



Some Interesting Observations about the Behaviour  
of Plankton in the Artificial Light Field

by  
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In the area of the Bay of Gdańsk some observations were made as to the behaviour of planktonic organisms against an artificial light source. The observations were carried out in winter (from 29th November to 15th December, 1967) and in summer (from 16th to 24th July, 1968). These investigations consisted in constructing an underwater light station and observing the water medium by means of an echo-sounder installed on board. The light station No.2 was equipped with two filament-lamps of Tungsraum type imp. 9266 D A of 1,000 W power, and a working voltage of 110 V. The whole light stream generated by the station amounted to 45,000 lm. Each of the stations No. 3 and 4 was equipped with one mercury lamp of type LRF-250, 250 W and 220 V of working voltage. The light stream of each station amounted to 11,000 lm. Each of the stations 6, 7 and 8 was equipped with one mercury lamp of type LRF-250 in a hermetic housing. The light sources were fed by an aggregate with an internal combustion engine, generating electric power of 2 kW, working voltage 220 V, alternating current 50 Hz.

The observations at stations 2, 3 and 4 were made by using an echo-sounder SP-403 and at stations 6, 7 and 8 by means of an echo-sounder SPN-11. At the time the light station was working, the ship was at anchor. The light source was lowered down to the depth required (10 to 20 m depth) by means of a line. The lowering and taking up of the light source were carried out by hand. In winter the lamps were lit at 17.00 to 17.30 and worked for 3 to 4 hours, in summer they were lit at 21.00 to 21.30 and worked for 1 to 1½ hours.

In all the echograms (the echograms will be shown on slides) can be seen the forming of an echo that was reflected from the masses of plankton, concentrated because of the effect of the light field. Below the plankton cloud probably the fish also concentrated.

One of the peculiarities consisted in the remaining of plankton concentrations at the level of the lowered light source. This is especially conspicuous in echogram No. 2. The thickness of the layer distinctly registered in the echograms, oscillated from 30 to 40 m. When the light station was working a constant increase in plankton concentration per volume unit of water could be seen from the intensity of the reflected signal. In the winter period, during the working of station No.4, an attempt to catch fish was made, but the result was negative. (For that purpose a conus net was used of 2.1 m diameter, 6 m bag length, made of net with meshes of 1 cm). During the working of station No.8 (in summer) a control haul was carried out, using a plankton net in order to ascertain the presence of plankton in the layer reflecting the sound. As a result, a great quantity of plankton was obtained.

At all stations the light source was lifted in order to see if the plankton was following (station 4), and the results were always positive. The speed with which the plankton followed the moving light source in a vertical direction was 5 to 8 m/min.

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It should be emphasised that periodical snow fall of great intensity during the observations at station No.3 caused an increase in plankton concentration. A surface current observed during the observations at station No.8 did not exert any negative effect on plankton concentration around the light source.

The positive reaction of plankton independent of the source of light used (filament or mercury lamps), shows either a slight dependence or an entire independence of spectral composition of the light.

Taking into consideration the considerable speed of concentrating (a period of 15 to 20 minutes), as well as the ability to follow the lifting up of the light source, a large migration rate of plankton in both a vertical and a horizontal direction could be ascertained. In the case of station No.8, even the ability of plankton organisms to overcome a rather strong surface current was observed.

The author is aware of the fact that the results obtained so far are only fragmentary. However, at present he has no possibility of making further experiments on this topic, so he restricts himself only to advise other investigators as to the possibilities in this field of research.

Three echograms will be shown as an illustration to this contribution, representing the phenomenon of plankton concentrating due to the effect of artificial illumination at three station, Nos. 4, 6 and 8 as mentioned above.