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# Pathologic *Hindia* (*'Lithistida'*, Porifera) from the Ordovician of Baltoscandia

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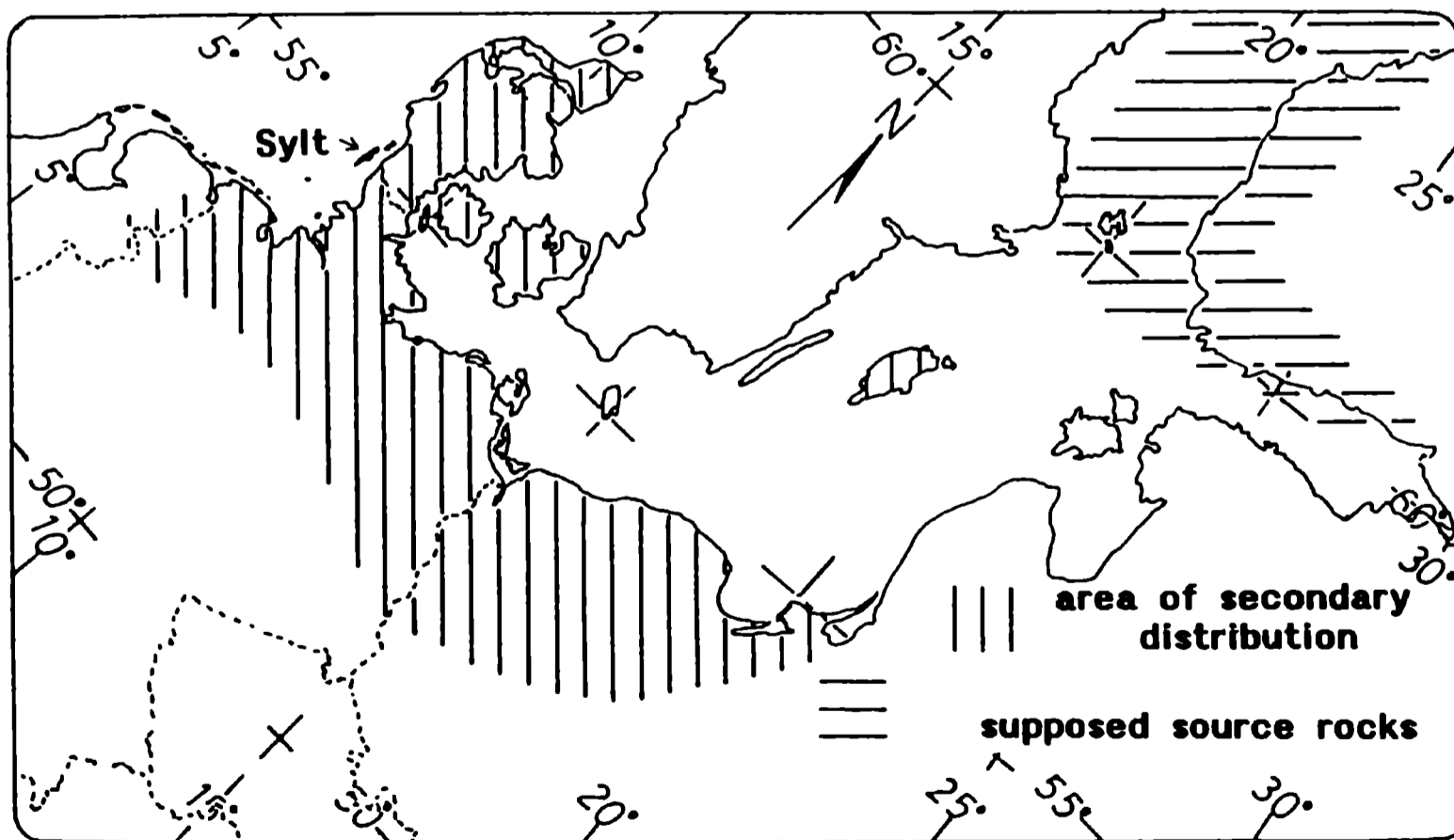
**A b s t r a c t:** Deviations from the normal shape and spicule skeleton of the lithistid demosponge *Hindia sphaeroidalis* are described. For the first time the *compositum* type which is known from other lithistids could be observed at *H. sphaeroidalis*. The second type is named forma *aegra parallelum*.

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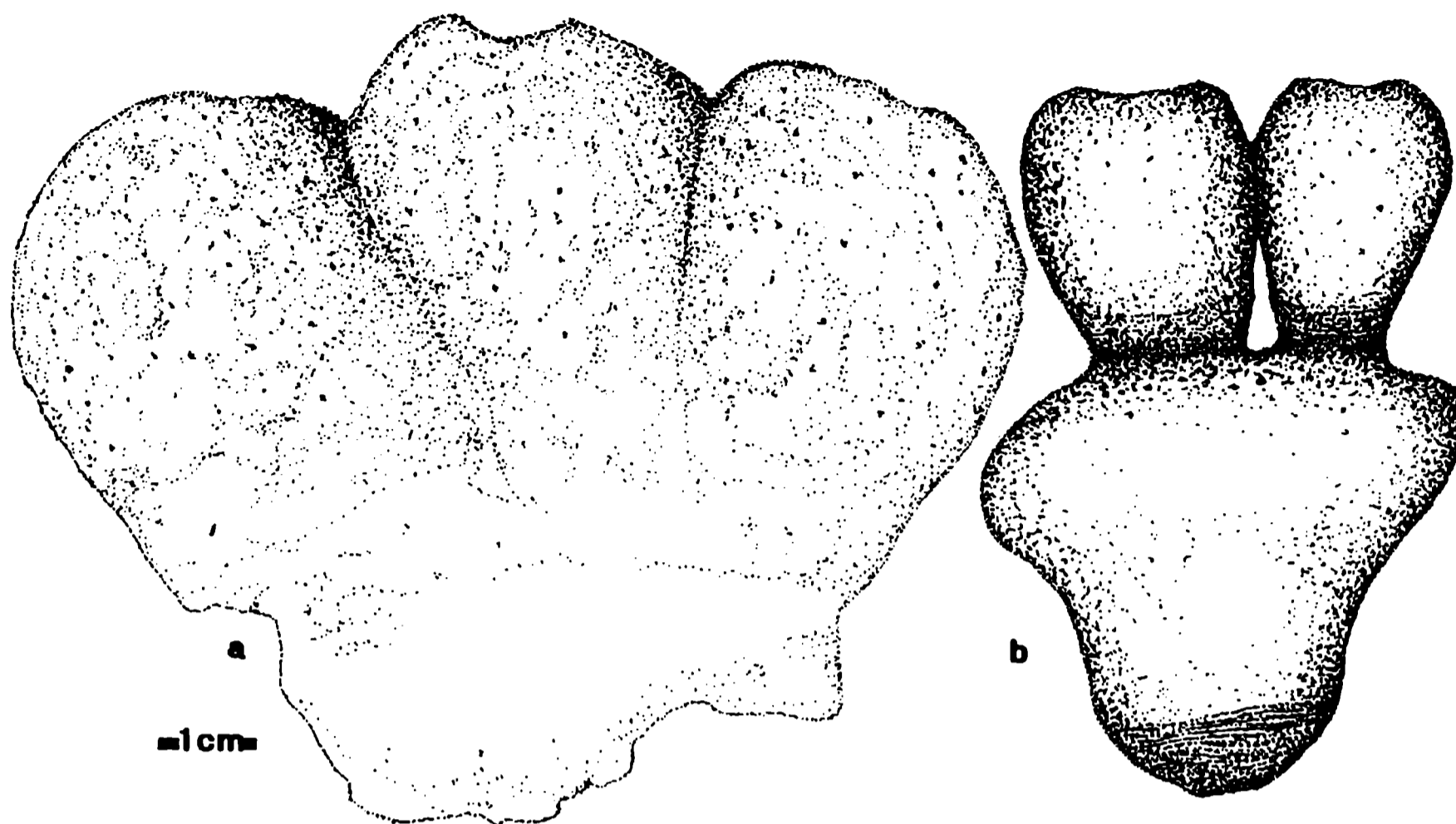
**K u r z f a s s u n g:** Zwei Typen von Abweichungen in der Gestalt und im spikulären Skelett bei der lithistiden Demospongie *Hindia sphaeroidalis* werden beschrieben. Außer der Erstbeschreibung des Typs forma *aegra parallelum* wird forma *aegra compositum* erstmals bei *H. sphaeroidalis* nachgewiesen.

## 1. Introduction

In 1861 ROEMER described the Baltoscandian fauna of Ordovician limestone geschiebes (glacial erratic boulders) from the area of Öls/Sadewitz in Lower Silesia. The more-or-less silicified lithistid demosponge associations were described by him systematically, part of them for the first time. Later, Lithistidae were also found in other glacial deposits.



Text-fig. 1. Area of "secondary distribution" of the *Lavendelblauer Hornstein* and macrofossils originating from the *Lavendelblauen Hornstein*.



Text-fig. 2. Various types of intergrowth in *Aulocopium aurantium*.  
 a) Collective intergrowth of three individuals (*A. aurantium* forma *aegra compositum* s.s.); b) Intergrowth of generations.

After seeing various collections of geschiebes, RAUFF had the opportunity (1894, 1895) to edit a reference book on lithistid sponges. Since the beginning of this century the island of Gotland is known for the occurrence of an allochthonous silicified fauna, including lithistid sponges. Today the Dutch/German borderland (the Twente-Overijssel province and the county of Bentheim) is a well-known area for the discovery of such sponges (van KEMPEN 1989).

Since the middle of this century, the same silicified fauna of the so-called *Lavendelblauer Hornstein* ("Lavender Blue Chert"), mostly of Ordovician and only a small part of Silurian age, has been described in Neogene deposits of the Central European Tertiary Basin (text-fig.1).

## 2. Source rocks and area of "secondary distribution"

The fauna of the *Lavendelblauer Hornstein* is especially known from the boulder-bearing "Lignite Sands" (Miocene) of Brandenburg (AHRENS & LOTSCH 1967), Lusatia (KRUEGER 1990) and Pomerania (BERGER 1941) as well as from Pliocene deposits (Kaolinsand Fm.) of northwestern Germany. The island of Sylt (Northern Germany) provides the best sampling conditions for the *Lavendelblauer Hornstein*, isolated sponges and other silicified microfossils (U von HACHT 1985-1990). Faunal comparison with the Ordovician/Silurian rocks of the eastern Baltic suggests that the *Lavendelblauer Hornstein* originated from an area north of Gotland, as far east as southern Finland (SCHALLREUTER 1986). However, a more precise location cannot be provided yet.

### 3. Growth anomalies of Ordovician Anthaspidellids

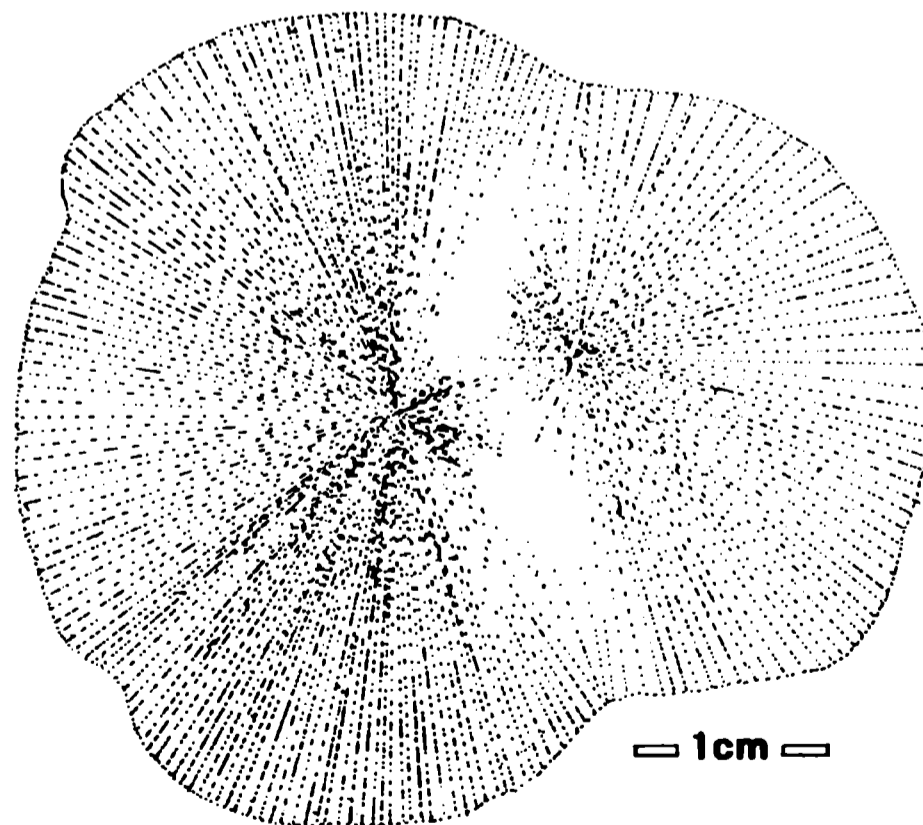
Growth anomalies of lithistid sponges from Northern Europe were first described by CONWENTZ in 1905. The most common species is *Aulocopium aurantium*, a mostly mushroom-shaped anthaspidellid sponge. An aggregate of several intergrowing individuals of that species from an Ordovician geschiebe has been named *A. compositum* (CONWENTZ 1905). Contrary to previous opinions, the aggregate lacks species character which suggests the term *A. aurantium* forma *aegra compositum*. Several intergrowing forms of *A. aurantium* forma *aegra compositum* (von HACHT 1982, 1990a, van KEMPEN 1982, KOK 1982) are known (text-fig.2). Furthermore, the *compositum* type is now known from other Anthaspidellidae (von HACHT 1993). Individual sponges form such aggregates by fusion along the vertical axis or in the horizontal plane. The former reflects an intergrowth of populations of different generations. The latter is formed by intergrowth of individuals of the same generation. If in the latter case several individuals form a common cortex the term forma *aegra compositum* is applicable in the strict sense (text-fig.2a).

### 4. *Hindia sphaeroidalis* DUNCAN, 1879

*Hindia sphaeroidalis* is one of the most common Lithistida in the Ordovician. It is known from Australia, Canada, the USA, Baltica, from Ingermanland (St. Petersburg area) and elsewhere. Therefore, this sponge should be considered cosmopolitan. *H. sphaeroidalis* is also one of the most common sponges among faunas from geschiebes which occur in the Kaolinsand of the Isle of Sylt, northernmost Germany (von HACHT 1991). In Europe *H. sphaeroidalis* is the only representative of the family Hindiidae. Within this group it is the only one that developed a single radial canal system.

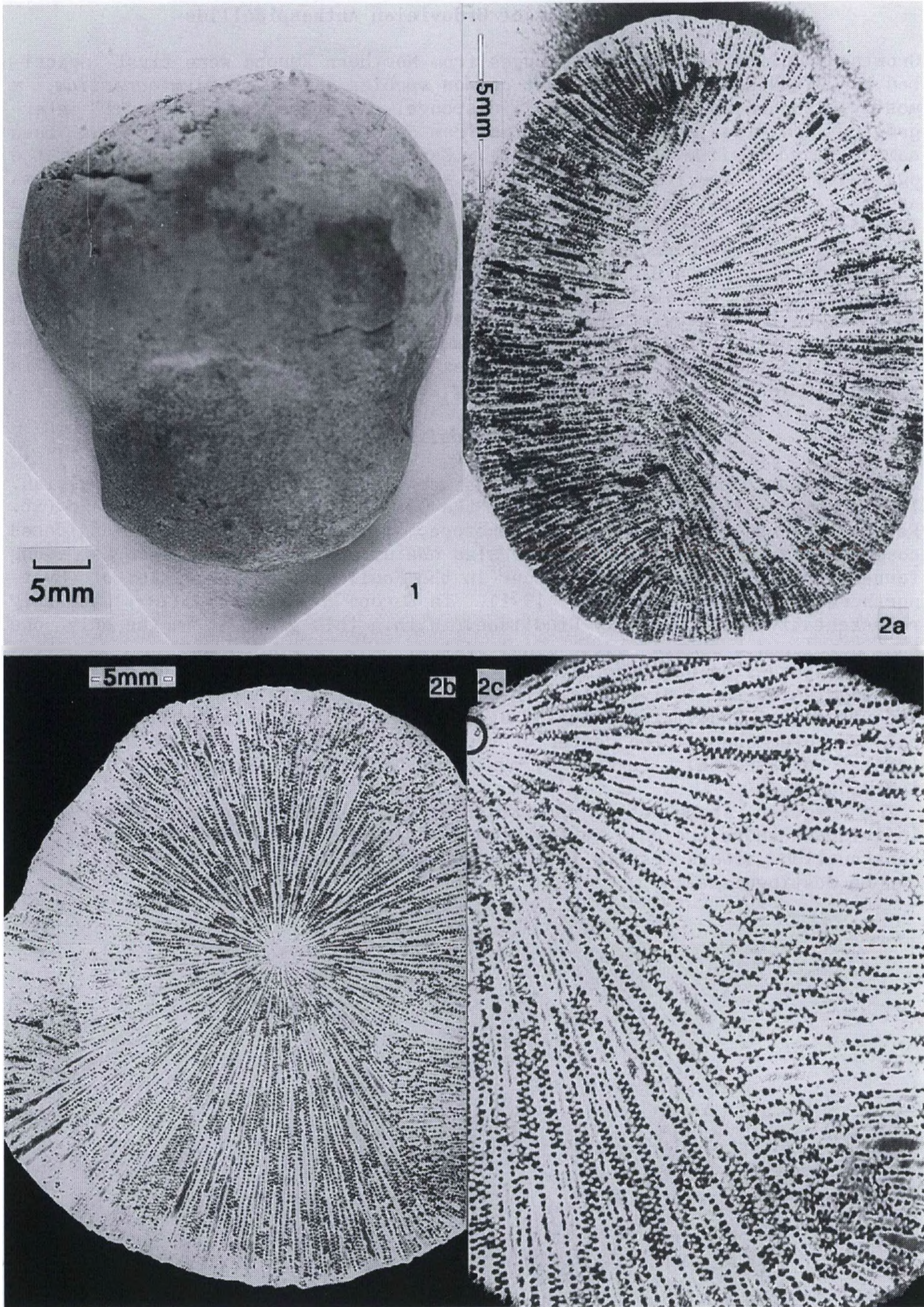
Since sponges do not form differentiated tissue, there are difficulties in distinguishing the individuals. There are two criteria to identify lithistid individuals of Ordovician/Silurian age. They display systematically an inner and an outer shape. The center of the radially oriented skeletal structure (center of growth) formed by chains of spicules is specific to every individual.

The regular shape of *H. sphaeroidalis* is a sphere. Among thousands of individuals there are only a few with an irregular shape. Pathologic skeletal construction always results in a non-spherical shape. Two pathologic forms can be distinguished:



Text-fig.3. *Hindia sphaeroidalis* forma *aegra compositum*. Median cross section.







*Hindia sphaeroidalis* forma *aegra compositum*

Text-fig.3; pl.1, fig.1

**D e r i v a t i o n o m i n i s:** after the composite arrangement of individuals.

**M a t e r i a l:** 1 sample from the Kaolinsand Fm. (Pliocene) of the island of Sylt, northernmost Germany.

**D e s c r i p t i o n:** The sample of *H. sphaeroidalis* shows two individuals represented by different spheres which are intermingled. The centres of their spicular growth are close to each other. A reason for this irregularity may be injuries or accidental intergrowth (with different rates of growth) of two sponge larvae.

**O c c u r r e n c e:** Lignite Sand Fm. (Miocene), Kaolinsand Fm. (Pliocene), geschiebes in the Pleistocene glacial deposits of northern Central Europe, mainly: Island of Sylt, north-western Lower Lusatia, Germany.

*Hindia sphaeroidalis* forma *aegra parallelum*

Pl.1, figs.2a-c

1979 - NEBEN & KRUEGER: pl. 139, fig.16

1982 *Hindia sphaeroidalis* - SØRENSEN: text-fig.1

1992 *Hindia sphaeroidalis* - BARTHOLOMÆUS: pl.2, fig.1

**D e r i v a t i o n o m i n i s:** after the parallel arrangement of the secondary canal system and skeleton.

**M a t e r i a l:** 5 samples from the Kaolinsand Fm. (Pliocene) of the island of Sylt.

**D e s c r i p t i o n:** The central part of *H. sphaeroidalis* forma *aegra parallelum* is built of a regular inner skeleton contrary to the secondary outer skeleton which must have developed later by irregular orientation of spicules. During the development of both skeletal types the living individuals suffered from a loss of tissue. Although the outer skeleton is built on the inner one it shows an independent orientation of spiculae, i.e. parallel instead of radial. The surface on which the secondary skeleton is built is not identical with that of the natural external sponge shape.

The loss of tissue may be restricted to one side only (pl. 1, fig. 2a). In these cases the "erosion plane" is more or less flat. In other cases the sponges were affected by an all-side-destruction that caused highly irregular shapes. The disintegration from all sides suggests absence or loss of a possible connecting organ between the sponge itself and the substrate. Nevertheless, sponges were able to regenerate the lost parts. Even after the loss of more than half of its entire volume which even exceeds the growth center (Pl. 1, figs. 2b-c), the individual was able to replace the tissue with close resemblance to its original form.

The loss of tissue may be due to scavengers with biting, cutting or rasping tools.

**O c c u r r e n c e:** Same as the preceding.

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Plate 1 (p.694)

Fig. 1 *Hindia sphaeroidalis* forma *aegra compositum* from the island of Sylt. Surface of example from text-fig. 3. Spherical form of both parts of individuals can hardly be recognized.

Fig. 2 *Hindia sphaeroidalis* forma *aegra parallelum* of the island of Sylt.

a) Sample with tissue loss on the left side exceeding the imaginable center of growth.

b) Sample injured on every side but regrown to nearly spherical form.

c) Detail of fig. 2b. Center of growth is marked.

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