

**STUDIES IN BIOLOGY FOR NEW
ZEALAND STUDENTS. NO. 3; THE
ANATOMY OF THE COMMON
MUSSELS (*MYTILUS LATUS*,
EDULIS AND *MAGELLANICUS*)**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649323678

Studies in biology for new zealand students. No. 3; The anatomy of the common mussels (Mytilus latus, edulis and magellanicus) by Alex. Purdie

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Cover @ 2017

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New Zealand —

Colonial Museum and Geological Survey Department.

STUDIES IN BIOLOGY

FOR

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THE ANATOMY OF THE COMMON MUSSELS (*MYTILUS*
LATUS, *EDULIS*, AND *MAGELLANICUS*).

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c.

NEW ZEALAND:

BY AUTHORITY: G. DODSBURY, GOVERNMENT PRINTER, WELLINGTON.

1887.

PREFACE.

SOME explanation of the style in which this paper is written is desirable, for had I known while preparing it for publication that it was to be published in pamphlet form I would have recast it in a shape more convenient for students' use. It owes its present form to the fact that the original paper was written as a thesis for the New Zealand M.A. examination, and thus naturally included argumentative matter that would be out of place, or, at least, unnecessary, in a paper written specially to serve as a guide to any student wishing to work out the structure of the mussel. The study of types is strongly recommended to biological students by many eminent teachers of natural science, and I trust that this paper, even as it stands, may be of service to some that are seeking to study a type of the Lamellibranchiata. As a subject for study the mussel has the advantages of being readily procurable at most points of our coast, and also of not being so small as to embarrass the tiro in the art of dissection. And here I would protest against the so-called study of the Mollusca in which consideration is had merely of the shell, without reference to the internal structure of the occupant, the only thought of the collector being the speediest method of ejecting the tenant of the shells. It may be, indeed, that hinge-teeth and such-like superficial structures furnish a ready and easy means of classification; but a true scientific spirit will not be content that the animals themselves, furnishing equally reliable characters, and in many cases having a most remarkable structure, should be rejected as unworthy notice. A thorough study of the anatomy of the molluscs as recommended would doubtless entail much harder work on the part of students of this group, but it would also have a much higher claim to be regarded as scientific work than the cursory methods often adopted.

ALEX. PURDIE.

Wellington, 2nd June, 1887.

LIST OF WORKS REFERRED TO.

It may seem that the following list is a scanty one; but it is to be borne in mind, as accounting for this, that students at this end of the world labour under great disadvantages in the matter of reference libraries of scientific works. There are many works and papers on the Mollusca that have not been within my reach, although aware of their existence and of their scope: hence, if on any point I have shown ignorance of what has already been noted by previous observers, the above is my excuse. In several cases not the original paper but only a brief abstract or review of it was accessible. The numbers given are the numbers appended to the authors' names when referred to in this paper:—

1. MANGILI. Nuove Ricerche Zootomiche sopra alcune Specie di Conchiglie bivalvi. Milano, 1804 (abstract).
2. DUCROUAY DE BLAINVILLE. Manuel de Malacologie et de Conchologie, p. 144. 1824 (abstract).
3. VAN BENEDEEN. Annales des Sciences Naturelles, II^e Série, t. 3, p. 198-200, pl. 8. 1835. (Mémoire sur le Dreissena.)
4. CANTRAINE. Histoire Naturelle et Anatomie du Système Nerveux du Genre Mytilina (Ann. des Sci. Nat., II^e Série, t. VII., p. 802, pl. 10. 1837).
5. DUVERNOY. Comptes Rendus, XX., 482-484. 1845.
6. MOQUIN-TANDON. Comptes Rendus, XXXIX., 265-267. 1854.
7. SABATIER. Anatomie de la Moule Commune (Ann. des Sci. Nat., VI^e Série, t. v., pp. 1-132, pl. 1-9. 1877).
8. HUTTON, Professor. Manual of the New Zealand Mollusca.
9. GEGENBAUM, CARL. Elements of Comparative Anatomy. (Translation.)
10. MILNE-EDWARDS. Sur la Circulation chez les Mollusques (Ann. des Sci. Nat., 1845, III^e Série, t. 3; and 1847, III^e Série, t. 8).
11. PECK, R. HOLMAN. The Minute Structure of the Gills of Lamellibranch Mollusca (Quarterly Journal of Microscopical Science, Vol. XVII.).
12. LACAZE-DUTHIERS. Organes Génitaux des Acéphales Lamellibranches (Ann. des Sci. Nat. 1854, IV^e Série, t. II., pl. 5-9).

STUDIES IN BIOLOGY.

THE COMMON MUSSELS.

(MYTILUS LATUS, EDULIS, AND MAGELLANICUS.)

THIS paper describes the structure of the above species of *Mytilus*, and their general characters are given in "The Manual of the New Zealand Mollusca," page 167. The descriptions refer chiefly to *M. latus*, but frequent comparisons are made where these three species differ. These species are found commonly enough near Dunedin, where my specimens were collected, but they do not seem to range throughout the Islands, except *M. latus*, which is everywhere common. Professor Hutton (8) states that *M. magellanicus* and *M. edulis* are common in the South Island, but not so in the North.

SHELL OF *M. LATUS*. (Plate II.)

Shell wedge-shaped, with a slightly prominent angle about the middle of the dorsal side; ventral side prominent in the anterior half; umbones in some specimens very prominent and diverging; concentric striations more or less evident in the hinder half of the shell. The colour usually serves to distinguish it from *M. edulis*, as the ventral side of *M. latus* is generally an olivaceous-brown, or yellow with green towards the posterior margin; the green colour is seldom altogether obscured, and sometimes in the young is spread over the shell. *M. edulis* is usually dark blackish-blue. The yellow specimens of young *Mytilus*, referred to by Professor Hutton (8), I find to be not *M. latus*, but *M. edulis*. The shell of *M. magellanicus* is at once distinguishable from the smoother shells of *M. latus* and *edulis* by its longitudinal striations or ribs. In *M. latus* there is usually one very distinct tooth in each valve at the hinge, and the right valve often shows another smaller upper one. The hinge-teeth in *M. edulis* are more numerous; I find several in each valve—not, as given by Professor Hutton, three or four in the left valve and one in the right valve (8).

Sections taken vertically through the two valves (Fig. 7) are somewhat rounded in the anterior third of the shell (Fig. 8, *a*), ovate about the middle of the shell (Fig. 8, *b*), and lanceolate in the hindmost third (Fig. 8, *c*), the wider part of these sections being ventral.

IMPRESSIONS OF THE MUSCLES. (Figs. 4 and 5.)

Taking first the impressions of the adductor muscles, the posterior adductor impression is similar in *M. latus*, *edulis*, and *magellanicus*. It is a large, distinct oblong or elliptical impression on the upper and hinder part of the shell, distant somewhat less than one-third of the length of the shell from the posterior end. (Figs. 5, 6, and 19, *pad*.)

Anterior adductor. In *M. edulis* and *magellanicus* this forms a small oval impression on the ventral side at the fore-end of the shell, placed just where the pallial line ends (*a ad*, Fig. 5). In *M. latus* there is no trace of the impression of an anterior adductor (Fig. 4).

Taking next the impressions of the retractors, I shall not now discuss whether they be retractors of the foot or of the byssus, but shall call them indifferently retractors.

Anterior retractor. This is alike in the three species as regards its impression, which is oval and placed close under the hinge at the anterior end of the shell (*art*, Figs. 4 and 5).

Posterior retractors. With respect to the impressions of these muscles, a considerable difference obtains between *M. latus* and *edulis* or *M. magellanicus*. In the two last there is an elongate impression just in front of and continuous with the posterior adductor impression. This retractor impression is not quite as continuous in *M. magellanicus* as in *M. edulis*, but the arrangement is the same in both (*prt*, Fig. 5).

In *M. latus* there is a short muscle impression just in front of and continuous with the posterior adductor impression (*prt*, Fig. 4); but there is in addition, midway between this and the anterior retractor impression, a very distinct and somewhat large oval impression (*mr*, Fig. 4).

These two impressions of *M. latus*, if brought together, would form an elongate impression exactly proportionate to that of *M. edulis* and *magellanicus* (Figs. 4 and 5). The first thought is that the continuous muscle impression of these two species has been divided in *M. latus*, part of the muscle being moved forward; and when the muscles themselves are examined this is found to be the case. I have called these middle muscles the "middle retractors:" hence in

M. latus the impression on the upper side about the middle of the shell is that of the middle retractor, while the term posterior retractor impression remains with that part of the retractor impression that is continuous with the posterior adductor impression.

In *M. edulis* or *M. magellanicus* the single impression, called that of the posterior retractor, corresponds to the two impressions of the middle and posterior retractors in *M. latus*.

GENERAL DESCRIPTION OF THE ORGANS OF *M. LATUS*. (Fig. 1.)

On opening the valves of the shell and viewing the animal from the ventral side, the body is seen to consist, speaking roughly, of two lateral flaps and a median portion (Fig. 35). The two lateral wings line the shell throughout, and are the mantle-lobes, being spoken of as right or left according to the valve they occupy. The median portion of the body in nearly the whole of the hinder half is a keel-shaped ridge—the mesosoma (*mes*, Figs. 1, 2, and 43). Going forward from the mesosoma, there is first an organ consisting of a central stalk with numerous bristle-like branches, by which the shell is moored to external objects (*bys*, Figs. 1 and 9: in these figures part of the byssus is cut off). This is the byssus. In front of it, in the median line, is a muscular organ, the foot, whose shape varies much according to the extent of its protrusion or retraction (*ft*, Figs. 1 and 9). At the anterior end of the animal inside the mantle there is, on each side, a pair of depending lobes, the labial palps (*ilp* and *olp*, Figs. 1, 2, and 28), that nearest the median line on each side being called the inner labial palp, the other the outer labial palp. Between the anterior ends of the labial palps is the mouth (Fig. 1). The mantle-lobes are connected at their posterior end by a nearly horizontal band below the level of the posterior adductor (*jm*, Figs. 1 and 2). This hinder junction is much more extended in *M. edulis* (*jm*, Fig. 3), as it reaches down the greater part of the posterior end of the lobes, starting from above the posterior adductor. The junction of the mantle-lobes in front in *M. latus* extends round the ventral side for some distance. There is a considerable cavity under the mantle at the anterior end, extending in front of the mouth and above the œsophagus between the anterior retractors (*sc*, Fig. 1). This chamber I have called the supra-œsophageal cavity, and mussels kept out of water are often found to have the foot curved round in front of the mouth and reaching into this cavity, which often retains water. Its walls are lined with a rich plexus of blood-vessels.

Extending from between the inner and outer labial palps to the posterior junction of the mantle there are on each side of the foot

and mesosoma a pair of lamellar organs, the gills (Fig. 1; and *ig* and *og*, Fig. 35). There are two gills on each side, and each gill-plate is doubled upon itself, so that we can distinguish an inner and an outer lamella for each gill. The two gills arise from the same line, and, taking the animal in its proper position, the first lamella of each gill is called the descending lamella as it hangs downward (Figs. 35 and 44). The inner gill is doubled upwards towards the mesosoma, and the outer gill is doubled upwards towards the mantle or shell. The plates or lamellæ thus turned upward are called the "ascending lamellæ." These ascending lamellæ in *M. latus* become attached at their upper side to the mantle or to the body (Fig. 35). By reference to *M. edulis*, in which the ascending lamellæ remain free (Fig. 37), the structure of the gills can easily be explained. From this figure it is seen that the outer lamella of the outer gill and the inner lamella of the inner gill are the ascending lamellæ which are free in *M. edulis* and *magellanicus*; while the inner lamella of the outer gill and the outer lamella of the inner gill are the descending or the original lamellæ of each gill.

Between the two lamellæ of the inner gill in *M. latus*, or by the inner side of the descending lamella of the inner gill in *M. edulis*, near the hinder end of the mesosoma on each side, is a small papilla (*gp*, Fig. 1), the genital papilla. Just behind this papilla is an opening, the renal aperture (*ra*, Fig. 1).

On the upper side of the posterior adductor in *M. latus* or on the posterior side in *M. edulis* is the anus, the latter part of the rectum being prominent upon the muscle.

INTERNAL STRUCTURE.

A great part of the body is occupied by the muscles upon which I have already touched in speaking of the impressions on the shell. The posterior adductor is a large transverse bundle of muscle-fibres extending from valve to valve. The retractors are muscular bands extending from their respective impressions to the base of the foot and byssois (Fig. 1). Above and supported by these muscles lies the main mass of the viscera. The space above the anterior retractors is occupied chiefly by the stomach and the surrounding liver. Above the posterior retractors is the pericardium, containing the two auricles and the ventricle, with part of the rectum which pierces the ventricle (Fig. 1). Below the pericardium are parts of the intestine and pyloric cæcum. The anterior coil of the intestine passes to the left of the stomach. The pyloric cæcum extends into the left mantle-lobe (Fig. 1; and *pc*, Figs. 13 and 14). (A more detailed account will be given under the name of each organ.)