The importance of fouling in the harbour of Ostend in 1964

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EXTRAIT: **L'importance de la salissure dans le port d'Ostende en 1964.** Début juin 1964, plusieurs cadres dotés de lames de nature différente furent immergés dans le port d'Ostende dans le but de détecter des différences éventuelles dans la colonisation des substrats. Deux mois plus tard, l'expérience dut déjà être interrompue, les cadres étant entièrement recouverts de boue. Ceci rendait toute analyse d'une lame à l'autre impossible. Nous avons trouvé que cet énorme envahissement était dû à l'accumulation progressive d'un polychète tubuleux: *Polydora ciliata* (JOHNSTON). La liste des organismes présents dans la boue a été dressée.

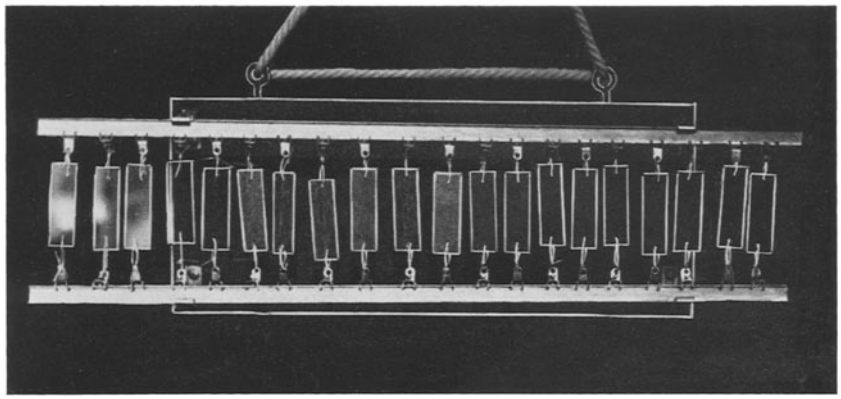

Fig. 1: Frame with slides at the moment of immersion (June 1, 1964)

On June 1, 1964, during our investigations on fouling, we submerged several frames with slides (Fig. 1) in the harbour of Ostend, Belgium (Fig. 2), from the terminus of the car-ferry Ostend-Dover. These devices, which were suspended by nylon cord from a raft[1], were submerged to a depth of about 1.5 m.

As test substrata we chose slides of glass, wood, iron, and iron coated with an antifouling paint. The dimensions of the slides were those of usual glass microscope slides

[1] We are indebted to the Administration of the Marine and Interior Navigation who very kindly put the raft at our service.

(7.5×2.5×0.1 cm). The various materials used would allow the detection of differences in the nature, speed and amount of colonization of substrata of different natures. After one month, on July 1, 1964, the first frame was taken out and the slides examined normally.

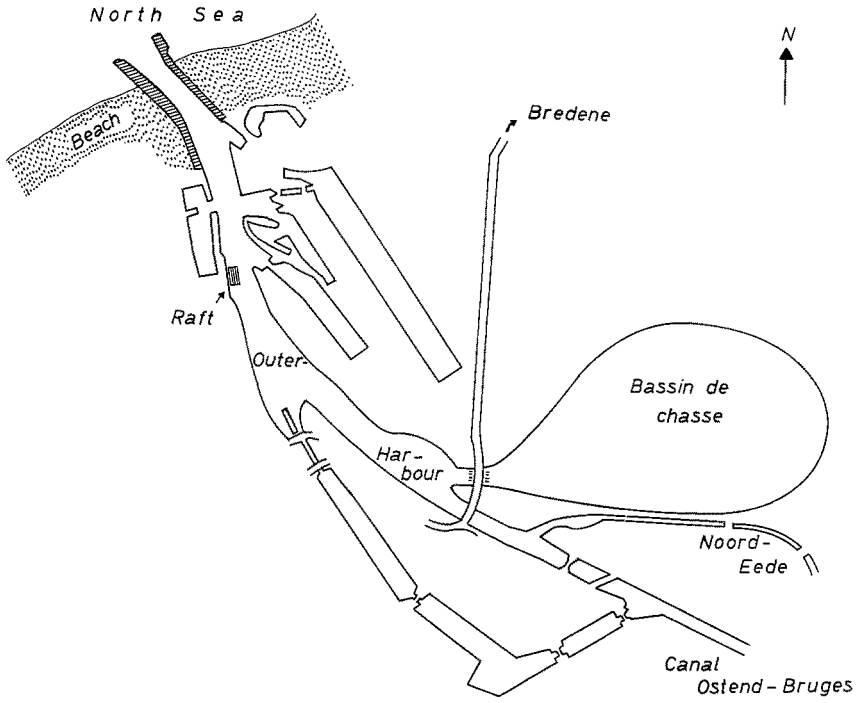

Fig. 2: Harbour area of Ostend (Flanders, Belgium), showing the location of the raft from which frames with slides were suspended and submerged into the harbour water

When we took out the second frame, on August 1, 1964, we found, greatly to our surprises, that it was entirely covered with a black layer of mud of several centimeters in thickness, which had filled not only the spaces between adjacent slides but also the gap of about 10 cm between slides and the supporting frame plates (Fig. 3).

At the moment of immersion the frame and counterpoise weighed about 8 kg, but when we took it out, it weighed more than 30 kg. Although a comparative qualitative and quantitative analysis of single slides was impossible, we nevertheless examined the mud covering the whole frame. In so doing, we found that the main overgrowth was due to the progressive accumulation of the tubes of a sedentary polychaete *Polydora ciliata* (JOHNSTON 1938). Between these tubes, which were composed of sand, mud particles, diatoms and planktonic detritus, we found a large number of sessile and free-living organisms belonging to several very different groups and constituting innumerable micro-biocoenoses in the smallest interstices.

Below is the list of the organisms which we were able to identify.

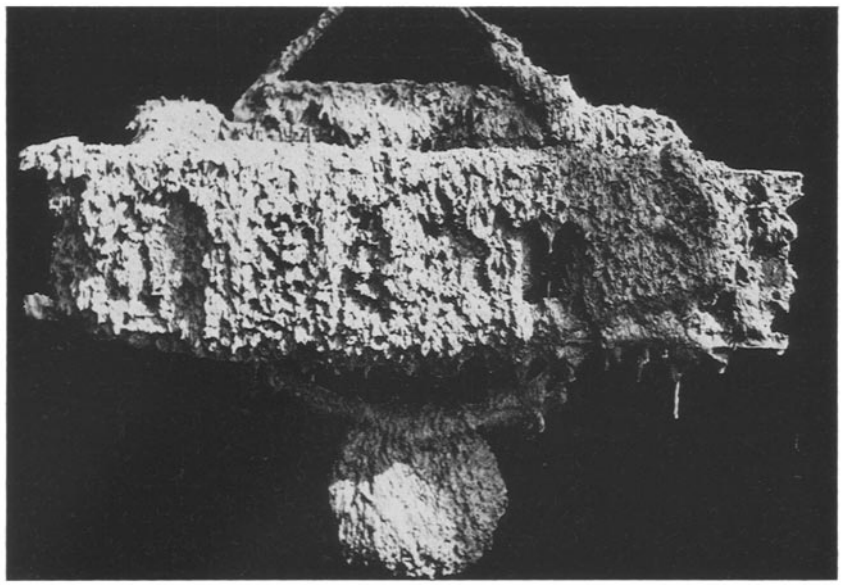

Fig. 3: The same frame as shown in Figure 1 with counterpoise, two months later (August 1, 1964)

Protophyta. Schizophyceae: *Microcystis* sp., *Oscillatoria* sp. Schizomycetes (filamentous forms only): *Beggiatoa alba* (VAUCHER), *Beggiatoa arachnoidea* (AGARDH), *Beggiatoa leptomitiformis* TREVISAN, *Gallionella ferruginea* EHRENBERG, *Leucothrix mucor* OERSTED, *Microscilla marina* PRINGSHEIM, *Sphaerotilus natans* KUTZING, *Thiothrix marina* MOLISCH, *Vitreoscilla* sp., sp. div.

Thallophyta. Chlorophyceae: *Ankistrodesmus falcatus* (CORDA) RALFS, *Enteromorpha intestinalis* LINK *var. compressa, Pediastrum duplex* MEYEN, *Scenedesmus acuminatus* (LAGERHEIM) CHODAT, *Scenedesmus opoliensis* RICHTER, *Scenedesmus quadricauda* (TURPIN) DE BREBISSON. Bacillariophyceae: *Achnanthes brevipes* AGARDH, *Achnanthes Hauckiana* GRUNOW, *Actinocyclus Ehrenbergi* RALFS, *Actinocyclus Ehrenbergi* RALFS *var. Ralfsii, Actinoptychus splendens* (SHADBOLT) RALFS, *Actinoptychus undulatus* (BAILEY) RALFS, *Amphora* sp., *Anomoeoneis sculpta* (EHRENBERG) CLEVE, *Asterionella japonica* CLEVE, *Aulacodiscus argus* (EHRENBERG) SCHMIDT, A., *Biddulphia aurita* (LYNGBYE) BREBISSON-GODEY, *Biddulphia granulata* ROPER, *Biddulphia regia* (SCHULTZE) OSTENFELD, *Biddulphia rhombus* (EHRENBERG) SCHMITH, W., *Biddulphia sinensis* GREVILLE, *Campylosira cymbelliformis* (SCHMIDT, A.) GRUNOW, *Cerataulus Smithii* RALFS, *Cocconeis clandestina* SCHMIDT, A., *Cocconeis scutellum* EHRENBERG, *Coscinodiscus cinctus* KUTZING, *Coscinodiscus excentricus* EHRENBERG, *Coscinodiscus lineatus* EHRENBERG, *Coscinodiscus nitidus* GREGORY, *Coscinodiscus oculis iridis* EHRENBERG, *Coscinodiscus radiatus* EHRENBERG, *Cyclotella striata* (KUTZING) GRUNOW, *Cymatopleura elliptica* (BREBISSON) SMITH, W., *Cymatosira belgica* GRUNOW, *Cymbella cistula* HEMPR., *Cymbella* sp., *Diatoma vulgare* BORY, *Diploneis bombus* EHRENBERG, *Diploneis Crabro* EHRENBERG, *Diploneis didyma* EHREN-

BERG, *Diploneis Smithi* (BREBISSON) CLEVE, *Diploneis splendida* (GREGORY) CLEVE, *Gomphonema constrictum* EHRENBERG, *Grammatophora hamulifera* KUTZING, *Grammatophora oceanica* (EHRENBERG) GRUNOW, *Grammatophora serpentina* (RALFS) EHRENBERG, *Melosira arenaria* MOORE, *Melosira islandica* MULLER, *Melosira Juergensi* AGARDH, *Melosira sulcata* (EHRENBERG) KUTZING, *Melosira westii* SMITH, W., *Navicula* AGARDH, *Melosira sucata* (EHRENBERG) KUTZING, *Melosira westii* SMITH, W., *Navicula anglica* RALFS, *Navicula cuspidata* KUTZING, *Navicula distans* (SMITH, W.) VAN HEURCK, *Navicula forcipata* GREVILLE, *Navicula monilifera* CLEVE, *Navicula peregrina* (EHRENBERG) KUTZING, *Navicula rhynchocephala* KUTZING, *Navicula spectabilis* GREGORY, *Navicula viridula* KUTZING, *Navicula* sp., *Nitzschia apiculata* (GREGORY) GRUNOW, *Nitzschia constricta* (KUTZING) RALFS, *Nitzschia lanceolata* SMITH, W., *Nitzschia navicularis* (BREBISSON) GRUNOW, *Nitzschia punctata* (SMITH, W.) GRUNOW, *Nitzschia sigma* SMITH, W., *Nitzschia* sp., *Plagiogramma leve* (GREGORY) RALFS, *Plagiogramma Van Heurckii* GRUNOW, *Pleurosigma angulatum* (QUEK) SMITH, W., *Pleurosigma naviculaceum* DE BREBISSON, *Pleurosgima* sp., *Podosira stelliger* (BAILEY) MANN, *Raphoneis amphiceros* EHRENBERG, *Raphoneis belgica* GRUNOW, *Raphoneis surirella* (EHRENBERG) GRUNOW, *Rhizosolenia imbricata* BRIGHTWELL *var. shrubsolei, Rhizosolenia setigera* BRIGHTWELL, *Rhizosolenia styliformis* BRIGHTWELL, *Sceletonema costatum* (GREVILLE) CLEVE, *Stauroneis parvula* GRUNOW, *Stauroneis phoenicenteron* EHRENBERG, *Surirella ovata* KUTZING, *Synedra tabulata* (AGARDH) KUTZING, *Synedra ulna* (NITZSCH.) EHRENBERG, *Tabellaria fenestra* (LYNGBYE) KUTZING, *Thalassionema nitzschioides* GRUNOW, *Thalassiosira decipiens* (GRUNOW) JORGENSEN, *Triceratium alternans* BAILEY, *Triceratium favus* EHRENBERG.

Protozoa. Rhizopoda: *Amoeba* sp., *Pelomyxa* sp., *Thecamoeba* sp., Sp. div. Flagellata: *Bodo* sp., *Distephanus speculum* EHRENBERG, *Monas* sp., *Pteridomona* sp., *Salpingoeca urceolata* KENT, Sp. div. Ciliata: *Acineta tuberosa* EHRENBERG, *Actinotricha saltans* COHN, *Aspidisca fusca* KAHL, *Aspidisca polypoda* (DUJARDIN), *Aspidisca steini* (V. BUDDENBROCK), *Aspidisca* sp., *Carchesium* sp., *Chilodonella helgolandica* KAHL, *Condylostomum rugosum* KAHL, *Cothurnia maritima* EHRENBERG, *Corynophrya lyngbyei* (EHRENBERG), *Cyclidium* sp., *Dysteria ovalis* (GOURRET-ROESER), *Dysteria* sp., *Euplotes elegans* KAHL *forma littoralis, Euplotes gracilis* KAHL, *Euplotes mutabilis* TUFFRAU, *Euplotes vannus* MULLER *var. balticus, Euplotes* sp., *Folliculina gigantea* DONS, *Holosticha diademata* (REES), *Holosticha milnei* KAHL, *Holosticha* sp., *Keronopsis rubra* (EHRENBERG), *Keronopsis rubra* (EHRENBERG) *var. flava, Keronopsis* sp., *Lembus longivelatus* KAHL, *Litonotus* sp., *Placus socialis* FABRE-DOMERGUE, *Stichotricha marina* STEIN, *Strobilidium minimum* (GRUBER), *Trachelocerca phoenicopterus* COHN, *Trochilia salina* ENTZ, *Trochilia sigmoides* DUJARDIN, *Trochilia sulcata* (CLAPAREDE-LACHMANN), *Trochilioides recta* KAHL, *Uronema marinum* DUJARDIN, *Vorticella marina* GREEFF, *Vorticella nebulifera* MULLER, *Vorticella perlata* KAHL, *Vorticella* sp., *Zoothamnion commune* KAHL, Sp. div.

Coelenterata. Hydrozoa: *Laomedea exigua* SARS, *Tubularia larynx* ELLIS-SOLANDER. Anthozoa: Immature forms.

Bryozoa. *Bowerbankia gracilis* LEIDY, *Farrella repens* (FARRE), *Membranipora pilosa* LINNE.

Mollusca. Lamellibranchia: *Mytilus edulis* LINNE.

Vermes. Nematoda: *Metaparoncholaimus campylocercus* (DE MAN), *Monhystera disjuncta* BASTIAN, *Monhystera parva* (BASTIAN), *Prochromadorella germanica* (BUTSCHLI), *Theristus acer* BASTIAN. Polychaeta: *Fabricia sabella* (EHRENBERG), *Nereis kerguelensis* (MCINTOSH), *Polydora ciliata* (JOHNSTON). Rotifera: *Colurella colurus* (EHRENBERG), *Encentrum marinum* (DUJARDIN), *Proales reinhardti* (EHRENBERG.

Crustacea. Amphipoda: *Corophium insidiosum* CRAWFORD. Cirripedia: *Balanus improvisus* DARWIN, *Elminius modestus* DARWIN. Copepoda: *Euterpina acutifrons* (DANA), *Mesochra pygmaea* (CLAUS), *Nitocra typica* BOECK, *Tisbe furcata* (BAIRD). Decapoda: *Carcinus maenas* (LINNE) (juvenile forms).

The quantity and diversity of the species present sufficiently illustrate the complexity of the settling of organisms on submerged surfaces. Diatoms and ciliates were by far the most abundant of the groups present, at least as regards the number of species, consisting of up to 70 % of the total number of organisms present (diatoms 50 %, ciliates 20 %).

It is not improbable, however, when we consider the planktonic or benthic origins of certain of the species cited, that they are present in the periphyton only by chance.

Better knowledge of the trophic relations existing between these sessile and free-living organisms, and their interrelationships with the plankton could be of great help in elucidating certain aspects of the biological and economic problem of fouling.

SUMMARY

1. Frames with slides of different nature were submerged in the harbour of Ostend, Belgium, on the first of June 1964, to detect qualitative and quantitative differences in their fouling.
2. After two months the devices were covered with a black mud-layer of several centimeters in thickness, which made a detailed analysis of the slides impossible.
3. Examination of this mud revealed that the tubulous polychaete *Polydora ciliata* (JOHNSTON) was the primary cause of this enormous overgrowth.
4. A list of the species found in the mud is given.

ACKNOWLEDGMENTS

We should like to thank Prof. Dr. F. EVENS, Director of the "Biogeografisch Instituut en Laboratorium voor Oekologie" of the University of Ghent, and Dr. E. LELOUP, Director of the "Zeewetenschappelijk Instituut" of Ostend, for their advice and criticism during this investigation.