

# FLOATS USED IN ITALY FOR THE STUDY OF SURFACE CURRENTS OF THE OCEAN

by

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*(Translated from the Italian).*

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1. The floats which have been used in Italy for the study of the surface currents of the ocean before 1912 were of the usual type as is shown by the following description which we take from FERUGLIO (1).

“ The floats employed consisted of a simple couple of bottles of ordinary glass, joined together by a cord of adequate strength which was wound in the form of a net about the bottles and permitted them to remain suspended vertically in the water.

“ The upper bottle was sealed with a paraffined cork, covered with a thick coating of red Spanish wax and contained a numbered slip on which were written various questions to be answered by the person recovering the bottle as well as an envelope for mailing. The lower bottle, on the other hand, remained open and filled with water. This pair of bottles was then ballasted to the extent necessary to cause the entire system to remain immersed in the water up to the neck of the upper bottle ; this, as one may readily perceive, in order that the wind might exert as little effect as possible and therefore exert a negligible influence on the movements of the pair of bottles. The length of cord which bound the two bottles together was three metres in the first which were launched, but was subsequently reduced to one metre.

“ This change in the length of cord was brought about by the fact that of the couples first launched at the beginning of the experiment only the upper bottle was recovered, with about 70 to 80 centimetres of the original 3 metres of cord, and for this reason reference was made in the questionnaire on the slip to the length of the cord. The cause of the rupture of the cord is still unknown. ”

Following the above method of procedure 20 such couples were set adrift in the upper Adriatic during the year 1910; of these couples, one sank as a result of incorrect ballasting, while four of the remaining 19 were recovered. During the year 1911, 100 couples were set adrift, of which 9 were lost, either as a result of breakage or because they sank immediately after launching. Of the remaining 91 serviceable bottles 33 were recovered. From 1912 to 1914, 685 couples were launched in the Adriatic of which 220 were recovered (percentage 32).

The valuable results which were obtained from these experiments are contained in the work of Dr. FERUGLIO (1).

2. During the year 1912 the *Comitato Talassografico Ligure*, wishing to undertake experiments on the surface currents in the Gulf of Genoa and in the Tyrrhenian Sea, had recourse to a type of float which differed somewhat from the preceding; this type having been constructed under the direction of the *Comitato Talassografico Italiano* for its new researches in the Adriatic. In this new model the upper bottle was made with a reinforced bottom pierced with a hole through which was passed one end of the attachment cord. The other end of the cord was wrapped about the neck of the suspended bottle. With this arrangement the preparation of the bottles is rendered easier and quicker. Of the bottles used in the experiments in the Gulf of Genoa, half were fitted with cord of one metre in length and the other half with cord 3 metres long. These couples were consigned, in groups of four at a time, to the captains of the steamers leaving Genoa. The captains filled up the slips as regards the conditions under which the drift bottles were launched and placed them in the upper bottle; then, after having sealed the drift bottles, each couple was dropped in the sea at the position indicated. In accordance with the prescribed instructions the bottles were to be thrown overboard between 1 and 5 miles from the shore, since it was desired on the one hand to avoid the influence which might possibly be exerted on the currents by the configuration of the coast in its immediate vicinity and on the other hand it was desired that the region explored be confined to the zone of action of the supposed coastal current of the Mediterranean.

In the course of the year 1913, 350 other couples were distributed but of these a return was made of only 57 slips representing only one sixth or about 17 % of the number launched. There is reason to believe however that all of the couples were not effectively launched and therefore it is probable that the percentage of bottles recovered based on the number effectively set adrift should not be estimated at less than 20 %.

This number however remains still somewhat small in comparison with the results obtained from the series launched elsewhere in the Mediterranean.

MARINELLI and PLATANIA (2) obtained 40 % on the coast of Sicily; FERUGLIO (1) obtained 36 % in the Adriatic; DANIELLI, MARINELLI and STEFANINI (3) obtained 59 % in the Tyrrhenian Sea in the vicinity of Livorno (Leghorn).

The small percentage obtained in the Bay of Liguria may possibly be attributed to the fact that the coasts, on both shores of Liguria, are preponderantly rocky, so that many of the bottles, if washed on shore, may have been broken on the reefs. Whenever this fact can be established, it should be taken into consideration in deducing the general results of the set of the currents which are being studied; but MARINI, in his preliminary report (4), from which these data have been extracted, has not taken this into account because the fact did not appear to him to have been sufficiently established.

3. MARINI, in his reference to the series of launchings we have discussed in the preceding paragraph, has devoted some space to the determination of which of the two lengths of cord (1 or 3 metres) is preferable for recovery, but in his conclusions he does not decide for either. We quote here the pertinent conclusions in his own words:

“ Of the 57 bottles of which we have knowledge, 24 were with 1 metre and 16 with 3 metres of cord; but for the 17 other couples the launching data gave no indication of the length of cord. Consequently, although the report seems to indicate that the one metre length is preferable, and apart from the objections which arise from having a shallower layer of water covered in the course of the experiment, and therefore a greater influence of the variable surface effects due to the wind, we can arrive at no definite conclusion until we know the exact proportion of drift bottles effectively launched with the two lengths of cord ”.

4. Since the above report was made experiments with floats were renewed in March 1914 (5); in all 169 drift bottles were launched and notification was received of the recovery of 53 couples which constitutes a higher percentage, about 31 %. But during the month of September the above mentioned launchings had to be reduced, and finally suspended, owing to the state of suspicion brought about by the European war, in order to avoid innocent bottles becoming an unfounded source of alarm.

In order to diminish the great percentage of loss due to the breakage of bottles against the rocky coast of Liguria and to avoid the irregular vagrancy of the upper drift bottle when “ freed ” from the lower, recourse was had to a model, suggested by MARINI, different from that which was utilised earlier and which had the advantage also of being more economical.

In this new model the upper float consists of a bottle of ordinary green glass, in the interior of which is placed the slip. Below and coupled to this bottle is a small enamelled iron bucket of which the area and volume are nearly equal to those of the upper drift bottle.

Besides, the entire float is prepared under the direction of the *Istituto Idrografico* and the upper bottle, after the introduction of the slip to be filled up, is suitably ballasted and sealed and is delivered in this condition to the captains who are aiding in the research work. These captains send in a notification of the launching to the *Istituto* on another slip on which is noted the date and the position at which the float was launched.

5. During the period from 1920 to 1922, 212 more bottles were launched in the Gulf of Genoa mostly of the type with the metal bucket described above. Of these 76 were recovered, or about 36 %, which is approximately the same as in 1914.

Of the 53 bottles of 1914, twenty-one (or 40 %) were found coupled together and of these only 5 were found to be entangled or aground as a result of the presence of the metal bucket or lower bottles. Of the 76 bottles of the years 1920 to 1922, 34 (or 45 %) were found coupled together and of these 8 had grounded as a result of the lower bottle or bucket.

6. VERCELLI also, in his thalassographic investigation in the vicinity of the Straits of Messina, made use of coupled bottles (6) similar to those described above by MARINI; but the cord which bound the two bottles together was about 2 metres long. The bottles were set adrift by the vessel in the course of her voyages.

a) Of the 12 appliances launched off the island of Panaria (Aeolian Isles, 27th. September 1922) three were recovered and of these only the upper bottle remained, due to the parting of the line to which the lower bottle was attached.

b) Of the 7 couples launched off Cape Miseno (28th. September 1922) three were recovered, all of which were without the lower bottle.

c) Of the 4 couples launched in the centre of the transversal line at Reggio (6th. October, 1922) three were recovered.

d) Of the 4 couples launched off Cape Armi (6th. October 1922) only a single couple was recovered.

e) The three couples launched mid-way between Cape Armi and San Alessio (6th. October, 1922) were all recovered.

All of the couples launched in the southern part of the Straits (*c*, *d*, and *e*) were recovered in their entirety, while those in the lower Tyrrhenian (*a*, *b*,) were all found with the lower bottle missing.

No explanation can be given for this difference.

7. It is evident that the method of floats, even when every conceivable care has been taken (length of cord, the lower weight being made unbreakable, buoyancy assured, etc.) permits data to be obtained which is but qualitative and purely documentary. Only in exceptional cases is the float recovered a short time after launching and the time and place of the launching and recovery determined with sufficient accuracy to furnish precise data on the velocity of the currents.

Consequently, it is necessary entirely to avoid the use of this method in those areas where the currents are not essentially progressive but alternate periodically with the state of the tide. This conclusion has received the approval of MARINI and VERCELLI.

MARINI adds further: "Such procedure, which certainly possesses the advantage over the others of being more easily and cheaply carried out, may, when used on a large scale, be capable of furnishing certain data of a general nature and is therefore the one which should be employed first for preliminary study in the execution of the programme. But it is necessary to complete the research subsequently with more special means, to follow the floats directly, to take observations of the currents by current meters and to determine the temperature and salinity."

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## NOTES :

1. FERUGLIO. — Primi risultati di esperienze con galleggianti per lo studio delle correnti nel mare Adriatico, *Bollettino del R. Comitato Talassografico Italiano* N° 17 (1912), pag. 295 ; Memoria N° 55 (1916) del R. Comitato Talassografico Italiano.
2. MARINELLI e PLATANIA. — Della corrente litorale del Mediterraneo ecc. *Memorie Geografiche*, published as a supplement to the *Rivista Geografica Italiana*, N° 5, Firenze, 1908.
3. MARINELLI, DANIELLI, STEFANINI. — Esperienze sulle correnti del Tirreno. *Memorie Geografiche* N° 22. Firenze 1908.  
MARINELLI. — Sulla corrente litorale del Golfo di Genova. — *Rivista Geografica Italiana*, Vol. VI, 1909.
4. MARINI. — Lanci di galleggianti per lo studio delle correnti superficiali nel Mar Ligustico eseguiti nel 1914. *Bollettino del R. Comitato Talassografico Italiano* ; N° 29/30, 1914, pag. 93-100.
5. MARINI. — Risultati dei lanci di galleggianti per lo studio delle correnti superficiali del Mar Ligure negli Anni 1914-20-22. *Atti della Società Ligustica di Scienze e Lettere*, pag. 173-230, Genova, 1927.
6. F. VERCELLI. — Il regime delle correnti e delle maree nello stretto di Messina — Ferrari, Venezia, 1925, pag. 155-156.

