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COMPLIMENTS OF
THE STATE BIOLOGIST.

NOTES ON THE SPAWNING HABITS

OF THE

RAZOR CLAM.

Machæra patula—DIXON.
Siliqua (*patula* var.) *Nuttallii*—CONRAD.

RECOMMENDATIONS

REGARDING

PROTECTIVE MEASURES.

BIOLOGICAL LABORATORY,

UNIVERSITY OF OREGON,

EUGENE, April 5, 1900. }

His Excellency, T. T. Geer:

DEAR SIR:—This clam, which forms such an important article of diet on this northwest coast, needs no introduction to the people of Oregon. The genus is of wide distribution, being reported as occurring in India, China, Ochotsk, Sitka, Behring's Sea, Newfoundland.

It is feared here, that, as a result of its unlimited persecution, both in summer and winter, it may eventually become rare, or even extinct. To guard against any possibility of the loss of this article of food, Mr. Johann Young, in the legislative assembly of 1898-1899, introduced House Bill No. 118, to provide for its protection. The bill reads as follows:

A BILL

For an Act providing for the protection of razor clams, and declaring an emergency.

Be it enacted by the Legislative Assembly of the State of Oregon:

Section 1. It shall be unlawful from and after the passage of this Act to dig, take, kill, injure, destroy, buy, sell, or offer for sale any shellfish commonly known as the razor clam, between the first day of June and the

fifteenth day of July, and the fifteenth day of October and the fifteenth day of December of each year; *provided, however*, that it shall not be considered unlawful for any person to dig razor clams for his or her own use.

Section 2. If any person shall dig any shellfish, commonly known as razor clams, whose length is less than two and one half inches, they shall immediately replace said clam in the place from which it was dug, with the least possible injury to the clam.

Section 3. Any person violating the provisions of this act shall be punished by a fine of not less than twenty (\$20) nor more than one hundred (\$100) dollars, or imprisonment in the county jail for a period of not less than ten (10) days nor more than fifty (50) days.

Inasmuch as there is urgent necessity for the protection to shellfish this act is intended to afford, it shall be in effect from and after its approval by the Governor.

This bill passed the house and was reported favorably in the senate by the Committee on Fishing Industries, but no further action was taken, and the bill, in consequence, failed to become a law.

In January, 1899, the Astoria Progressive Commercial Association, through Mr. H. G. Van Dusen, asked me if I would make an examination of clams, sent me from time to time, to determine the season of spawning. This I gladly agreed to do, and batches of from six to ten were sent me monthly from Astoria. These were given a careful microscopical examination and the results reported to Mr. Van Dusen. Before stating these results it will be well, that they may be the more readily understood, to give a brief and popular description of the

ANATOMY AND HABITS OF THE RAZOR CLAM.

The name "Razor Clam," by the way, is doubtless applied to it on account of its elongated and somewhat flattened shape. There are other species, however, in the same family, which are more razor-like in appearance than the one we are so familiar with as an article of diet.

The shell of a large individual will measure about six and one-half inches, and, as every clam digger knows, they range from that size down, the average being, perhaps, five and one-half inches.

From the anterior end (the end that is down when the clam is in the sand) protrudes the muscular "foot," the tissues of which are capable of being distended to some extent with water, and the whole foot protruded several inches beyond edge of shell and drawn quickly and forcibly back. This so-called foot is really a part of the visceral mass or body of the clam



THE RAZOR CLAM — (*Machaira patula*.)



which contains the alimentary canal, liver, generative products, etc. It is by means of this "foot" that the clam is enabled to get out of the reach of the clam digger, if the latter does not work quickly, for it stretches it down through the soft yielding sand as far as it will go, then the lower end is expanded, forming a temporary suction, and the retractor muscles of the foot are then contracted. Ordinarily, the effect of this would be to draw back the foot, but, the lower end of this organ being at this time expanded or curved, the body of the clam is drawn down to the improvised anchor, and the process is then repeated. This, with minor modifications, is the method of locomotion with most of the clams.

At the end of the clam opposite the foot the "siphon," wrongly called the "neck," protrudes. This is a curious organ and has to do with the respiration and feeding of the creature. Two tubes traverse this siphon longitudinally, one opening into the space just above the gills, the other, the one nearer the ventral or free edge of the shell, opening into the general space between the valves of the shell. In this space, on each side of the visceral mass are two gills, four in all, which serve as organs of respiration; and covering and protecting both visceral mass and gills is a thin layer of tissue known as the "mantle." This mantle lies next the nacreous inner layer of the shell which it has helped to form by its secretions. When the clam is in the sand and covered with water the siphon is stretched until its end is above the surface of the sand. Water is drawn in the lower opening and passes over and through the gills, the minute particles of food contained therein being carried to the mouth which is at the lower or anterior part of the animal; the water which has passed through the gills, flows back and out through the other tube, the exhalent tube of the siphon. The smooth epidermis covering the outer surface of the shell is of a brownish color and glistens as though it were varnished. There are evidently nerve endings at the distal end of the siphon which are sensitive to light and shadow, though this has not been definitely proven for this species. The sexes are distinct, as will be shown later. This is placed beyond all question, even if it had not been previously known, by these recent studies. Yet there are those in the State who claim that these animals are hermaphroditic. Familiarity with the use of the microscope and a knowledge of the anatomy of the creature would soon dispel this erroneous conception.

METHODS OF EXAMINATION AND RESULTS.

In making the following examinations one valve of the clam was removed, the visceral mass opened above the "foot," and some of the contents, after being spread on a glass slide, were examined under high and low powers of the microscope. When spawning, the ripe eggs, readily recognized with low power, look like Figure 1.



Fig 1

Under the high power, the actively moving sperm resemble Figure 2.

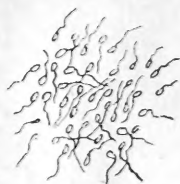


Fig 2

RESULTS OF MICROSCOPICAL EXAMINATION.

Jan. 15, 1899.—No eggs nor sperm.

Feb. 27, 1899.—A very few immature eggs. No ripe sexual products.

Mar. —, 1899.—Omitted examination. But note that the February examination was very late.

Apr. 17, 1899.—Eight clams examined.

No. 1, ripe sperm.

No. 2, ripe sperm.

No. 3, many mature eggs.

No. 4, many mature eggs.

No. 5, many mature eggs.

No. 6, ripe sperm.

No. 7, ripe sperm.

No. 8, spoiled.

May 13, 1899.—Ten clams examined.

No. 1, full of ripe eggs.

No. 2, full of ripe eggs.

No. 3, full of ripe eggs.

No. 5, full of ripe eggs.

No. 7, full of ripe eggs.

No. 4, full of ripe sperm.

No. 6, full of ripe sperm.

No. 8, full of ripe sperm.

No. 9, full of ripe sperm.
 No. 10, full of ripe sperm.
 June 22, 1899.—Eight clams examined.
 No. 2, female which had spawned.
 No. 3, female which had spawned.
 No. 4, female which had spawned.
 No. 5, female which had spawned.
 No. 8, female which had spawned.
 No. 1, male which had spawned.
 No. 6, male which had spawned.
 No. 7, male which had spawned.

I use the term "spawned" for both sexes. The specimens were all lank, had discharged their genitive products. Would be called "poor" by fishermen.

The July examination was omitted because of press of work connected with oyster investigations.

Aug. 23, 1899.—Ten clams examined.
 No. 1, male with sperm.
 No. 3, male with sperm.
 No. 5, male with sperm.
 No. 7, male with sperm.
 No. 8, male with sperm.
 No. 2, female with a few ripe eggs.
 No. 4, female with a few ripe eggs.
 No. 6, female with a few ripe eggs.
 No. 10, female with a few ripe eggs.
 No. 9, no results.

These specimens all looked "lank" or poor, and the scarcity of eggs would make it appear that the spawning season was practically over.

Sept. —, 1899.—Batch of clams examined. Very few with eggs or sperm.

Oct. 13, 1899.—Out of a batch received on this date, very few were found with eggs; evidently way past spawning.

Nov. and Dec. 1899.—No results.

From the results of the above examinations it is very evident that the bulk of the spawning is during April and May, for it was during that time that I found them full of generative products. June examination showed that they had finished spawning. A few eggs were found in August, it is true, but so few as to indicate that the spawning season was long over. In no case were ova and sperm found in the same individual; in other words, the sexes are distinct. The development of this species has never been studied. While it is not of interest economically, it is of sufficient scientific importance to invite investigation on the part of a biologist.

DEDUCTIONS AS TO PROTECTIVE MEASURES.

It is evident from the above that should the razor clam need legal protection, the close season should be during April and May, or possibly from March 15 to June 15, thereby giving them every advantage of variation in seasons.

A clam cannery, in its zeal to make a big season's pack of minced clams, might use very small individuals, such as one seeking clams for his own need would discard. This contingency is provided for in Mr. Young's bill.

As I understand, it is not intended to prevent seashore visitors from using clams during the summer months. This, in view of the long stretches of beach where clam digging is indulged in, would be a matter of extreme difficulty, if not an impossibility.

If this treatise throws any light on the best time for a close season, supposing such protection were necessary, I shall feel amply repaid for the expenditure of time and trouble it has caused. My thanks are due Mr. Van Dusen for very kind cooperation.

Respectfully,

F. L. WASHBURN,
State Biologist.



"The long stretches of beach, where clam digging is indulged in."



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