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EXPLOSIVE DEVELOPMENT OF *STYELA CLAVA* HERDMAN, 1882,
IN THE NETHERLANDS AFTER ITS INTRODUCTION
(TUNICATA ASCIDIACEA)

D.A.G. BUIZER

ABSTRACT

Distribution and explosive development of the introduced ascidian *Styela clava* Herdman, 1882, in the Netherlands is described. Notes on the ecology and origin of the Dutch population are given.

INTRODUCTION

Styela clava Herdman, 1882, (fig. 1) is an indigenous ascidian in the Sea of Okhotsk and the coasts of Korea, Japan and Siberia (Millar, 1960). The species was recorded for the first time in the Plymouth area (U.K.) in 1953, and described as a new species: *Styela mammiculata* Carlisle, 1954. In 1960 this species was synonymised with *Styela clava* Herdman, 1882, by Millar. After its introduction on the south coast of the United Kingdom it spread over neighbouring coasts of W. Europe. Records are known from Southampton (Holmes, 1969), Hampshire (Houghton &

Millar, 1960), Wales (Coughlan, 1969) (all U.K.), Cork area (Guiry & Guiry, 1973) (Ireland), Dieppe (Monniot, 1970), Dinard (Huwae & Lavaleye, 1975) and Ambleteuse (R. Houtenbos, pers. comm.), (all France). In 1974 the species was first recorded in the Netherlands in Den Helder harbour (Huwae, 1974). Holmes (1976) reported the species from the southern hemisphere in Hobsons Bay, Victoria, Australia.

EXPLOSIVE DEVELOPMENT IN THE NETHERLANDS

A small population was discovered in Den Helder

harbour in 1974, and a few months later the species settled at the nearby harbour of the Texel ferry (Huwae, 1974). In 1976 a large population was recorded on the pontoons in the navy harbour in Den Helder. In autumn 1974 it was first found in the Eastern Scheldt (S.W. Netherlands) (Westerweel, 1975). Despite numerous collecting trips to the area it lasted until the spring of 1976 before the species was discovered again. At that time a large population was present on the walls of the sluices at Wemeldinge. A density of up to 300 specimens/m² was recorded; Sandee a.o. (1980) recorded a maximum density of 500 specimens/m² during subtidal diving investigations in the summer of 1979. From that time (1976) *Styela clava* spread all over the Eastern Scheldt (see map) and presumably the whole area will be populated. In spring 1980 the species was recorded for the first time in lake Grevelingen (see map).

ECOLOGICAL OBSERVATIONS

The density noted before (300 specimens/m²) can be found at several localities along the Eastern Scheldt. The substrate is mostly hard: stones, brick, iron, wood, but occasionally softer, like peat. The test of *Styela clava* itself forms also a very suitable substrate for young specimens of its own species, but also for other species. Recorded from it are four species of sponges, five species of ascidians, at least four species of hydroids, at least four species of bryozoans, several species of brown, red and green algae, and several species of diatoms. In the organic mass covering the test of *Styela clava* several nematodes have been found. According to Holmes (1969) *Styela clava* prefers an already fouled substrate, but we cannot confirm that statement for the Dutch population. According to Holmes (1969) room for the placement of *Styela clava* supposedly is present after the death of part of earlier settled populations of the ascidian *Asciditella aspersa* (Müller, 1776).

In the Eastern Scheldt the bathymetrical distribution ranges from depths of about fifteen metres up to the intertidal zone. Tidal exposition is recorded for some of the localities where the species is present, where shelter is found under

stones.

The species is able to withstand a great temperature range. Holmes (1969) found a range from 2° to 23° C under laboratory conditions, and from 10° to 23° C from the Hobsons Bay (Holmes, 1976). In the Eastern Scheldt more extreme values are recorded in some years (-2° to 22° C), and also in the severe winter of 1979 no increased mortality was observed.

Styela clava is a newly introduced species and there seems to be no competition with other sessile species up till now.

ORIGIN OF THE DUTCH POPULATION

According to several authors (e.g. Houghton & Millar, 1960; Millar, 1971) the European extension of *Styela clava* is due to settlement and transport on ship's hulls as a fouling organism. Settlement of the species for both localities in the Netherlands must be explained likewise. The free swimming larvae live only 24-28 hours under laboratory conditions (Holmes, 1969), too short to cover the distance between nearby populations (Plymouth, U.K. and Pas-de-Calais, France) and the Netherlands. Oyster fishermen volunteered that *Styela clava* was imported together with oysters from the Mediterranean, but up till now the species has not been recorded there. Introduction of the species with oysters from the United Kingdom is also not very likely, because import is not known from 1974. The oyster industry is afraid that *Styela clava* will become a new oyster pest like the slipper limpet - *Crepidula formicata* (Linnaeus, 1758).

Study of the Dutch population of *Styela clava* is in progress.

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D.A.G. Buizer
 c/o Institute of Taxonomic Zoology
 University of Amsterdam
 Plantage Middenlaan 53
 1018 DC Amsterdam
 The Netherlands

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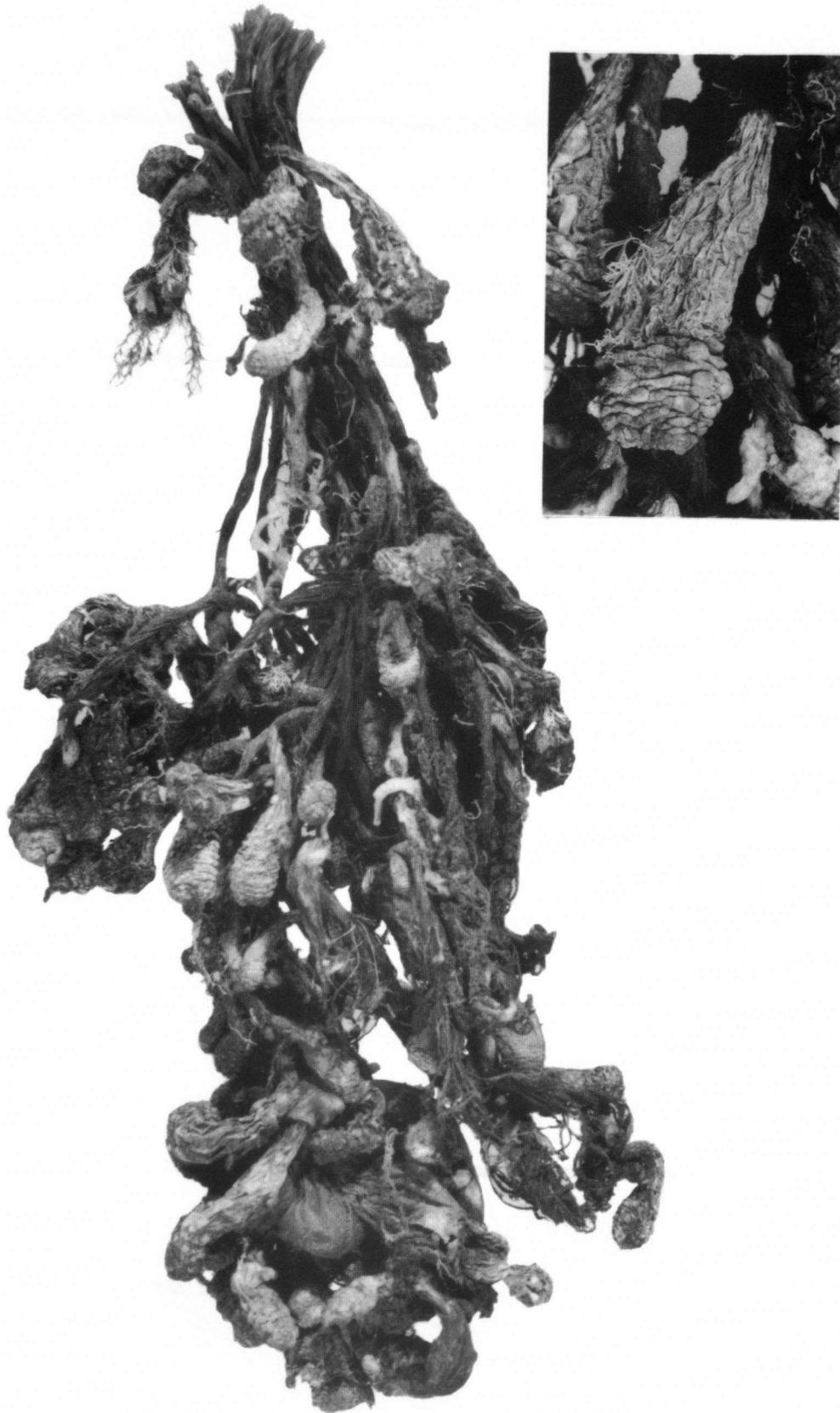


Fig. 1. *Styela clava* on a rope; Wemeldinge, November 1977. Coll. ZMA Both X 0.5.

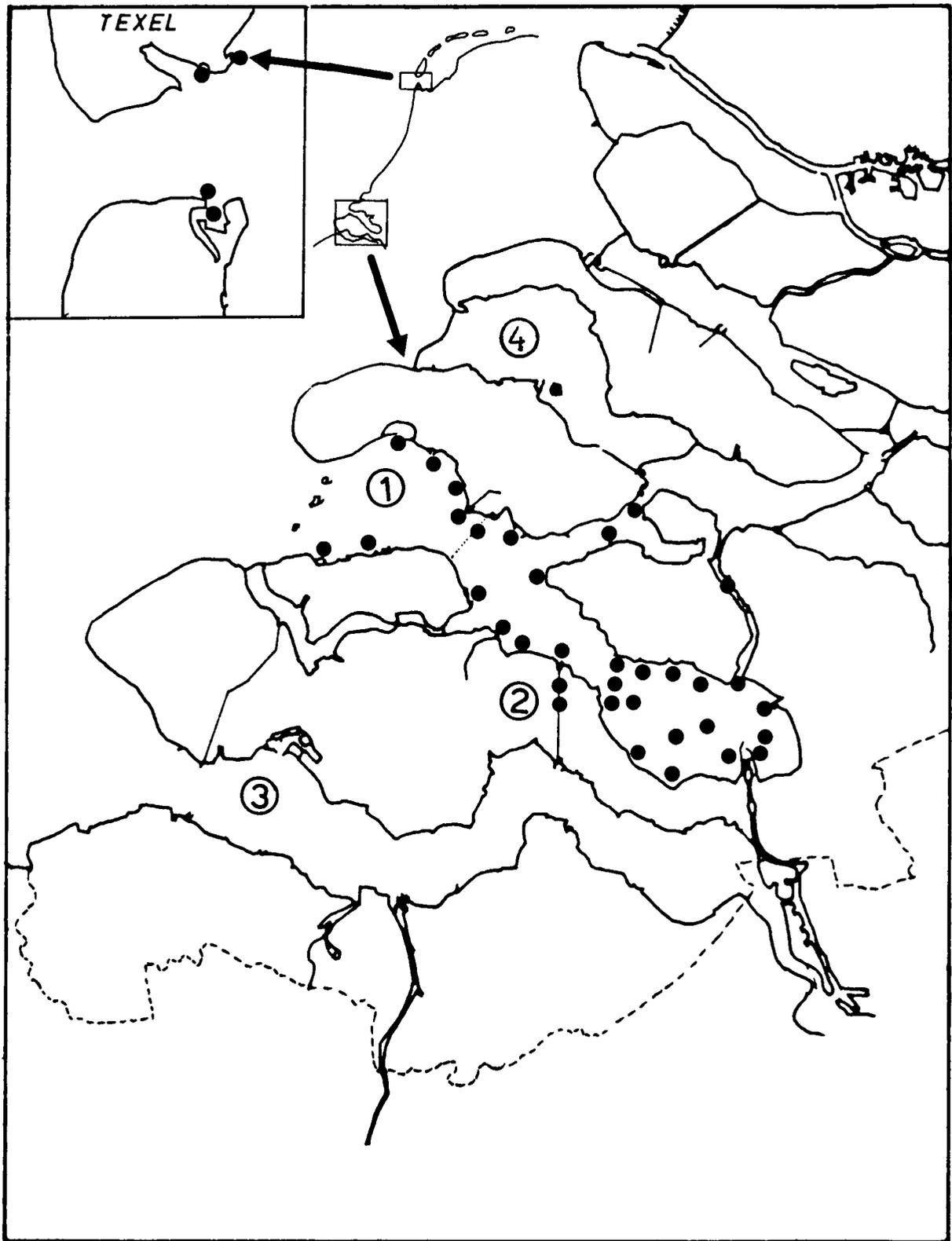


Fig. 2. Distribution of *Styela clava* in the Texel - Den Helder area (upper left inset) and the southeastern part of the Netherlands. 1, Eastern Scheldt; 2, Canal through Beveland, salt/brackish water; 3, Western Scheldt; 4, Lake Grevelingen.