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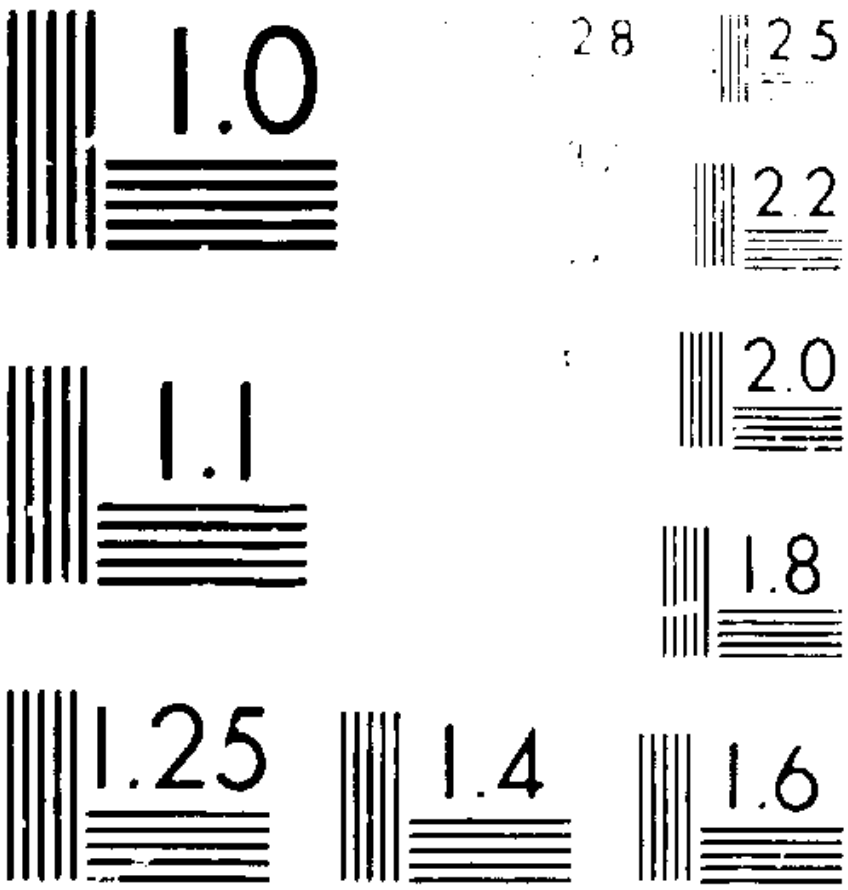
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CONSTRUCTION AND REPAIR OF SMALL FISHING VESSELS - POLISH EXPERIENCE*

prepared by

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** Experts in shipbuilding and shiprepair.

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CONTENTS

G e n e r a l.

The development of the Polish fisheries, the beginning of which dated back to the end of the 2nd world war, covered:

- the Baltic coastal /boat/ fishing;
- the Baltic open sea /cutter/ fishing;
- the European continental shelf and slope fishing;
- the oceanic open water fishing.

A small distance from the fishing grounds, not exceeding - in general - 100 nautical miles, as well as a specific character of the Baltic Sea fish stock, especially the ever varying conditions in which the said stock can be used, are the reasons due to which the exact design requirements for an optimum Baltic cutter have not been prepared, up to date. During the postwar period, there have been built a dozen or so of the cutter prototypes, yet only a few of them were built in series. Those vessels were designed to match the ever varying ideas on the subject among the shipowners. All those cutter types are characterized by their simplified fishing arrangements and a low degree of mechanization.

Table 1 presents the characteristics of the discussed Baltic fishing cutters. At that time, state and co-operative fisheries were established, while individual fishermen were granted suitable licences. This paper deals with problems connected with the construction and operation of the cutter vessels of the lengths of up to 25 metres.

There was also created the Marine Fishing Institute to achieve soon the due importance and to become the leading scientific and research post in the fishing economy. The reconstructed Shipbuilding Industry rapidly filled up the national deficiencies and adapted itself to the export

production offering a full variety of fishing vessels. In the opening postwar period, there were built cutters of wood /oakwood/ construction; of mixed construction, including pinewood plating and steel frames/, and, finally, of only steel construction. As an experimental vessel, in 1960, there was built a plastic /glass polyester/ cutter, 19.70 metres in length, which, irrespective of its technical advantages, was not constructed in a series.

Now, the Polish Shipbuilding Industry, is in a position to build and outfit fishing vessels of all kinds, while the Repair Shipyards can carry out all sorts of repairs. Four Shipyards can build plastic cutters, two Shipyards, aluminium alloy cutters. The construction of wood cutters was completely dropped in the recent years in view of an acute shortage of wood as a raw material and of a limited operational lifetime of the wood vessels.

Summing up the production possibilities of the Polish Shipbuilding Industry it may be stated that Poland has at its disposal full possibilities of construction and repair of all types and kinds of fishing vessels.

TABLE 1.

FISHING CUTTERS BUILT IN POLAND IN LONG SERIES.

MAIN TECHNICAL CHARACTERISTICS.

Item No.	Cutter Type:	Prototype Construction Year:	Principal Parameters: L m	B m	H m	Cargo Hold Capacity, RT	Deadweight, T	Type of Construction:	Fishing Method:	Complement:	Engine Type:	Propeller Type:	Radius of Action: Days:	No. of Vessels Built:	Fig. No.:
1.	KS-17	1948	17.38	5.03	2.44	36	15	Steel	Side trawling.	4	Puck 120	Fixed.	6	156	1.
2.	B-12	1951	24.00	6.40	3.05	74	50	Wood	Side trawling.	8	Volund 225	Fixed C.P.	8	10	2.
3.	B-25	1955	24.00	6.40	3.43	82	55	Mixed	Side trawling.	8/9	Volund 225	Fixed C.P.	12	32	3.
4.	B-25a	1960	24.58	6.58	3.38	107	44	Steel	Side trawling.	8/9/10	DM330 225	C.P.	15	148	4.
5.	B-410	1974	25.70	7.21	3.49	112	68	Steel	Stern trawling.	7	Puck 420	C.P.	15	60	5.

C.P. = Controllable-Pitch Propeller.

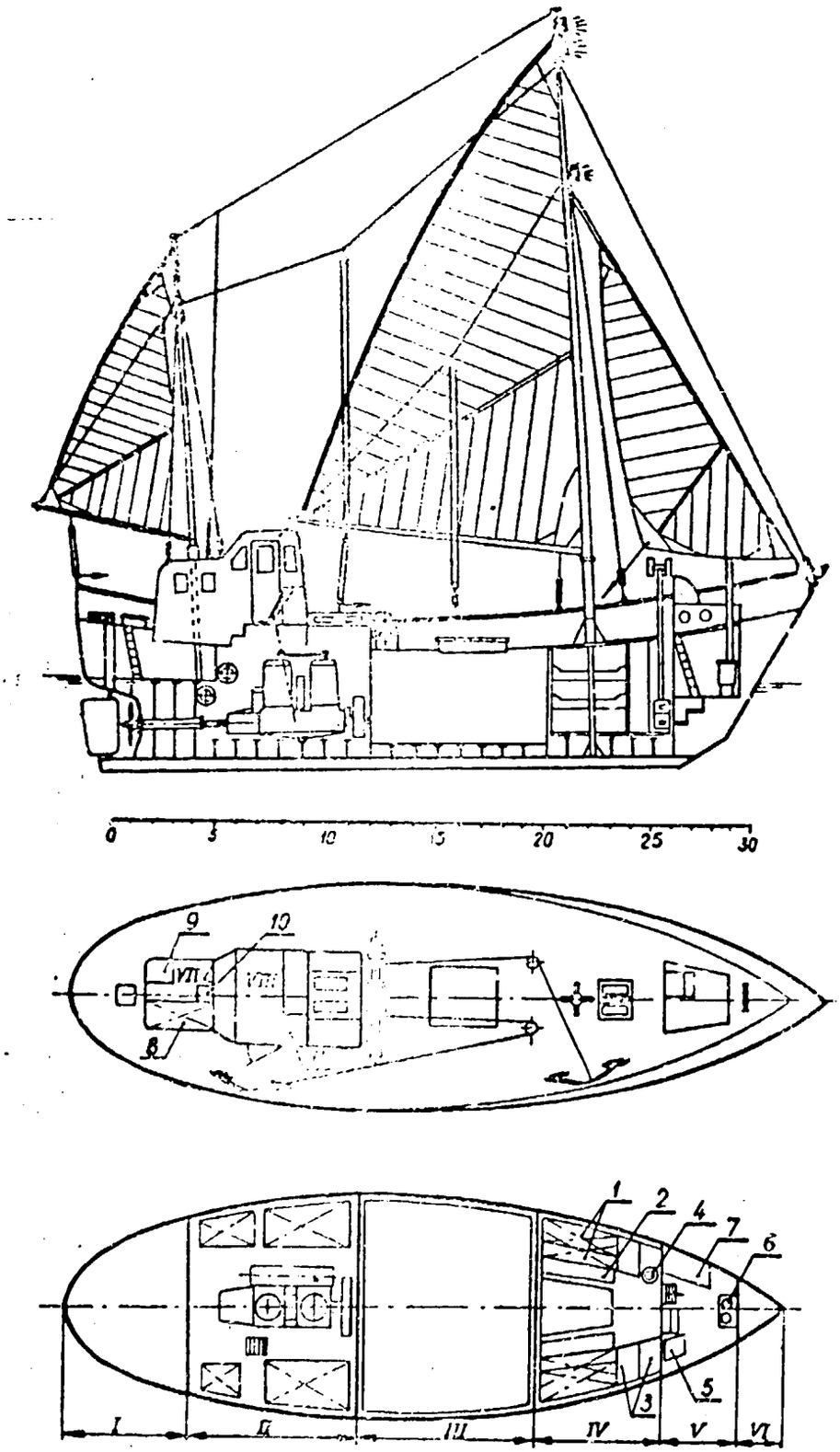

Fig.1. GENERAL ARRANGEMENT PLAN OF CUTTER KS-17. VERSION III.

1 - Crewsberths. 2.- Bench. 3 - Lockers. 4 - Stove.
5 - Galley wash sink. 6 - Kitchen range. 7-Galley shelves.
8 - Skipper's berth. 9 - Table. 10 - Locker. 11 - Companionway to Engine Room.

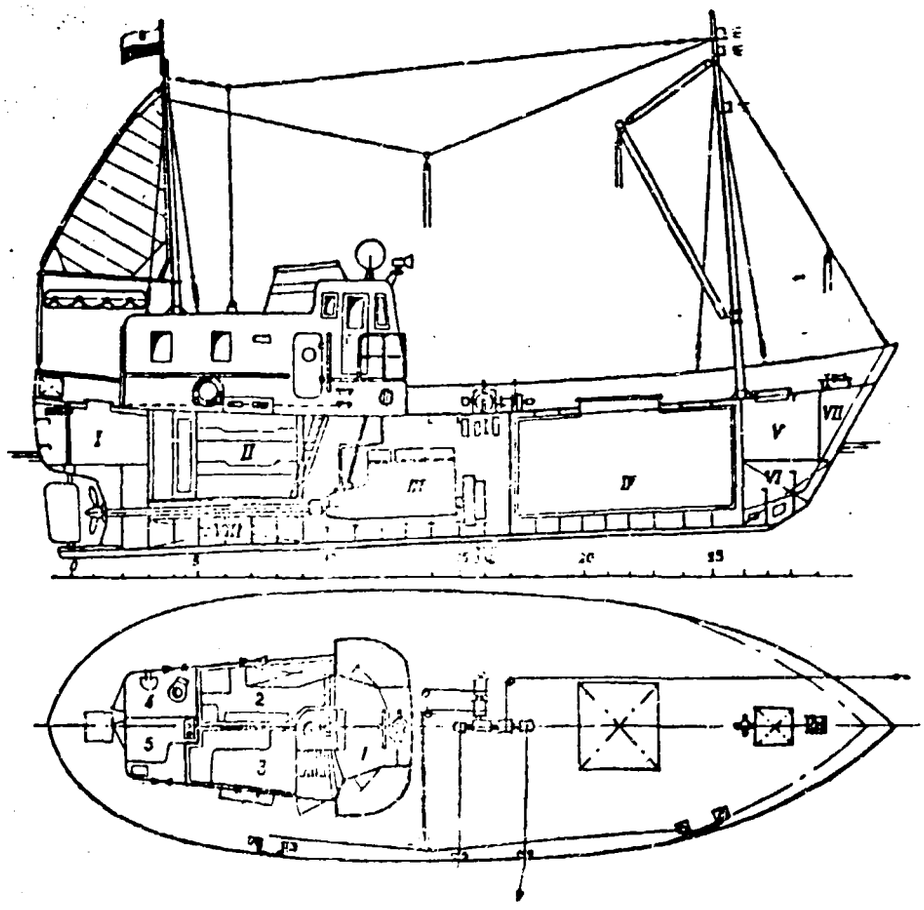

Fig. 1a. GENERAL ARRANGEMENT PLAN OF CUTTER KS-17-W.

I - Aft Bosun's store. II - Crew's accommodation. III - Engine Room. IV - Cargo hold. V - Net store. VI - Ballast water tank VII - Anchor chain locker. VIII - Water tank.

1 - Wheelhouse. 2 - Skipper's accommodation. 3 - Crew's mess room. 4 - WC. 5 - Galley. 6 - Drying room.

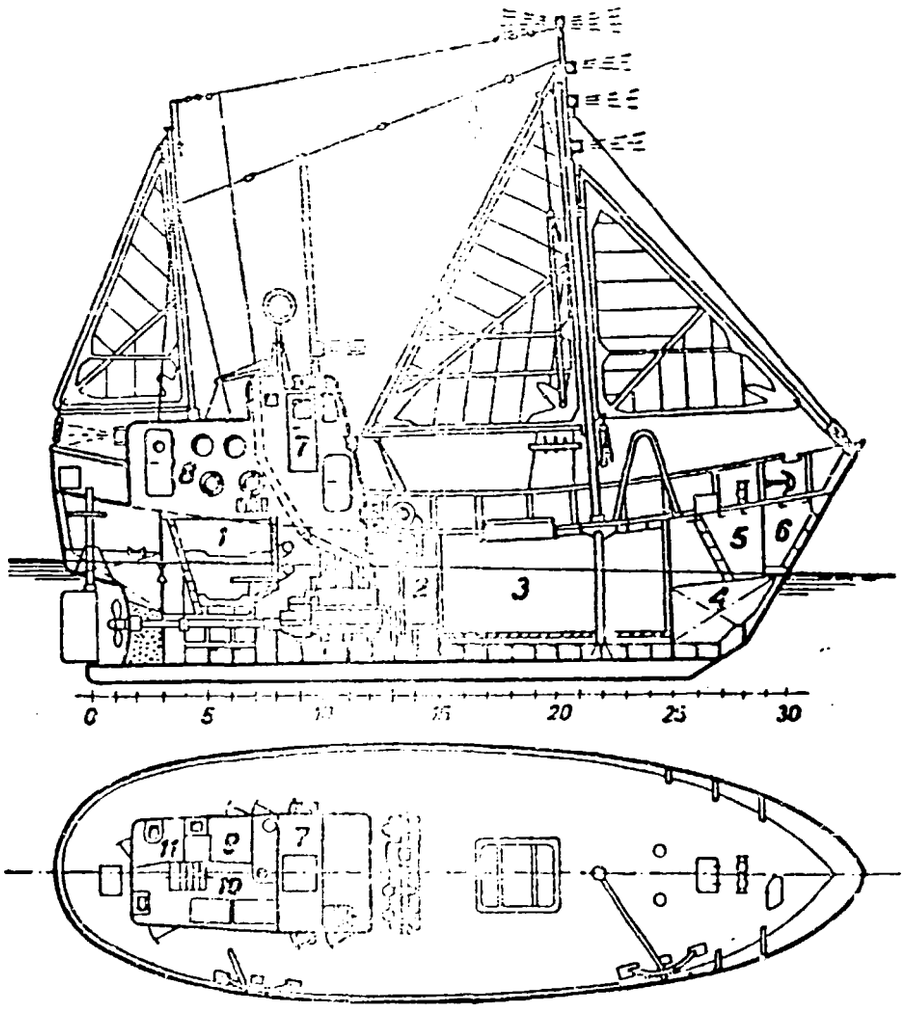

Fig.1b. GENERAL ARRANGEMENT PLAN OF CUTTER KS-17.
VERSION "STOREM-4".

1 - Four-man Crew's accommodation. 2 - Engine Room. 3 - Cargo hold. 4 - Ballast water tank. 5 - Bosun's store. 6 - Chain locker. 7 - Wheelhouse. 8 - Superstructure. 9 - Galley. 10- Crew's dining room. 11 - Trawling W.C.

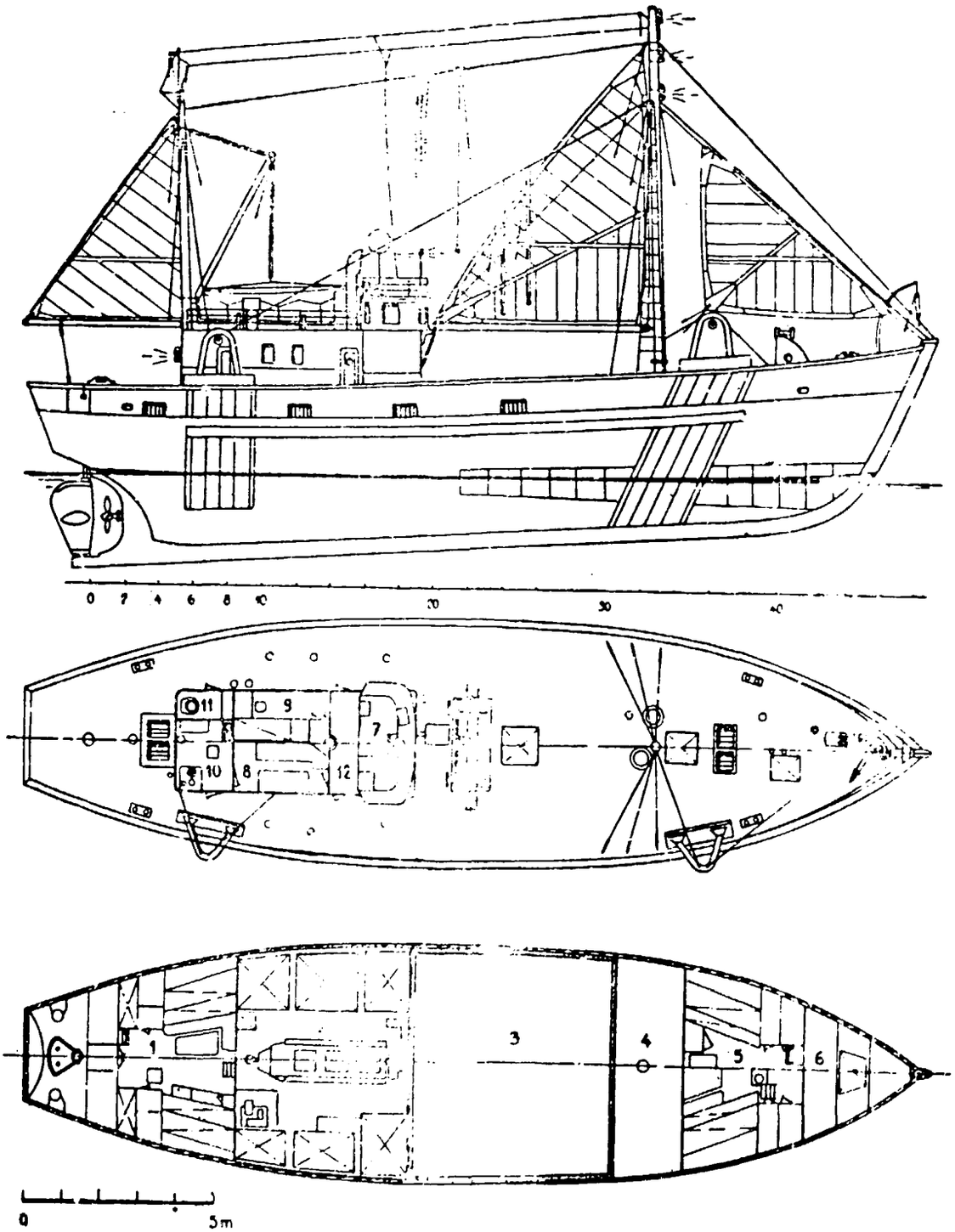

Fig.2. SUPERCUTTER, FROM B-12 VERSION.

1 - Crew's accommodation aft. 2 - Engine Room. 3 - Cargo hold. 4 - Net store. 5 -Accommodation fore. 6 - Anchor chain locker. 7 - Wheelhouse. 8 - Mess room. 9-Skipper's accommodation. 10 - Galley. 11 - W.C. 12 - alleyway.

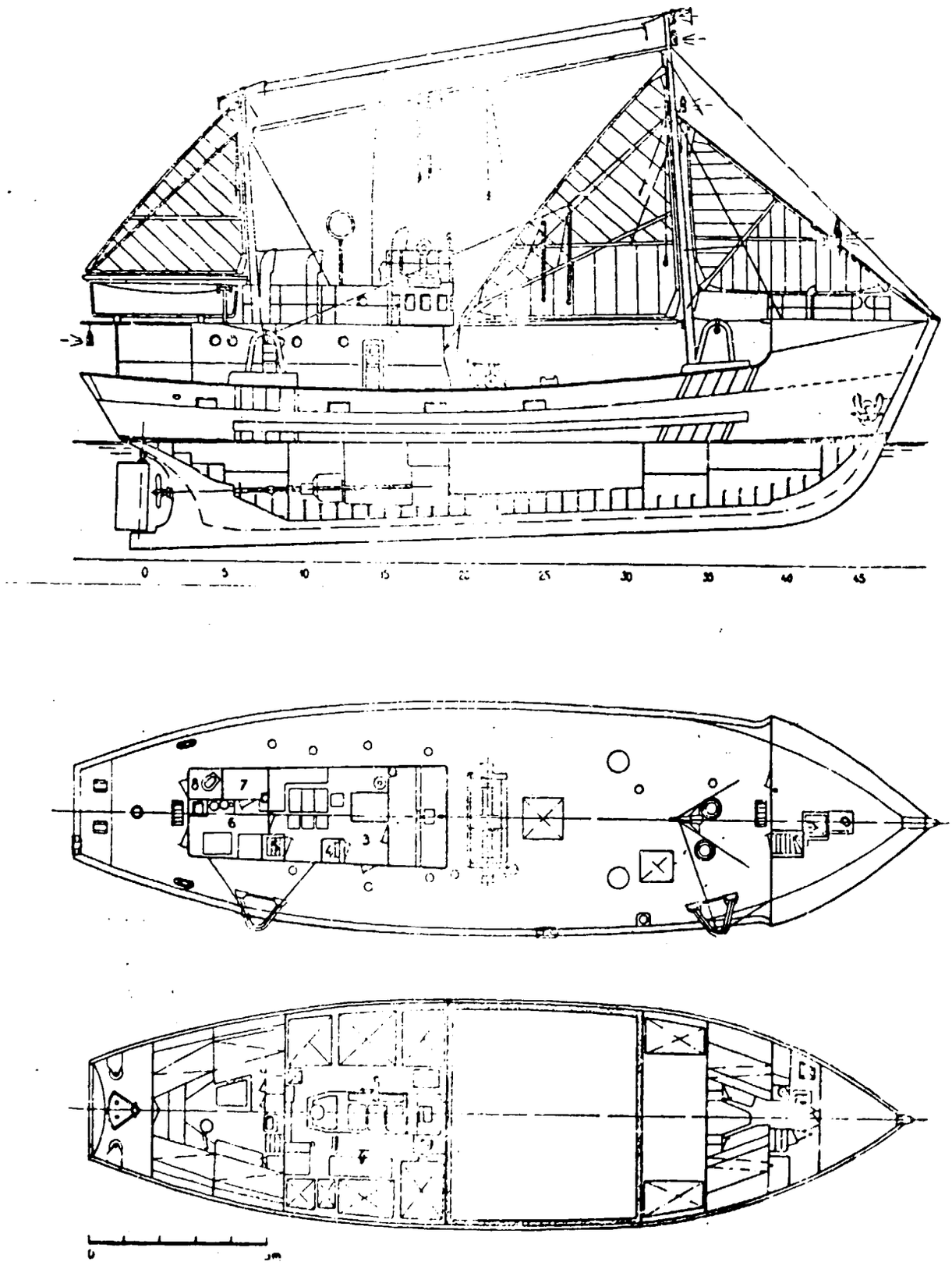

FIG.3. SUPERCUTTER. VERSION B25.

1 - Wheelhouse. 2. Skipper's accommodation. 3 - Mess room. 4 - Companionway to Engine Room. 5 - Companionway to Crew's s accommodation aft. 6 - Galley. 7 - Provisions store. 8 - W.C.

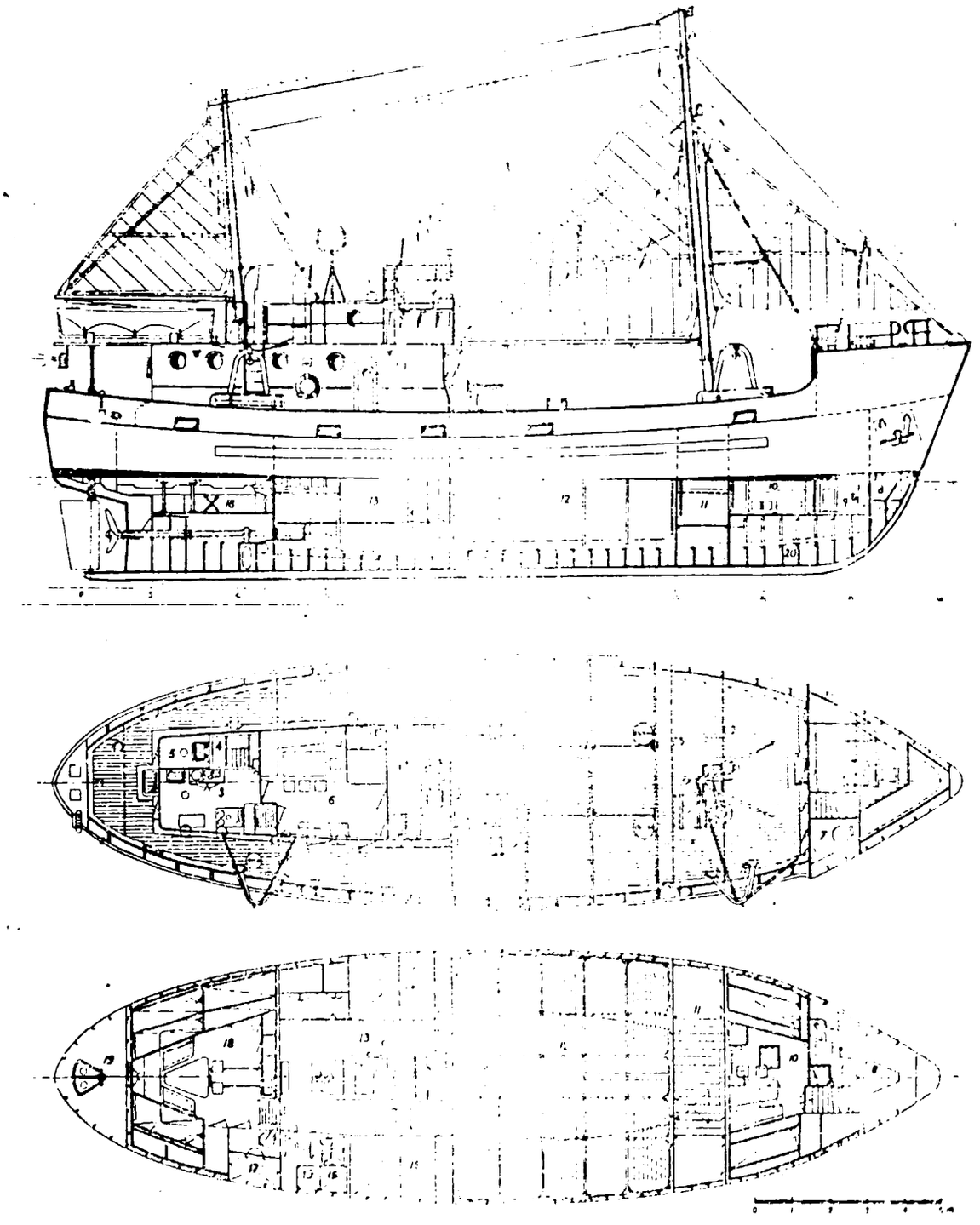

Fig.4. SUPERCUTTER B-25s.

1.Wheelhouse.
2.Skipper's cabin.
3.Galley.
4.Storeroom.
5.Shower.
6.Dining room.
7.W.C.
8.Chain locker.
9.Wash room.
10.Four-man Crew's cabin.
11.Net store.
12.Fish hold.
13.Engine Room.
14.Fuel tank.
15.Oil tank.
16.Fresh water tank.
17. Coke bunkers tank.
18. Five-man Crew's cabin.
19. After peak.
20. Fresh water tank.

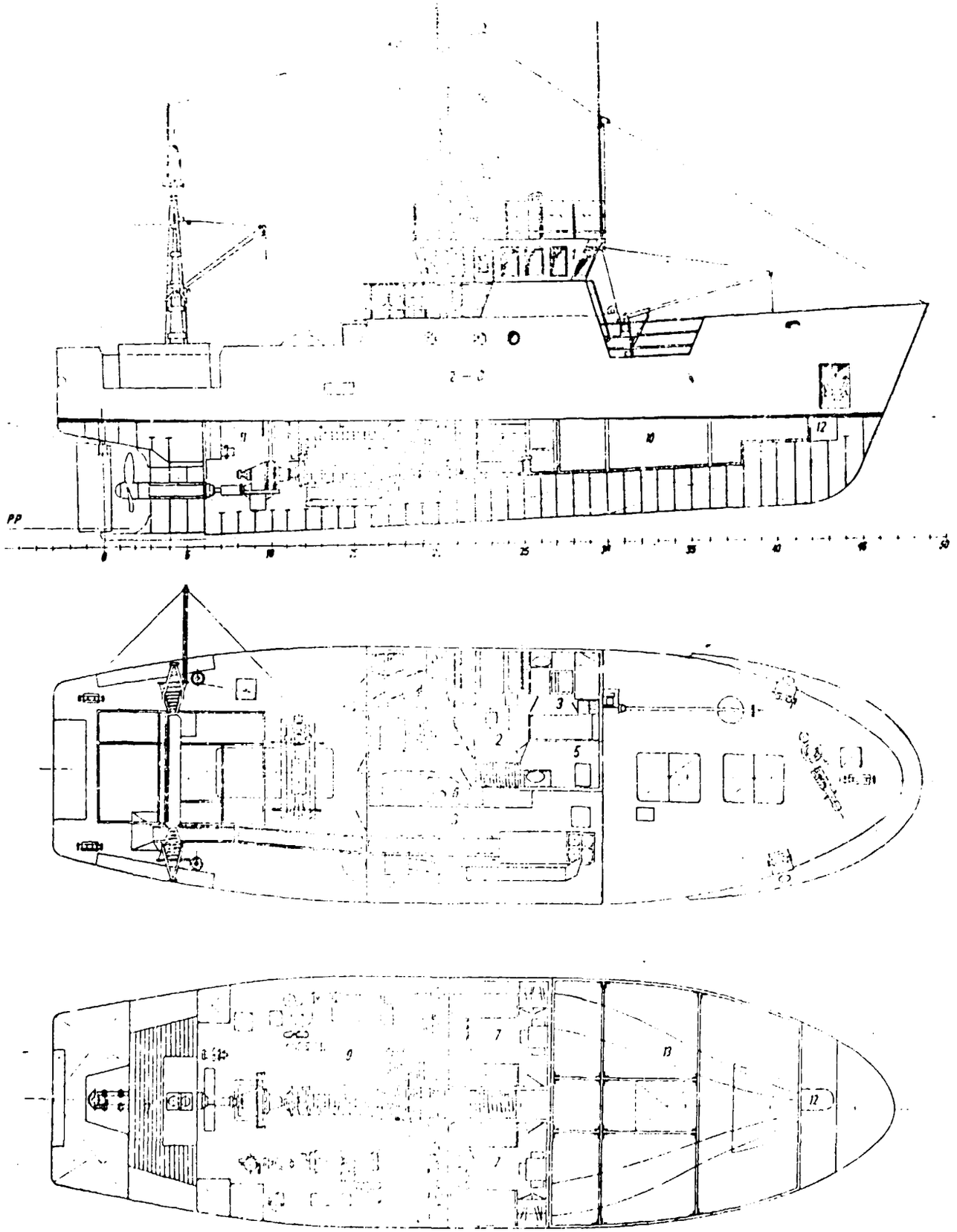

Fig.5. GENERAL ARRANGEMENT PLAN OF FISHING TRAWLER B-412. VERSION III.

1.- Wheelhouse.
2.- Mess room.
3.- Master's cabin.
4.- Galley.
5.- Bathroom.
6.- W.C.
7.-Four-man fishermen's cabin.
8.-Fish processing room.
9.-Engine Room.
10.-Cargo hold.
11.-Wheelhouse and steering engine.
12.-Chain locker.

Construction of Cutters.

The idea of construction of the cutter KS-17 arose at the beginning development period of the Polish Baltic fisheries when it was necessary to compensate the losses suffered during the war. At that time, the type of the steel cutter KS-17 was designed with sharp lines.
The production of the cutter was started in two Shipyards where the hulls were welded in special turning tables which considerably simplified and hastened the construction. Those cutters proved to be successful and their hulls served as a basis for the construction of the greatest number in Poland of several variants of fishing vessels, i.e. of about 250 units. The cutters B-12 and B-25 are to be counted among the constructional solutions of a transitory character. They were supplied to the state enterprises and now they serve individual users. Based on the body lines of the B-25, the steel cutter B-25a was built, estimated actually by the fishermen as good as the KS-17 type cutters. When sufficient numbers of the above mentioned vessels were delivered to the fishing enterprises, a new idea arose of building an optimum Baltic cutter.

Analyses made of the Baltic stock were to serve as an essential material to work out the suitable design requirements. The whole problem was comprehensively discussed at the 2nd Scientific Symposium of the Marine Fishing Institute in Gdynia in 1970, but no exact requirements were prepared which was reflected in the later designs.

The cutter "Sola" built in 1967 in the Gdynia Repair Shipyard, and the B-410 type cutter built in the Ustka Shipyard did not achieve the intended degree of optimization Their essential shortcomings are the high prices, both of the vessel and of the fish catch. Consequently, the problem of

an optimum vessel adapted for the fishing in the Baltic from the Polish Coast remains still open. The above mentioned cutters with their rich outfit and great fishing capability are not adapted to the decreasing stock of the Baltic Sea.

In the Baltic Sea, three main fish species are caught: cod, herring and sprat. Other species participation in the mass of the fish catch amounts to up to 5%. /Table 2./

Statistical figures showed that, in order to achieve good fishing results, together with good economic effects, it is sufficient to employ a catcher vessel with a length limited to about 20 metres with the actual main parameters and proportions of 17-metre cutters kept. Special attention is paid to the applied simple technology of construction and a minimum of the costly outfit of the cutters KS-17. The cutters KS-17 proved their slight susceptibility to failures and their high reliability.

In one of the fishing enterprises the cost of operation of the cutter B25a was calculated on the basis of synthetic factors of its service. Based on the participation factors of the particular fish species in the whole mass of the fish catch , three variants were assumed for consideration.

TABLE 2.

MODEL OF FISHING VARIANTS /in Thousands of Tons/.

Fish Species Caught:	Variant: Leading:	Minimum:	Maximum:
Cod:	250	220	290
Herring:	280	240	320
Sprat:	90	80	100
Others:	80	60	90
T o t a l:	700	600	800

The collective balance sheets of the operational costs of those cutters as per the variant showed in Table 3, which do not cover the amortization costs but include the repair costs, may be used for the investments effect calculations. They provide the correct indications what fish should be caught, and how the fishing is to be done, in order to obtain a high factor of economic effects. The analysis of the balance sheet presented in Table 3 shows that the payment factor is comparatively high. Hence the tendency to limit the number of the crew and to introduce a more extensive automation and a richer outfit. Unfortunately, no success was achieved in co-ordinating those proportions which became evident in the vessel B-410.

It can be noted that the repair of the vessels in Table 3 do not involve high expenditure and that they do not provide any essential technical problems being estimated by specialists of the particular industrial branches as normal. Complex repairs, such as a complete replacement of, for example, propulsive arrangements, are not carried out in the Polish Shipyards. The replacement of the whole propulsive arrangements is done only when the necessary conditions are favourable.

TABLE 3.

SHARE OF PARTICULAR COMPONENTS OF OPERATIONAL COSTS,

WITH NO SINKING FUND PART PAYMENTS TAKEN INTO ACCOUNT.

Synthetic Components:	Variants as per costs in per cent: Leading:	Minimum:	Maximum:
Fuel:	10.70	11.75	9.80
Fishing equipment and repair of same:	7.90	8.70	7.25
Packaging for fish:	3.40	3.20	3.55
Other materials:	5.18	5.20	5.15
Salaries and social insurance:	40.17	38.10	41.87
Catering:	1.30	1.45	1.44
Repair and maintenance:	8.00	8.78	7.30
Property insurance:	3.10	3.40	2.84
Port, towage, etc. dues:	0.40	0.50	0.40
Department charges:	9.90	9.42	10.00
General establishment charges:	9.95	9.50	1
T o t a l:	100.00	100.00	100.00

R e p a i r P r o b l e m s.

The ideas of the Shipowners have not been changing for years. Every fishing enterprise would like to maintain in its fleet a high degree of technical readiness. Finally, this degree has been determined as follows: -

- The cutter should be in technical readiness for: 320 days.
- There should be assumed for repair : 45 days.

The number of days assumed for technical readiness includes:

- Holiday and inter-trip stay in port of: 50 days.
- Storms and climatic conditions of: 72 days.
- Stay at sea /including 190 days for fishing/: 198 days.

Those 190 days should be decisive for the profitability of thecutters. But, in fact, the fishing enterprises achieve slightly different division of the time. At the beginning of the year a plan is assumed which is to be binding for such enterprises. This plan, however, as a result of delayed repairs done by other enteprises, or even by own works, cannot be put into practice. For example, in the "Jedność Robotnicza" /"Workers' Unity"/ enterprise, the technical readiness in relation to the calendar days was as follows: -

	1979:	1980:
Planned:	73.89%	79.52%
Carried out:	70.29%	74.77%

As a matter of fact, exactly maintenance + repair , quite often done in a negligent manner, lower the technical readiness over the periods of big catches.

It is the opinion of experienced fishermen, in some sense quite controversial, that the propulsive arrangements and fishing equipment should be simple and easy to repair. This opinion is a result of the fluntuation of the crew as the work on board of fishing cutters is by no means an easy job.

The main cause of differences in technical readiness are the repair. If the enterprise has at its disposal a suitably fitted and located shore repair background, it is in a position to maintain a high factor of technical readiness of its fleet. In Poland there has been accepted, in principle, the division between the production and repair Shipyards. This does not exclude the fact, that both the former and the latter carry out, in parallel, new construction and repair . The repair Shipyards treat the construction of new vessels as a marginal production, which, from the economical viewpoint, is not a bad industrial policy. Big fishing enterprises in Poland have their own, rather big, repair Shipyards, adapted as regards their outfit to serve the vessels operated by them. There are several such repair works on the Polish Coast. However, they are not in a position to ensure the necessary repairs of the whole fishing fleet. It is estimated that about 15 to 20% repairs are done out of those repair works, in other Shipyards. The greatest repair problems are encountered by a, comparatively, very numerous fleet of individual users. This fleet is old, including many different types of vessels. It employs frequently engines, such engines, which are not manufactured any more, and this makes the correct use of spare parts quite impossible. The outfit of those vessels is simplified and, comparatively, seldom failing. Private Shipyards do not exist, while the

co-operative ones are very few and their repair posibilities are limited. The lack of hoists, or of other lifting arrangements, is the main reason of their limited attractiveness, especially as regards the repair of hulls. If, on board the operated cutters there are installed more than 25 types of propulsive engines, comparatively older, as the engine Puck B,120 of the year 1939 fitted on board the cutter Jas , and those modern coming from the actual production series, this fact gives the true picture of repair problems and of difficulties encountered in keeping the whole fleet in the correct proportions of technical readiness. In fact, the old cutters and their propulsive arrangements are owned by individual fishermen, not bound to the planned economy principles, but the vessels maintenance costs make them apply a very strict repair policy.

In the second half of the fifties, in the "Nauta" Shipyard use was made of the phenomenon that Zu (zinc) has a lower electric potential in electrodes than iron. The zinc coatingsin the Fe/Zu corrosion link act in most of the corrosion areas as an anode, namely they become solved thus protecting the steel plate . As an experiment, several hulls of the cutters KS-17 were provided, by a spray metal coating, with an anticorrosive layer of zinc. However, irrespective of promising results obtained on the experimental cutters, it was not possible to introduce this method in general on the other vessels of the fleet. The decisive factor preventing making same common were, presumably, the high costs involved.

TABLE 4.

SPECIFICATION OF BALTIC CUTTER FLEET ACCORDING TO YEAR OF CONSTRUCTION.

STATUS IN 1981 ACCORDING TO POLISH REGISTER OF SHIPPING.

CUTTER'S CONSTRUCTION YEAR:	Number of Cutters / Per Cent	
	Steel Construction	Wood Construction
Before 1940	1 / 0.39	24 / 9.09
1941 - 1945	0 / 0	6 / 2.27
1946 - 1950	9 / 3.52	86 /32.57
1951 - 1955	20 / 7.81	35 /13.25
1956 - 1960	55 /21.48	32 /12.12
1961 - 1965	58 /22.65	9 / 3.41
1966 - 1970	34 /13.28	30/11.36
1971 - 1975	37 /14.45	30/11.36
1976 - 1980	42 /16.40	12 / 4.54
T o t a l:	256 /100.00	264 /100.00

In the fifties, when the epair problems became ever more important, Shipyards of a repair character were built by the bigger fishing enterprises. At that time, the size of a typical Baltic cutter was already known. Consequently, the Shipyards were specially outfitted for the purpose of serving such cutters. The Shipyard at Władysławowo is a typical example of specialization in the repair of the cutters as presented in Table 1. The capacity of this Shipyard as achieved over several years is of 320 thousand working hours, on the average. The Shipyard carries out emergency and Class repairs under the survey of Inspectors of Classification Societies. Great experience of this Shipyard as regards such repairs allowed to work out working hours factors in relation to the types of cutters and the kinds of repairs done. For example, the repair of the cutter B-25a takes, on the average, 2,550 working hours, while the major repair of same, about 6,200 hours. The annual repair of the cutter B-410 requires 3,600 working hours; the major repair of same, 5,000 working hours. As regards the major repairs, the following specification has been prepared. For simplification reasons, same has been worked out in per cent.

R e p a i r s:	B-25a:	B-410:
Machinery /Engine Room/:	35	30
Deck equipment:	20	35
Hull and carpentry items:	30	20
Electrical:	5	5
Machining:	10	10

A slip type arrangement having a lifting capacity of 160 tons can set ashore cutters having a draught of up to 4 metres. Technological posts ashore are so arranged that

there are 7 such posts on the left side, while 6 such posts on the right side, others being located along the permanent quay and piers. There is one Derrick type stationary crane with a lifting capacity of 12 tons and one 5 ton travelling crane. The technological posts cannot be provided with covering roofs in unfavourable atmospheric conditions. The average capacity of the Shipyard is of 100 cutter vessels per year. The planning of the extent of the repair is done based on the inspection reports. The binding price of a working hour for the repair , also taking into account the cost of the materials required, is about 3 times lower in comparison with the prices charged for repair in the production Shipyards.

The range of problems connected with repairs of cutters in other Shipyards is very similar. The actual repairing potential of the Shipyards is sufficient and it fully meets the demand of the fishing enterprises, although the cutters are comparatively old. Please refer to Table 4.

Final Conclusions.

The essential repair problems remain connected with the problems of operation of cutters. The development of the fishing fleet throughout the world is inspired by the growing demand for proteins. The specific character of the Baltic Sea, which is, in principle, a closed sea, is the reason that the fishing possibilities there become limited, while the cost of operation of fishing vessels becomes higher from year to year. Further increase in the number of such vessels does not help to obtain positive economic results. Yet, much can be done to make the fishing vessels efficient and more reliable in service.

The above is an inducement to a revision of the actually prevailing opinions , both as regards the design requirements concerning the fishing vessels and the methods of operation of same, with a view to accentuating more the quality problems.