparatively coarse material

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(30–40μ) was wholly retained and that finer particles (1–5μ) largely escaped the mussel's selective action. Except in the case of the coarsest particles, it is possible for the mussel to change its straining rate considerably. These findings did neither tally with the idea that the straining could be brought about by a sieve formed by gill openings, nor by that of a mucus ultra sieve. The suspended particles, either small or large, are supposed to be retained when they contact the cilia of the gills. Large particles should then more likely be hit and retained than smaller ones.

This picture was confirmed by direct observations on very young mussels, where it was possible to look right through the shells. The large latero-frontal cilia were seen sweeping through the water like swaying lime sticks and the adhering particles being wiped off to the row of frontal cilia, from which they were further transported to the food groove.

The pumping output of the so prepared mussels was subnormal, so that the recorded quantities could only be attributed a relative value. Still, the method is excellent to establish the effect of external conditions, e.g. temperature, on the pumping rate. It would be worth while to extend the results already obtained in this direction.

The experiments on the sense physiological relation between Nudibranchiate slugs and Coelenterates were, for a month, continued by Miss DE KONING (Utrecht). Previously, it had been shown that the slug can find anemones or hydroids against the current. It was then assumed that under the conditions used there was no scent gradient. In order to ascertain that the current actually directs the search of a slug once excited by scent, experiments were devised in which there were currents and no gradient in scent. Unfortunately, these trials had to be discontinued by unforeseen circumstances. It is hoped that the subject will be taken up again in the near future.

An inquiry into the possible influence of light or darkness on the vitality of settled young cockles and mussels was started by Mr BAS from Leiden. No results can as yet be given. It is felt, however, that subsequent experiments should as far as possible be made under natural conditions, since such problems cannot easily be solved indoors.

The study of migrants was carried on as before by buying up southern species offered by local fishermen. In 1952 Mr KRISTENSEN again spent much of his time on this work.

Pre-war observations had suggested that two groups of migrants occur in the North Sea, viz., 1. those which enter in spring or early summer through Dover Strait, and, 2. those which reach us in the autumn after having rounded Scotland. Generally speaking, all species arriving with us in autumn or winter were since that time consider-

ed to have entered the North Sea in the North. Mr KRISTENSEN's data more and more suggest that these species arriving late in the year largely represent animals which flee for cold. There is no sufficient reason, therefore, to assume that all of these animals have rounded Scotland; some of them indeed are hardly known from there. Since the latter are neither observed with us in spring, however, Mr KRISTENSEN supposes that they may enter through Dover Strait, keep to the East-Anglian side, and then hide during summer on stony grounds, where fishing is seldom practised, till they are driven from there by cold. We may expect some more evidence on this point in the years to come.

Part of the southern migrants, recorded in 1952, are enumerated in the list below.

I. The species denoted by numbers 1–8 are supposed to have entered

Species	Size in cm	Locality
I. Southern migrants, supposed to have entered the North Sea through Dover Strait.		
1. *Acipenser sturio*	± 100	off Texel, near Silverpit-Texel nr 5, 30 m
2. *Clupea pilchardus*	20–23	8, Texel dike; 64, surroundings Texel Hole
3. *Merluccius merluccius*	♂ 57	off Zuiderhaaks, 18 m
4. *Hippocampus europaeus*		southern part Dutch coast
5. *Spondyliosoma cantharus*	22–33	Texel Hole-Oyster Grounds, 29–36 m
6. *Box boops*	30	Texel dike
7. *Atherina presbyter*	6–14.4	coastal waters
8. *Trigla cuculus*	17.5–33	between Silverpit and Dutch coast
II. Tardy southern species, that have possibly entered through Dover Strait.		
9. *Petromyzon marinus*	75	neighbourhood Texel Hole, 30 m
10. *Scylliorhinus catulus*	♀ 61; ♂ 59	neighbourhood of Texel Hole
11. *Raia brachyura*	60–89	neighbourhood of Texel Hole
12. *Raia montagui*	30–70	between Silverpit and Dutch coast
13. *Solea lascaris*	26	N. of Terschelling, 38 m
III. Southern species, supposed to have rounded Scotland.		
14. *Cetorhinus maximus*	± 25	Den Helder harbour
15. *Brama raii*	51–60	14, stranded; 6, Texel Hole-Oyster Ground
Northern species, that have reached the southern North Sea from the North.		
16. *Gadus virens*	41–22	neighbourhood of Texel Hole, 29–32 m
17. *Molva molva*	46	Texel Hole, 30 m
18. *Onos cimbrius*	15, 18, 19, 20	Callantsoog–IJmuiden, 7–9 m
19. *Raniceps raninus*	5.0–5.7	5 from Waddensea, 5 from North Sea, 2–15 m
20. *Labrus berggylta*	31; 30	Den Helder dike; off Zuiderhaaks, 18 m
21. *Crenilabrus melops*	♂ 18	off IJmuiden, 18 m
22. *Anarhichas lupus*	36–45	neighbourhood of Texel Hole
23. *Scorpaena dactyloptera*	15; 17.7	Callantsoog, 9 m; near buoy Silverpit-Texel nr 3, 30 m

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the North Sea through Dover Strait. The following notes on them may be added to the data in the list. *Box boops* rarely reaches our coast, only 8 specimens being known to us from there. *Atherina presbyter* may apparently propagate on our coast: about 100 young of 6 cm length were caught leeward of Texel in September. *Trigla cuculus* was less abundant in 1952 than during the period 1946–'50; prior to 1940 it was rare with us.

II. The numbers 9–13 comprise species that may have entered the North Sea through Dover Strait, but were only caught on their way back in winter. Of these, *Scylliorhinus catulus* hardly occurs in the North Sea, 5 specimens being known to us from the Dutch coast up till now; of *Solea lascaris* 10 specimens are now known from the Dutch coast.

Locality	Numbers per month											
	J	F	M	A	M	J	J	A	S	O	N	D
ed the North Sea through Dover Strait.												
off Texel, near Silverpit-Texel nr 5, 30 m				1								
8, Texel dike; 64, surroundings Texel Hole			2	4	60	6						
off Zuiderhaaks, 18 m						1						
southern part Dutch coast					2		4					
Texel Hole-Oyster Grounds, 29–36 m							8	7	2	1		
Texel dike					1							
coastal waters				2	1	1	1		±100			
between Silverpit and Dutch coast			2		14	3	7	3	3	1		
entered through Dover Strait.												
neighbourhood Texel Hole, 30 m											1	
neighbourhood of Texel Hole		1♀	1♂									
neighbourhood of Texel Hole	2		1								2	
between Silverpit and Dutch coast		72	15	4	2	4	4			1	18	5
N. of Terschelling, 38 m												1
led Scotland.												
Den Helder harbour										1		
14, stranded; 6, Texel Hole-Oyster Grounds											9	10
ern North Sea from the North.												
neighbourhood of Texel Hole, 29–32 m				1	1							3
Texel Hole, 30 m					1							
Callantsoog–IJmuiden, 7–9 m			1	2						1		
5 from Waddensea, 5 from North Sea, 2–15 m			5	5								
Den Helder dike; off Zuiderhaaks, 18 m							1		1			
off IJmuiden, 18 m			1									
neighbourhood of Texel Hole				4		1	1					
Callantsoog, 9 m; near buoy Silverpit-Texel nr 3, 30 m						1		1				

III. Numbers 14–15 represent southern species supposed to have rounded Scotland. The invasion of *Brama raii* in the southern North Sea was less important in 1952 than in 1951, when 39 specimens were recorded, 35 of which between December 3 and 26 (2 specimens in January, 1952). The 1952-invasion took place earlier than that of 1951, presumably as a result of early cold.

It is gradually becoming clear that not only southern species are constantly on the move, but that the same holds to some extent for northern species. Their southern limit may shift from year to year. After the war it looked as if southern species in the southern North Sea had moved farther northward than previously and driven a number of northern species back. Since then, some northern species seem to have retaken their former place. In order to get more insight into such changes also northern species have been studied by Mr KRISTENSEN to some extent; they are mentioned in the list under numbers 16–23. *Onos cimbrius* is not rare on the Oystergrounds, but seldom found nearer our coast, presumably because of the higher summer temperatures there. *Scorpaena dactyloptera* is very rare in the southern North Sea, from where 7 specimens are now known to us. Two species, not mentioned in the list, are *Cyclopterus lumpus* and *Lophius piscatorius*. Adults of *Cyclopterus* were rather common in early spring 1952, juveniles were numerous in the Waddensea in the autumn. *Lophius* was more common than in the foregoing years: 14 specimens were received from the vicinity of Texel Hole; most of these were young (25–49 cm), only one was older (81 cm).

As in foregoing years, attention was also given to the Cephalopods. All of the species found in the southern North Sea are migrants, but they occur in different periods of the year.

A specimen of *Todarodes sagittatus* was recorded from Texel Hole on May 8, and 2 *Todaropsis eblanae* were brought in from the same area on January 24 and May 22. *T. sagittatus* is nearly always found washed ashore; its capture by fishermen (as in this case) is a rare event. *T. eblanae* is extremely rare in the southern North Sea. In addition to these, 2 specimens of *Octopus vulgaris* were received, one in November, the other in December, and 4 *Eledone cirrhosa*, 2 in May and 2 in December.

For reasons of continuity and for sustaining the supply of material to University courses 88 *Sepia officinalis*, several hundred *Loligo vulgaris* and a thousand *Loligo forbesi* were bought. Among the *Sepia*'s, the 1951 year-class was scantily represented. The 1951 year-class of *Loligo vulgaris* yielded 9 specimens in January (1952), this being a great exception; the species is a summer visitor to our coast (April–September); 18 young ones, hatched in 1952, were received between Sep-

tember and November. The number of older *Loligo vulgaris*-individuals was relatively small, young ones were probably more frequent than usual.

In connection with previous records, 10 *Portunus puber* may be mentioned; 4 came from the vicinity of Texel Hole, 6 from localities closer inshore. Further, 2 *Maia squinado* were also received from the vicinity of Texel Hole: a male with a carapace length of 14.1 cm on February 27, another male whose carapace length was 15.9 cm on November 25. Up to now, 3 records of this species are known to us from the North Sea.

Finally, the increase in southern direction of *Nephrops norvegicus* should be mentioned. After the severe cold of early spring, 1947, the species had only one centre of occurrence in the vicinity of the Dutch coast, which was situated in Botney Gut, south of the Dogger. In the ensuing years it spread more and more in southeastern direction, until in 1952 2 specimens were caught in the Schulpengat near Den Helder. The following numbers were received from the vicinity of Texel Hole since 1947:

1947	none	1950	5
1948	none	1951	4
1949	1	1952	17

These records lead us to believe that, besides soft bottoms, severe winters are the main cause of the restricted occurrence of this species in the southern North Sea.

The hydrographic investigations under the direction of Mr Postma dealt mainly with two questions: the cycle of nutrients in the Wadden Sea, and the chemical composition of suspended matter.

In previous years the study of nutrients was chiefly restricted to inorganic and organic phosphorus. This study, together with observations on water movement and suspended matter, resulted in a better understanding of the basic principles of the cycle of organic matter in the Wadden Sea. In order to obtain more detailed information on this subject, the cycle of inorganic nitrogen compounds was included in the research in 1952. Besides, the study of the cycle of chlorophyll, already started in 1950, was continued in the course of 1952. It is hoped that in this way a more or less complete picture of the production of organic matter will be gradually developed.

The chemical analysis of the suspended matter of the Wadden Sea was started by Mr Scheele of the Rijkswaterstaat, when he was on duty at our Station during the period 1936–1945. After the war, attention was first given to water movements and the distribution of suspended matter over the Wadden area as a whole, without entering into the details of the composition of the suspended material. In the present state, however, a more extended knowledge of this composition

is again felt necessary, especially in connection with seasonal and geographical differences and with the results of our investigations on molluscs. The analyses are now carried out by Mr BEKE, analyst to the Station.

It will follow from a later part of this report that Mr POSTMA participated in a combined geological and hydrographical expedition to the Caribbean Sea. In connection with his work at Den Helder, a study was made of the transport of suspended matter carried into the Caribbean by the Orinoco river. Certain aspects of this investigation may shed light on Wadden Sea problems.

Relatively much time and attention was given to the study of salinity and oxygen content of the Nieuwediep, the harbour of Den Helder, from where the Station pumps its sea water. This inquiry was made as a result of the partial closure of the harbour in 1951. The question will be treated in fuller detail below.

The investigations of Dr TAMMES, concerned with the influence of waste water disposal on life in the sea, made good progress. The work included the study of several species. The uptake and removal of organic poison in the animal body was studied for different ages and at different temperatures. Also the disappearance of poison in the sea made part of the program. The primary importance of the results lies, of course, in the possibility of their application, but the purely scientific aspects give these results an interesting background. Dr TAMMES' great technical ability, moreover, proved of much value to other workers at the Station.

Before leaving this part of our report, concerned with research proper, mention should be made of a grant made by the Netherlands Organization for Pure Research for an inquiry into lunar influence on the reproductive cycle of marine animals. The application for the funds had been made by Dr KORRINGA and the undersigned and the research will be carried out at the Zoological Station by Mr DE BLOK.

The summer courses, given at the Zoological Station in 1952, were attended by 22 students. The total number of man-days for individual investigators and summer course participants was 736; the number of individual workers was rather large, the average duration of their stay was short. The total number of visitors was not small, but, still, there was a decline since previous years. This situation in our opinion reflects the growing possibility for biological specialisation in our country. In addition, there is perhaps a growing inclination for institutions working on applied problems to obtain their scientists at an early age.

Close cooperation was maintained with several authorities: the

Rijkswaterstaat, the Government Institution for Fisheries Research, the Royal Netherland Meteorological Institute, the Government Institution for Waste Water Research, University laboratories, etc. The German research vessel "Gauss" visited Den Helder in the beginning of March. The English fisheries research vessel "Sir Lancelot" and the Dutch research vessel "Anthony van Leeuwenhoek" payed a visit simultaneously. On board the "Gauss" as well as in the Zoological Station a survey of some aspects of marine research now carried out by England, Germany, and the Netherlands, was given. The Netherlands Zoological Society held a meeting at Den Helder on the 19th and 20th of September. On that occasion a general account was given of the results obtained at the Station since 1932. Six investigators gave lectures concerning their special fields of study. Apart from these occasions, the Zoological Station was visited by a small number of foreigners.

For several reasons upkeep and repair of the building were rather neglected. This was partly due to an attempt at general economy, so that more money could be spent on the cutter "Max Weber" for a new crank-shaft; partly, to the fact that the handiman during the summer months was burdened with additional duties. Repairs inside the building, which can be carried out in winter, are easier to accomplish than outside upkeep, which should preferably take place in summer. In the autumn of 1952 most of the flooring in the building was varnished, several carpentry repairs were made and so forth.

The new aquarium functioned well and will be a valuable addition when it becomes available for our own research. The aquarium was supplied with a glass roof in order to ensure an adequate light supply. We have in this way consciously accepted the possibility that the maintenance of a somewhat constant temperature would be difficult. Our reasoning was that in summer the temperature could be modified by whitewashing the windowpanes, whereas in winter it could be accomplished by heating. Contrary to our expectations, the summer temperature rose higher than is desirable, but the winter temperature never fell too low. For the present experiments we are using four 1.5 K.W. electromotors. Part of their energy is turned into heat, which is accumulated in the water, well isolated in the subterranean tanks. The cooling of the water hardly keeps pace with the development of heat and even in periods of frost the water temperature hardly sinks below about 8°C. Fortunately, the aquarium in its final form will be in much better condition than now, because only one motor will be used. Still, difficulties in maintaining low enough temperatures in summer may be anticipated.

The repairs of the "Max Weber", already mentioned in the pre-

vious annual report, lasted until May and cost much more than anticipated, because the insurance refund was lower than expected. Part of this additional cost was overcome by economising on other items in the budget, part of it was paid by the Government. From May onward, the "Max Weber" was rather regularly in use. Either the ex-engineer of the lifeboat, Mr EELMAN, or our own technician, Mr PRINS, acted as skipper. During the second half of 1952 the ship underwent a thorough overhaul, so that it was in satisfactory condition at the commencement of winter.

There were few changes in personnel. In the place of Mr PIJL, who left for New Zealand, Mr BEKE was appointed analyst from February 1st onward, whereas Miss H. NAGTEGAAL, who left for Australia, was replaced by her sister C. NAGTEGAAL. Mr POSTMA, as already mentioned, participated in a research expedition to the Caribbean Sea, organized by Royal Dutch Shell, from April 1 to July 1. Thereafter, he visited the United States, especially Scripps Institution of Oceanography at La Jolla, California, and Woods Hole Oceanographic Institution at Cape Cod, Massachusetts. His salary, which was then available for other purposes, was partly used for the temporary appointment of Mr DE BLOK.

The Station's personnel at the end of 1952 consisted of:
Dr J. VERWEY, Director
I. KRISTENSEN, Biological research and supply of materials
Dr J. WESTENBERG, Biological research and library work
H. POSTMA, Hydrographic research
Miss T. STOLL, Administrator
N. PRINS, Technician
M. BUHRE, Handiman
A. DRAL, Biological analyst
CH. BEKE, Chemical analyst
Miss C. NAGTEGAAL, Student analyst
T. DE BOER, Student analyst
Vacant, Resident caretaker-skipper and wife
Mrs D. FERNHOUT–GLAS, Char woman
Dr P. M. L. TAMMES, Applied biological research, paid by industry
G. VAN DER WAL, Student analyst for Dr TAMMES' research.

The library conditions have improved since Dr WESTENBERG took the responsibility of its care in 1951. Several pre-war exchange relationships were resumed. In addition, a number of new exchange agreements were reached. It was attempted to fill up gaps in the files. Much attention was also given to the binding of periodicals. Some new books were purchased, but the small library budget hardly permits expenses in this direction. A word of thanks is extended to

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those inside and outside the Society, who furnished the library with books or reprints. The lack of space for the library, which has been mentioned in several annual reports, is becoming more and more severe, and it is hoped that the Society will succeed in finding a solution for this difficult siuation.

The supply of study material was, according to our own notions, rather important. The receipts were about fl 4300.—, in which "Artis", the Amsterdam Zoo, took an important part. The purchase of animals, including those for our own research and for aquarium food, amounted to about fl 3400.—, so that there was a surplus of fl 900.—. Up to this time, the cost of formalin, alcohol, etc. was never subtracted from the surplus. These costs in 1952 amounted to some fl 200.—, so that the profit realized was about fl 700.—.

The Government grant in 1951 amounted to fl 60 400.—; in 1952 it was about fl 66 800.—, in 1953 it is fl 70 000.—, whereas the budget for 1954, if accepted by the Government, will call for another increase. These increases have been brought about in the first place by periodic salary increases, but for 1954 there is included in the request a sum of fl 1200.— for a new custodian with additonal duties as skipper on the "Max Weber", a sum of fl 1200.— for electricity for the new aquarium, and an additonal sum of fl 6000.— for some expensive instruments.

It was pointed out in the previous annual report that the year 1951 ended with a deficit of fl 2822.48. When the repair costs of the "Max Weber" appeared to be so much higher than expected it was apparent that this additional expenditure could not be met within the 1952 budget. The Government then supplied the necessary financial aid to meet these costs and part of those for the vessel. Because of the high costs of the latter we were extremely economy conscious on other parts of the budget as well, with the result that the year 1952 ended with a deficit of less than fl 150.—. Once again, we should thank the Government for the support it is giving to marine biological research.

Finally, as in the previous report, a few words should be added concerning the construction of the new naval port in the immediate vicinity of the Station, which caused us much additional work. In September, 1951, the southern entrance of the Nieuwe Diep was closed and the surface salinity of this old harbour became much lower due tot the entrapped fresh water, sluiced in from the North Holland Canal. The Royal Dutch Navy, whose Ministry had guaranteed us a supply of good sea water, utilised a water supply boat, which furnished us with salt water from the Marsdiep. In the spring of 1952 it was decided to lengthen the existing cast iron piping by a plastic part to the bottom of the harbour. Salt water could then be furnished directly

from below, in front of the Station. Before the piping had been laid, it appeared that the oxygen content near the bottom had fallen considerably and the laying of the piping was postponed. After some further months of study it was decided to lay the piping, because the operating costs of the supply boat during summer would be higher than the costs of the piping. The piping was then laid in October, and since that time the Station pumps its water from a depth of 8 metres, 1.5 metres above the bottom. We intend to use from now on the piping in winter, whereas during summer, should the oxygen content again decrease, a water boat will supply water for the aquaria. The total cost of the plastic piping and water boat has amounted at this time to about fl 25000.—, which were paid by the Navy Department.

The oxygen content of the water pumped from the bottom of the Nieuwe Diep was abnormally low even in October, but it is brought to the level necessary for the aquaria through changes in the water circulation. As stated already, we do not expect this temporary situation to suffice in the summer months. This winter, however, a connection between the old and the new harbour has been made not far from the Zoological Station, and it is hoped that the oxygen content and salinity conditions may improve. The study of the condition of the water is therefore being continued.

Den Helder, February, 1953

J. VERWEY

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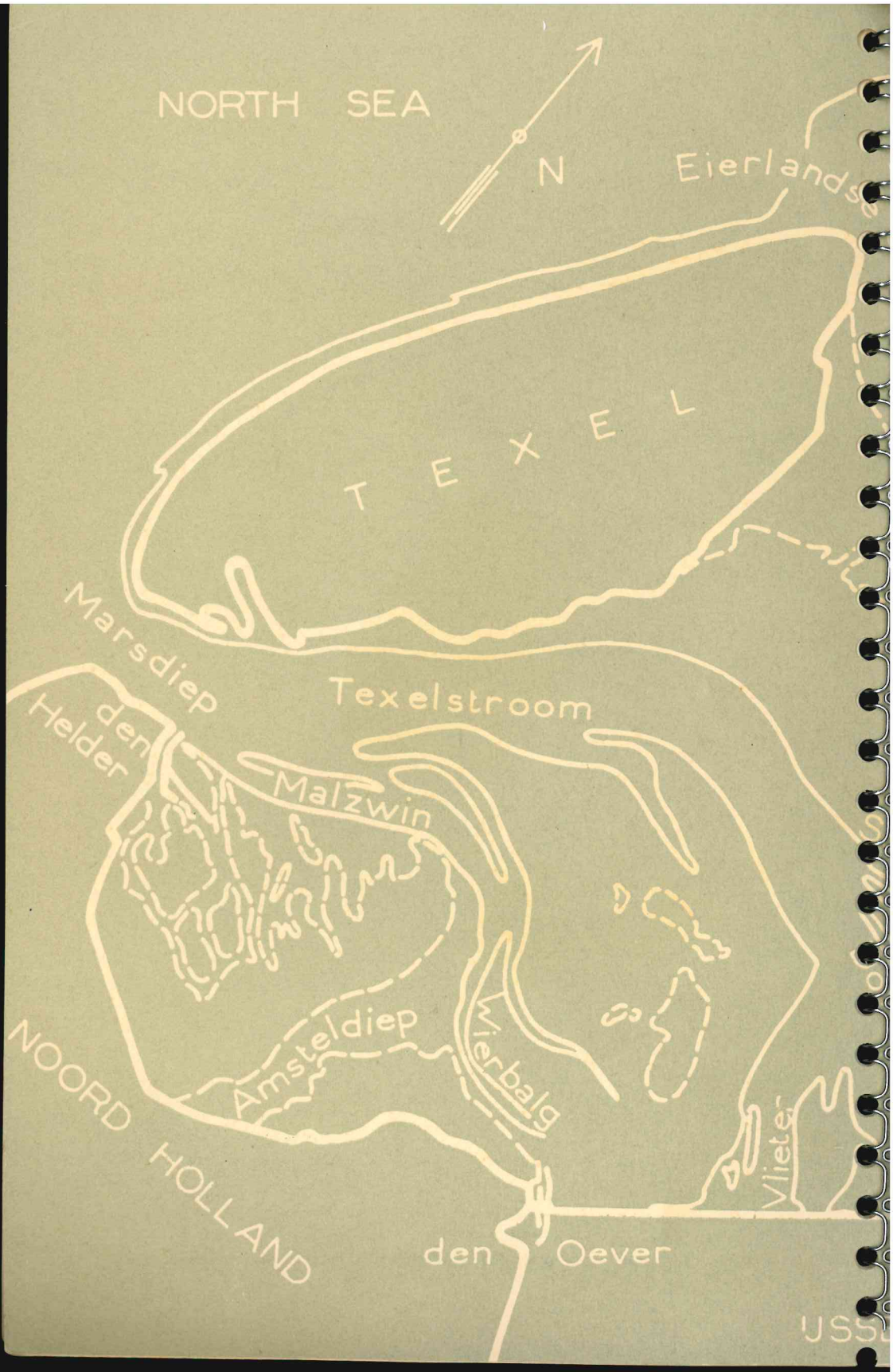
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