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A COMPARATIVE STUDY OF THE REPRODUCTIVE CYCLE
OF COCKLES *CARDIUM GLAUCUM* (POIRET 1789)
AND *C. HAUNIENSE* (PETERSEN, RUSSELL 1971) — (BIVALVIA),
FROM THE GDAŃSK BAY

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ABSTRACT

The gonad maturation cycle of two species of cockles: *C. glaucum* and *C. hauniense*, from the Gdańsk Bay was presented. The maturity of gonads was determined by macro- and microscopic examination, using a 5-score gonad maturity scale. In *C. glaucum* oogenesis began on the turn of August and September, and spermatogenesis — between November and December. In *C. hauniense* gametogenesis started on the turn of July and August. In winter the development of gametes was slowed down or inhibited, and since spring it became very intense. Reproduction took place in *C. glaucum* in mid-June and in *C. hauniense* — from the end of May till the end of July; it depended on the temperature conditions. There were no clear-cut differences between the rate of gametogenesis at various depths.

1. INTRODUCTION

Studies on reproduction biology in species of genus *Cardium* (= *Cerastoderma*) have so far mainly concerned *C. edule* being a commercially exploited species (Bouxin 1937, Creek 1960, Gimazane 1971), whereas the morphologically similar species *C. glaucum* (*C. lamarecki*) was given less attention, mainly from the angle of comparison with *C. edule* (Boyden 1971, Kingston 1974). Moreover, all studies have taken up the populations from the coasts of Great Britain (Boyden 1971, Kingston 1974), southern France (Lucain, Martin 1974) and Danish coasts of Kattegat (Brock 1982). As concerns the reproductive cycle of *C. glaucum* in the Baltic (Mecklenburg Bay), some information has been reported by von Oertzen (1972).

C. hauniense has been described in 1971 from Danish fiords. This species, endemic for the Baltic, has not so far aroused any greater interest. There are some findings concerning its morphology, ecology (Petersen, Russell 1971, 1973), composition of population (Wołowicz, Wiktor 1975), distribution and biomass in the Puck Bay (Wołowicz 1977), whereas information on the reproduction period, rate of gametogenesis or sex ratio in the population is lacking.

Since bivalves, including genus *Cardiidae*, play a predominant role in the bottom fauna resources of the coastal zone of the Baltic, gaining deep insight into their life cycle is an important problem.

The goals of the present studies were to describe and compare the rate of gametogenesis in *C. glaucum* and *C. hauniense*, as well as to discuss the influence of some environmental factors on this process.

2. DESCRIPTION OF TERRAIN, MATERIAL AND METHODS

The Gdańsk Bay (Fig. 1) is a shallow reservoir with a sandy or sandy-muddy bottom. Water temperature is between 0 and 20°C. It is a brackish mixohaline water body belonging to the β -mesohaline zone with salinity fluctuations between 6.5–8.5‰. The north-western part of the Gdańsk Bay, i.e. the Puck Bay, is somewhat different. It is a shallow reservoir with a mean depth of 3 m (Nowacki 1977). The small depth of the Puck Bay permits rapid heating of water in spring and summer (at this time water temperature is by 2–3°C higher than in the Gdańsk Bay), and rapid cooling in the autumn-winter period.

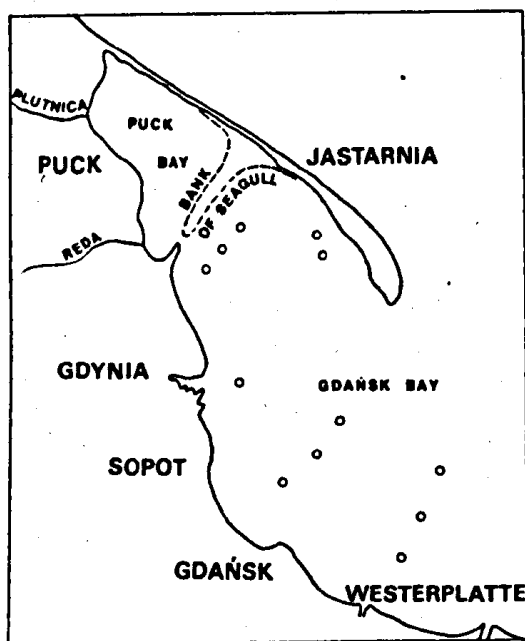


Fig. 1. Gdańsk Bay—terrain of studies. Sample collection sites are denoted with circles

A prolonged ice-cover period which averages 79 days and strongly influences desalting of this reservoir in spring is characteristic of this region (Łomniewski 1959). Despite separation of the Puck Bay from the Gdańsk Bay by a sandy bank, water exchange between them is efficient enough for the salinity to remain within the range of 6.5–7.5‰; only near to the estuaries of the Reda and Plutnica rivers water is more desalted. The Puck Bay is characterized by vertical water mixing expressed by a minimal difference in temperature and salinity between the surface and near-bottom waters. The bottom of the Puck Bay is mainly covered by algal vegetation and macrophyte meadows.

C. glaucum samples for the determination of sex and of the rate of gametogenesis were collected once monthly between August 1976 and December 1978 in Gdynia, 0.5 Mm from the coast at a depth of 3 m (Fig. 1), as well as on the turn of March-April and

of May-June, in August, and on the turn of October-November 1979 in the Jastarnia-Westerplatte region, at depths of 3, 10 and 20 m, in order to compare the rate of gametogenesis at various depths. *C. hauniense* samples were collected in the vicinity of the port in Puck (Fig. 1), at a depth of 3 m, once monthly, between May 1977, and November 1978. Analysis was made of 1385 *C. glaucum* and 770 *C. hauniense* individuals. Samples were taken with a dredge (100×50 cm), with net mesh size of 1×1 mm. The material was preserved with 4% formalin. From each sample, for detailed analysis 30—60 individuals were collected at random, and specimens of their gonads were taken for microscopic examination. Determination was made of the sex and gonad maturity degree (using a 5-score scale). For specification of the criteria for assignment of the maturity degree, use was made of the classification accepted for *Mytilus edulis* (Chipperfield 1953), *Venus striatula* (Ansell 1961), *Mercenaria mercenaria* (Keck et al. 1975) as well as for *Cardium edule* and *C. glaucum* (Boyden 1971, Kingston 1974, Lucain, Martin 1974). Reproductive cells were measured under a microscope, with at least 30 gametes inspected per 1 individual.

3. RESULTS

Cardium glaucum and *C. hauniense* are dioecious bivalves with a similar life cycle and reproductive cycle. Their sexual development comprises several consecutive stages of reproductive cells maturation, beginning from young individuals starting their first gametogenesis (in which distinction of sex is very difficult or even impossible) to individuals after reproduction in whose gonads the remainder of reproductive cells can be observed.

GAMETOGENESIS

I — initiation of gametogenesis

Females: ovaries are difficult to distinguish, even under a microscope; they contain many round oogonia with a small number of primary oocytes attached to germinal epithelium. Oocytes with a characteristic germinal vesicle coat the ovarian follicle whose lumen is poorly visible. Some few remainders of eggs, undergoing cytolysis, are usually distinguishable but only in individuals after completed reproduction.

Males: testicular follicles are hard to distinguish in the foot tissue. The follicles only contain spermatogonies and some few spermatocytes. This stage lasts from autumn till the beginning of spring; it is represented in greater number in winter.

II — developmental stage

Females: oogonia are scarce; pear-shaped oocytes with big vesicles and accumulating cytoplasm are easily distinguishable (Fig. 2). Oocytes are attached to the germinal epithelium by micropyles. The interfollicular tissue is greatly developed, similarly as in stage I.

Males: in the testes spermatocytes are dominant; spermatids are unfrequent and are situated in the centre of follicles. Similarly as in females, the inter-follicular tissue is greatly developed.

III — mature stage

Females: the ovarian follicles are easily visible; they are filled with tightly packed oocytes. In the lumen of follicle, unfrequent round and completely free egg cells surrounded by gelatinous layer are visible (Fig. 3). Cytoplasm of the oocyte is evidently granular. Gonads greatly increase in volume, whereas the interfollicular connective tissue is deficient, owing to use of reserve materials in the process of oocyte maturation. Gonads are pale-orange in colour.

Males: testicular follicles form the major part of visceral mass; they grow big and occur in great numbers. Spermatocytes are scarce and spermatozoa are arranged as characteristic dark-coloured ribbons. Gonads are filled with mature spermatozoa (Fig. 4) being milk-white and pale-yellow in colour. From this stage the reproductive cells are ready for reproduction.

IV — reproductive stage

Females: gonads are inflated; the oviduct lumen is completely filled with mature egg cells packed so closely that under a microscope they appear as polygons (Fig. 5). Eggs released into water assume a spherical form, and the volume of the gelatinous layer rapidly enlarges (Fig. 6). The pear-shaped oocytes are scarce. The small number of mature eggs and a lack of oocytes in the gonad indicate that reproduction takes place.

Males: the gonads are greatly enlarged, and follicles are filled with mature, though immobile spermatozoa; the lumen of testes is completely closed by sperm. Spermatozoa are arranged in strips, with heads towards the interior of follicles; after release into sea water, they are active. At this stage the connective tissue is deficient.

V — postreproductive (rest) stage

Females and males: the visceral mass becomes flaccid. The gonads are fallen in, often with a small number of remaining gametes. In a later period cytolysis of the reproductive cells begins, and then the sex can easily be distinguished. Ovaries often contain several big eggs not having been released during reproduction; their shape is irregular, but never pear-like. After completion of cytolysis sex determination may present difficulties, but mostly at this time differentiation of the germinal tissue of gonads is initiated, and the consecutive gametogenesis cycle begins.

SEASONAL CHANGES IN GONAD MATURITY

In *C. glaucum* oogenesis begins on the turn of August and September (Fig. 7); in samples collected in September, oogonia are present in more than 50% of females. At the same time, in autumn and even in winter in the oviduct lumen there are egg cells having remained after reproduction, and undergo resorption. Till mid-February, all females exhibit the beginning of gametogenesis in all ovarian follicles and an increase in the number of primary reproductive cells. Between March and May the development of the oocytes is accelerated; there is an increase in the number of oocytes in the follicles and in their diameter (from 18—21 to 27—36 μm). Prior to reproduction, the ovarian follicles are filled with oocytes attached to the germinal epithelium by micropyles. Oocytes (diameter of 49—59 μm) separate before reproduction which usually takes place in the 2nd half of June. Reproduction lasts about 25 days, all females participating in this process. In females undergoing gametogenesis for the first time, as compared with those having reproduced at least once, gametogenesis begins earlier (already in August), but its course is slower and the number of oogonia — smaller.

In *C. hauniense* (Fig. 8) oogenesis starts earlier than in *C. glaucum*, and in August about 80% of females are in the I—II gonad maturity stage. In some few females, after reproduction small numbers of egg remain in the ovaries. From April, the ovarian follicles are tightly filled with oocytes which grow intensely (from a diameter of 15—19 μm to one of 28—32 μm). Reproduction takes place by the end of May and lasts longer than in *C. glaucum*, i.e. till the end of July; this may testify to portioned development of this species. Reproduction is most intense by the end of May and beginning of June.

Spermatogenesis begins later than oogenesis in both species; in case of *C. glaucum* it starts in November-December (Fig. 7). This year's individuals initiate gametogenesis already in mid-September. At first it is difficult to distinguish the follicles of the testes from the surrounding tissues. The presence of spermatozoa unreleased during reproduction helps in the identification of males. Spermatogonia are small and difficult to distinguish. In February spermatocytes are predominant in the testes, and the sperm formation activity is highest in April-May. From the beginning of June, the follicles of the testes are filled with mature spermatozoa arranged as dark-coloured ribbons. Upon contact with sea water spermatozoa (9—10 μm in length) are active. The release of mature gametes takes place in mid-June and may last till mid-July; after reproduction, considerable amounts of sperm, visible till winter, remain in the follicles.

In *C. hauniense* (Fig. 8), as compared with *C. glaucum* (Fig. 7), spermatogenesis — similarly as oogenesis — begins earlier, and already in August up to 70% of males exhibit advanced gametogenesis. Developing spermatogonia dominate still in the beginning of April, and already in May 60—70% of males are ready for reproduction. The remaining testicular follicles are filled with spermatocytes. Spermatozoa (8 μm in length) are released

from May till the end of July. Reproduction is most intense in the beginning of June. Immediately after reproduction the consecutive spermatogenesis cycle starts, and small amounts of unreleased sperm remain in the testes.

RATE OF GAMETOGENESIS AS A FUNCTION OF DEPTH

In parallel with studies of the seasonal changes in *C. glaucum* gonad maturity, the maturity of gonads of cockles originating from different depths was observed. There are no differences in the percentages of females (49.5%) and males (50.5%) at various depths, and an analysis of the gonads indicates that the gametogenesis rate is identical at all depths (Tab. I).

Table I. The rate of gametogenesis in *C. glaucum* as a function of depth. The numbers represent the percentages of individuals with gonads at maturity stages I—V

Date	Depth (m)	Females N = 141					Males N = 140				
		I	II	III	IV	V	I	II	III	IV	V
10.04.78 30.03 — 12.04.78	3*	12.5	56.2	31.3	—	—	78.6	21.4	—	—	—
	3	—	60.0	40.0	—	—	100.0	—	—	—	—
	10	—	72.7	27.3	—	—	58.3	41.7	—	—	—
	20	—	—	—	—	—	—	—	—	—	—
2.06.77 17.05 — 13.06.77	3*	—	—	63.2	36.8	—	—	—	78.9	21.1	—
	3	—	—	100.0	—	—	—	—	—	100.0	—
	10	—	—	60.0	40.0	—	—	—	64.3	35.7	—
	20	—	—	100.0	—	—	—	—	—	—	—
23.08.77 08.77	3*	—	—	—	23.5	76.5	—	—	—	—	100.0
	3	77.8	—	—	—	22.2	52.2	—	—	—	47.8
	10	—	—	—	—	100.0	—	—	—	—	100.0
	20	—	—	—	—	—	—	—	—	—	—
13.10.77 13.10 — 8.11.77	3*	66.7	—	—	—	33.3	8.3	—	—	—	91.7
	3	100.0	—	—	—	—	71.4	—	—	—	28.6
	10	100.0	—	—	—	—	14.3	—	—	—	85.7
	20	100.0	—	—	—	—	—	—	—	—	100.0

* The site of monthly sample collection was accepted as reference point for the gametogenesis rate at various depths.

This can probably be explained by the fact that throughout the major part of the year similar temperature conditions prevail within the whole water mass. Only in summer and autumn the more shallow part of the Gdańsk Bay gets warm or cools more rapidly than the near-bottom waters. Therefore, in this period some slight differences in the rate of gametogenesis may take place; they do not, however, influence its further course.

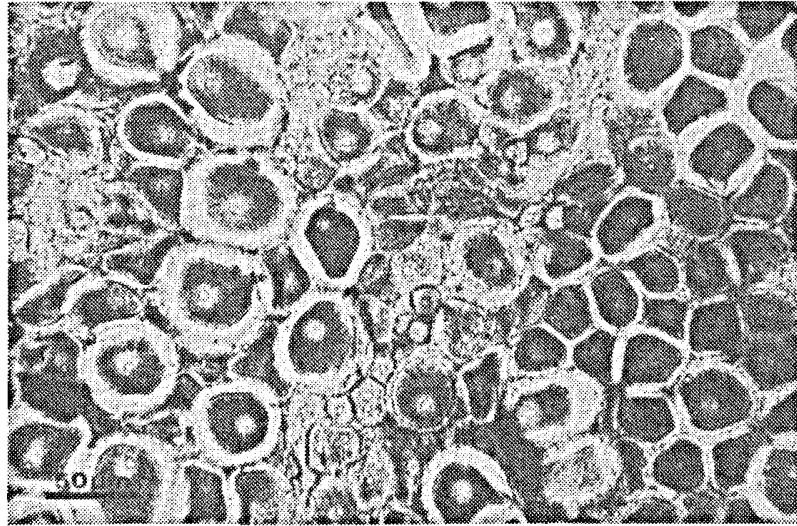


Fig. 2. Ovarian follicle of *C. glaucum* at the developmental stage. Visible many fine oogonia (oog) and unfrequent oocytes (ooc)

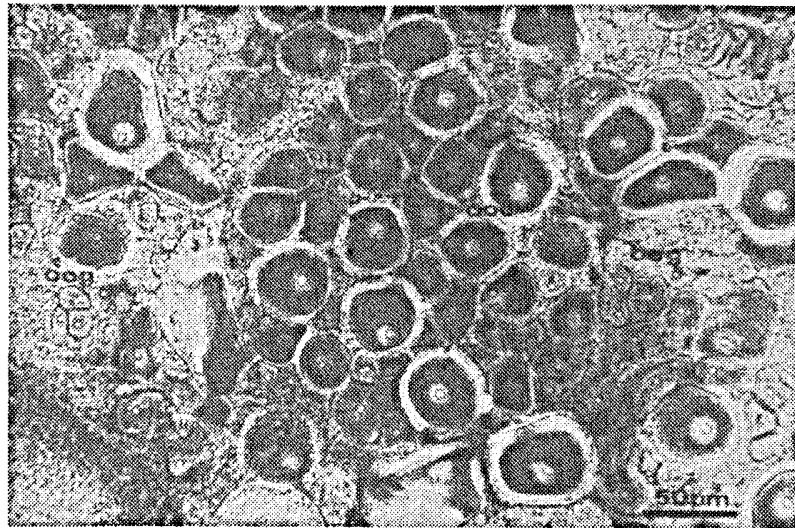


Fig. 3. Maturing oocytes of *C. glaucum* — III stage of gonad maturity

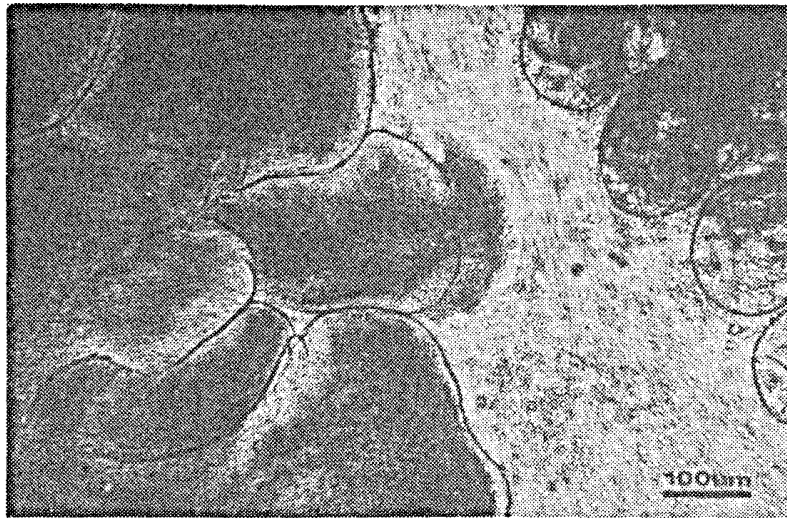


Fig. 4. Testicular follicles of *C. glaucum*, filled with mature spermatozoa

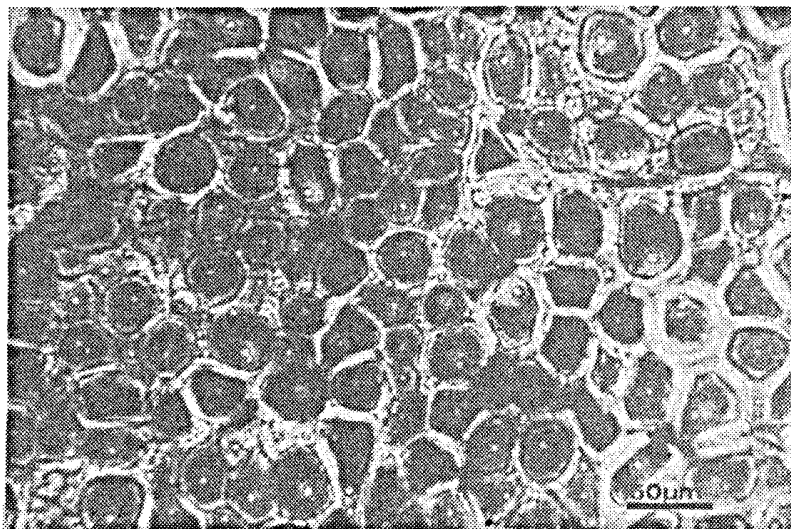


Fig. 5. Mature eggs cells of *C. glaucum*. prior to release from gonads

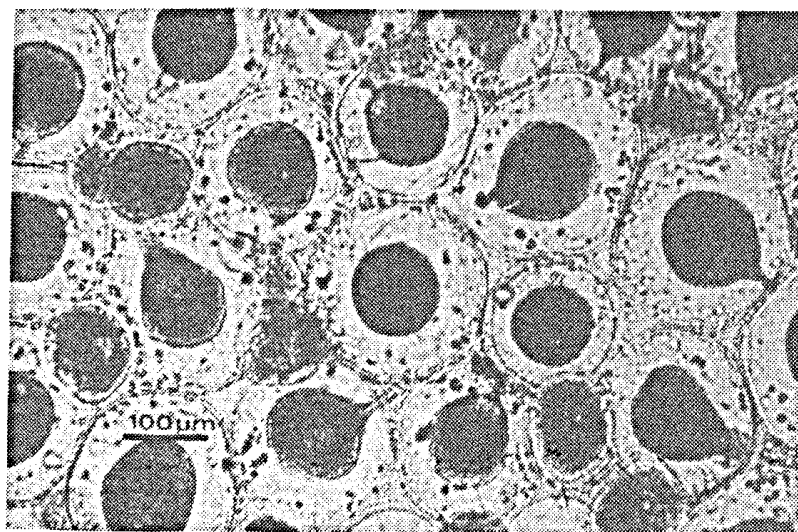


Fig. 6. Released egg cells f *C. glaucum* in sea water

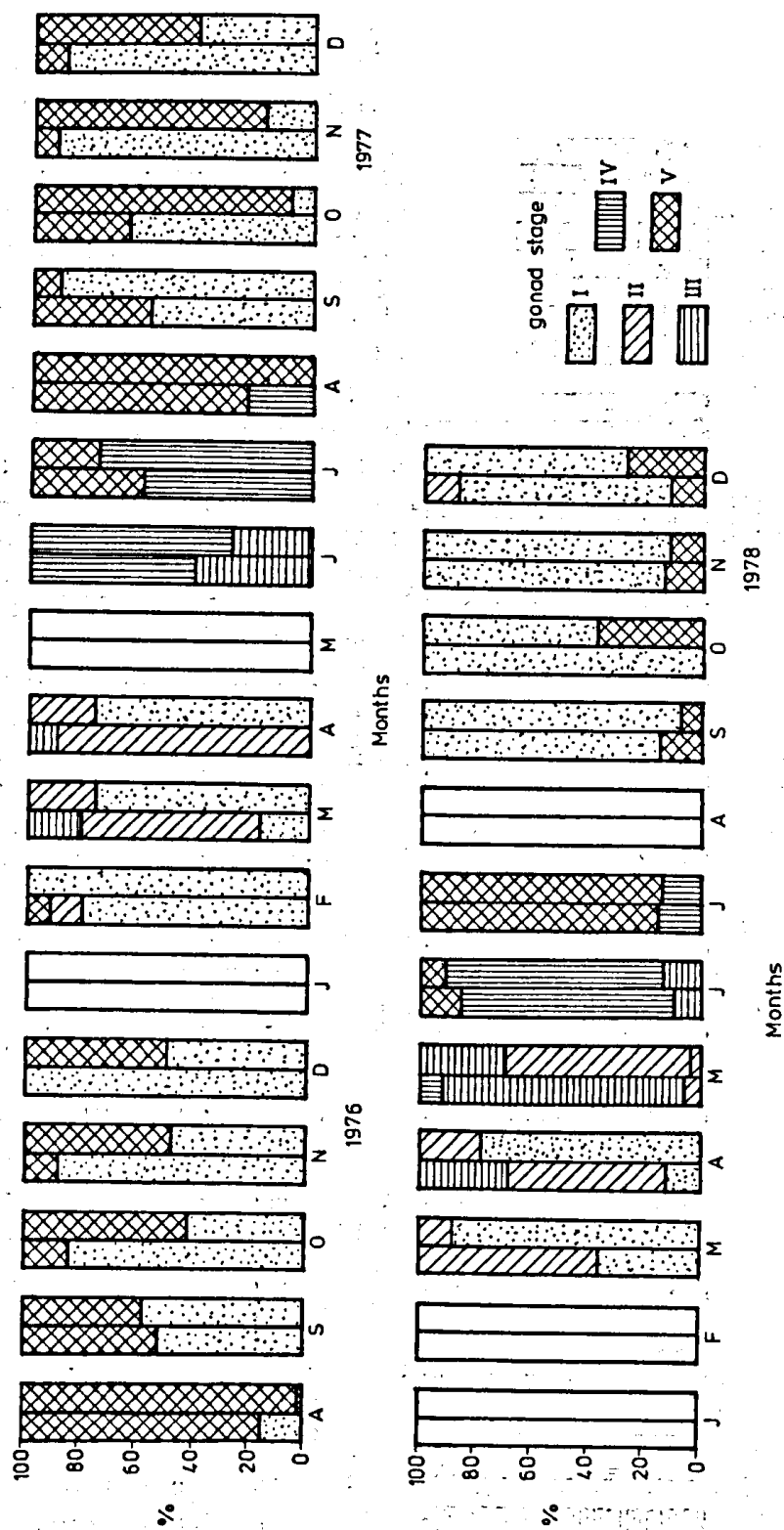


Fig. 7. Seasonal changes in gonad maturity in *Cardium glaucum*; left bars — females, right bars — males plain bars — months free from studies

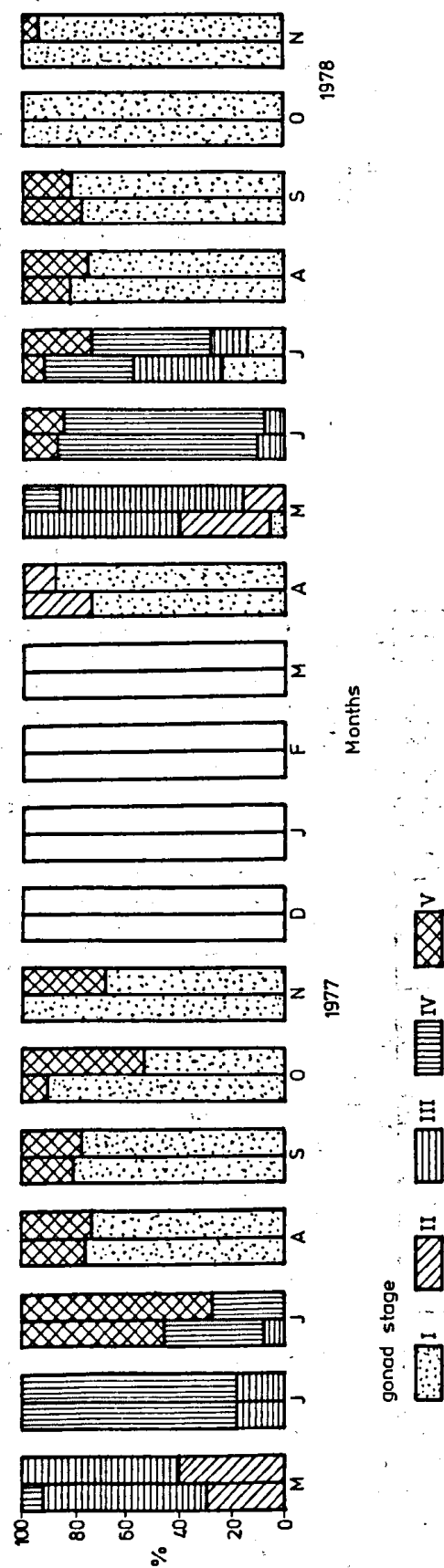


Fig. 8. Seasonal changes in gonad maturity in *C. hauniense*; denotations as in Fig. 7

4. DISCUSSION

Sexual maturity of bivalves is classified according to microscopic properties, e.g. to the presence of gametes in gonads and to the degree of their development (Kingston 1974, Keck et al. 1975). Sometimes sexual maturity can be determined from macroscopic properties, i.e. from the appearance and colour of foot tissues. In Pectenidae, Mytilidae and Limidae, both — the sex and gonad development degree can be determined from the colour of gonads (Chipperfield 1953, Lubet 1959). In the present studies, for the determination of sexual maturity of *C. glaucum* and *C. hauniense*, a new modification of the bivalve gonad maturity scale was developed on the basis of the classification accepted by Chipperfield (1953), Ansell (1961), Boyden (1971), Kingston (1974) as well as by Lucain and Martin (1974), taking into consideration the macro- and microscopic properties. It is important that this classification enables simultaneous consideration of oo- and spermatogenesis, and singles out the postreproductive stage. In case of difficulties in sex determination, an additional unidentified stage is often accepted. This division has been adopted by — among others — Boyden (1971).

The gonad maturation cycle of bivalves from the boreal zone is similar to that of the investigated cockles; gametogenesis is initiated in late autumn, the gamete development rate is slowed down in winter and is accelerated in spring, reproduction takes place on the turn of spring and summer. The course of this process in both *Cardium* species is analogous. Despite a longer reproduction period, gametogenesis begins in *C. hauniense* in July, i.e. by 1 month earlier than in *C. glaucum*. In these two species gametogenesis starts in the individuals after reproduction — as well as in 3–4 months old spat. Cockles spat begin gametogenesis about 10–14 days earlier than cockles having reproduced in summer. Probably both *Cardium* species resorb — after reproduction — the gametes remaining in the gonads. In winter all bivalves are in the same gametogenesis stage. The rate of gametogenesis is analogous in *C. glaucum* and *C. edule* from SE England (Boyden 1971, Kingston 1974), *C. glaucum* from the coast of the Mediterranean Sea (Lucain, Martin 1974), *C. edule* from the coasts of England (Creek 1960) and from the Seine estuary (Gimazane 1971). Kingston (1974) has reported that the resorption of egg cells was slower in *C. glaucum* than in *C. edule*, and still in winter he observed eggs in the gonads; this is consistent with our observations in the Gdańsk Bay.

Gametogenesis of *C. glaucum* and *C. hauniense* is initiated at 5 months of age, and — taking into consideration 1 month of pelagic life — 4 months after metamorphosis the first gametogenesis cycle begins. Orton (1926) has studied *C. fasciatum* from the coasts of England, and found reproduction maturity at the age of 3–4 months; this seems to be quite unlikely. Under natural conditions *C. fasciatum* reproduces in July, whereas — on account of the gonad development time (in *C. edule* gonads develop 2 months after metamorphosis — Creek (1960)), time necessary for gamete maturation (from 3 weeks to 1 months — Gimazane 1971) and pelagic life period

(about 1 month)—reproduction of 3—4 months old bivalves would fall in November. Petersen (1958) has observed in August sexually mature individuals among a *C. lamarcki* 0 age group (4—9 mm in length); since in Kysing Fiord reproduction has occurred in mid-May, it seems improbable for the animals to attain — during 2—2.5 months after metamorphosis — the length of 8 mm (in *C. edule*, at 3 months after metamorphosis the length is up to 1.5 mm) and sexual maturity. Perhaps this author has classed animals of the I age group to the 0 age group, since he states that the first winter ring appears at a length of 2—10 mm, and growth

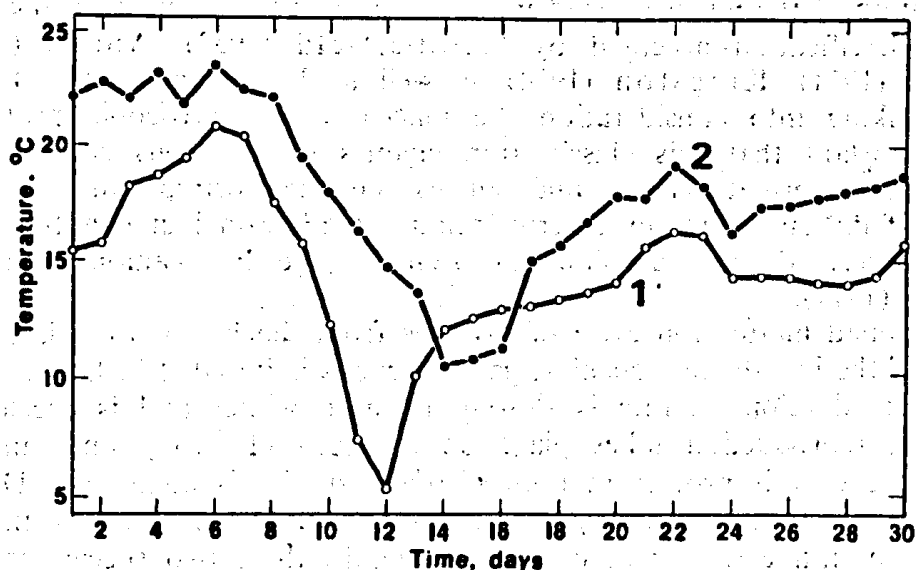


Fig. 9. Water temperature in June 1978; 1 — Gdańsk Bay (measurement site in Gdynia), 2 — Puck Bay (measurement site in Puck)

ceases in October; thus, bivalves originating from the autumn reproduction period, in which the ring either failed to appear or was mechanically abraded, could be involved in this case. In the light of these facts it can be assumed that gametogenesis begins in 3—4 months old bivalves, whereas the reproductive ability of so young animals seems very controversial.

In the Gdańsk Bay the spawning of *C. glaucum* takes place in the second half of June. The spawning period depends on temperature conditions; this is testified to by the fact that in the Puck Bay spawning occurs 10—14 days earlier. Differences in the spawning period are found also for the Gdańsk Bay, where spawning began in 1977 on about 24 June and in 1979 10 days earlier. In 1978 spawning started on 6 June, whereupon it was interrupted by a sudden drop in water temperature (Fig. 9), to once more gain in intensity on about 20—22 June. According to Gimazane (1971), even a substantial lowering of water temperature cannot interrupt *C. edule* spawning if started. *C. glaucum* spawning lasts about 2 weeks; individuals of all age groups take part in this process. In the Gdańsk Bay, neither portioned spawning nor a second spawning period in autumn

Table II. Spawning period of *C. glaucum* and *C. hauniense* from different localities

Species	F	M	A	M	J	J	A	S	O	Area of distribution	Authors
<i>C. glaucum</i>	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	Bay of Fos sur Mer—S. France Trondheimsfjord—Norway Bay of Gdańsk—Poland Essex—SE England Dybsø Fiord—Denmark Kysing Fiord—Denmark Sussex—SE England Bay of Mecklemburg—DDR 7 localities in Denmark	Lucain, Martin (1974) Rygg (1970) Present paper Boyden (1971) Petersen (1958)* Petersen (1958)* Kingston (1974) Oeritzen von (1972)* Brock (1982)*
<i>C. hauniense</i>	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	Dybsø Fiord—Denmark Bay of Puck—Poland	Petersen (1958)** Present paper

* *C. glaucum* is referred to as *C. lamarkii*; ***C. hauniense* is referred to as *C. exilium*.

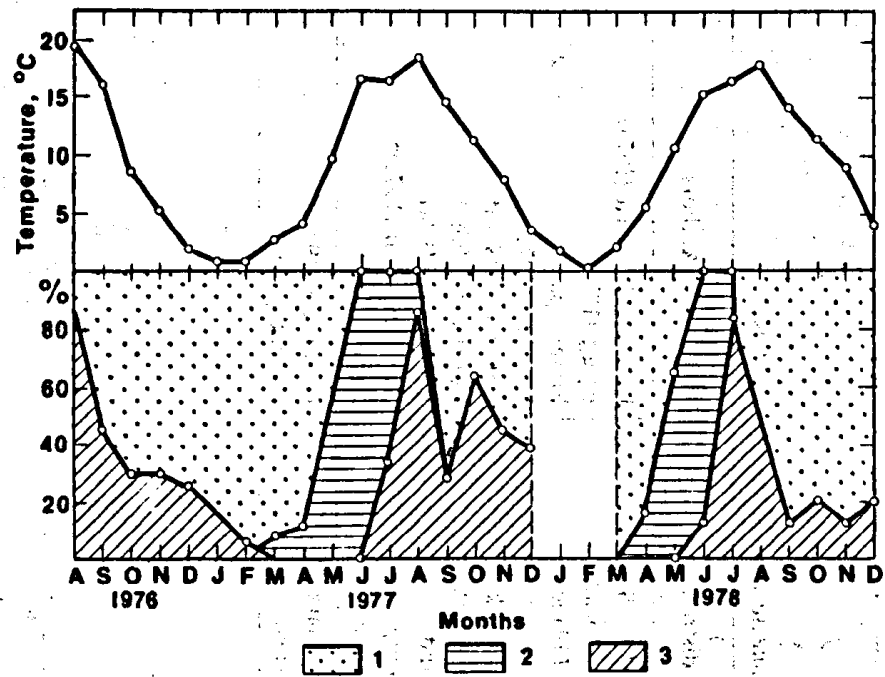


Fig. 10. The effect of temperature conditions on the rate of gonad maturation in *C. glaucum*; 1 — development, 2 — reproduction, 3 — postreproduction

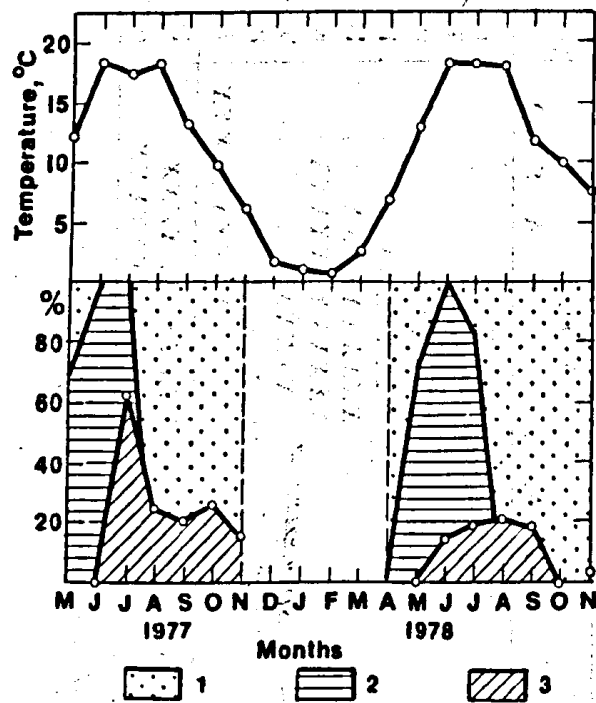


Fig. 11. The effect of temperature conditions on the rate of gonad maturation in *C. hauniense*; denotations — as in Fig. 10

take place, in contrast to Kysing Fiord (Denmark) (Petersen 1958). Geographic differentiation of the spawning times of *C. glaucum* and *C. hauniense* is recorded in Table II.

In case of *C. hauniense* in the Puck Bay, individuals attaining in May the length of 4—5 mm go through the reproduction process; on account of their short life span, only some few of them spawn twice in life (Petersen 1958). *C. hauniense* spawning begins by the end of May and can last till the end of July, as testified to by the presence of mature gametes in the gonads and high density of planktonic larvae — more than 28000/m² (Szaniawska 1977). Observations of Petersen (1958) in Dybsø Fiord indicate that *C. hauniense* is sexually mature for spawning from May till August; during this time the numbers of eggs in gonads decrease, this pointing to a portioned nature of spawning and being consistent with the results obtained for the Puck Bay. Muus (1967) has observed cockles spat of different size within one reservoir, and suggested that individuals living at a higher temperature in shallow waters in the internal part of a bay spawn earlier than those living outside a sandy shoal. This situation is analogous to that prevailing in the Gdańsk Bay. Spawning of *C. glaucum* takes place earlier in the Puck Bay than in the Gdańsk Bay, similarly as gametogenesis whose rate is more similar to that of *C. hauniense* than to that of *C. glaucum* from the Gdańsk Bay. Water temperature is the immediate cause of these differences. The effect of this factor on gametogenesis is particularly evident, if the rate of gametogenesis is compared with water temperature. For this purpose, the gametogenesis cycle was divided into 3 phases: developmental (I and II gonad maturity stage), reproductive (III and IV) and postreproductive (V), according to the classification accepted by — among others — Lucain and Martin (1974). An analysis of the rate of gametogenesis in *C. glaucum* and *C. hauniense* (Fig. 10, 11) points to a clear-cut consistence of this process with changes in water temperature.

The effect of trophic conditions on gametogenesis is a controversial problem. Gimazane (1971) finds no influence of food on gametogenesis of *C. edule*. Petersen (1958) is of the opinion that the spawning period of cockles in Dybsø Fiord and Kysing Fiord is "qualitatively and quantitatively" related to their nutrition, since the temperature conditions are similar in both fiords. However, he gives no attention to water salinity in Dybsø (10‰) and Kysing fiords (25‰), exerting — according to Le Dantec (1968) — an important effect on the spawning period in *Crassostrea angulata*. Gimazane (1971) states that salinity does not essentially affect gametogenesis in *C. edule*, owing to euryhalinity of this species. Among the many factors capable of influencing the gametogenesis rate, trophic conditions and salinity are most essential. The depth at which bivalves live exerts no effect on the rate of gametogenesis and spawning period. This is probably due to the fact that in the Gdańsk Bay, being a shallow water body, the hydrological conditions are more or less stable and do not distinctly influence the course of this process.

5. SUMMARY

Gametogenesis of *Cardium glaucum* and *C. hauniense* from the Gdańsk Bay was investigated. The rate of oo- and spermatogenesis was analogous in both species; in *C. hauniense* the rate of gametogenesis during autumn and spring was more rapid, whereas in *C. glaucum* the gametogenesis rate was more uniform. There were differences between both species in the size of gametes developing in the gonads, the gametes of *C. glaucum* being bigger. The spawning time of *C. hauniense* preceded that of *C. glaucum* by about 2 weeks. Spawning of *C. glaucum* proceeded between mid-June and end of June, whereas in *C. hauniense* it lasted from the end of May till the end of July, and was of a portioned nature. There were no differences in the rate of gametogenesis between *C. glaucum* living at 10 and 20 m depths and this species living at a 3 m depth.

6. STRESZCZENIE

Przeprowadzono badania gametogenezy *Cardium glaucum* i *C. hauniense* z Zatoki Gdańskiej. Stwierdzono, że przebieg zarówno oo- jak i spermatogenezy u obu gatunków odbywa się analogicznie, przy czym u *C. hauniense* przebieg gametogenezy w okresie jesieni i wiosny jest szybszy, podczas gdy u *C. glaucum* tempo gametogenezy jest bardziej równomierne. Zaobserwowano różnice w wielkości gamet rozwijających się w gonadach; gamety *C. glaucum* są większe.

Rozród *C. hauniense* wyprzedzał o około dwa tygodnie rozród *C. glaucum*; decydujący wpływ odgrywała w tym przypadku temperatura wody. Okres rozrodu *C. glaucum* zamykał się w okresie od połowy do końca czerwca, podczas gdy u *C. hauniense* trwał od końca maja do końca lipca i miał charakter porcyjny. Nie stwierdzono różnic w przebiegu gametogenezy *C. glaucum* żyjącej na głębokości 10 i 20 m, w porównaniu z jej przebiegiem w strefie przybrzeżnej (3 m głębokości).

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