Beschadigde schelpen hebben meer te vertellen

Spoorzoeken op schelpen

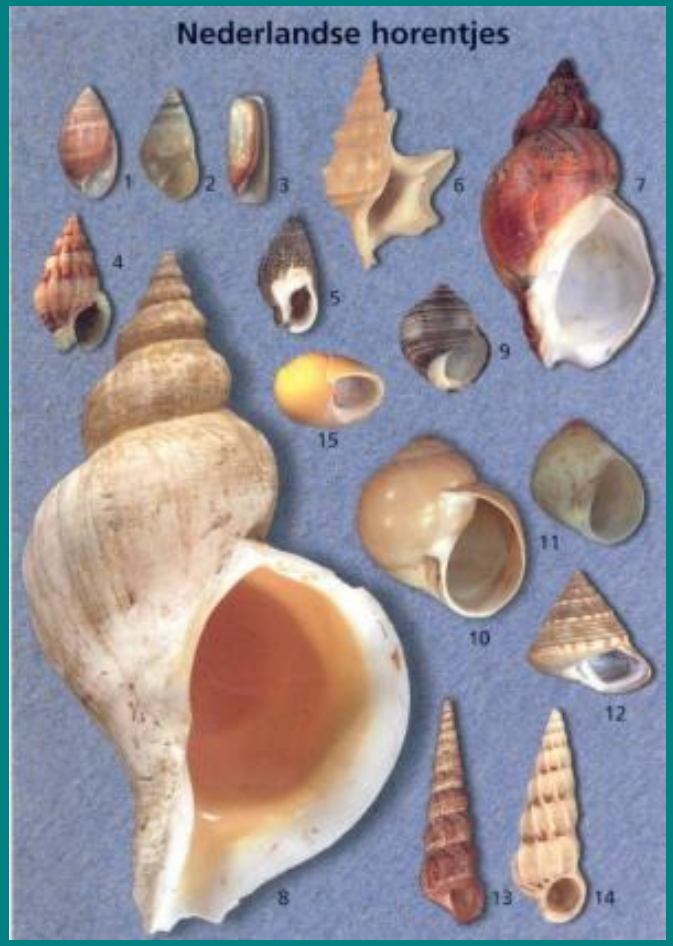
Gerhard C. Cadée

Kon. NIOZ, Texel

Oostende 17-2-2019

Van Zoologisch Station Den Helder tot NIOZ op Texel

We verzamelen graag hele en puntgave schelpen



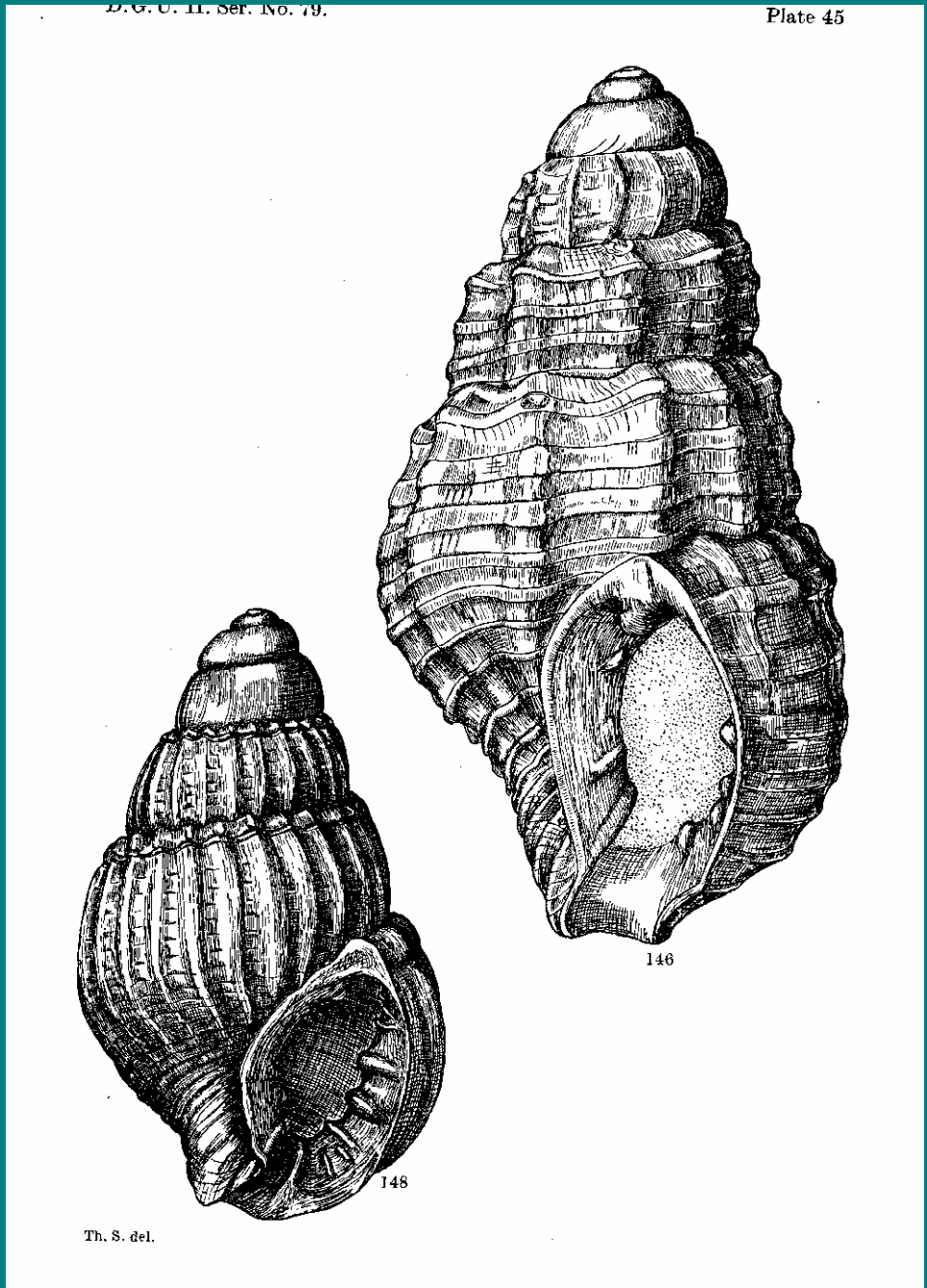
NIOZ ansicht , Foto B. Aggenbach

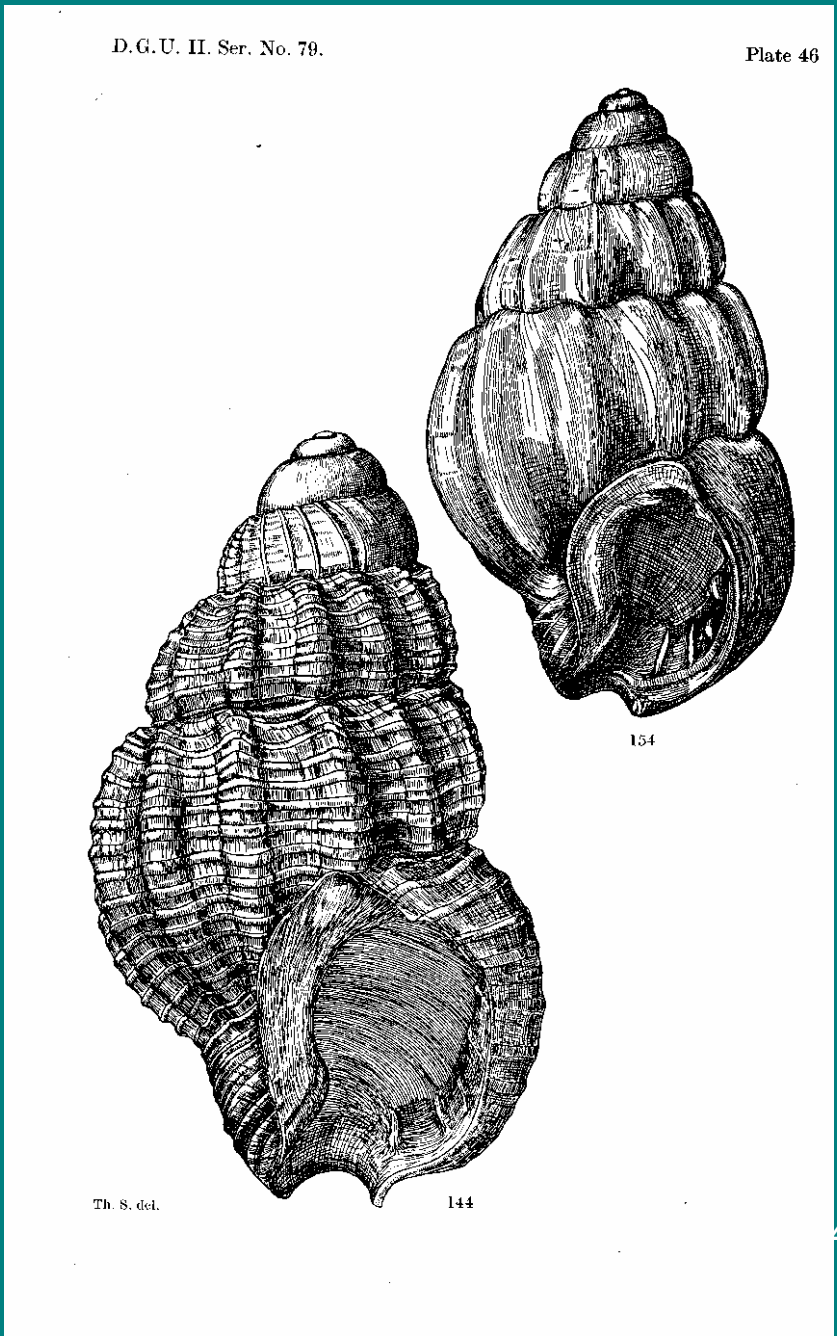
Trivia monacha Foto C. Brochard

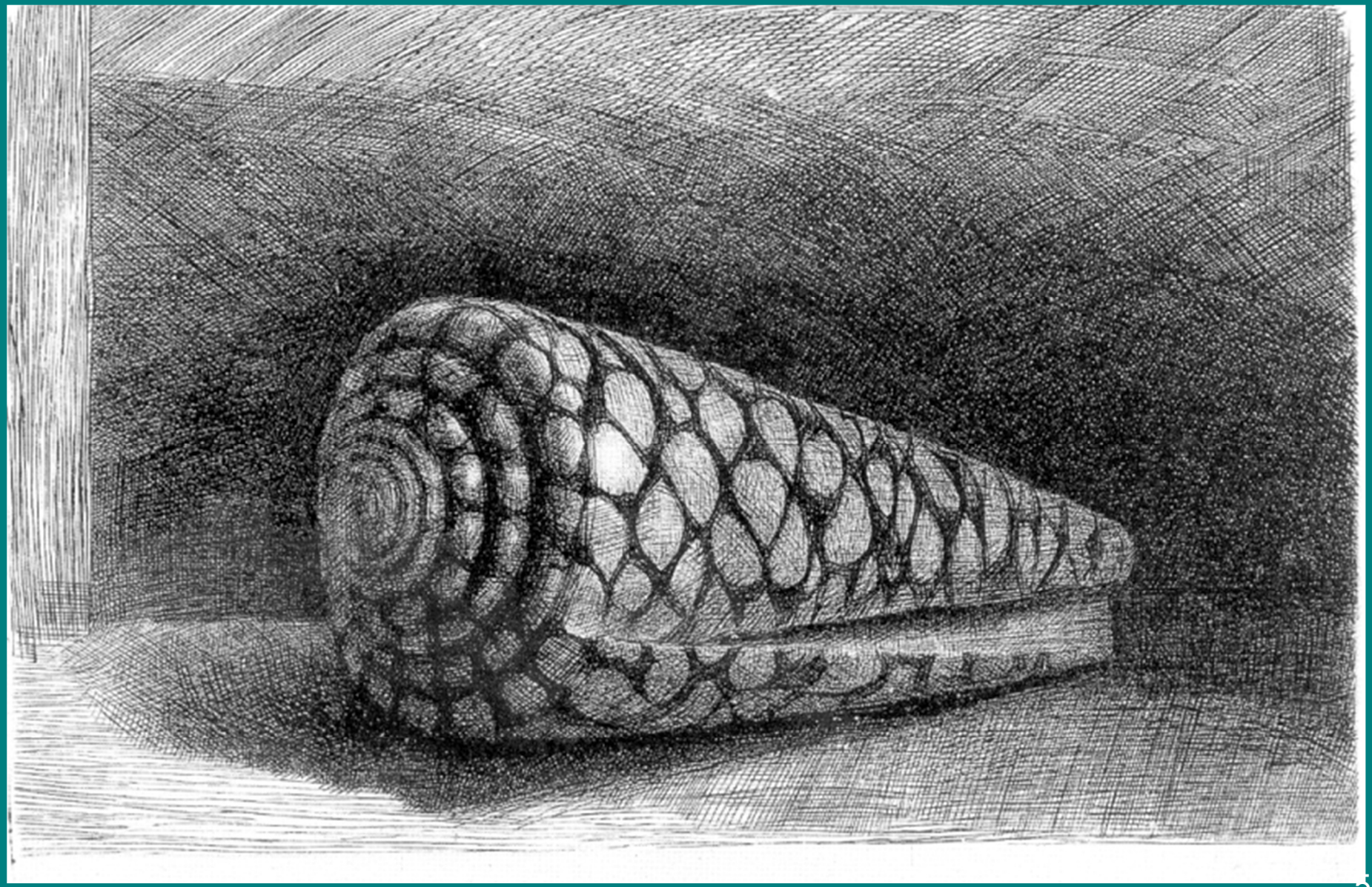
Murex cabriti

Dat geldt ook voor fossiele schelpen

(*Tekeningen van Th. Sorgenfrei*)







Ets Rembrandt

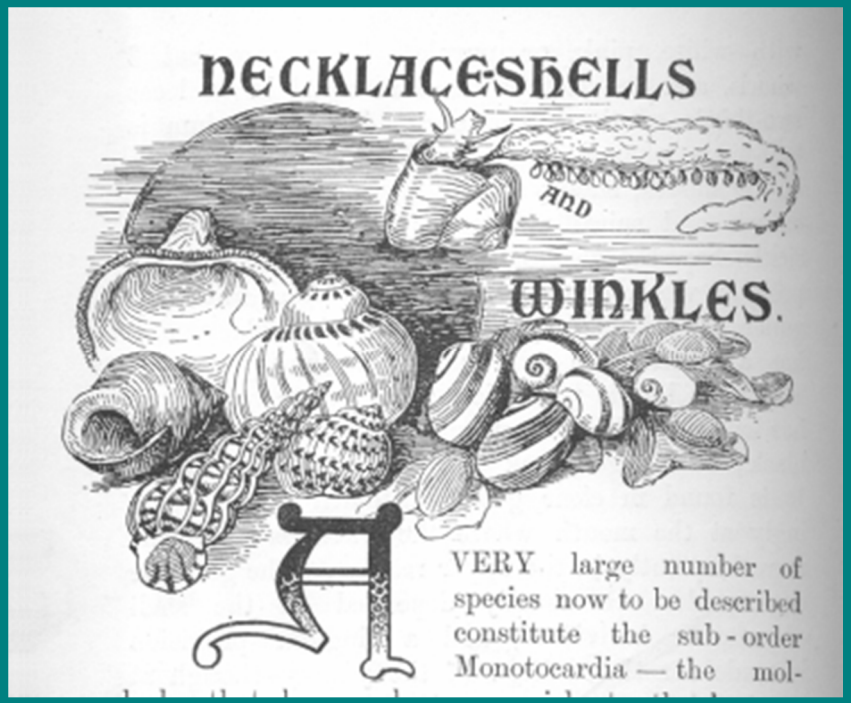
Onze voorouders waren ook al verzamelaars

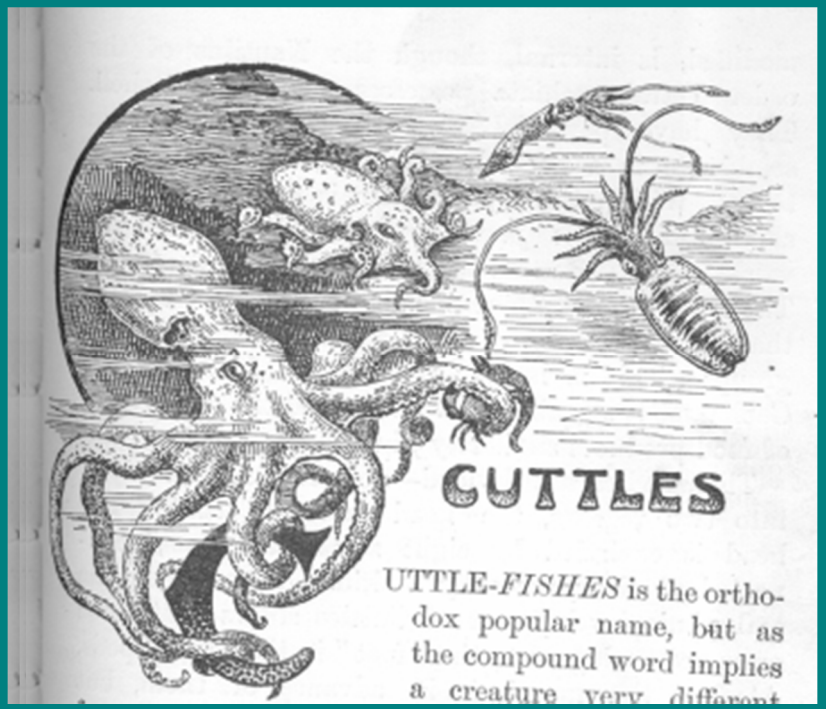
Balthazar van der Ast plm 1640 schelpen stilleven (Boymans, R'dam)

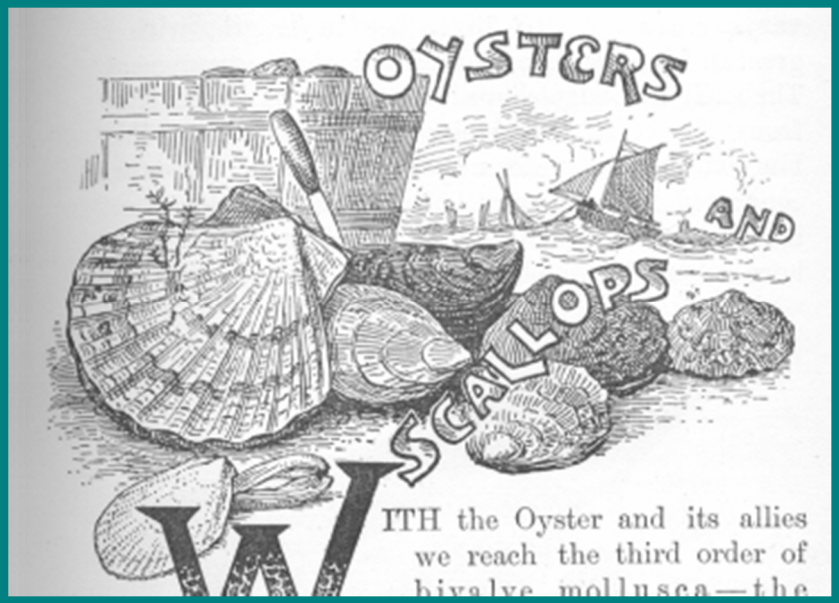
Kunstkabinet Frans Francken
de Jongere 1617 Antwerpen

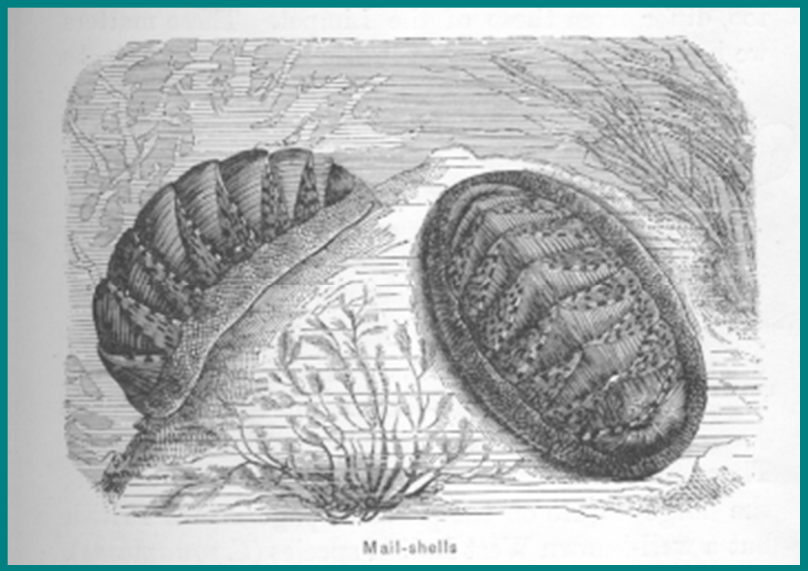
Detail met tropische zaden

Schelpen zijn het skelet van weekdieren





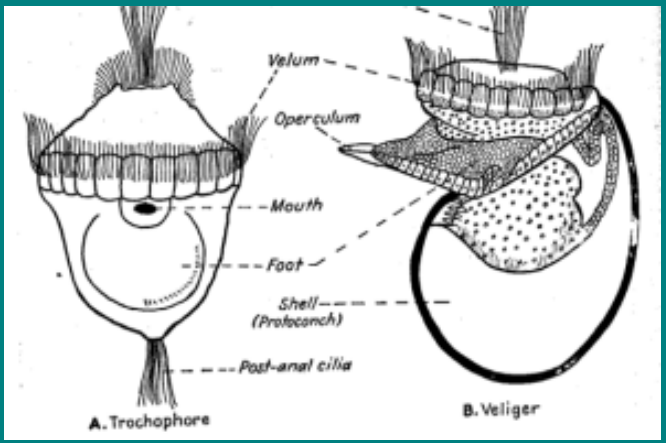


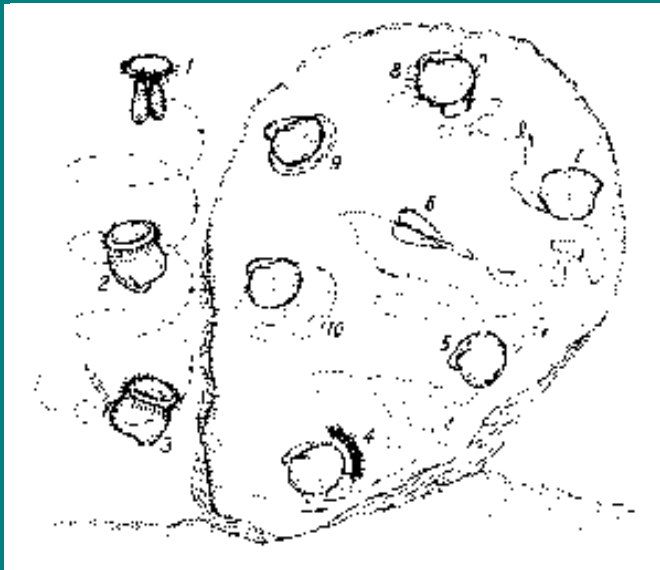


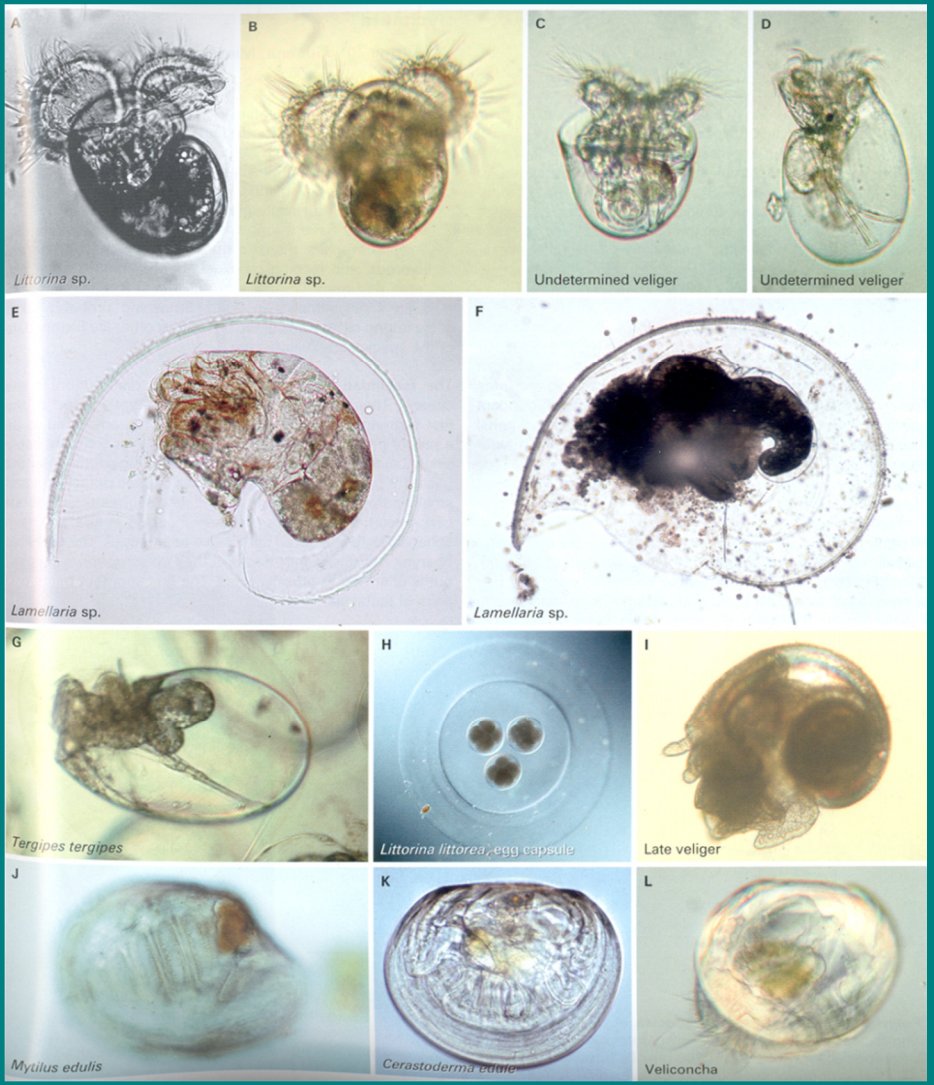
Indeling schelpdieren; vignetten uit Step (1901) *Shell Life*

Een schelp is het huis en het skelet van een weekdier

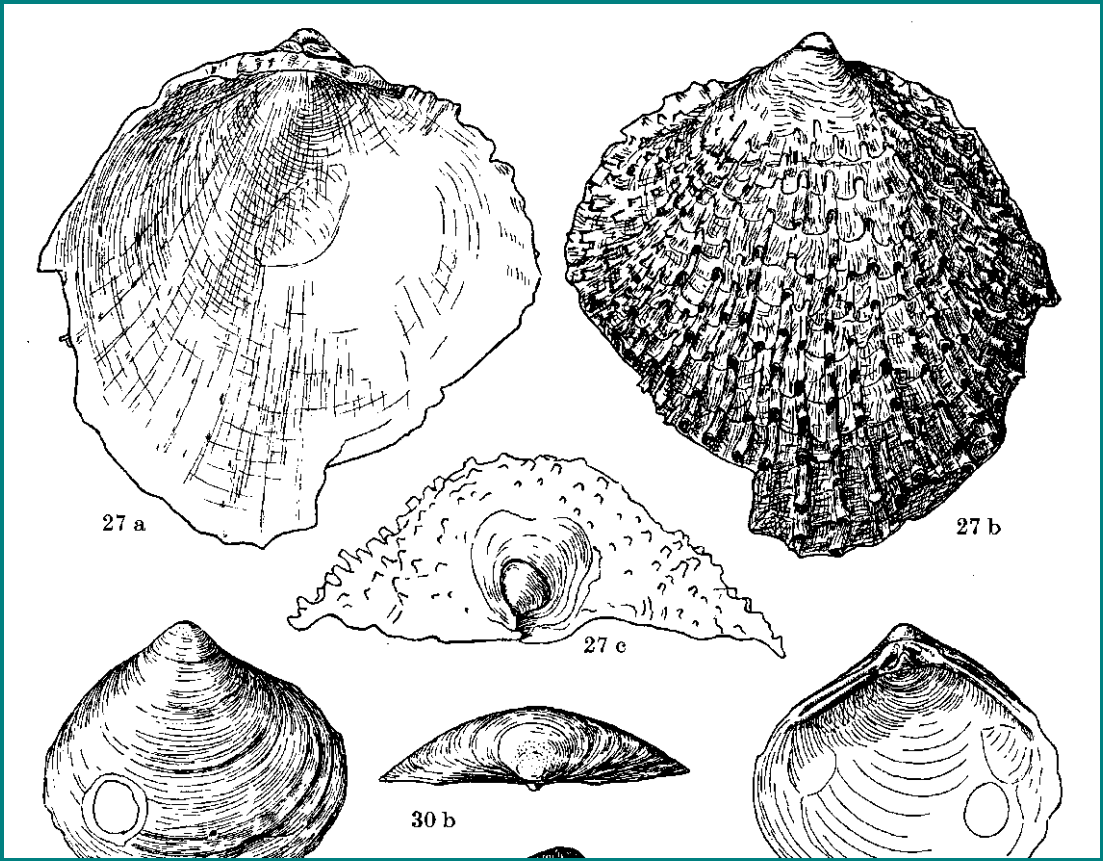
Schelpen zijn het skelet van weekdieren, als veliger-larve hebben zij al een schelpje en dat groeit met ze mee

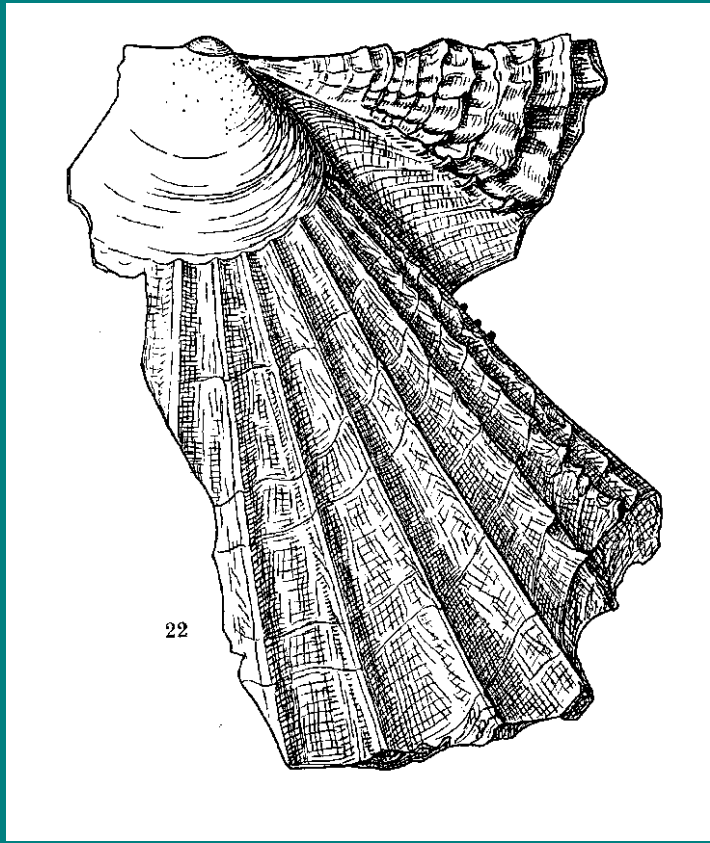






Larvale schelpje vaak andere sculptuur dan adulte schelp





Uit Sorgenfrei 1958 M Mioc. DK

De grootte van de larvale schelp geeft informatie over larvale levenswijze: wel of niet planktonisch

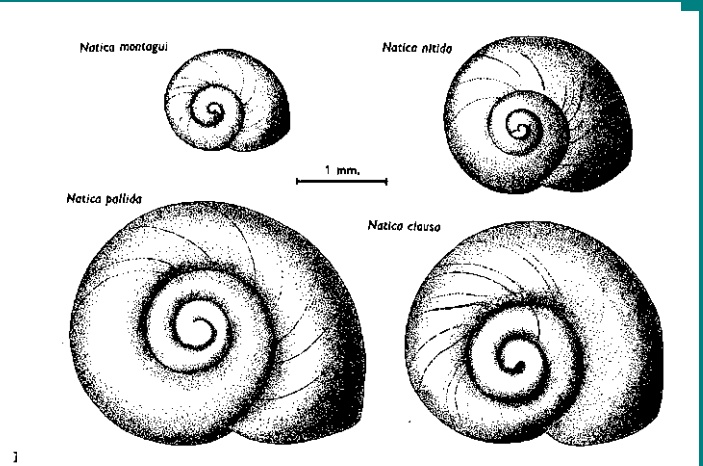
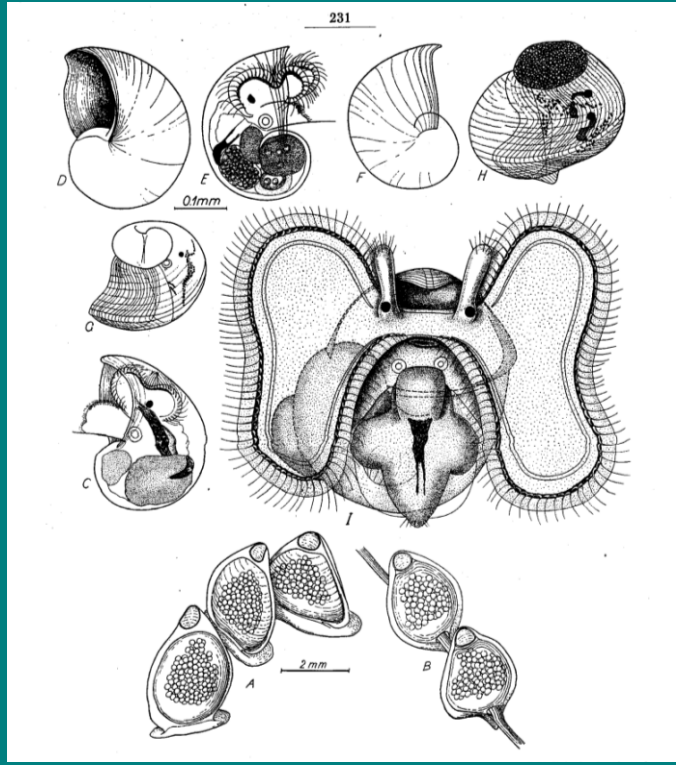
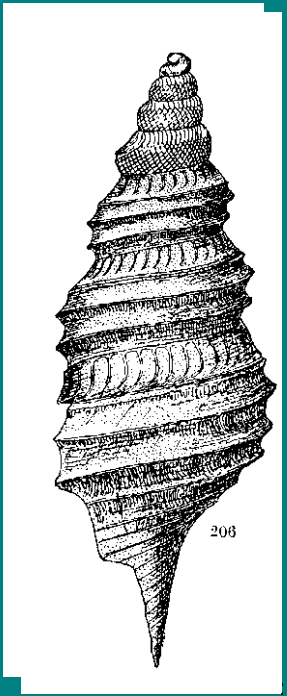


Fig. 6. Top-whorls of four species of the prosobranch genus *Natica* showing two species with a pelagic (above) and two species with a non-pelagic larval development (below).

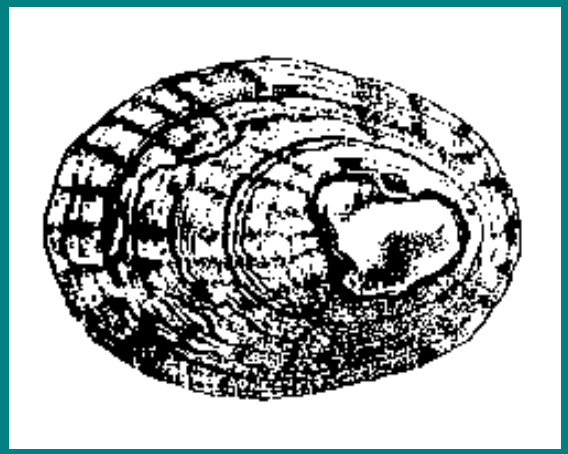




Wulk eieren en larvale schelp

Groeilijnen en jaarringen op schelpen

Kapotte schelpen niet alleen maar ‘lelijk’
Hoe raakten zij beschadigd??



napslak

wulk

Oester

Mijn interesse begon in de Ria de Arosa

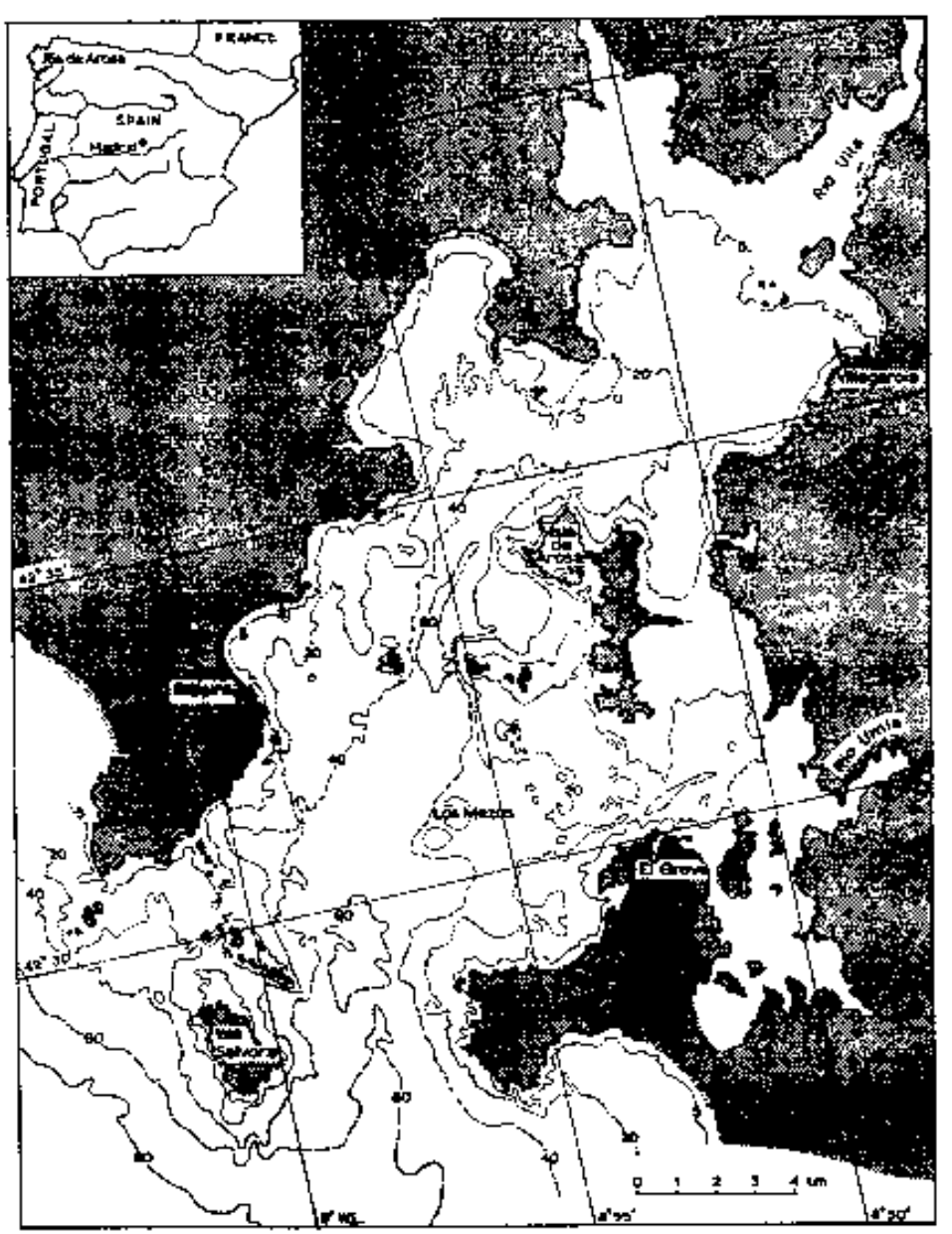
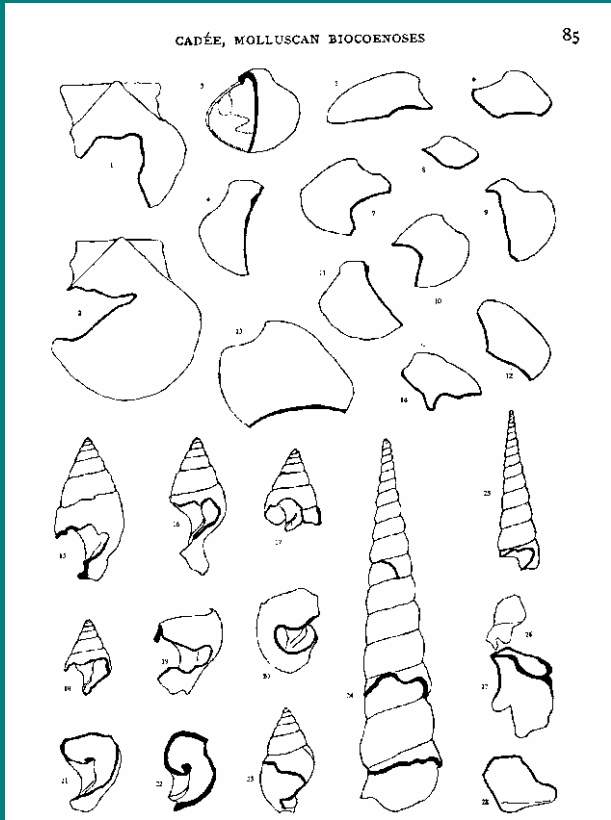
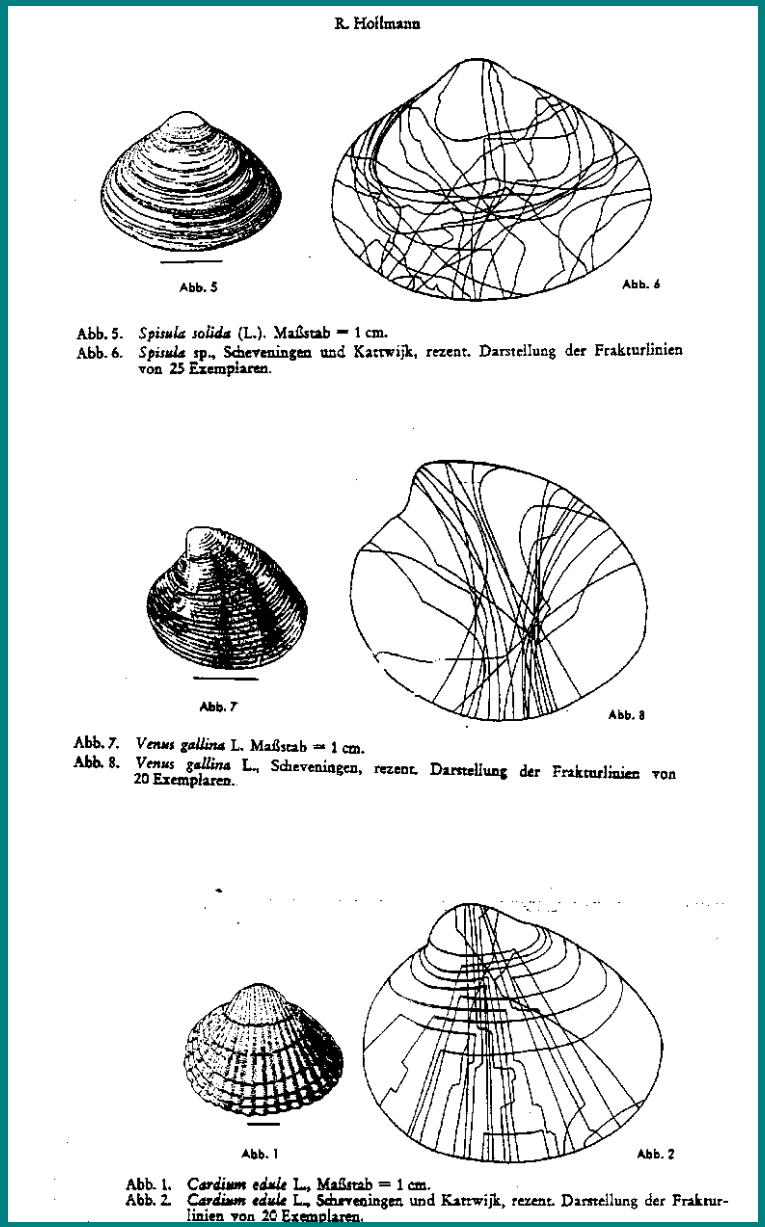


Fig. 1. Situation map and bathymetry of the Ria de Arosa.



Een minder geschikt stukje strand voor dit soort onderzoek

Schelpen vertonen karakteristieke manier van kapot gaan in branding

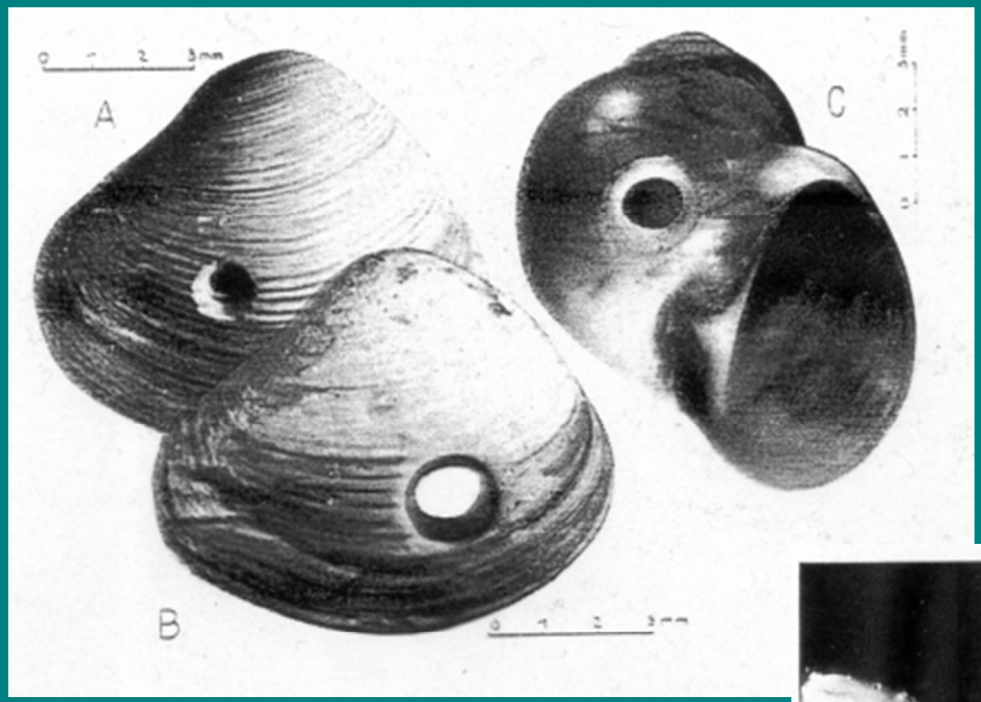


kokkels met afgeslepen top

Fossiele tapijtschelpen van het strand breken ‘typisch’ en krijgen andere sculptuur

Aangespoelde schelpen langs waddenkust Texel

Aangespoelde schelpen langs Waddenzeekust
ook vaak kapot, strandgapers niet



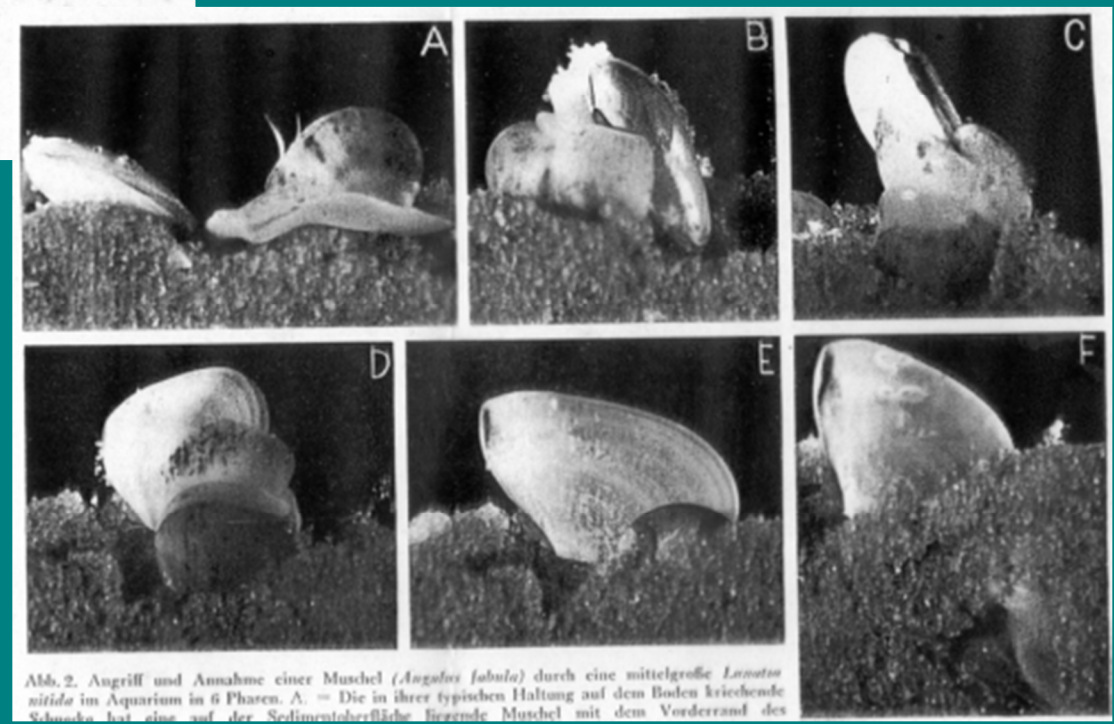
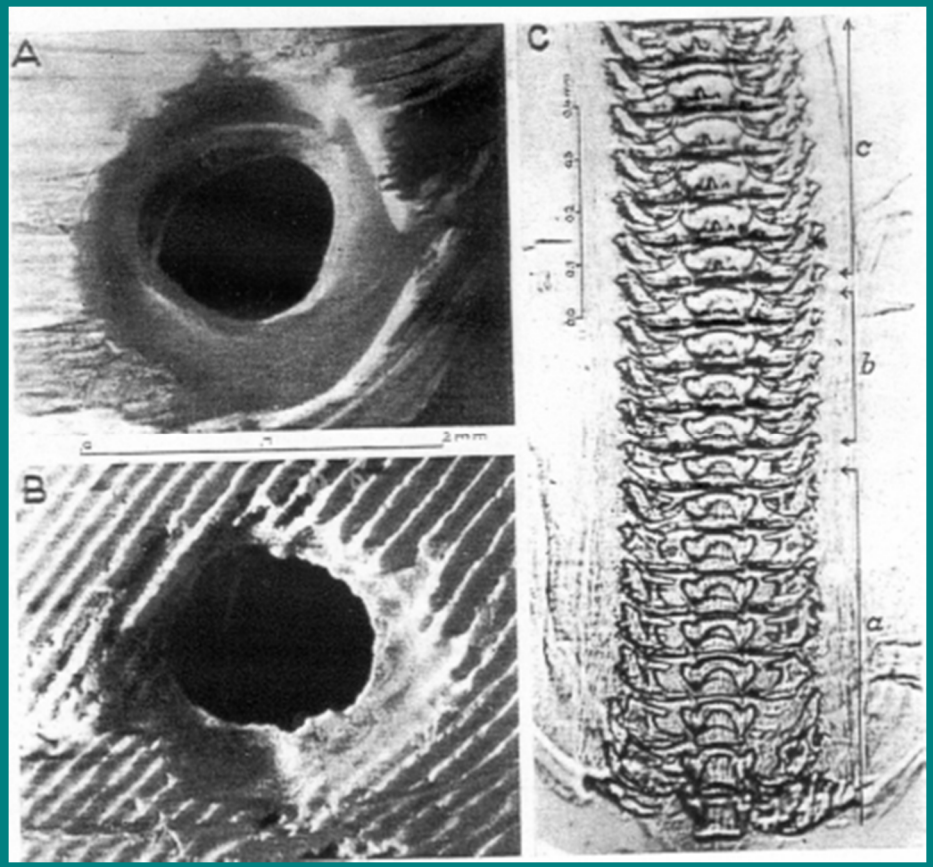
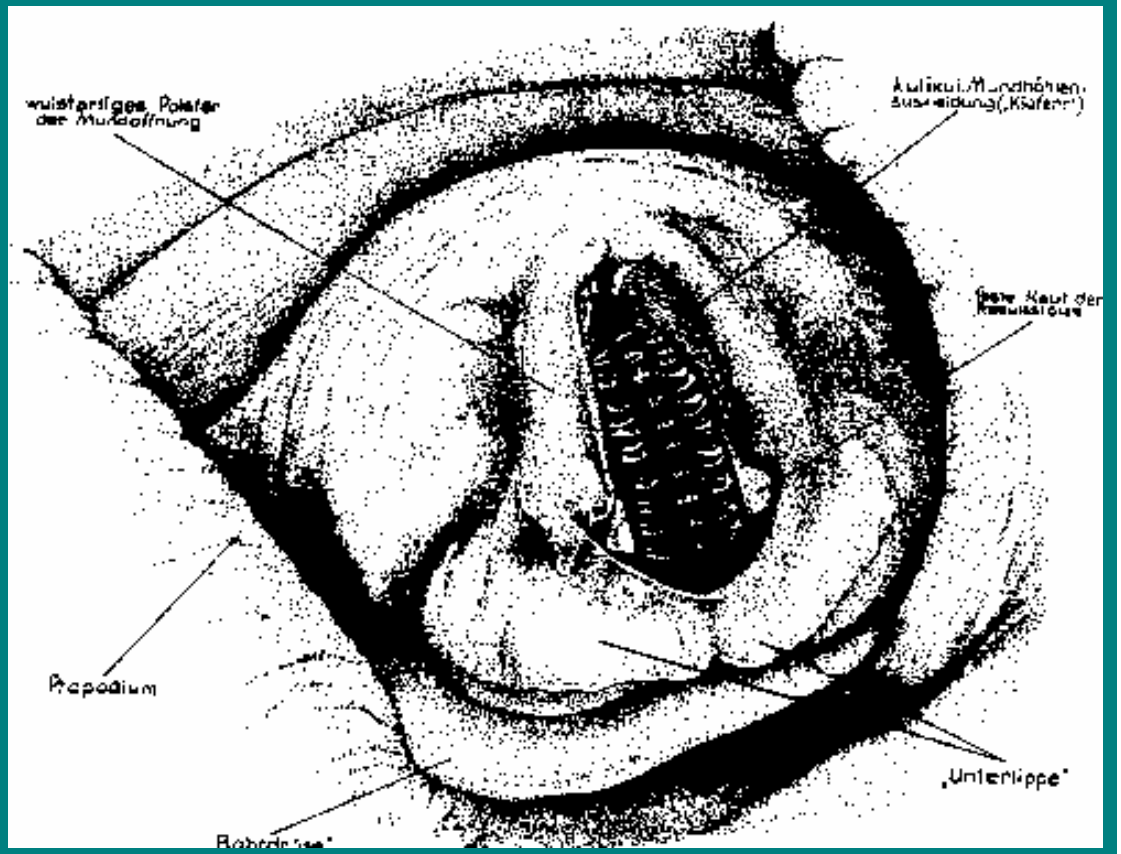


Abb. 2. Angriff und Annahme einer Muschel (*Angulus fabula*) durch eine mittelgroße *Lunatia nitida* im Aquarium in 6 Phasen. A. = Die in ihrer typischen Haltung auf dem Boden kriechende Schnecke hat eine auf der Sedimentoberfläche liegende Muschel mit dem Vorderrand des

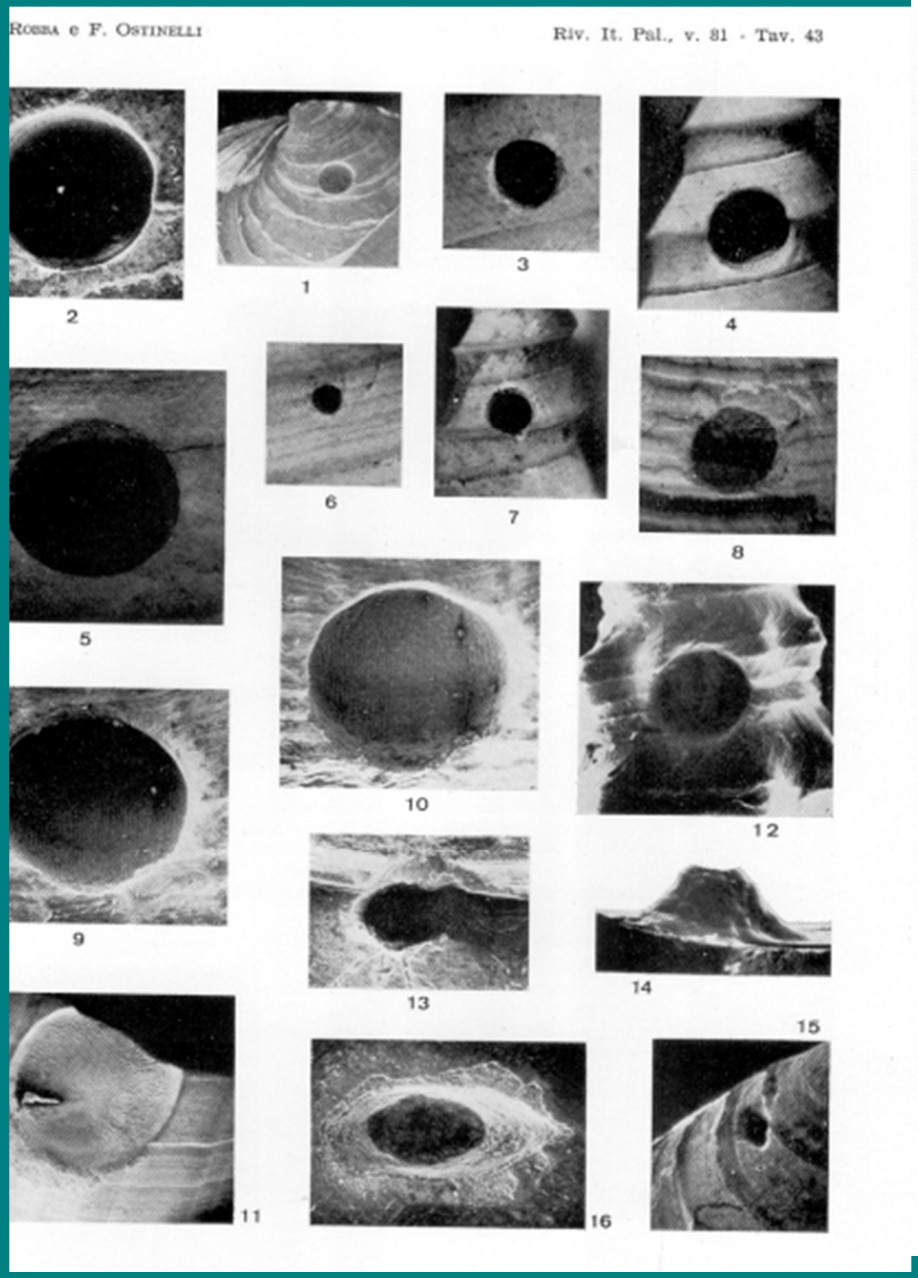
Gaten in schelp werk van roofslak Tepelhoorn (*Natica*)

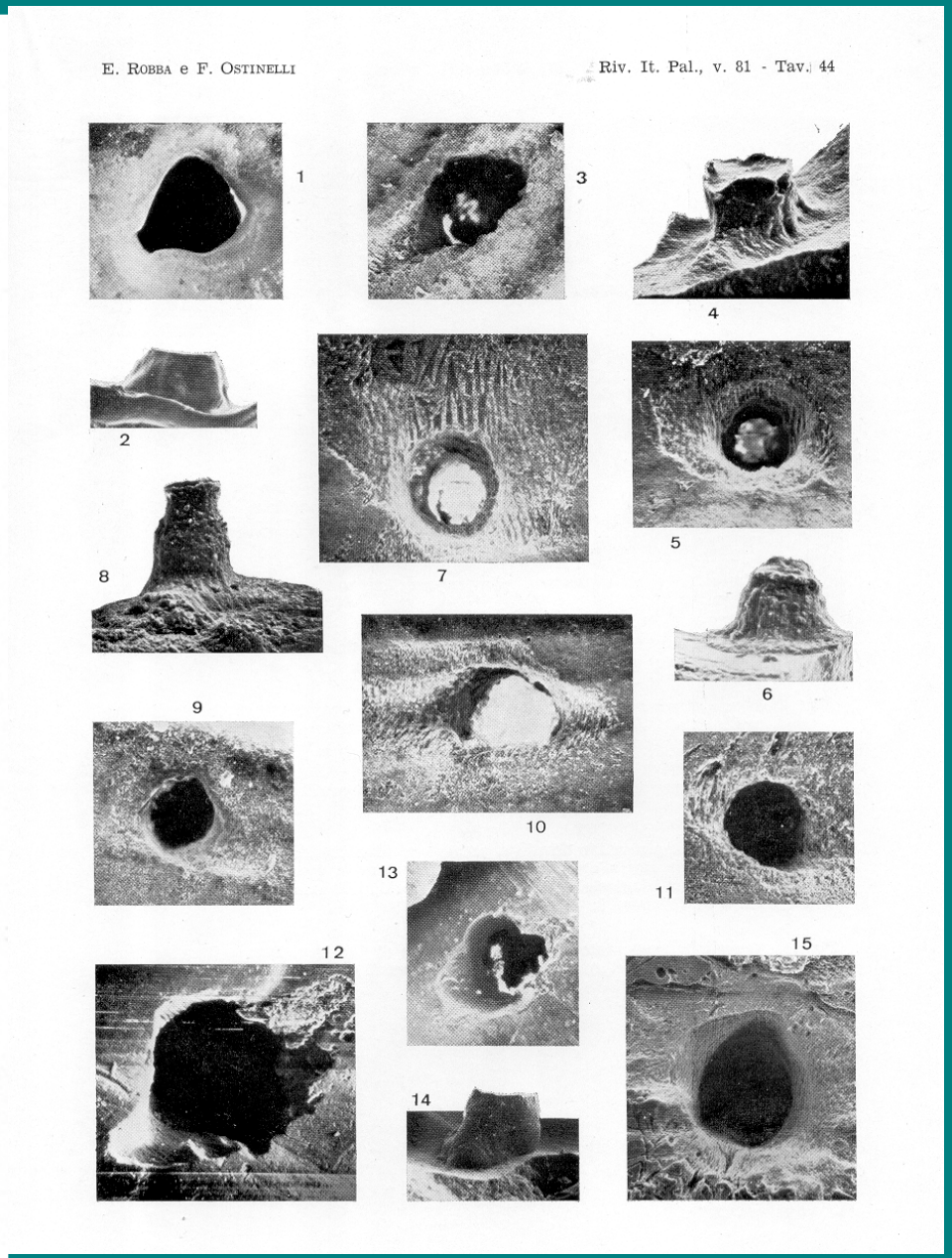
Tepelhoorn boort zowel mechanisch met rasptong (radula) als chemisch. Boorsnelheid gering 1 à 2 dagen!



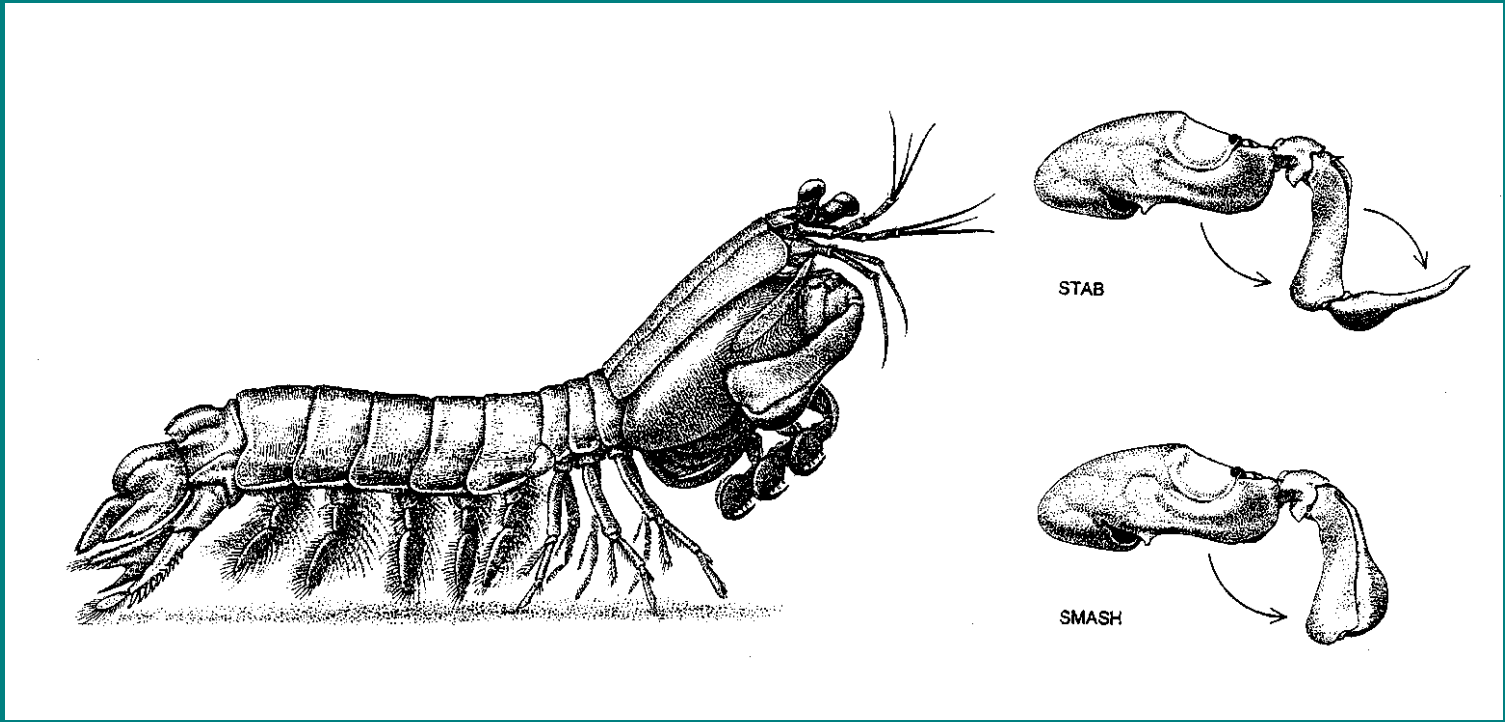


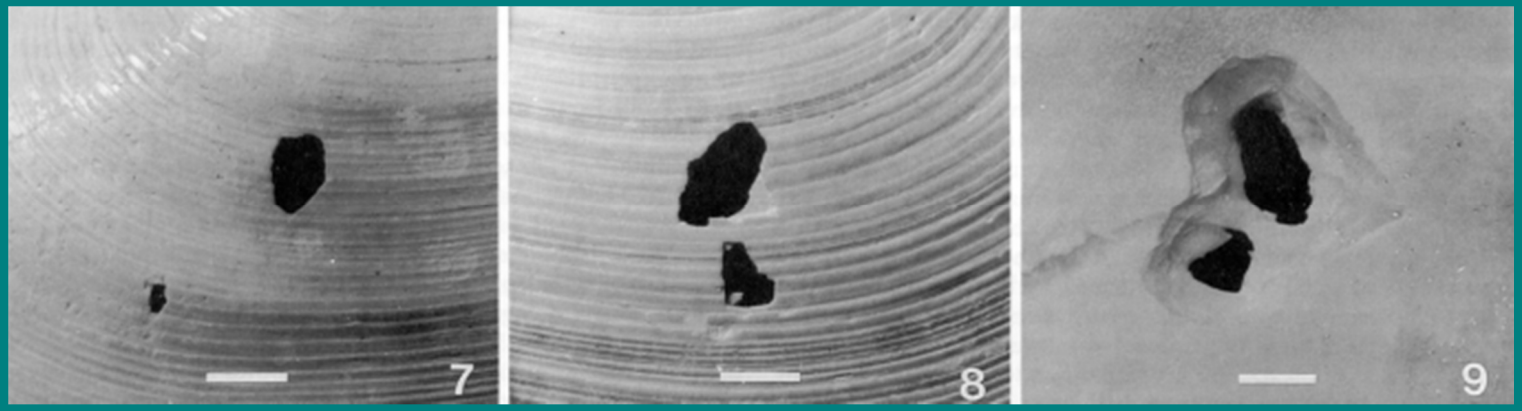
Borende Muricidae en Cephalopoda





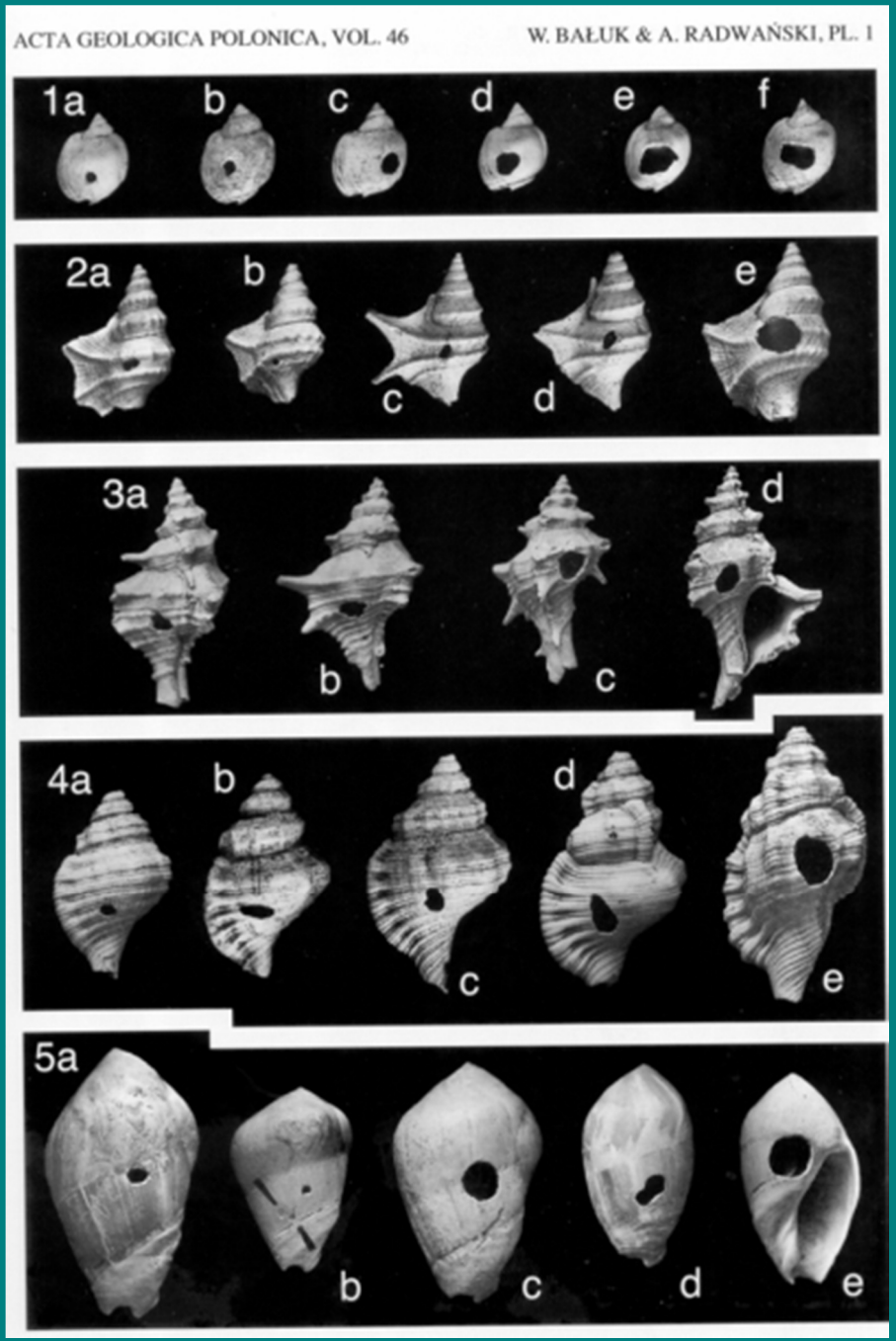
Stomatopoda als schelpkrakers

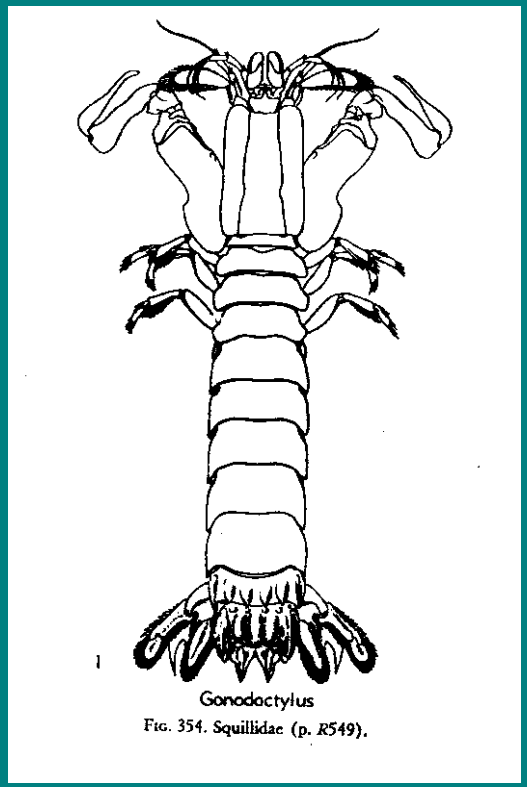




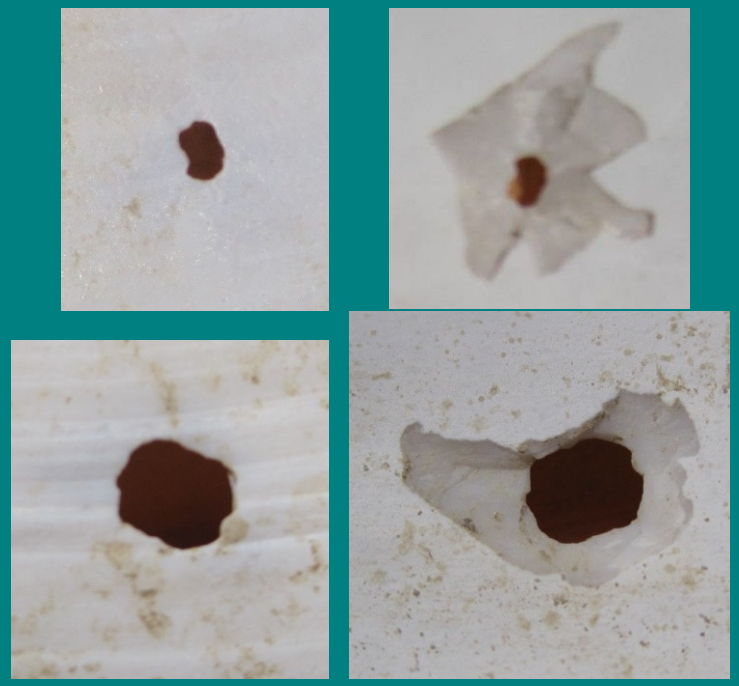
Ichnospecies *Belichnus* Perth 1995

Stomatopoda als schelpkrakers



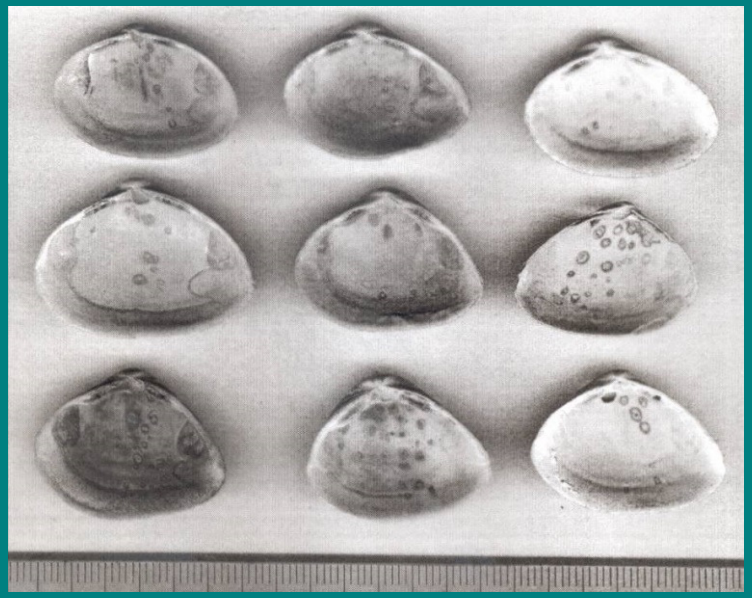


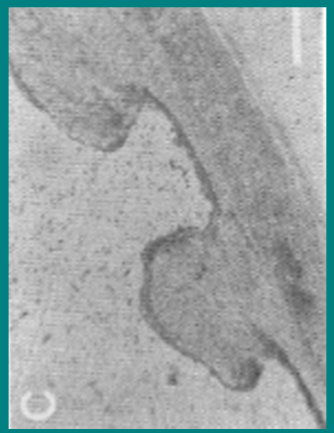
Gaten in Otterschelpen op strand Texel

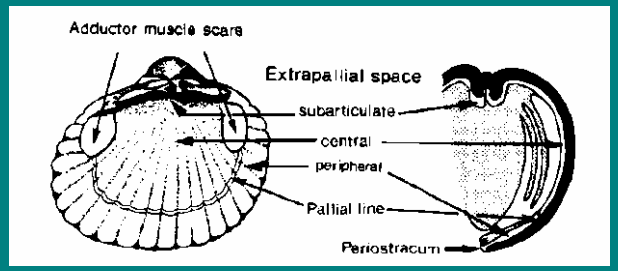


Ook *Belichnus*

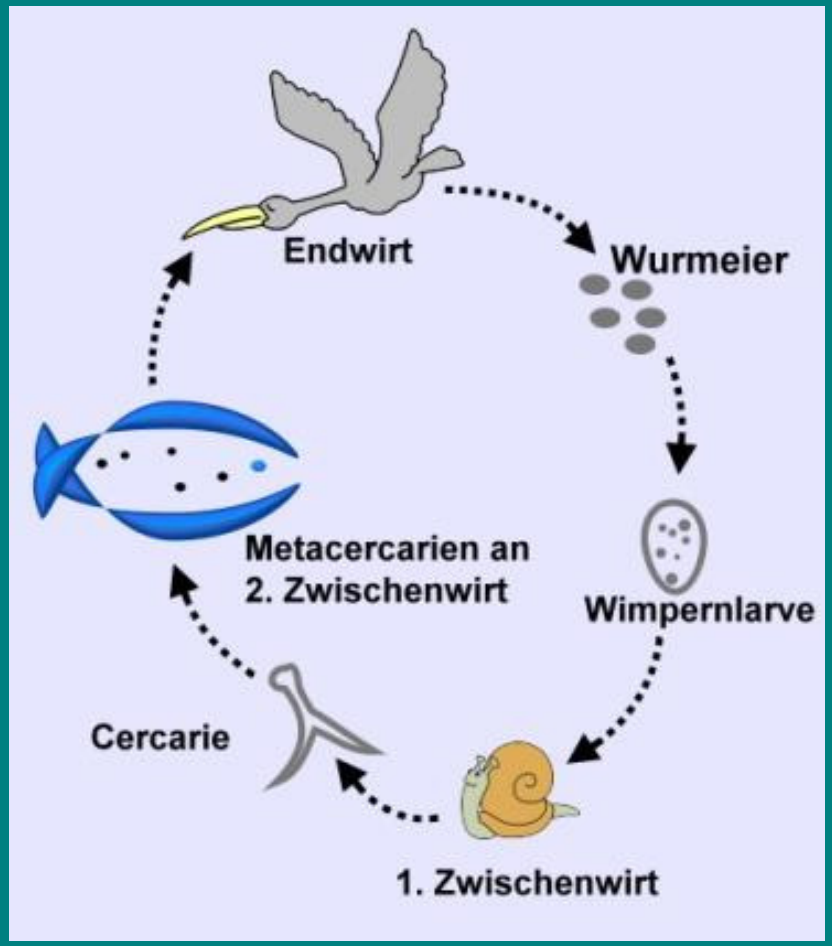
Putjes aan binnenzijde strandschelp gemaakt door parasieten (Trematoden, zuigwormen)







Metacercarien kapselen zich in
In tussengast tot die gegeten wordt



Oplossen van schelpen, hoornlaag beschermt schelp

Yoldia eightsi
King George Island

Cardium tuberculatum
zandmotor

Astarte
Noorwegen

Zoetwaterslak
Suriname
Pomacea

Beschadigde napslakken *Nacella concinna*

Leefmilieu *Nacella concinna*

kust King George Island
Antarctisch schiereiland
62° S

Mijn autochtone hulpkrachten: meeuwen

Ophoping *Nacella* uit braakballen van meeuwen

Wadfauna en haar predatoren

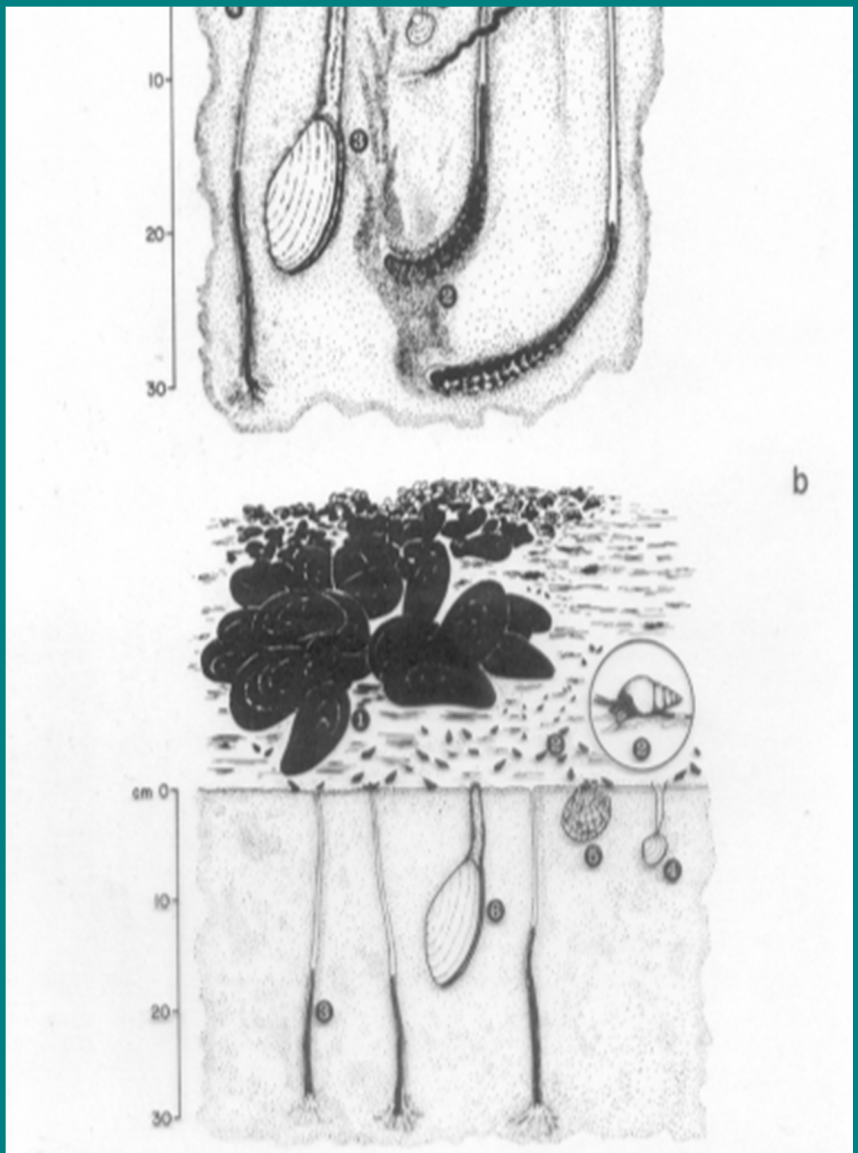
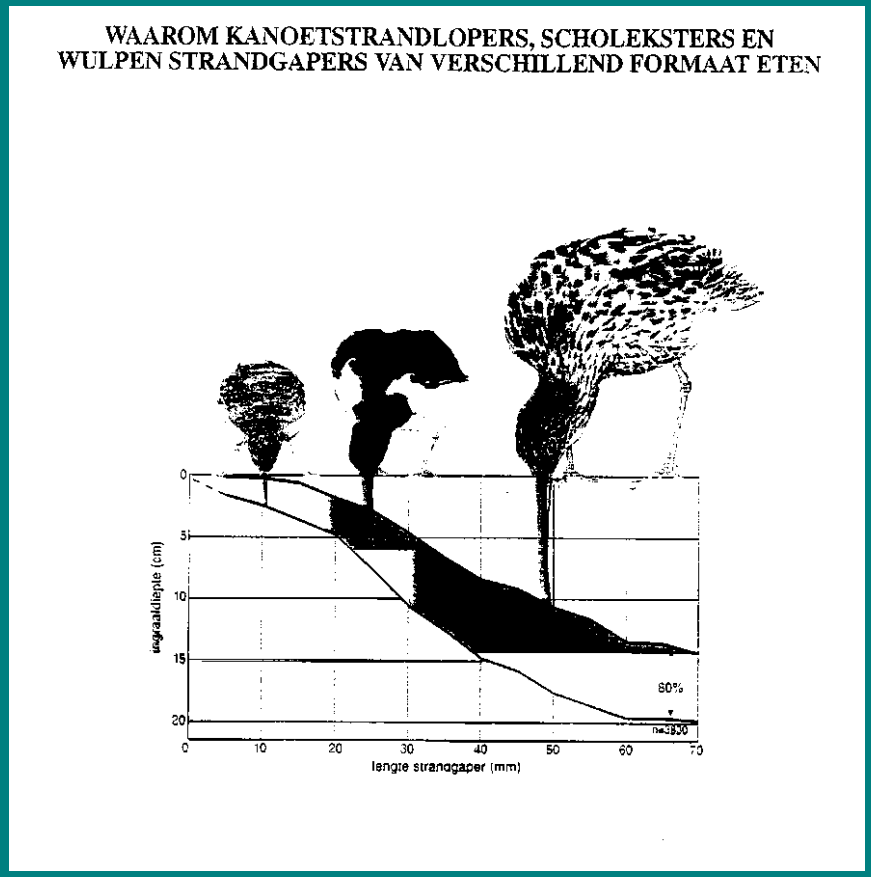


Fig. 2.a. Macrofauna assemblage (7 most dominant species) of intertidal flats. 1. *Mytilus edulis*, 2. *Arenicola marina*, 3. *Mya arenaria*, 4. *Cerastoderma edule*, 5. *Macoma balthica*, 6. *Nereis diversicolor* and 7. *Heteromastus filiformis*. b, Idem; subtidal areas. 1. *Mytilus edulis*, 2. *Hydrobia ulvae*, 3. *Heteromastus filiformis*, 4. *Macoma balthica*, 5. *Cerastoderma edule*, 6. *Mya arenaria*



De Scholekster als schelpkraker

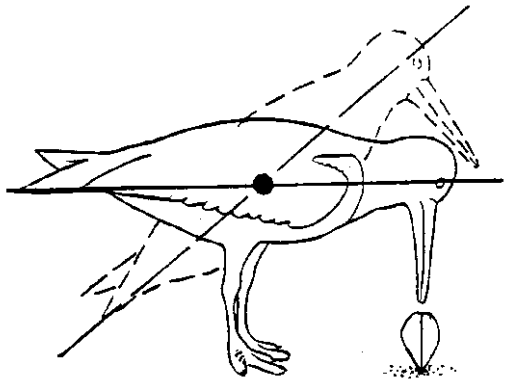
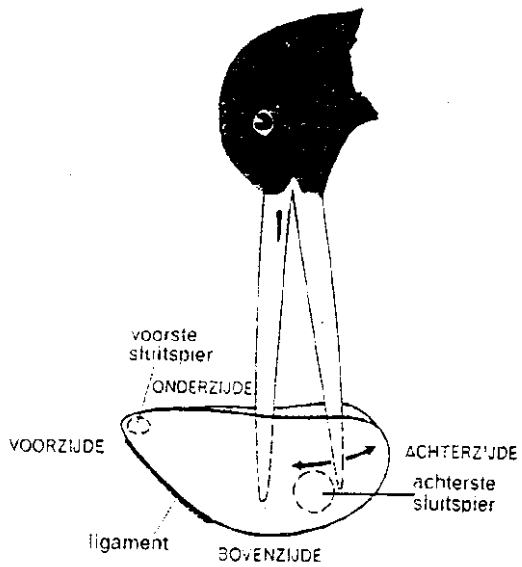
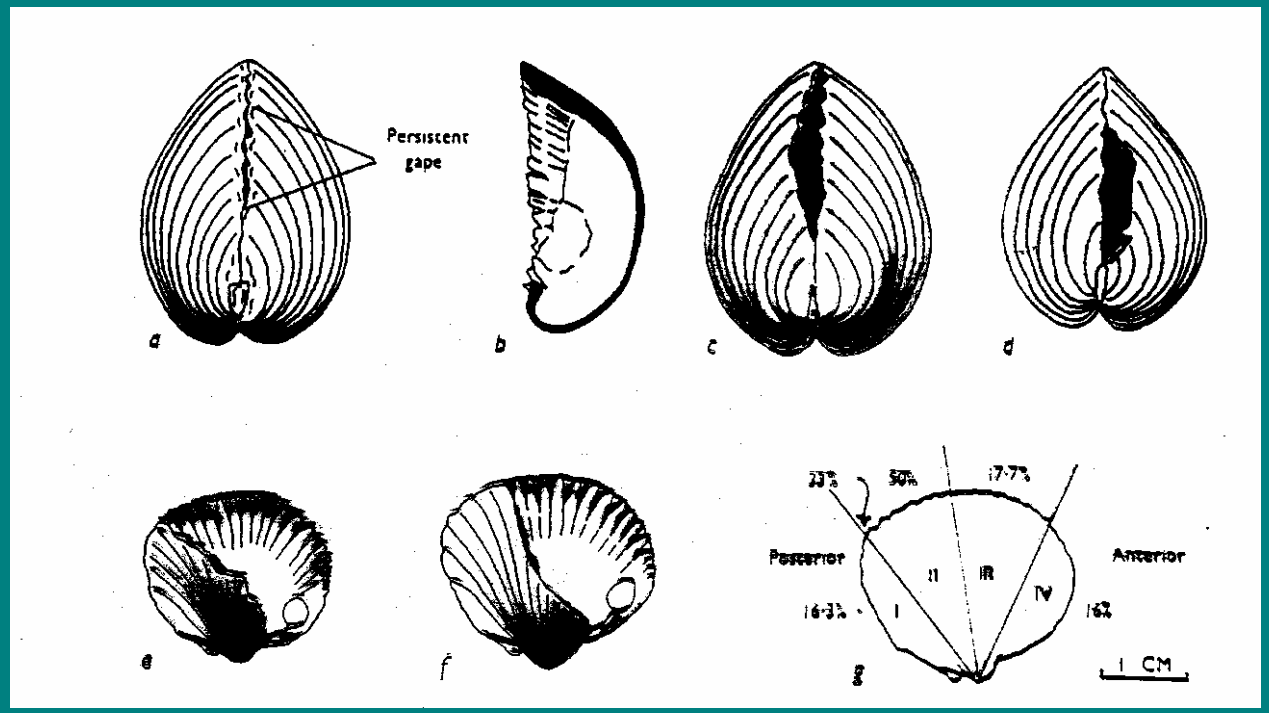


Fig. 5. *De hakbeweging.*

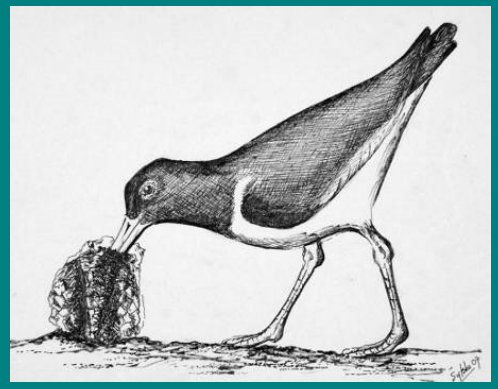




Door Scholeksters gegeten

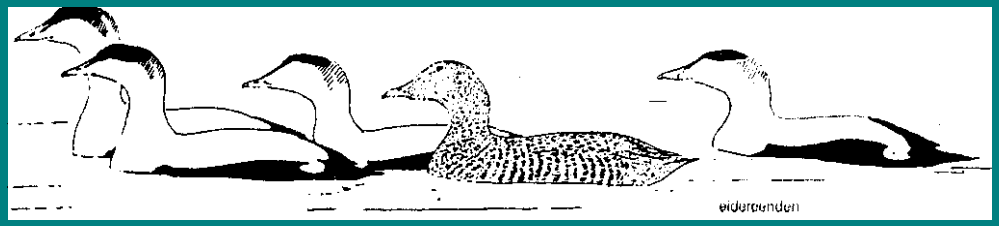
Japanse oesters langs waddenkust Texel

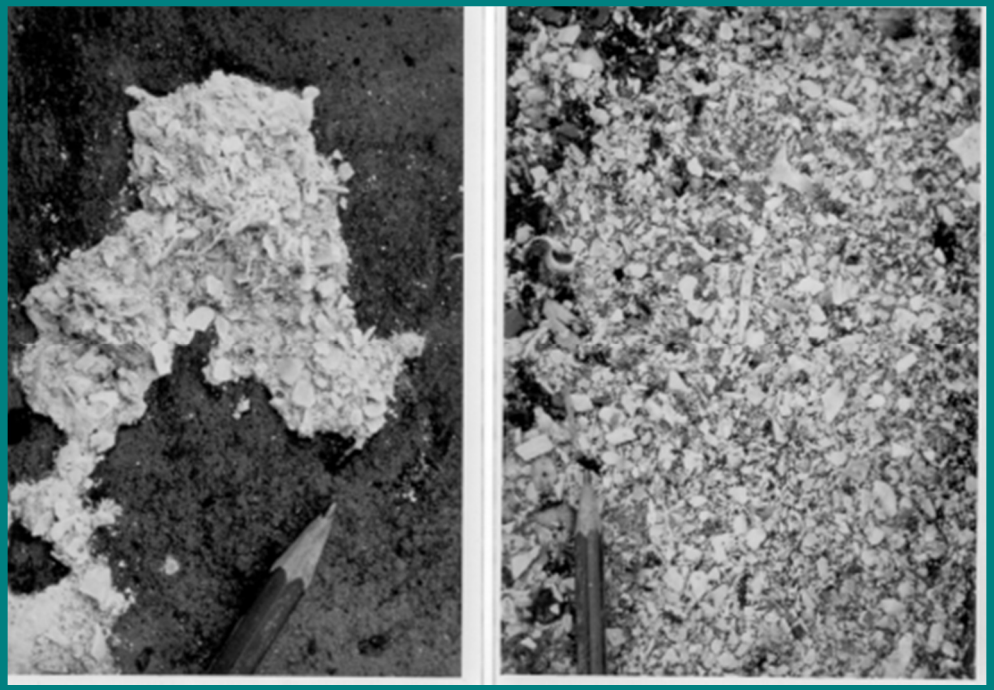
Scholekster consumeerde Japanse oester op fietspad



Door scholeksters gegeten japanse oesters

Eidereenden kraken ook schelpen



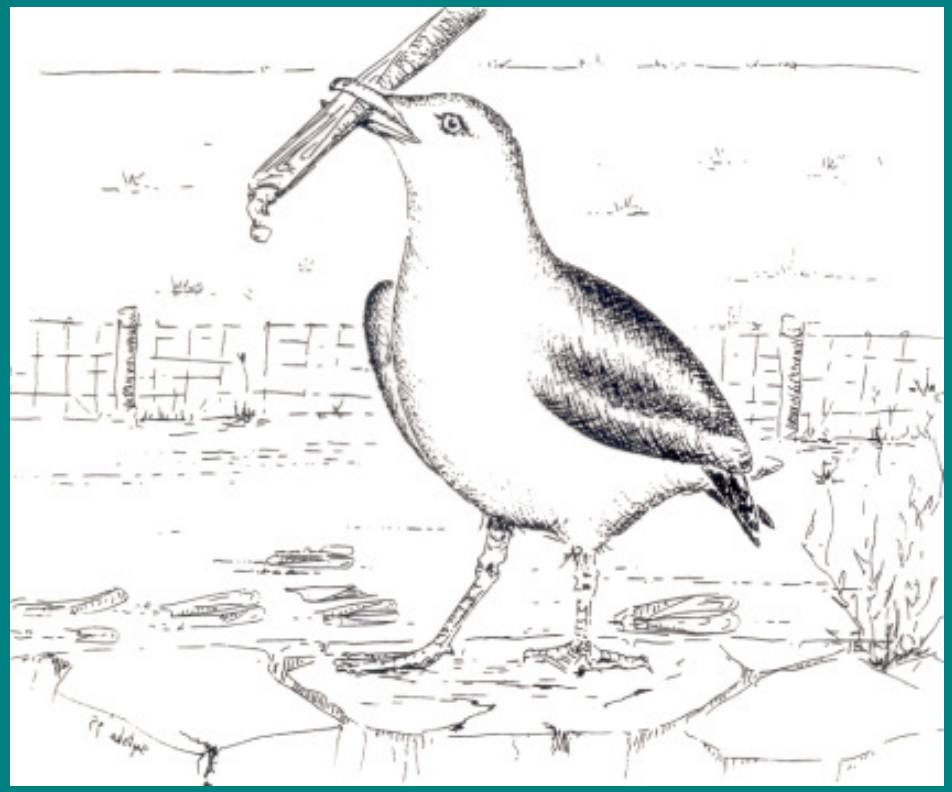


Tafel op strand soms rijk gedekt, Texels strand na storm Februari 2011

Foto Texelse Courant

Wat overblijft na bezoek van zilvermeeuwen

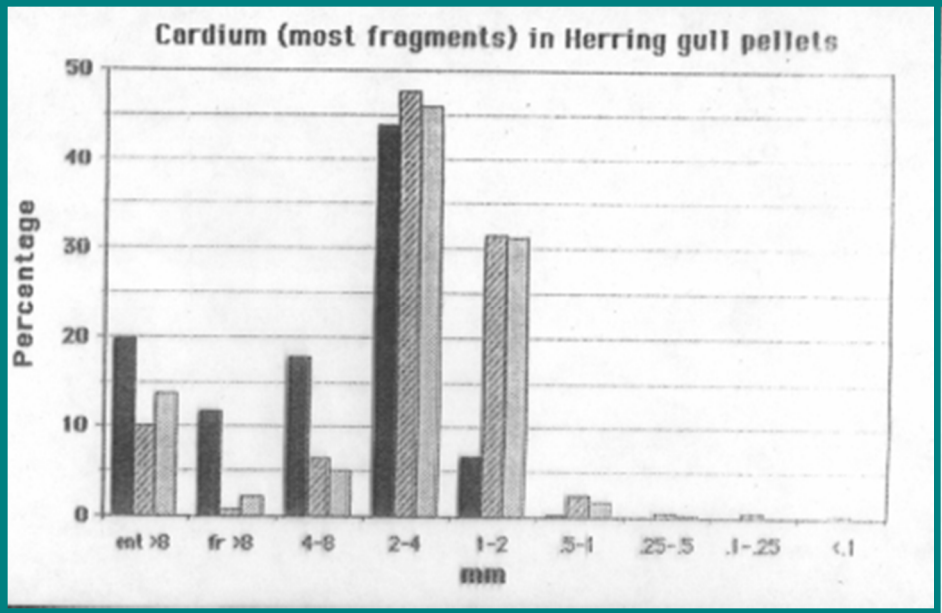
Zilvermeeuwen vangen zelf ook schelpdieren

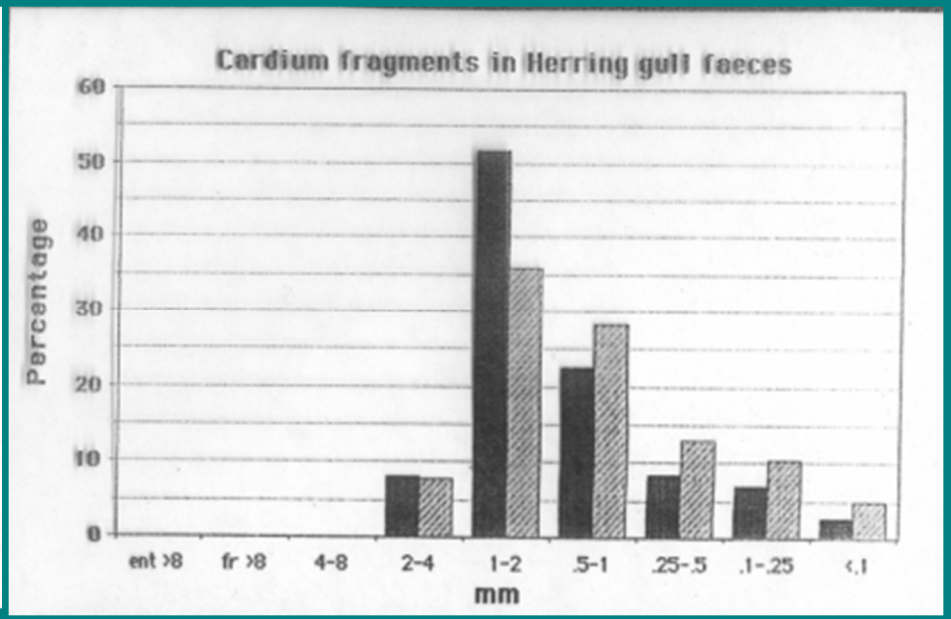


Amerikaanse zwaardschede
als lekkernij

Grotere schelpen worden ‘gedropt’

Zilvermeeuwen als schelpenkrakers





Schelpfragmenten uit zilvermeeuwbraakballen

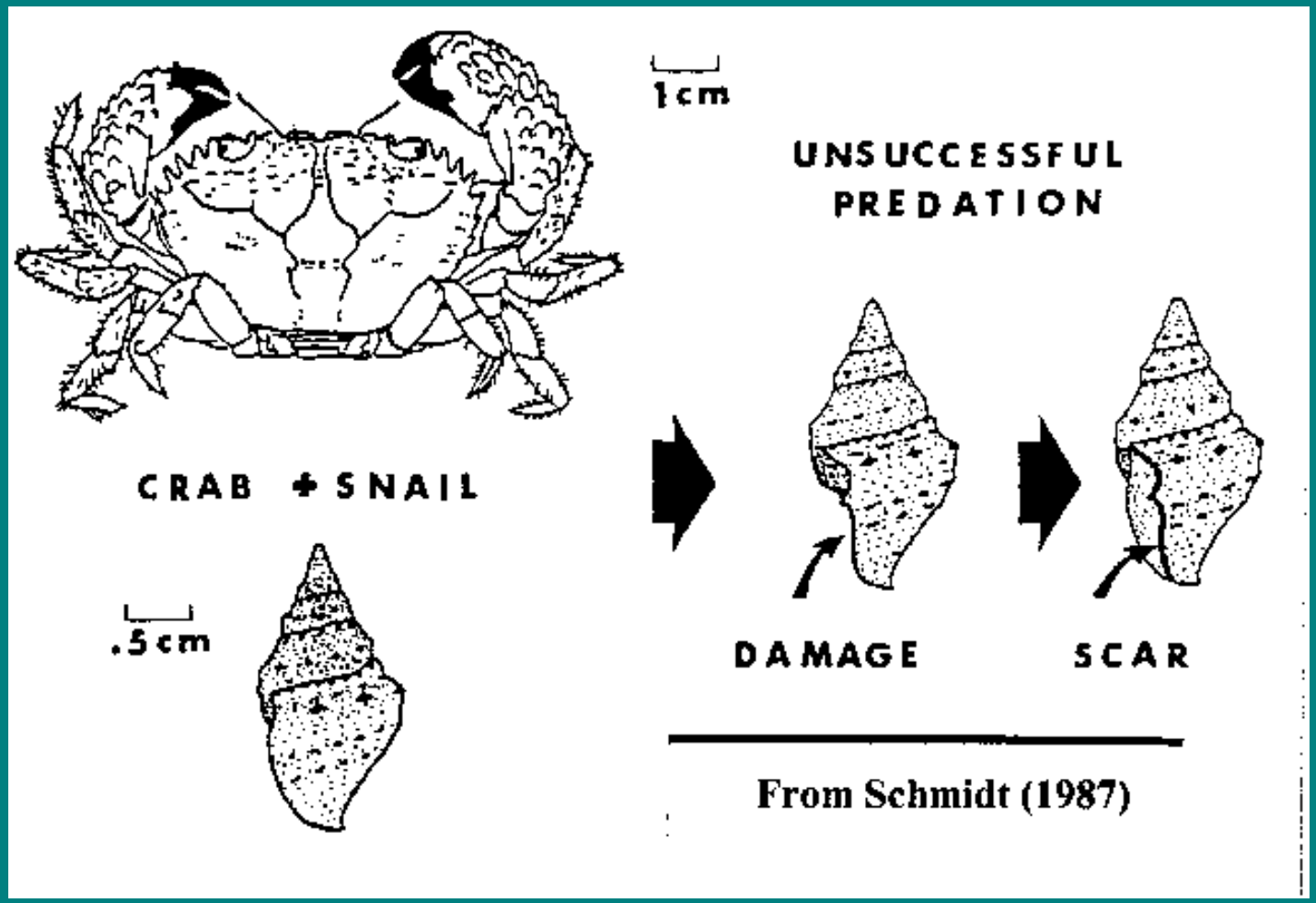
Braakballen voegen kalkdeeltjes toe aan strandzand

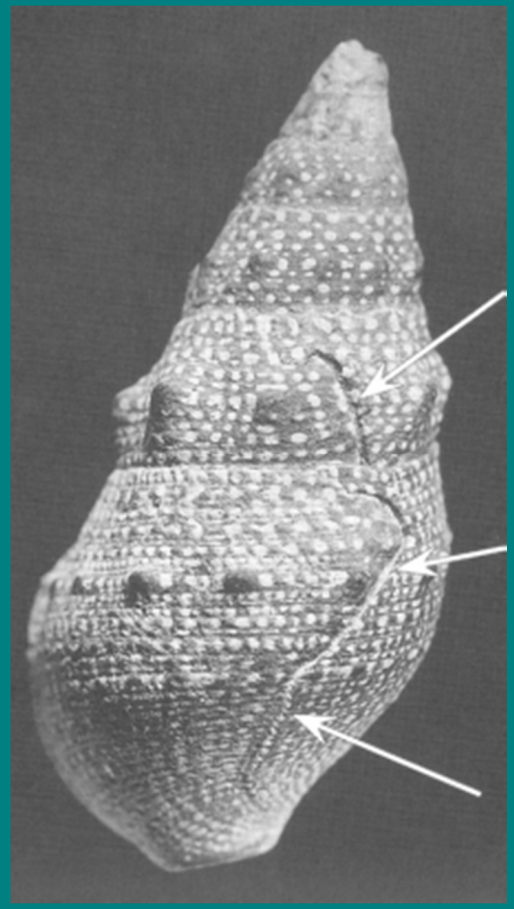
Foto's Hors Texel

Door strandkrab (in aquarium) gegeten schelpdieren

Linker en rechterschaar strandkrab

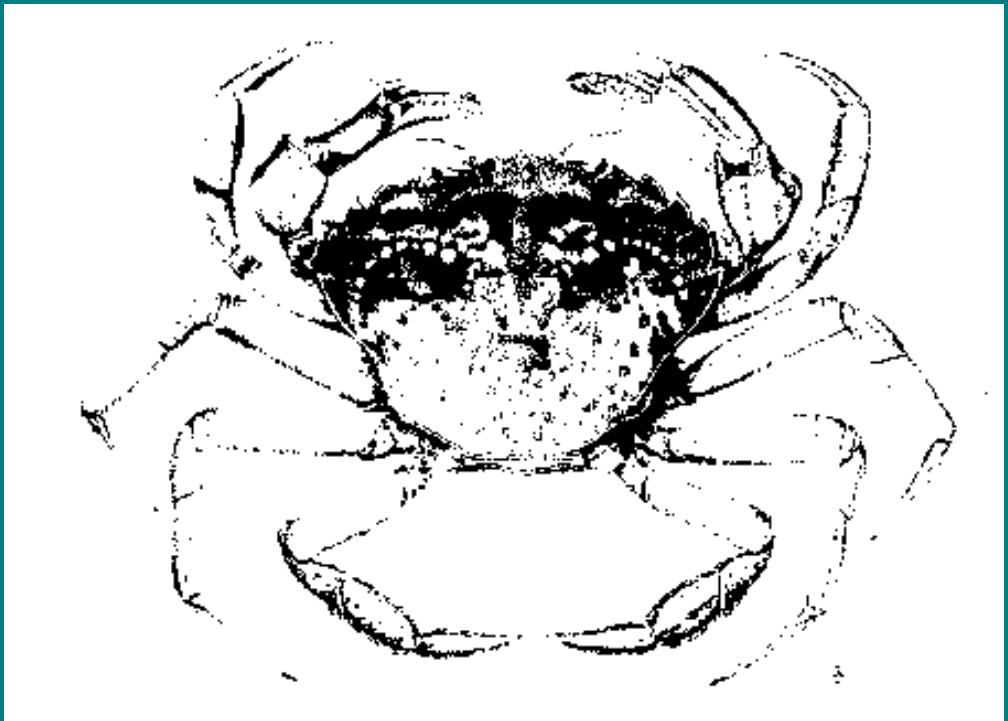
Krabben als schelpenkrakers niet altijd succesvol

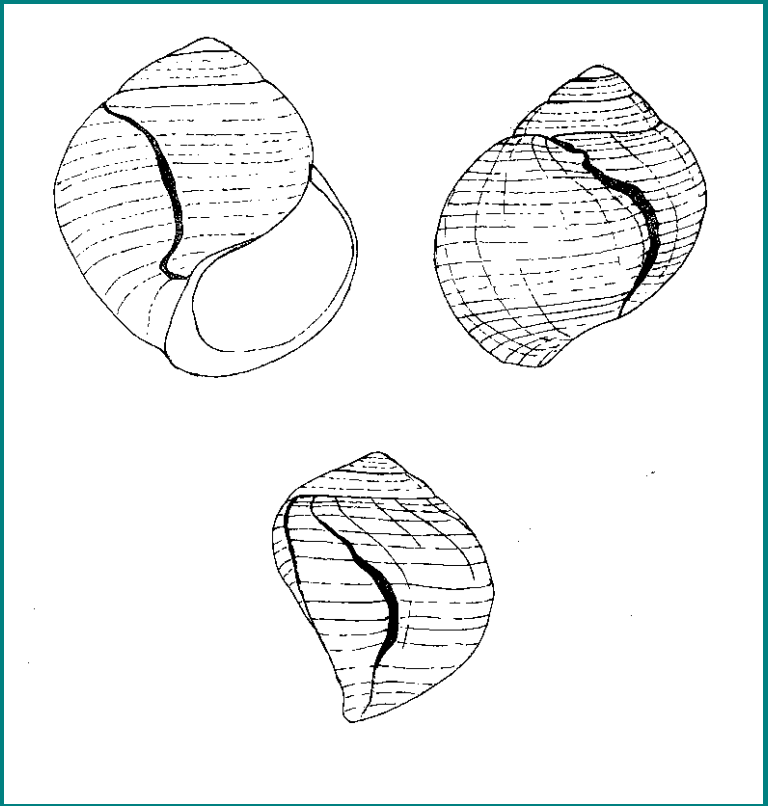


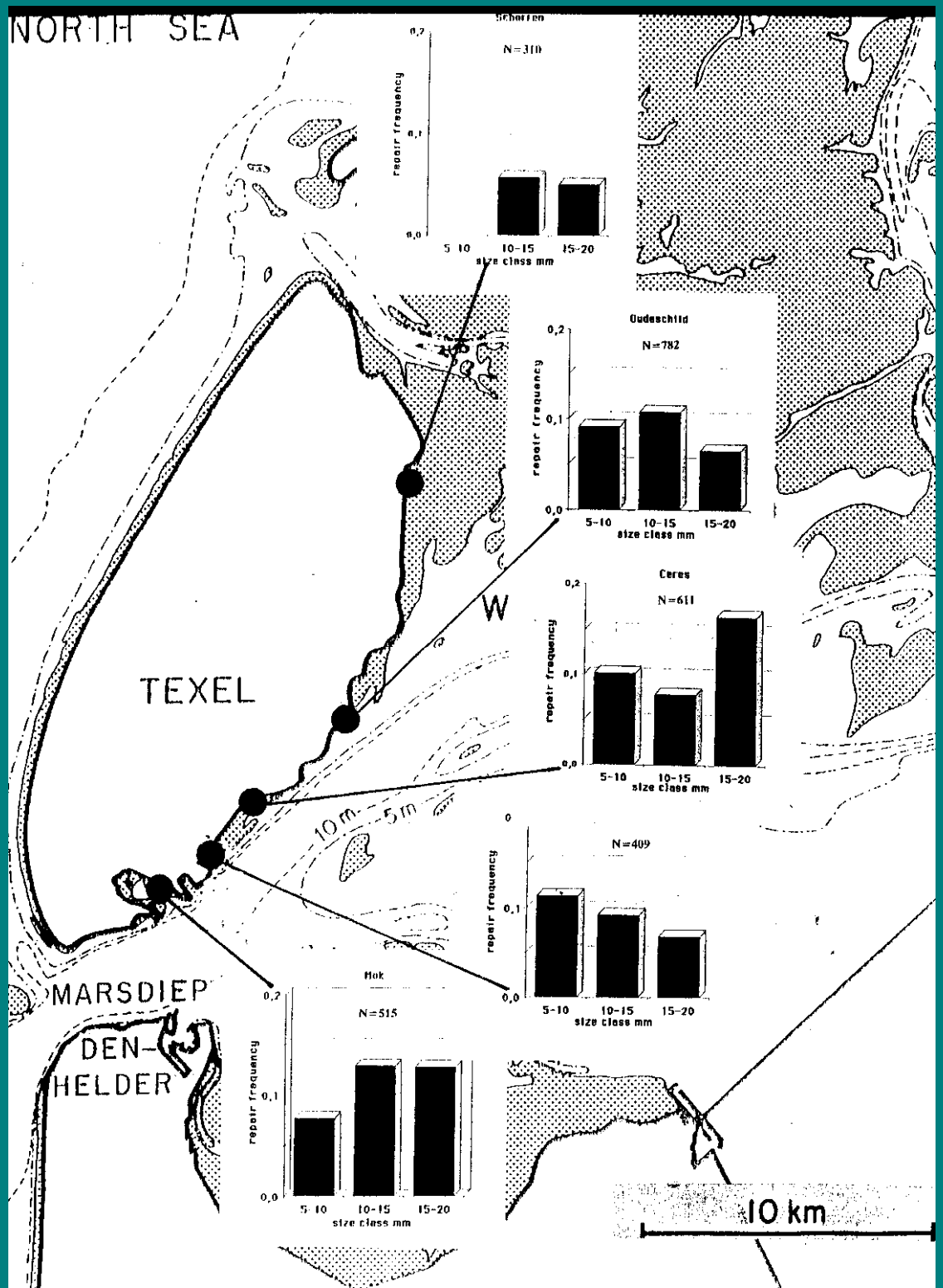


Cerithium stercusmuscarum
Bahia la Choya (Mexico)
Cadee et al 1997

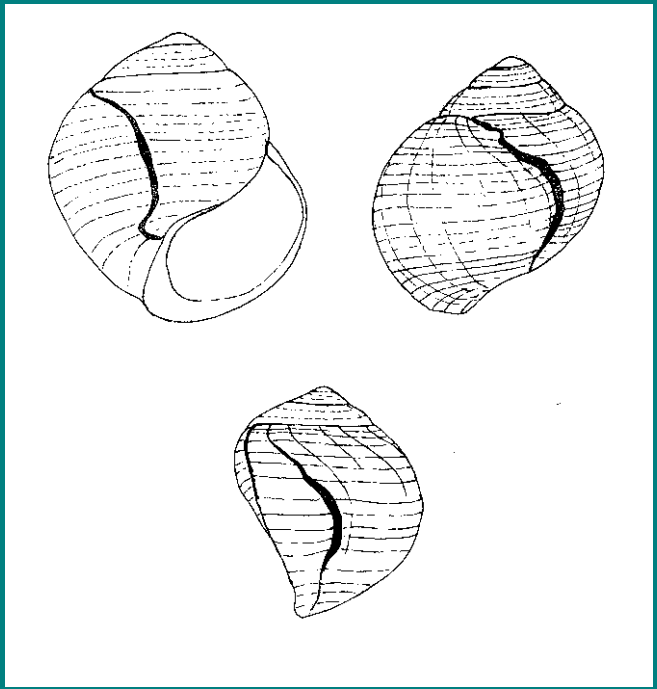
Strandkrab en alikruiken







5-10% alikruiken vertoont schelpreparatie

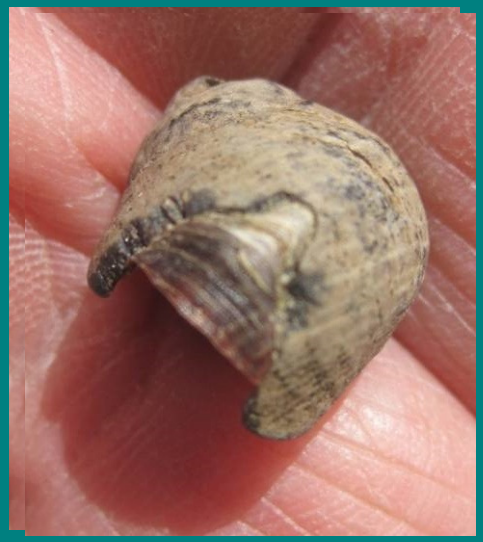


Schelpreparatie met slakkengang

1.4.’15

7.4.’15

12.4.’16

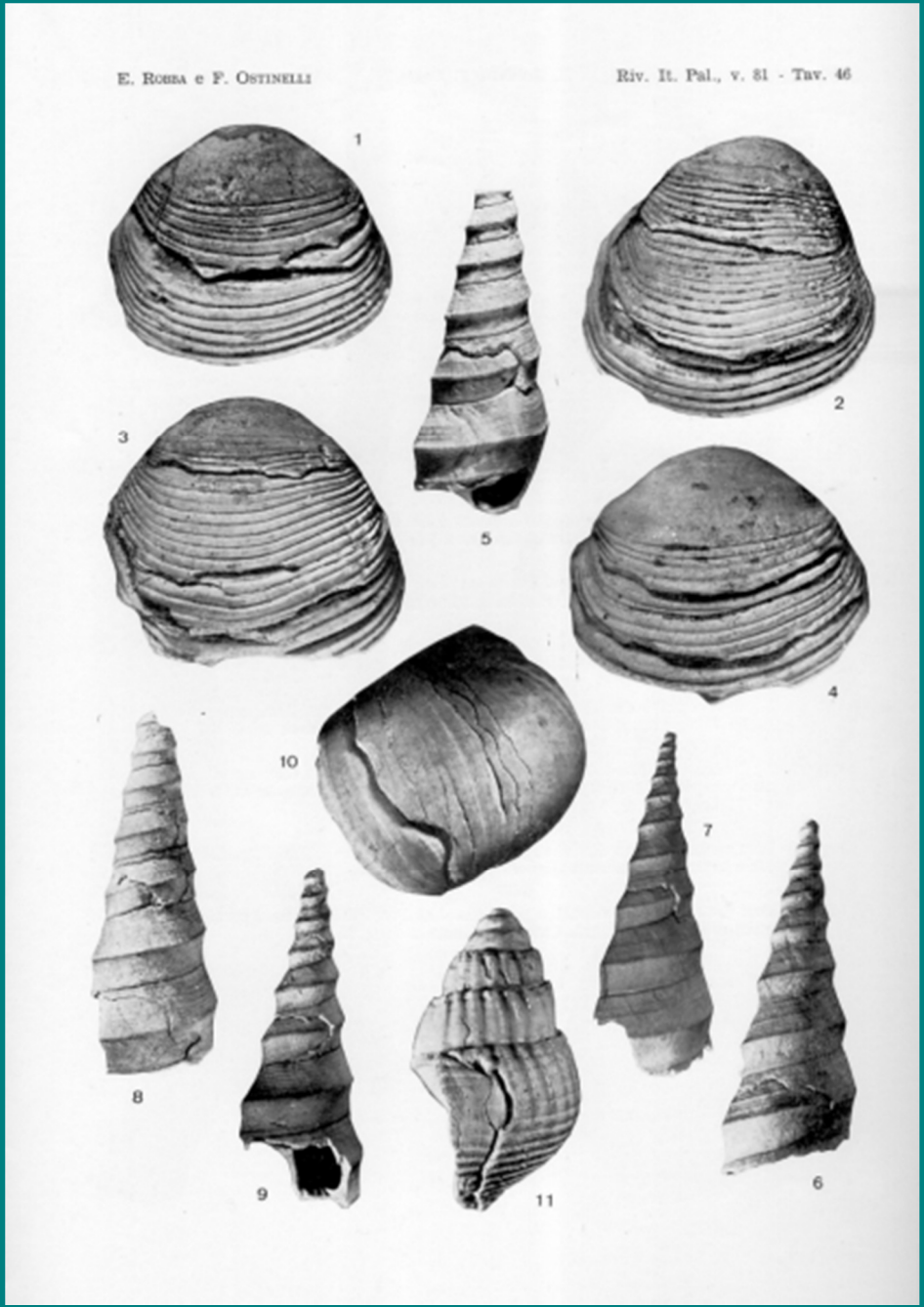


28.4.’15

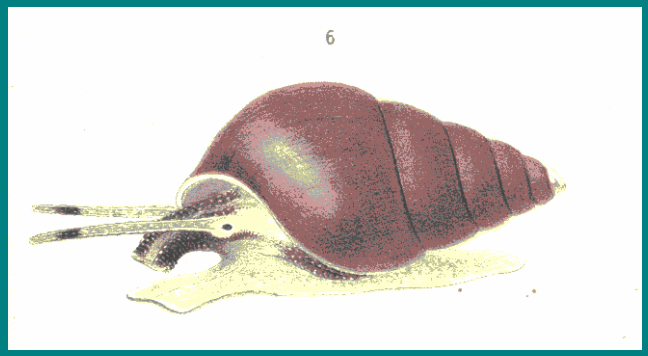
17.5.’15

16.6.’15

Gerepareerde fossiele schelpen en wulk



Wadslakjes overleven soms bergeend maaltijd



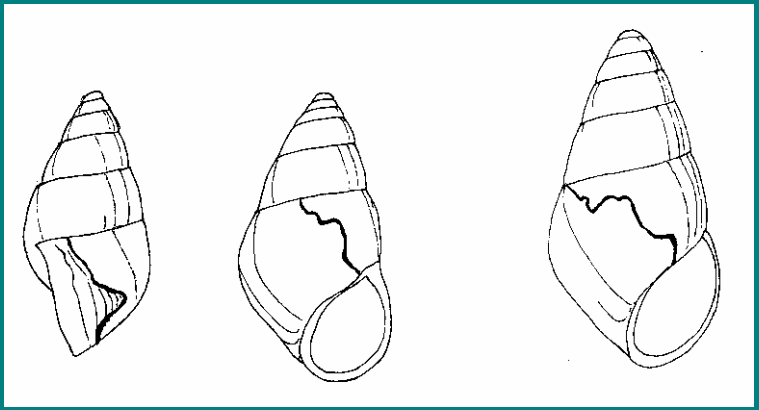
Wadslakjes in
Bergeend faeces

Schelpreparatie binnen een week

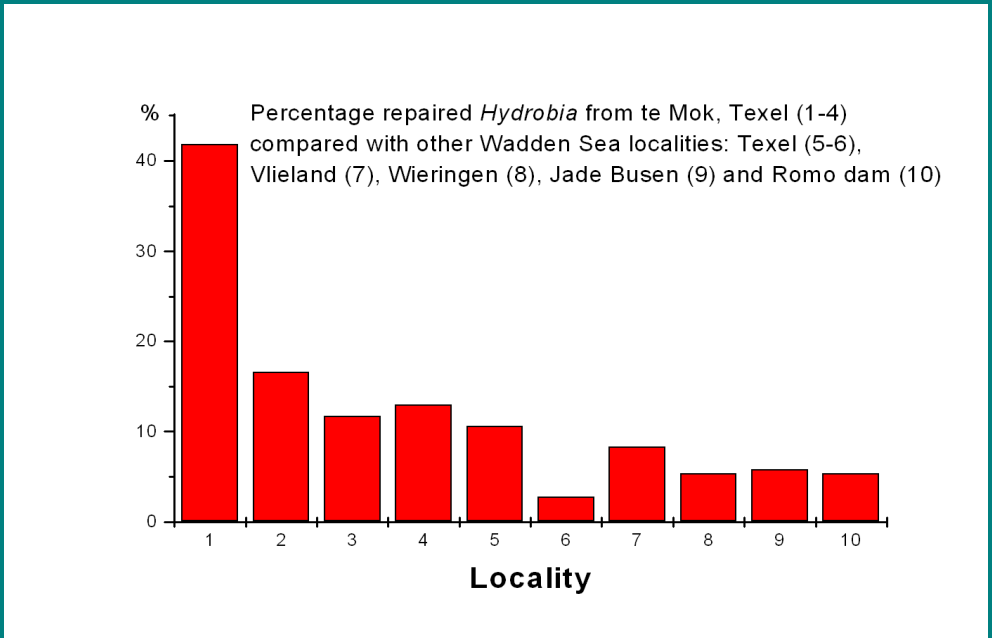
Aquaria met wadslakjes

Gerepareer**de** wadslak

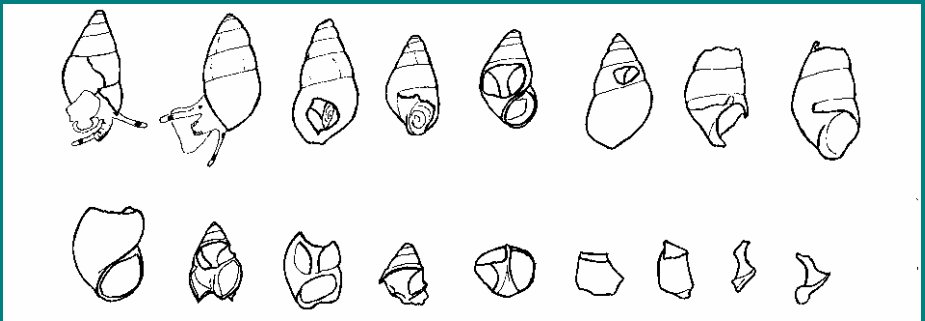
Komt schelpreparatie vaak voor bij wadslakjes?



Gerepareerde wadslakjes



Mokbaai Texel



Wadslakjes uit bergeendfaeces

Misvormde grote strandschelpen (Mactra) strand Texel door sipho begrazing

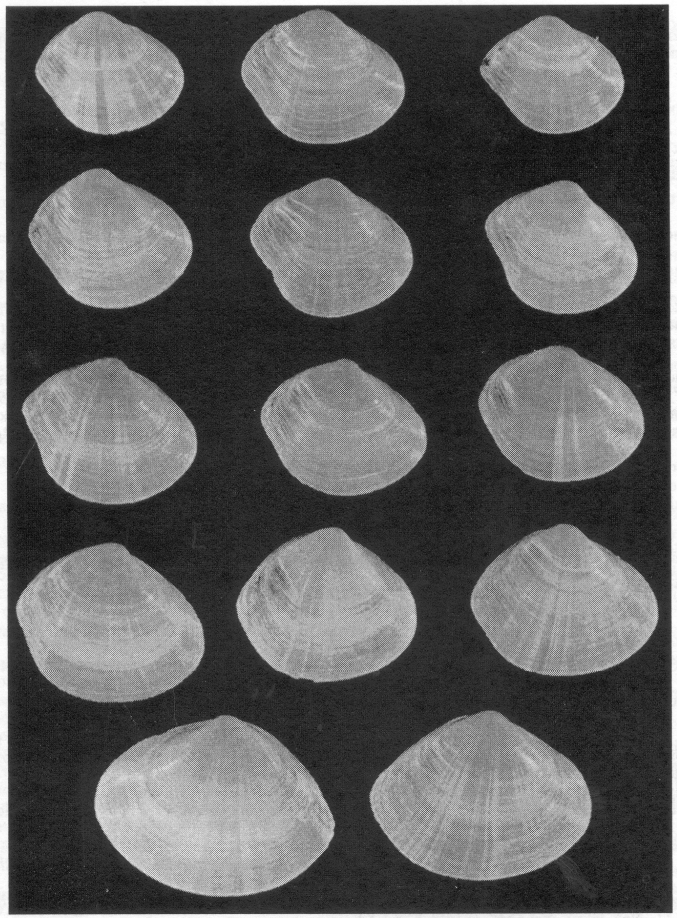
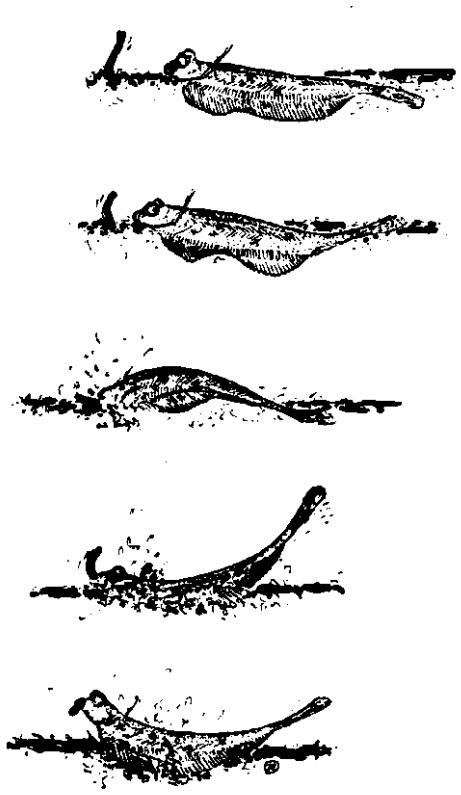
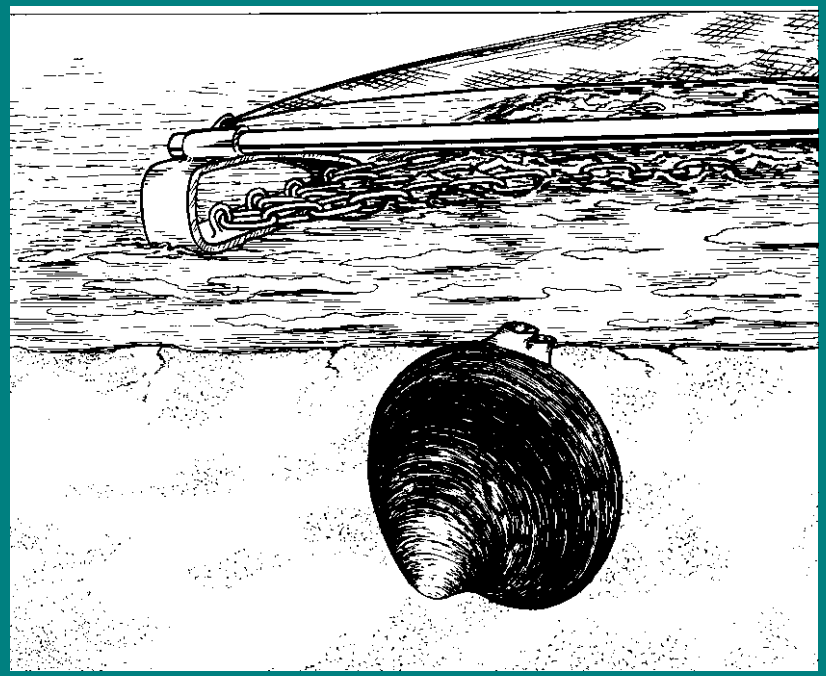


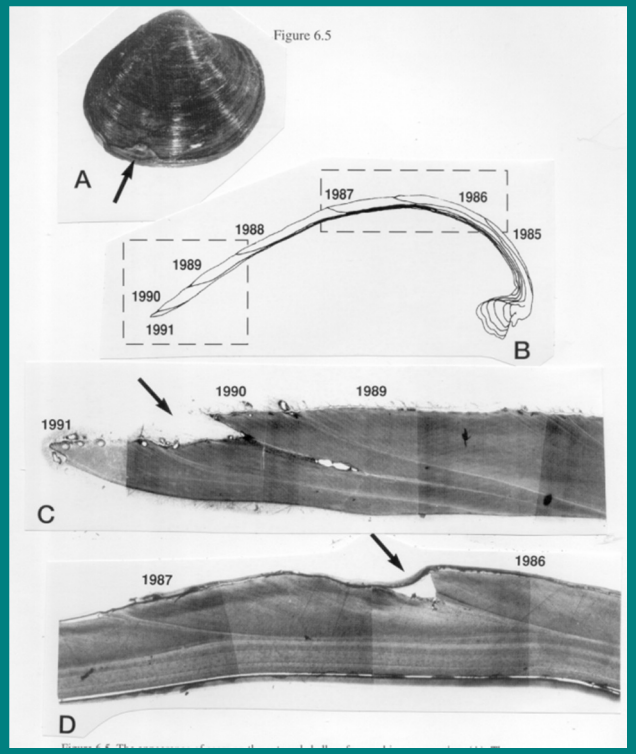
Fig. 1. Misvormde *Mactra corallina cinerea* schelpen (boven) en enkele normale exemplaren (onder). Alles van het strand bij De Cocksdorp, Texel, 10 januari 1999. De sterkst misvormde exemplaren zijn ook in groei achtergebleven. Grootste exemplaar links onder 52.5 mm lang. Afgebeeld materiaal gedeponeerd in de collectie van het Zoölogisch Museum Amsterdam.

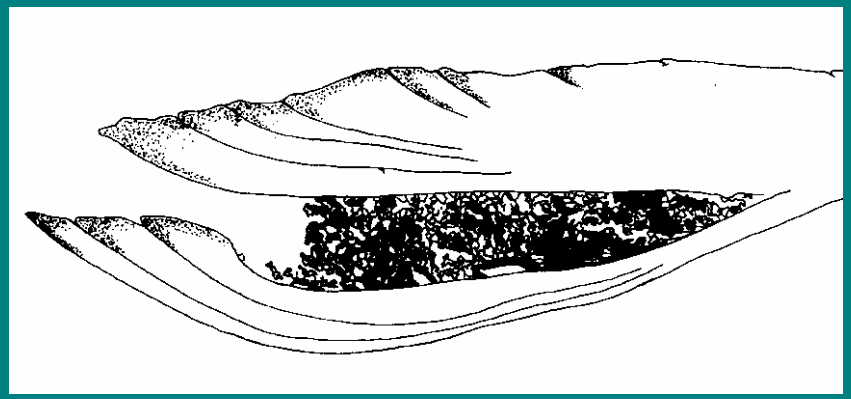


Nadat een scholletje een sipho heeft ontdekt, (1) zwemt hij met schokjes naderbij, (2) dan schiet hij toe, (3) duikt naar de basis van de sipho onder het zand, (4) rukt hem los en (5) verslindt het afgebeten stuk.

Schelpbeschadiging door boomkor (onderzoek Rob Witbaard)
Noordkromp overleeft soms en herstelt schelp







Door visserij beschadigde schelpen

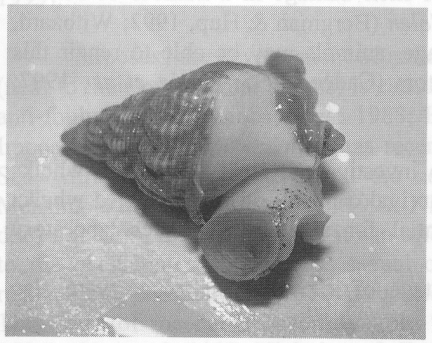


Fig. 6.1a. Severe outer lip damage in *B. undatum* from the North Sea.

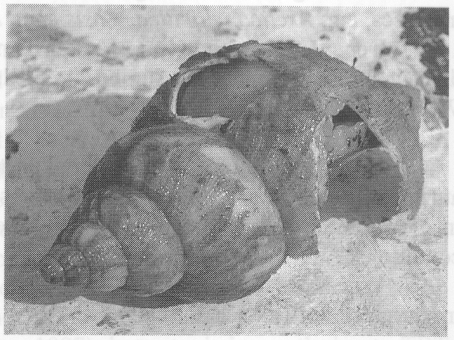


Fig. 6.1b. Hole in the final whorl of the shell of *B. undatum* from the North Sea.

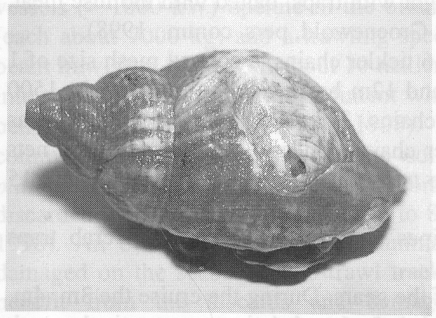


Fig. 6.1c. Damaged outer layer of the shell (grazed shell) of *B. undatum* from the North Sea.

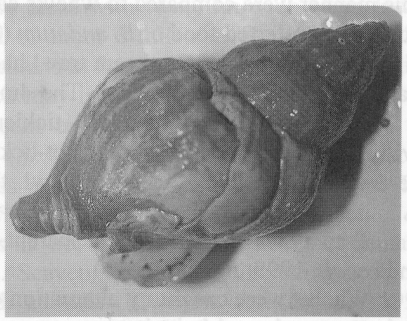


Fig. 6.1d. Scars from former shell damage of *B. undatum* from the North Sea.

Figures 6.1a-d : Examples of shell damage as observed in *B. undatum* caught with a beam trawl or baited traps in the North Sea.

Door RV Tridens (RIVO) met boomtrawl verzamelde wulken Z. Noordzee, 1995

Pelikaansvoet strand Denemarken

Beschadigde Am. Zwaardschede strand Texel

Beschadiging en blaasvorming bij Am. zwaardschede

Fig. 1. Blazen gevormd aan binnenkant posterieure zijde van een Amerikaanse zwaardschede. Foto Gerhard Cadée.

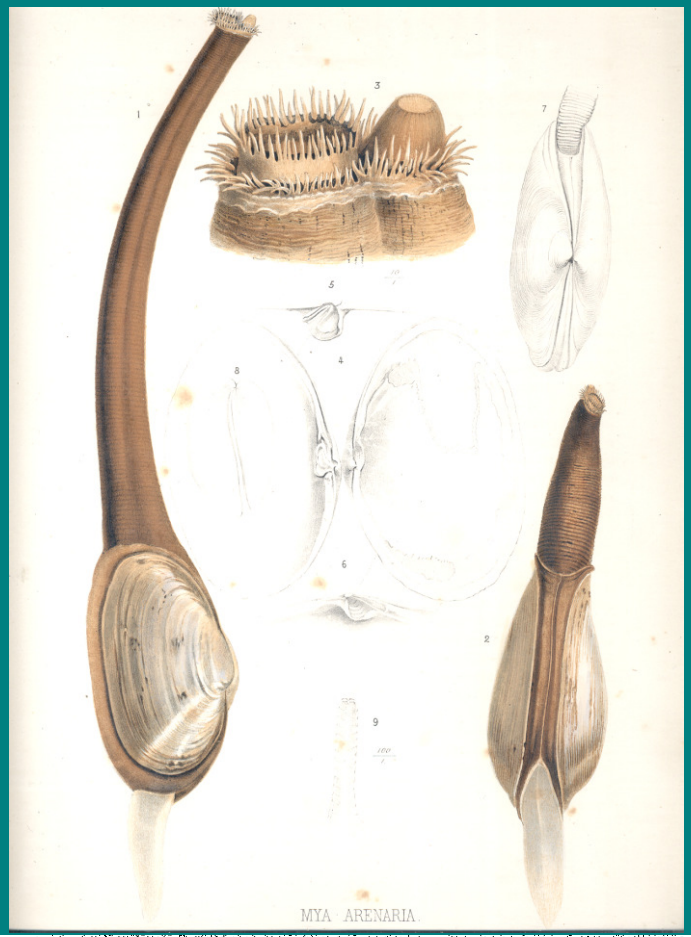
Fig. 2. Idem als fig. 1; ander exemplaar. Foto Gerhard Cadée.

Fig. 3. Buitenzijde Amerikaanse zwaardschede met beschadigde jaarringen (gerafeld; 'scalloped' *sensu* Alexander & Dietl, 2003). Foto Gerhard Cadée.

Fig. 4. Idem als fig. 3; ander exemplaar. Foto Gerhard Cadée.

Zelfbeschadiging bij Strandgaper

Uit
Meyer &
Moebius
1872



W'zee
Texel

Uit
Thorson
1971

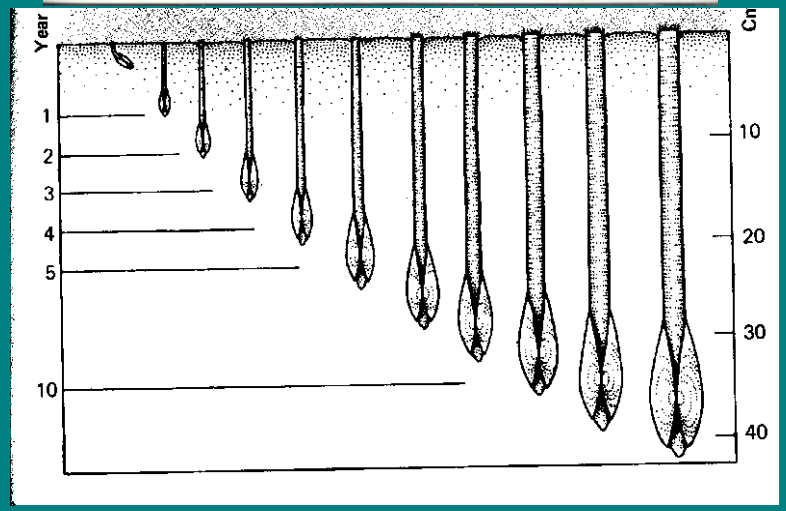


Foto
K v.d.
Wende

Even Pauze

daarna
gebruik en hergebruik
van schelpen

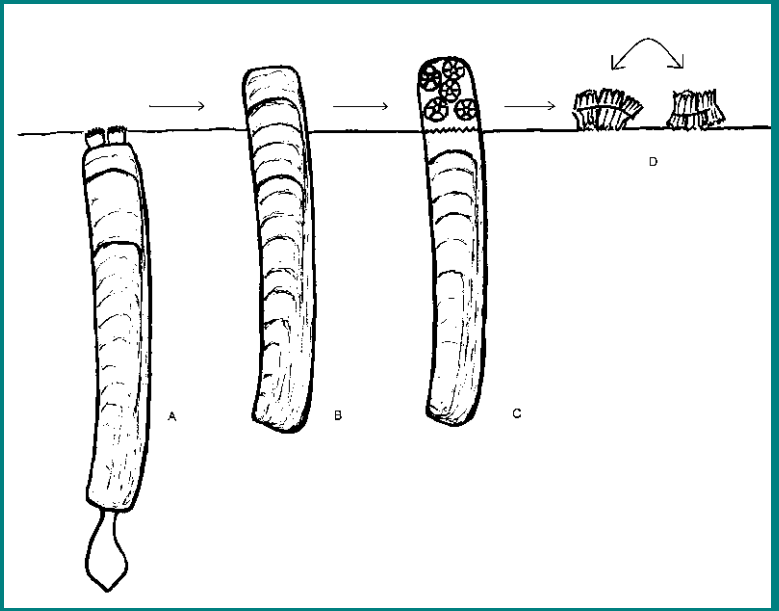
Hergebruik door heremietkreeften

Slijtageplek door slepen over de zeebodem

Door heremietkreeft bewoonde fuikhoorns

Door heremiet bewoonde wulken trekken borende organismen aan

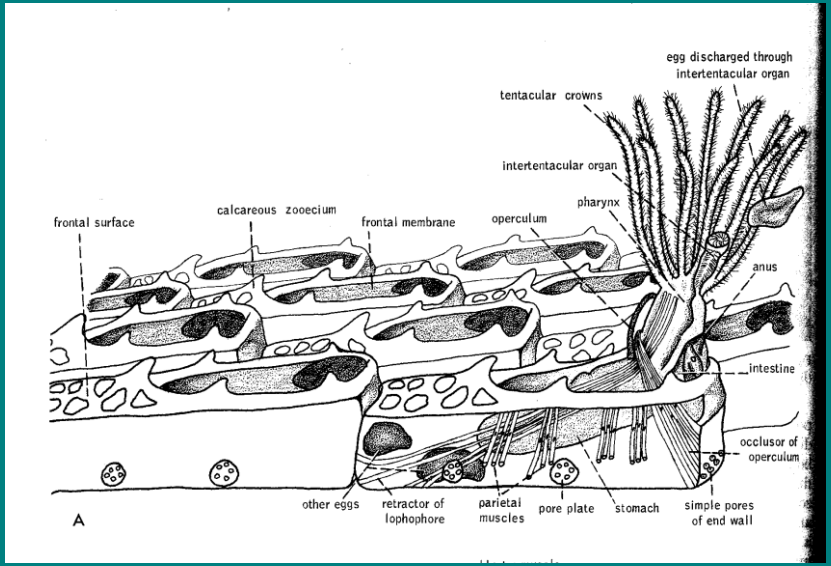
Begroeiing van Amerikaanse zwaardscheden

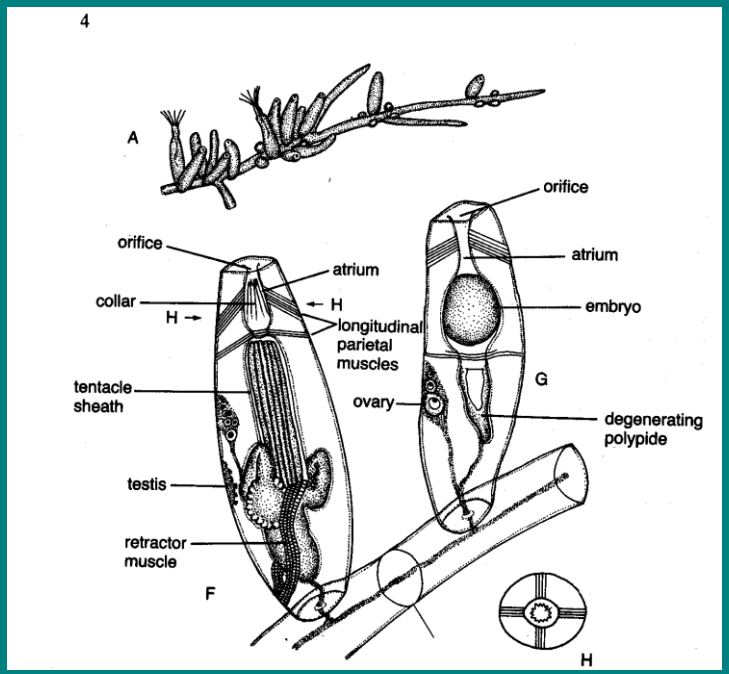


Strand Ouddorp foto Katie vd Wende

“Balanulieten” strand IJmuiden

Bryozoen (mosdiertjes) en Phoroniden (hoefijzerwormen boren soms ook





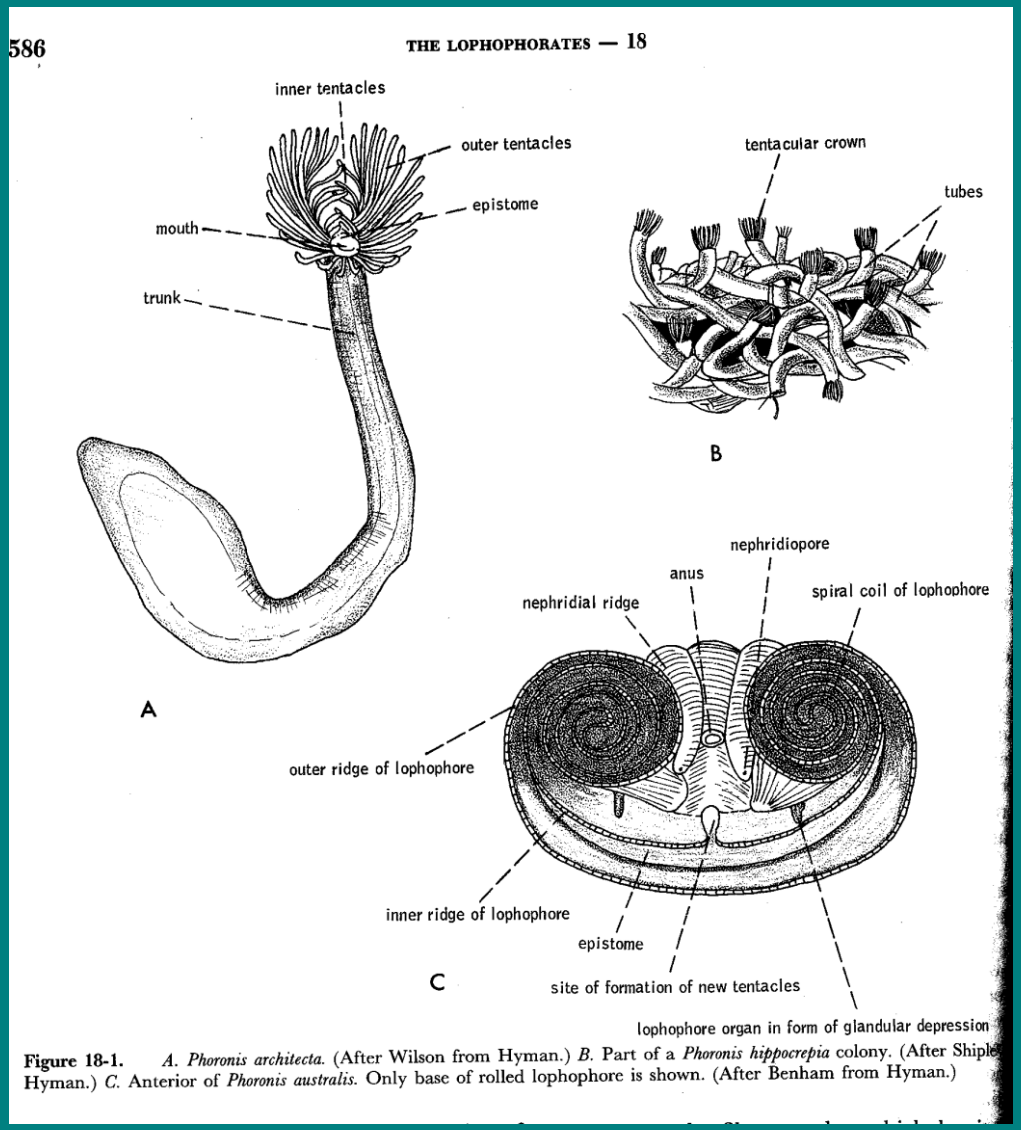


Figure 18-1. *A. Phoronis architecta.* (After Wilson from Hyman.) *B.* Part of a *Phoronis hippocrepia* colony. (After Shiple Hyman.) *C.* Anterior of *Phoronis australis.* Only base of rolled lophophore is shown. (After Benham from Hyman.)

Bryozoe *Electra monostachys* etst binnenkant lege kokkel

Borende Bryozoa in schelpen

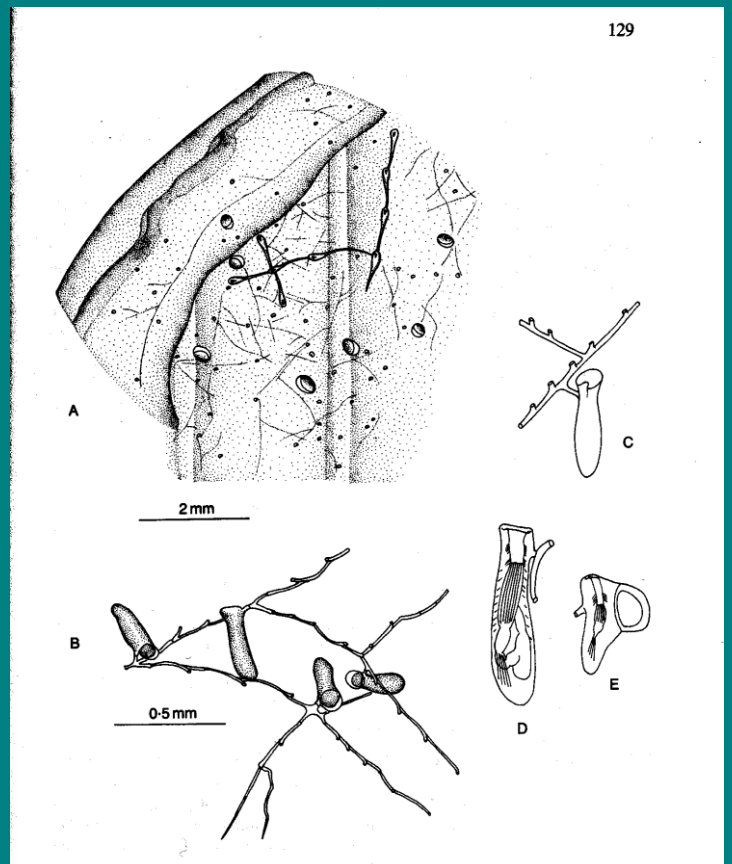
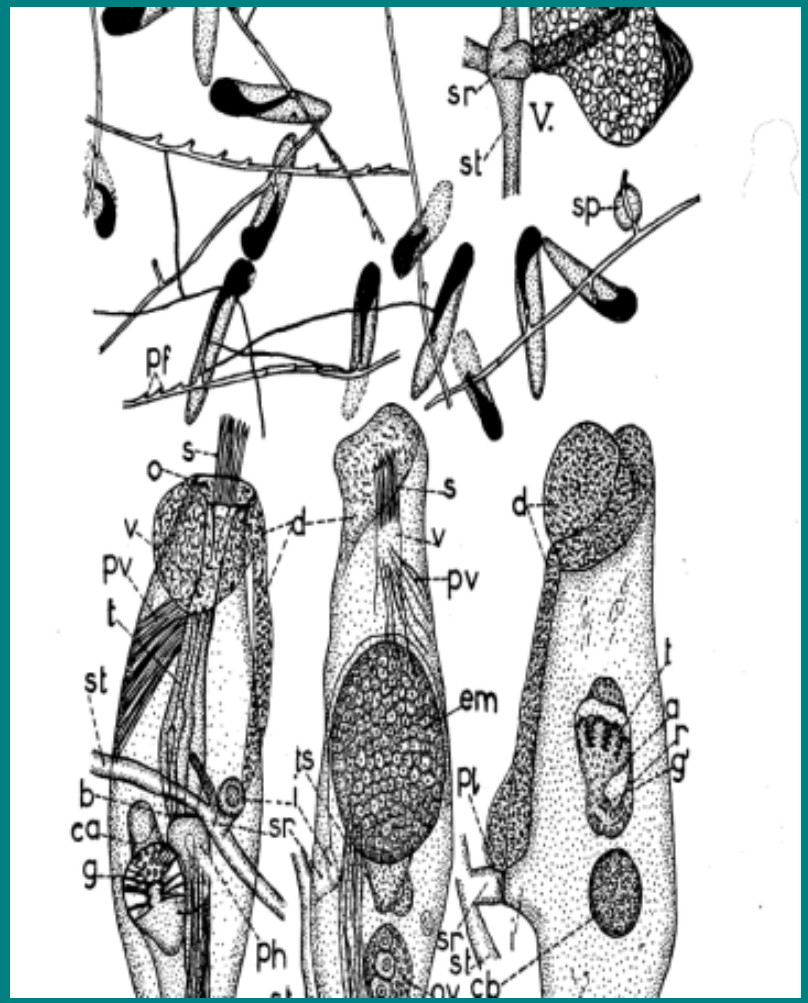
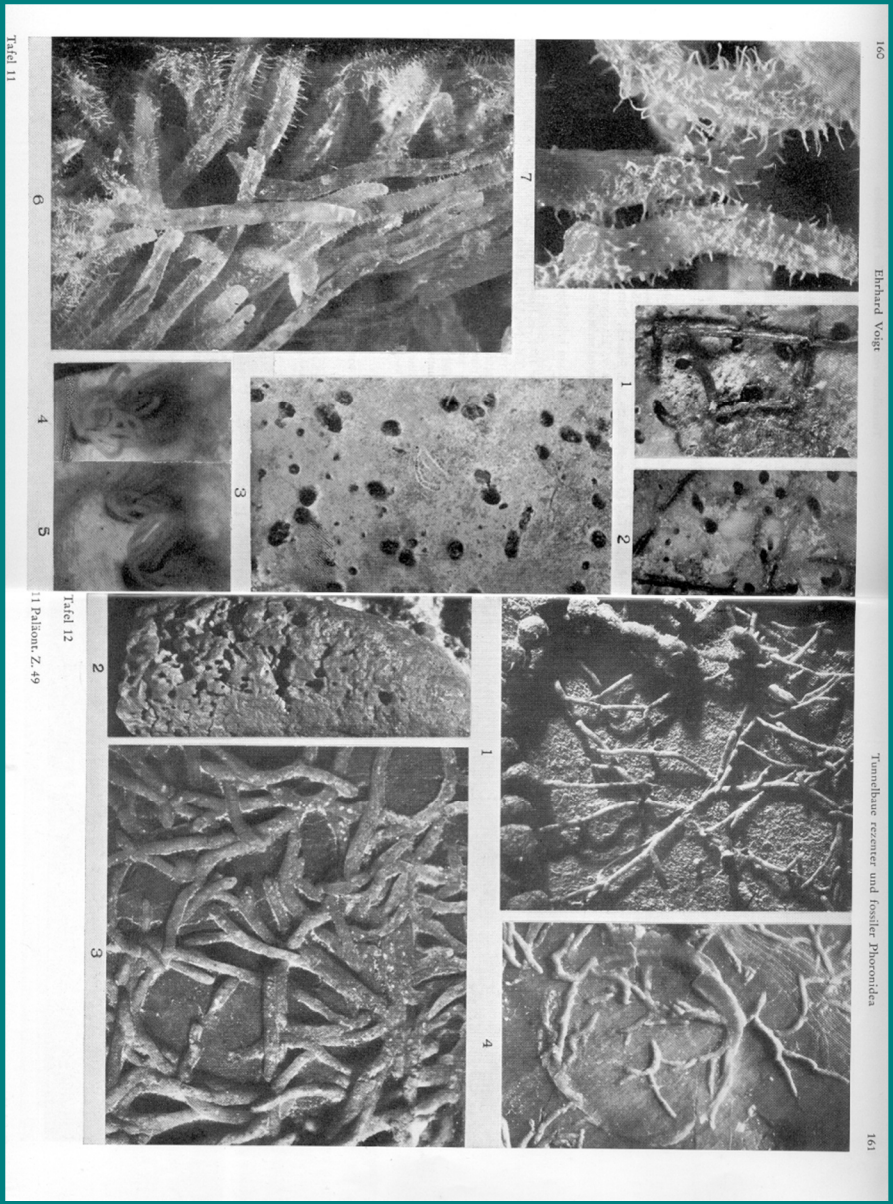
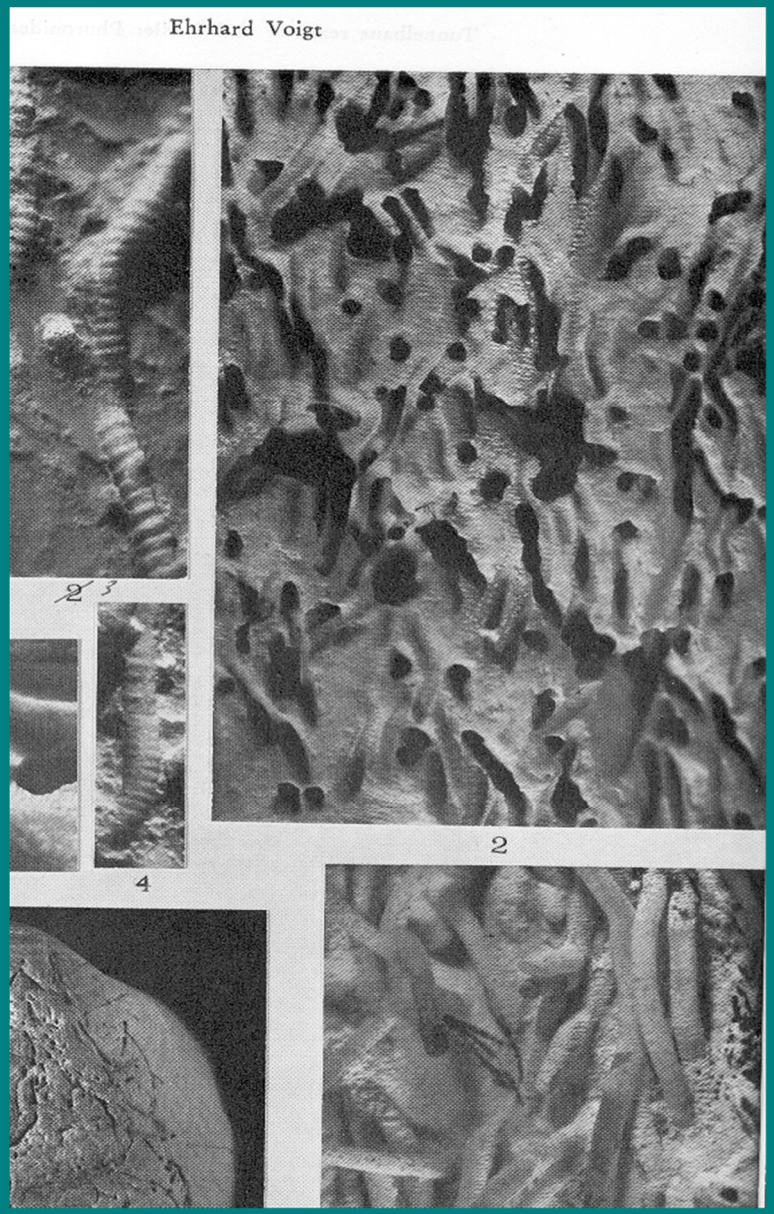


Fig. 43. *Penetrantia concharum*. A, Detail from the surface of a *Pecten* valve encrusted with a serpulid tube and a uniserial colony of the ascophoran bryozoan *Hippothoa*; the large holes are made by a boring sponge, the *Penetrantia* colony is seen as tiny comma-shaped borings linked by a tracery of stolons. B, Portion of a colony removed from the substratum. C, Diagram showing relationship of autozooid to stolons (After Pohowsky, 1978). D, Diagram of an autozooid. E, Diagram of a gonozooid. (D, E, after Soule and Soule, 1969).

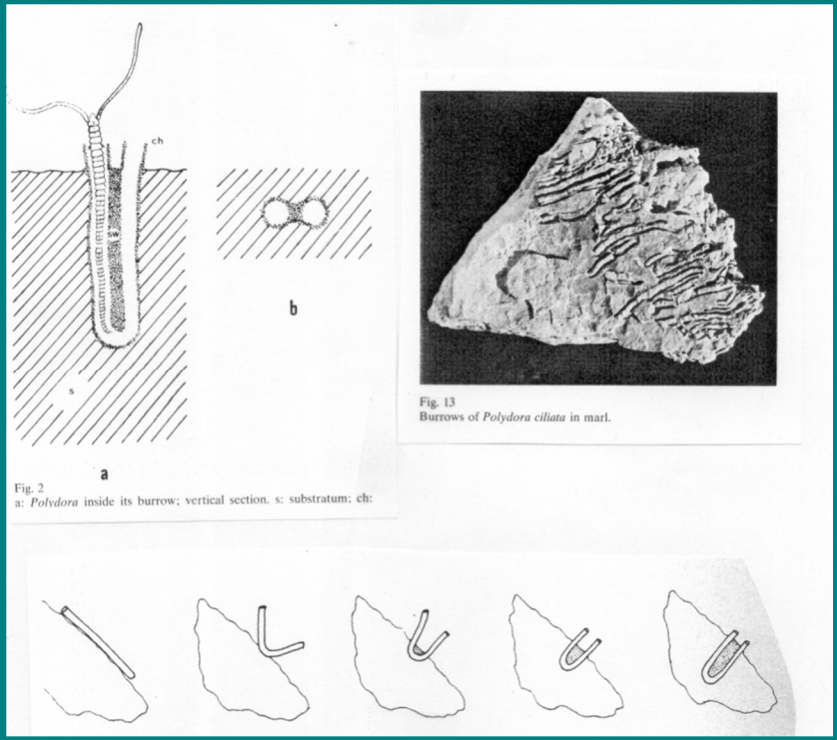


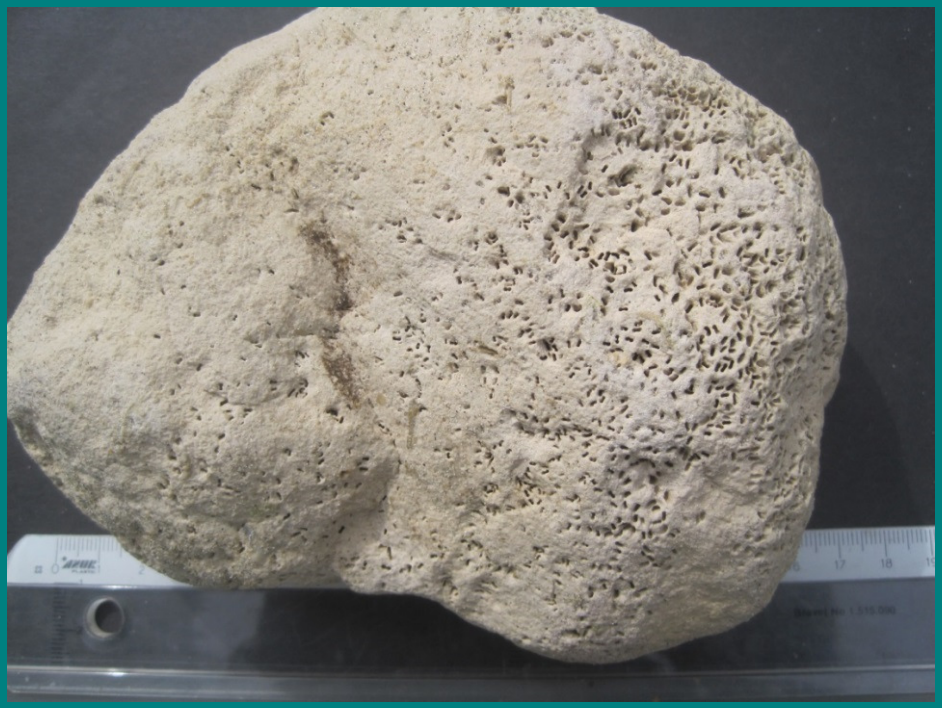
Borende Phoroniden (Hoefijzerwormen)

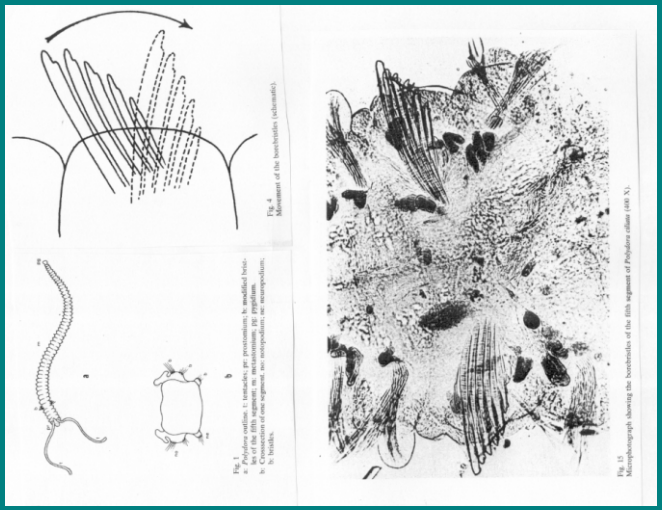




Borende borstelworm Polydora







Polydora in oesters

HERTWECK Polydora op levende kokkels

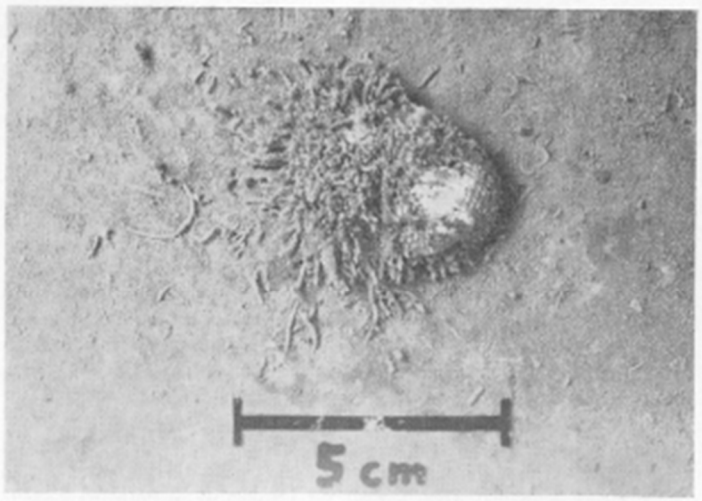


Abb. 3. Von *Polydora ciliata* befallene Herzmuschel nach drei Wochen Liegezeit im Aquarium. Die Muschel ist schon in den ersten Tagen abgestorben; die Würmer haben ihre Röhren bartförmig über den Boden und die Muschelklappen verlängert.

Abb. 4. Von *Polydora ciliata* befallene Herzmuschel (links Außenseite; rechts Innenseite ohne Weichkörper) nach drei Wochen Liegezeit in einem Aquarium ohne Sedimenteinlage. Die Würmer verlängern ihre Röhren, wobei sie das Baumaterial aus dem Röhrentürmchen entnehmen. Schließlich müssen sie ihre Bautätigkeit wegen Baustoffmangels einstellen (vgl. Abb. 3, wo den Würmern genügend Baustoff zur Verfügung stand).

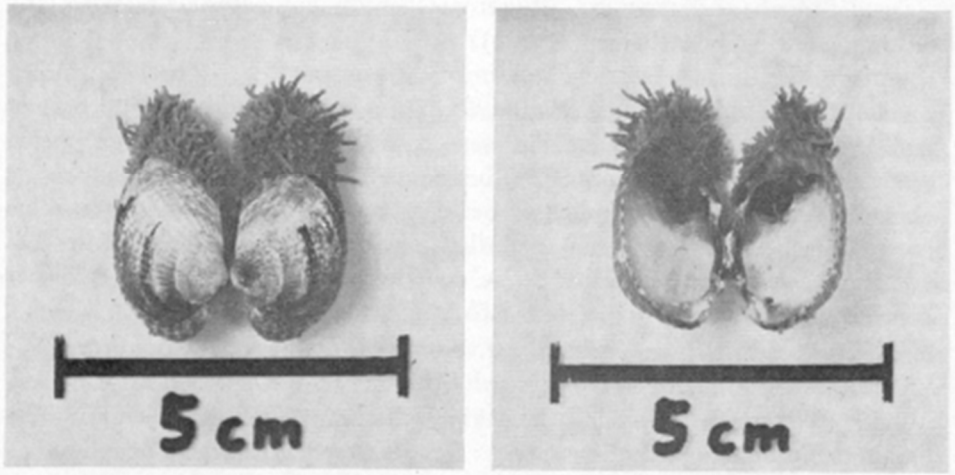
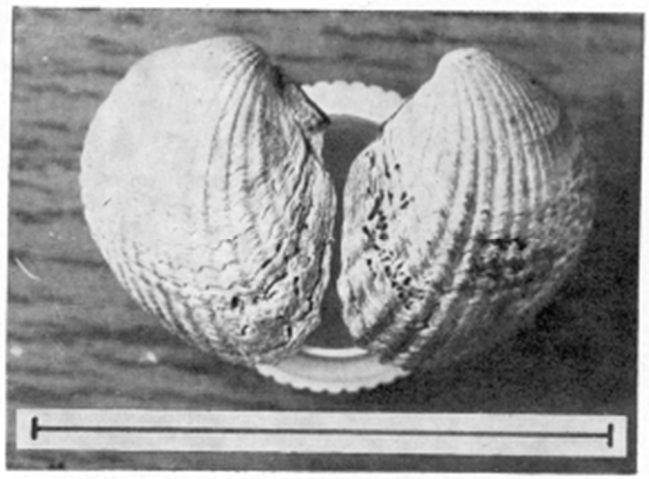
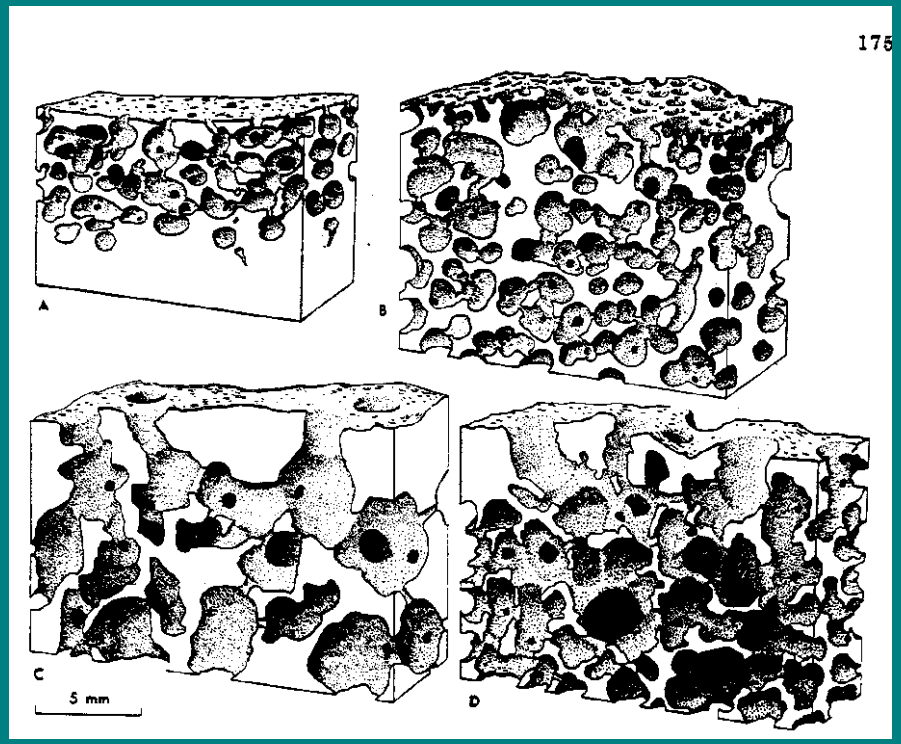
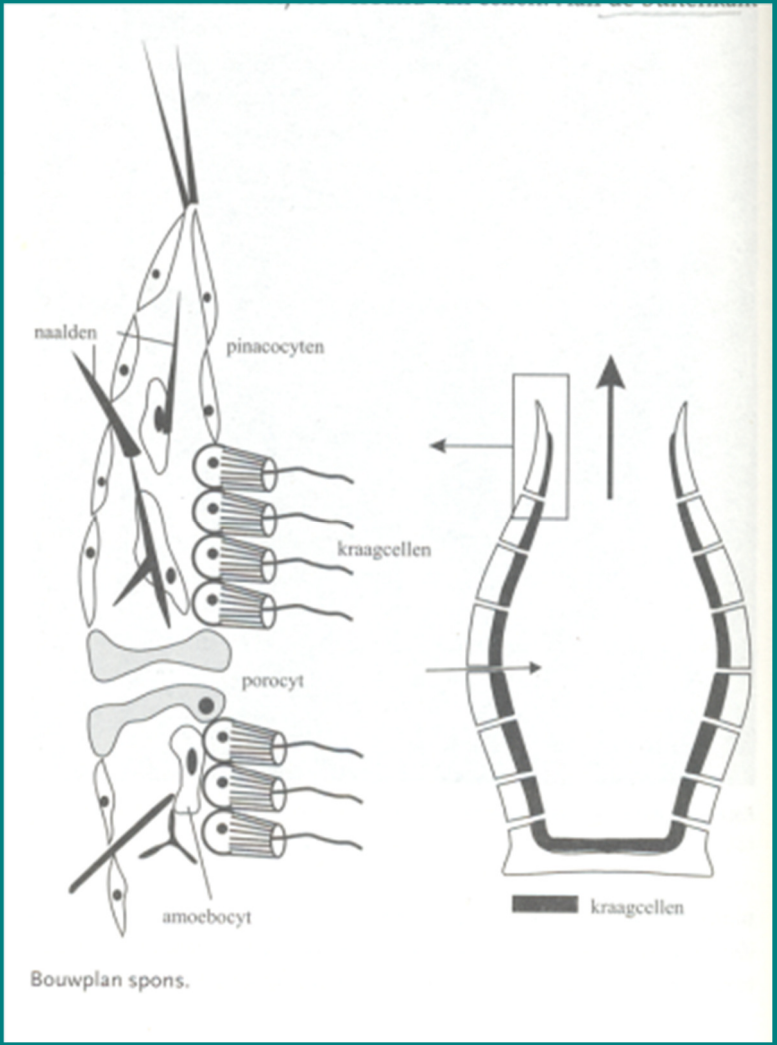


Abb. 6. Klappen der Herzmuschel *(Cardium edule)* mit Bohrlöchern von *Polydora ciliata*. Man erkennt die einzelnen Schenkel der U-Gänge und die Spreitenausfüllungen dazwischen. — Maßstablänge 5 cm. — Alle Aufn. G. Hertweck.

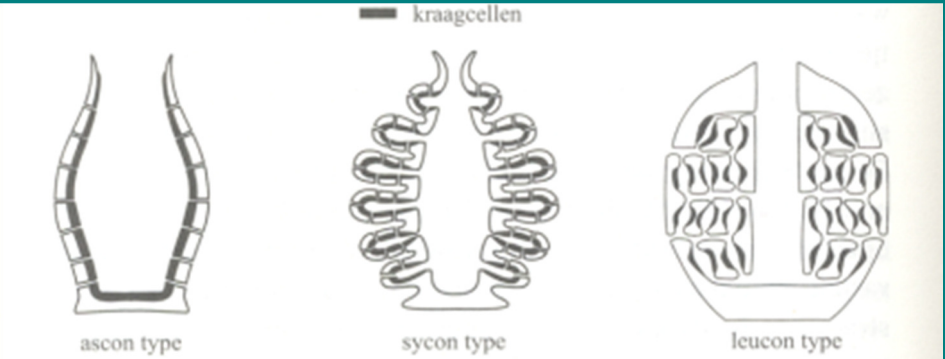


Werk van boorsponzen



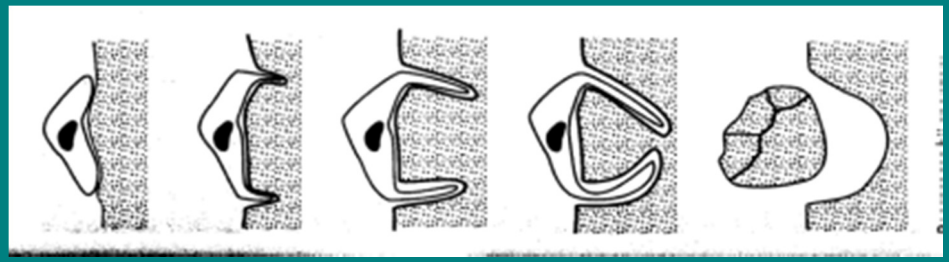


Bouwplan spons.



Vergroting van het oppervlak bezet met kraagcellen bij drie typen sponzen.

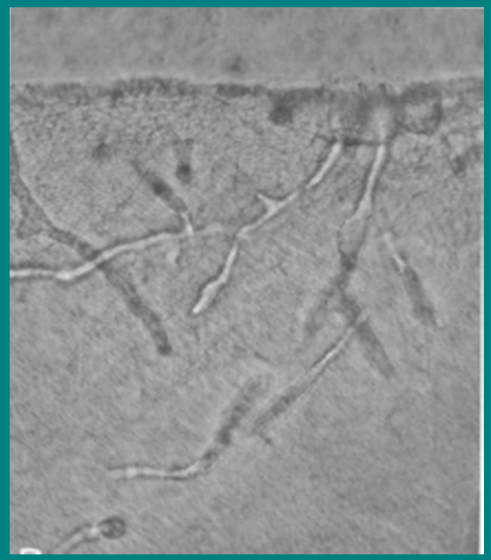
Boorsponzen ‘boren’ in kalk
met speciale etscellen



Plaatjes uit J.J. Videler (2010) *Bionica*

Boorspons in oesters

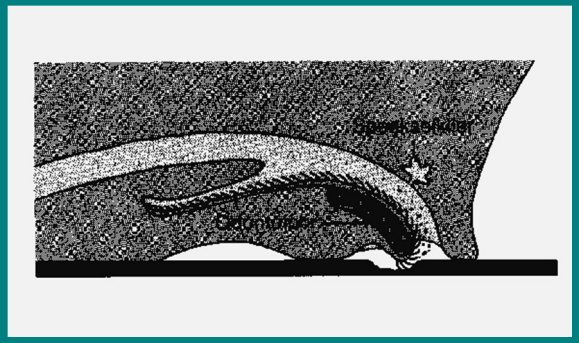
Microboorders in schelpen

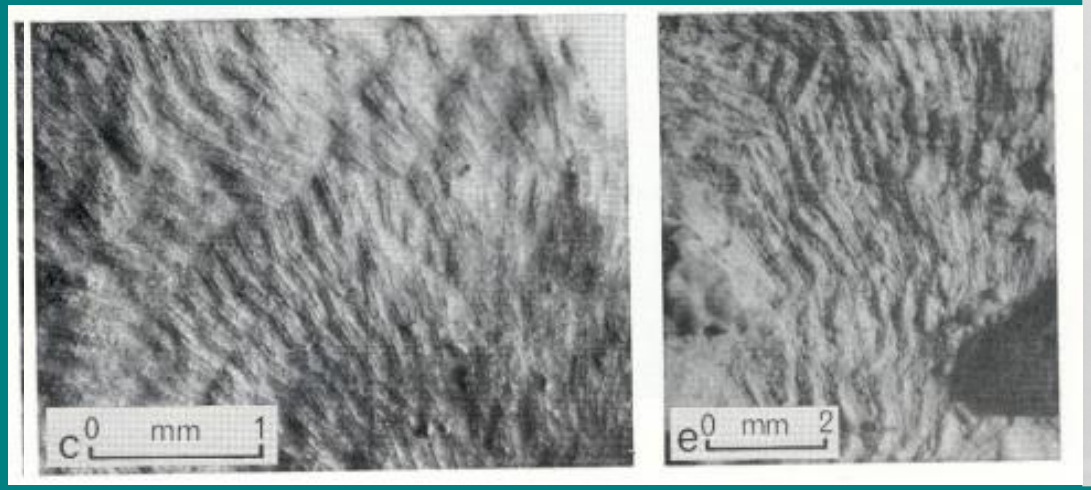


Kokkel Mokbaai Texel

Strandgapers door microboorders aangetast

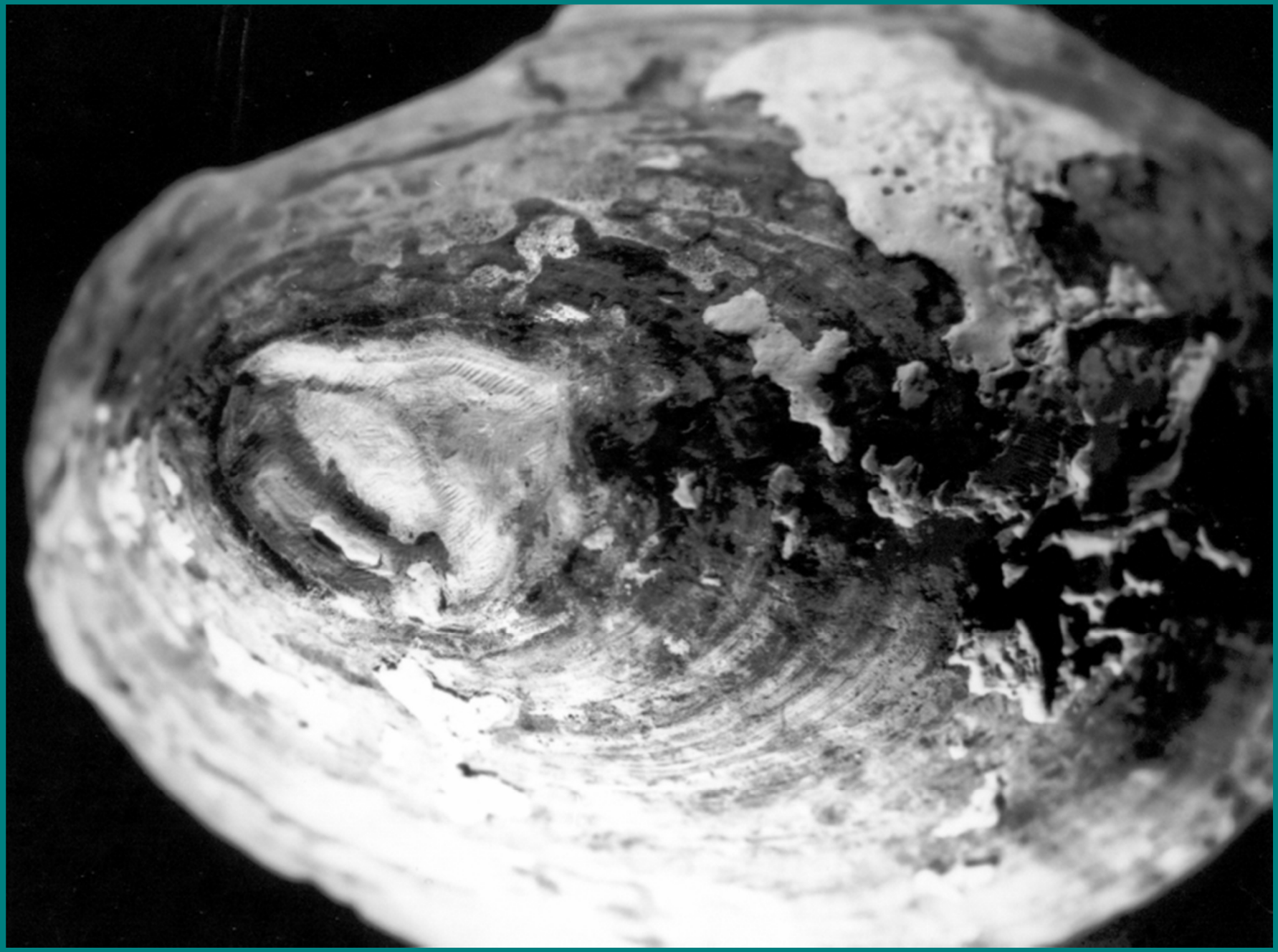
Keverslak grazer op microboorders in schelpen

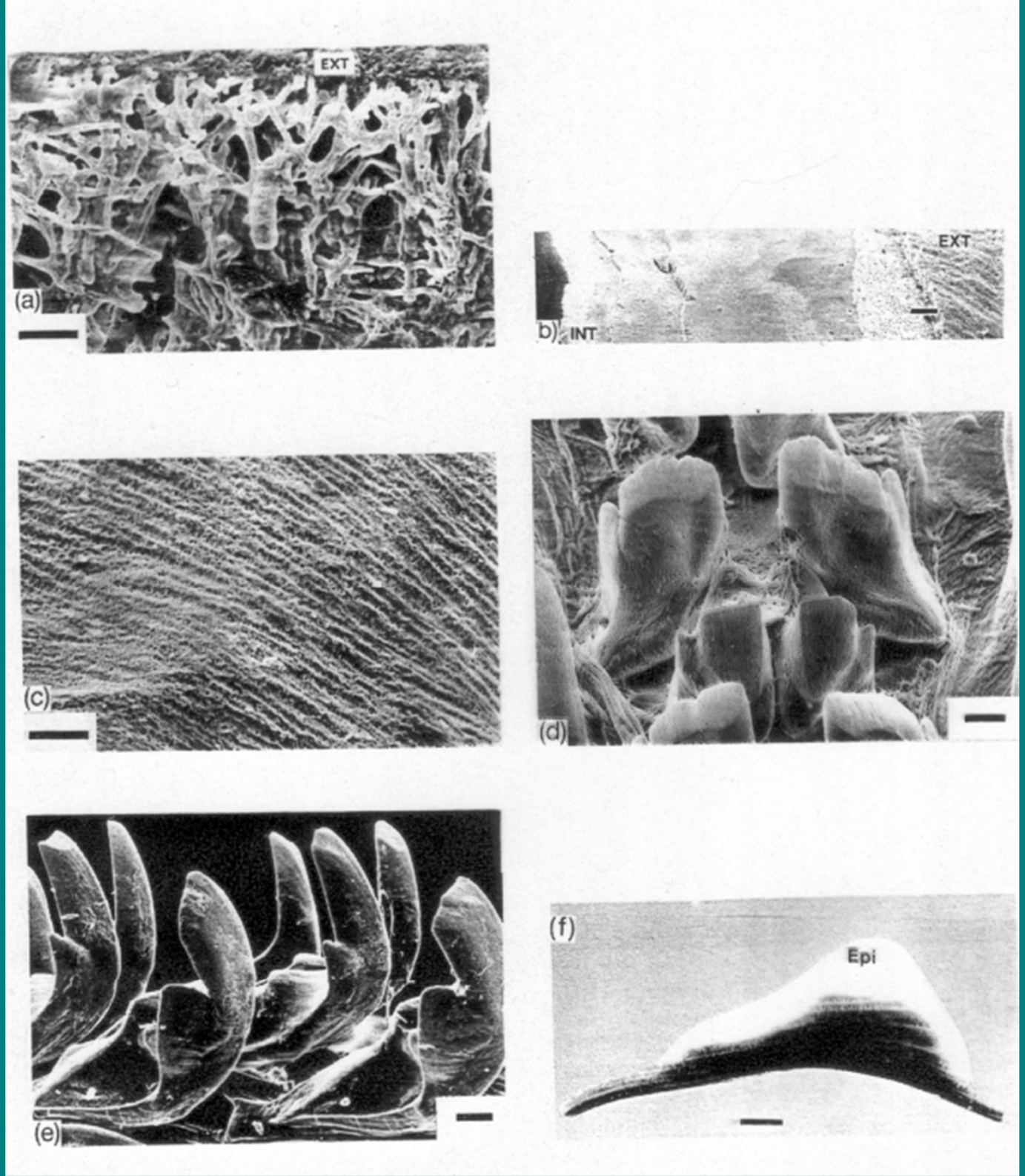




Boven: Enkele van de harde tanden op de radula van deze *Chiton olivaceus* vertonen al slijtage. De foto is gemaakt met een scanning electronenmicroscoop. In werkelijkheid is het gefotografeerde stuk 0,4 mm breed.

Graassporen op napslak





Napslak foerageert op borende algen en maakt graassporen

Grazende Alikruiken op schelpen van levende Japanse oesters

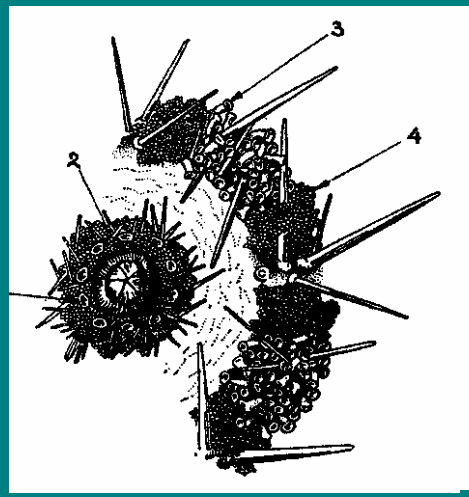
Microboorder is hier een korstmos, de Zeepokkorst
Alikruiken grazen daarop en veroorzaken
gaten in de lege oesterschelpen
Texel Juli 2013

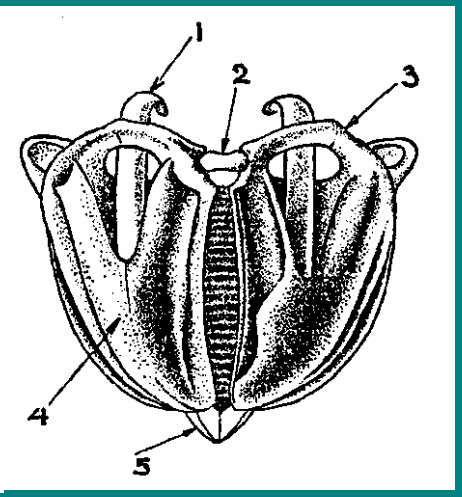
Zeepokkorst

Schraapsporen van regulaire zeeegel

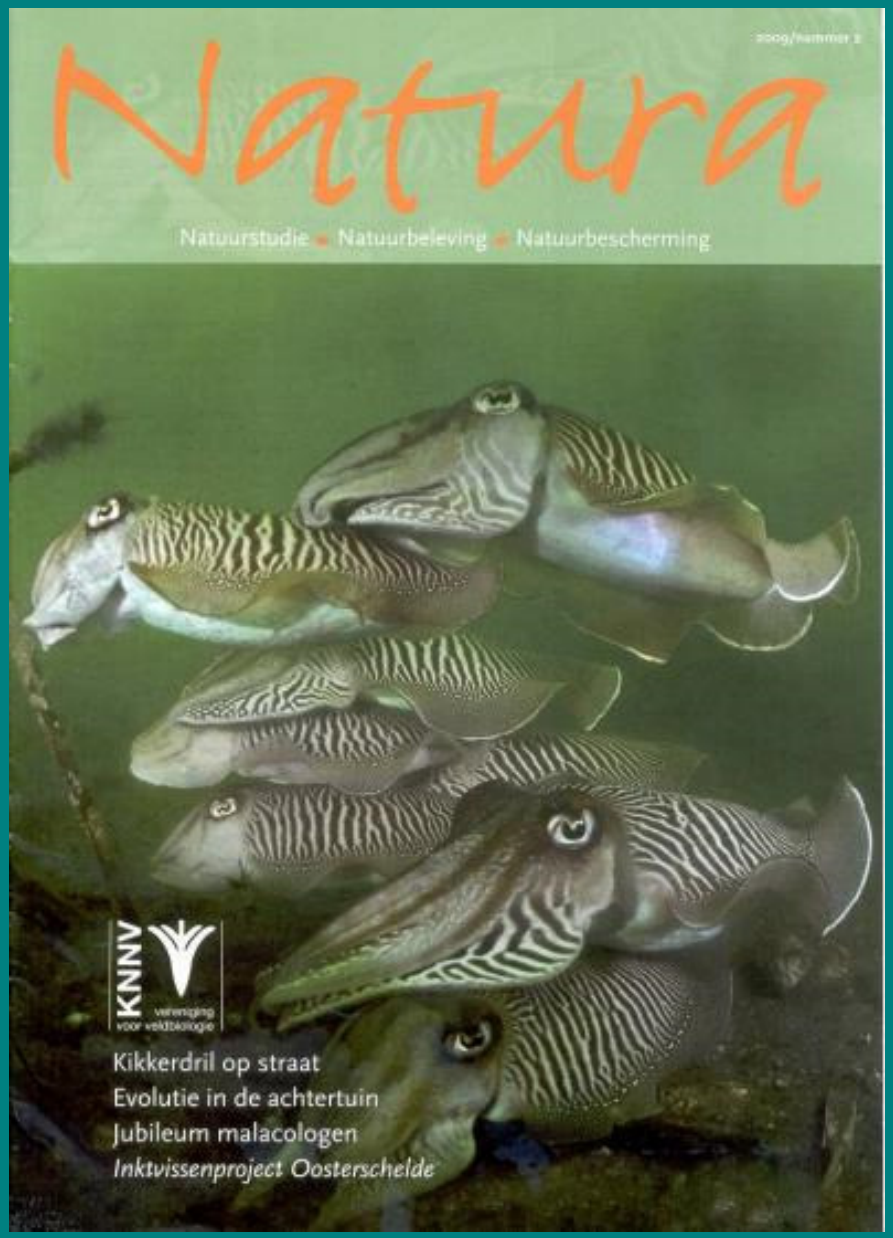
Ostrea edulis strand Texel

Psammechinus miliaris



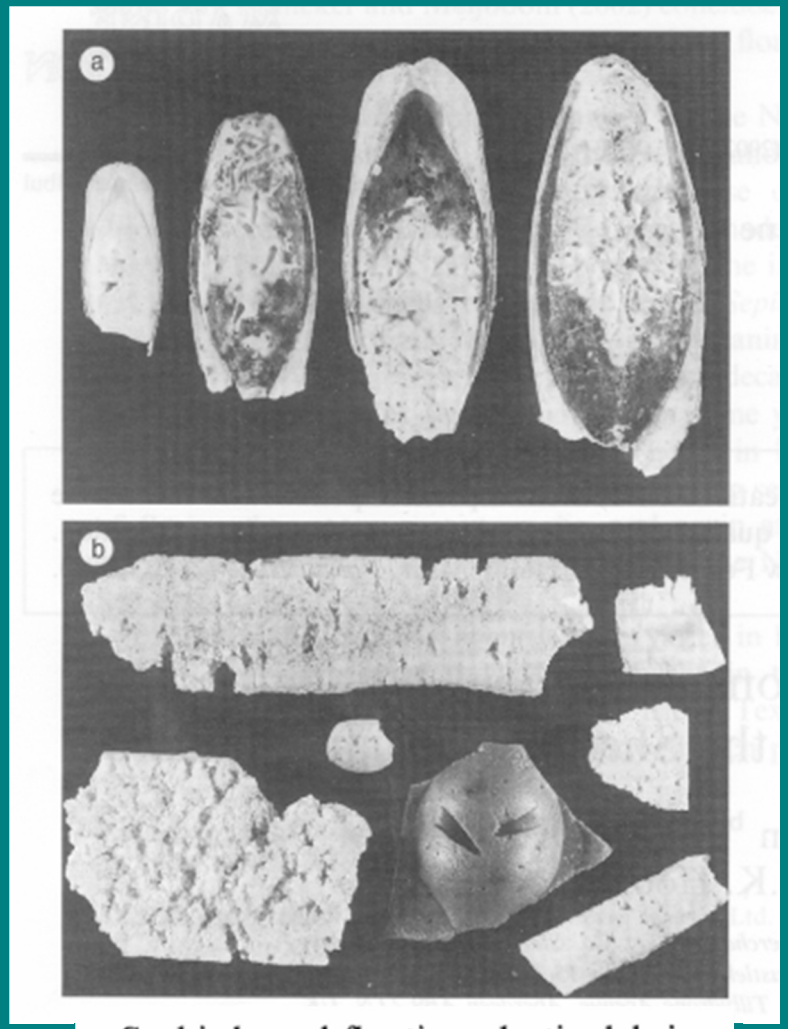


Zeekatten in ‘Natura’ en hun schilden op het strand



Sepia-schilden met krassen en piksporen

Piksporen gemaakt op in zee drijvendeSepia schilden en op drijvend plastic



Seabirds and floating plastic debris

Gerhard C. Cadée

MARINE POLLUTION BULLETIN

Kapotte schelpen ‘vertellen meer’, daarom interessanter dan hele?

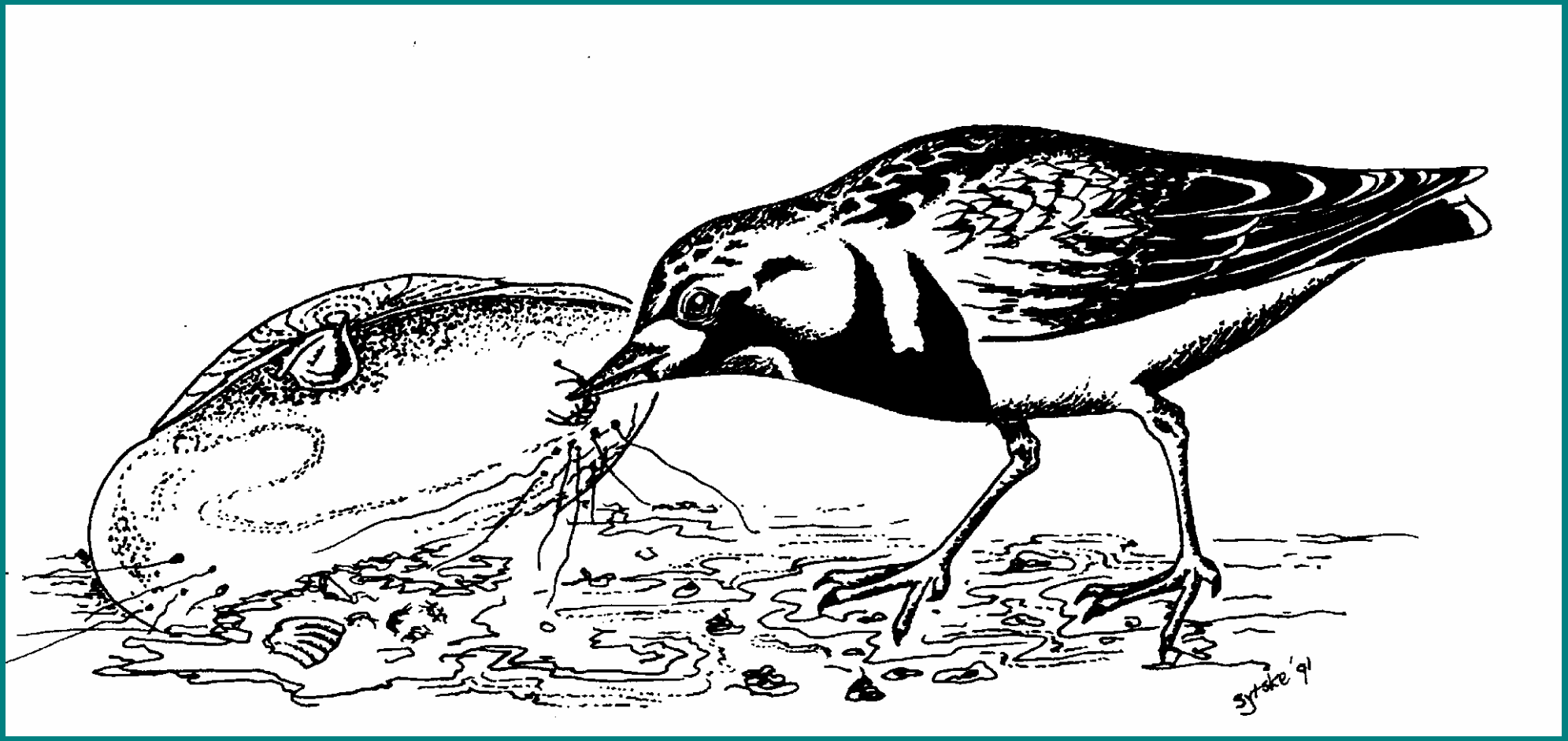
napslak

wulk

Oester

Ook kapotte schelpen kunnen fraai zijn

Het loont een schelp aan alle kanten te bekijken



Einde