B.Sc First year Zoology (Honours)

Paper-1

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Lecture-2 and 3

Structure of Foot:

In most typical gastropods, particularly in prosobranchs the foot is usually differentiated into:

(1) A small anterior propodium,

(2) A large middle mesopodium and

(3) A posterior metapodium (e.g., Natica,).

(A) Primitive foot:

The primitive and simplest form of foot in Mollusca is considered to be a broad ventral flat sole having the above mentioned three regions (e.g., Polyplacophora, Gastropoda, Bivalvia [Protobranchia]). Beside these they adapt certain structures as parapodia and epipodia.

Parapodia:

Lobe-like lateral extentions given out from below upwards from the edge of the ventral sole (e.g., Aplysia), and act as fins.

Epipodia:

Projecting paired ridges or folds developing from the sides or base of the foot along its entire length. These may be beset with papillae or tentacles (e.g., Fisurella).

These parts are variously modified in different species of gastropods.

Modification of Foot:
Foot-as the Creeping or Crawling Organ:
Class Aplacophora

True molluscan foot is absent in Aplacophorans but some structure may be regarded to be the starting point. The ventral foot in Chaetoderma, Limifossor (Subclass Chaetodermomorpha) is absent.

In Neomenia (Subclass Neomeniomorpha), a mid-ventral groove from mouth to anus with non-muscular ciliated ridge is believed to be homologous with the foot of other molluscs and serves as locomotory organ. The foot helps to glide or to creep over the substratum with a mucous trail.

Class Polyplacophora:
In Polyplacophora, the foot of Chiton is broad, muscular and flattened that extends the entire ventral surface of the body. In Chitonellus and Crypsoplax the foot is narrow. In Ischnochiton the anterior portion of the foot is elongated.

The foot helps to creep or glide on the rocky substratum by the waves of muscular activity which is lubricated by mucus glands. It also helps to be attached firmly to the rocks by generating a suction, secreting the mucus along the girdle.

Class Monoplacophora:
In Neopilina and Vema the foot is centrally placed, broad, flattened and almost circular in outline. The foot helps in creeping by muscular movement.

Class Gastropoda:

In most gastropods the foot is an elongated, flat creeping sole that contains numerous mucus-producing gland cells. In the members of the subclass pulmonata the foot is undivided with a very large flat lobe containing a large pedal gland. In these cases the foot is used for creeping on a mucous trail. The terrestrial pulmonates retain the primitive type of foot.

The locomotion of most pulmonates is accomplished by the monotaxic waves, i.e., the amplitude of the wave proceeds across the entire width of the foot. In prosobranchs, Patella has a well-developed ventral foot with a flat creeping sole which is adapted for clinging or moving over the rocks. The creeping foot may be contractile as in Triton. In some cases foot shows partial regional modification.

In Pirulus only the left part of the foot acts as creeping organ. In Acteon and Cypraea foot has a large creeping sole. They move by producing waves of contraction on the foot.

In Bullia the foot is peculiar and encircles the whole of the body. In Atlanta the posterior part of the creeping foot is altered into a sucker. In Haliotis, the epipodium is well- developed with many small tentacles (sensory in function).

The flat sole of Murex and the highly glandular foot of Conus with a long backwardly bent siphon are efficient creeping organs. In Caecum, the creeping movement is performed only by the action of cilia present in the ventral surface of the foot. The bubble snail, Bulla crawl rapidly on the surface of soft bottom as their foot is widely extended on all sides.

Mechanism of Locomotion:
Typical creeping movement in molluscs, especially in gastropods, is brought about either by muscular activity or by a combination of ciliary and muscular activity. Muscular activity of the foot during creeping movement is effected by a series of wave-like contractions of the longitudinal muscles of foot.

The waves of contraction may be monotaxic, i.e., the wave spreads along the entire width of the foot or ditaxic, i.e., the wave spreads only half of the width of the foot and the animals are progressed by advancing alternately the right and left sides of the foot.

The wave of muscular contraction may be direct, i.e., the wave is moving in the same direction as the movement of the animal or may be retrograde, i.e., when the pedal wave passes from forwards to backwards.

In most of the molluscs the amplitude of the waves is small but in some gastropods as exemplified by Helminthoglypta dupetithouarsi the amplitude as well as wavelength are increased during galloping motion.

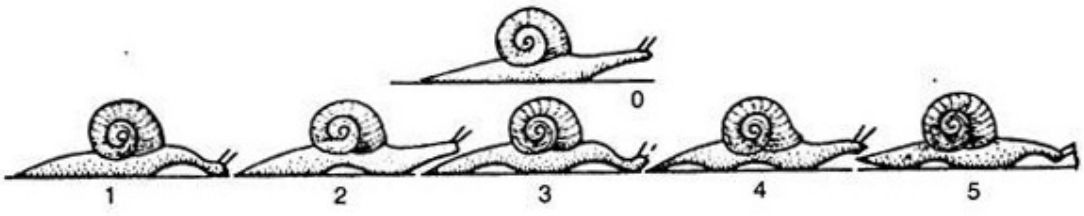

Fig. 16.64: Showing successive events in 'galloping' movements in *Helminthoglypta dupetithouarsi.*

During galloping motion the anterior portion of foot is elevated and thrust forward. Foot gets the nerve supply from the pedal ganglion.

Bivalvia:
The foot in Nucula and Area are considered as primitive type, which possess a flat, ventral surface of sole on which the animal creeps.

Foot—as the burrowing organ:
In some molluscs foot becomes greatly deviated to act as burrowing organ.

Class Scaphopoda:
In Dentalium the foot is conical, trilobed and protrusible. In Siphonodentalium, the foot terminates in a retractile disc with papillated margins. The foot of the Scaphopoda is adapted rowing habit in sand and the co foot is buried into sand and lateral the foot, epipodial lobes assist in burrowing.

Class Gastropoda:
In Terebra, the extremity of foot with flow of blood is extended and acts as anchor. In Natica, Polinices, Sigaretus, the propodium is demarcated from the rest of the body by deep transverse grooves as a semicircular flap and the metapodium is provided with lateral parapodium.

The animals have adapted for burrowing on soft bottom habitat. The propodium acts like a plough and anchor, and a dorsal flap-like fold of the foot protective shield. In Harpa the propodium is separated by a constriction.

Class Bivalvia:
In Anodonta and Unio, the foot is triangular and plough-share like. The foot can perform the effective burrowing organ in addition to acting as a creeping organ. In Solemya, Yoldia the foot has a flattened sole and two sides of the sole can be folded to form a blade-like edge which can penetrate into the mud or sand and act as soft bottom burrowers.

In Pholas foot assumes a short and blunt form. In Mya the foot is feebly developed and used as a weak burrowing organ. Donax has a thin pointed foot. Tagelus, a razor clam possesses an elongated foot which acts as burrower. The foot of Solen and Ensis is large and cylindrical, and can be outstretched into a wide sheet of Muscles as it plunges into the sand.

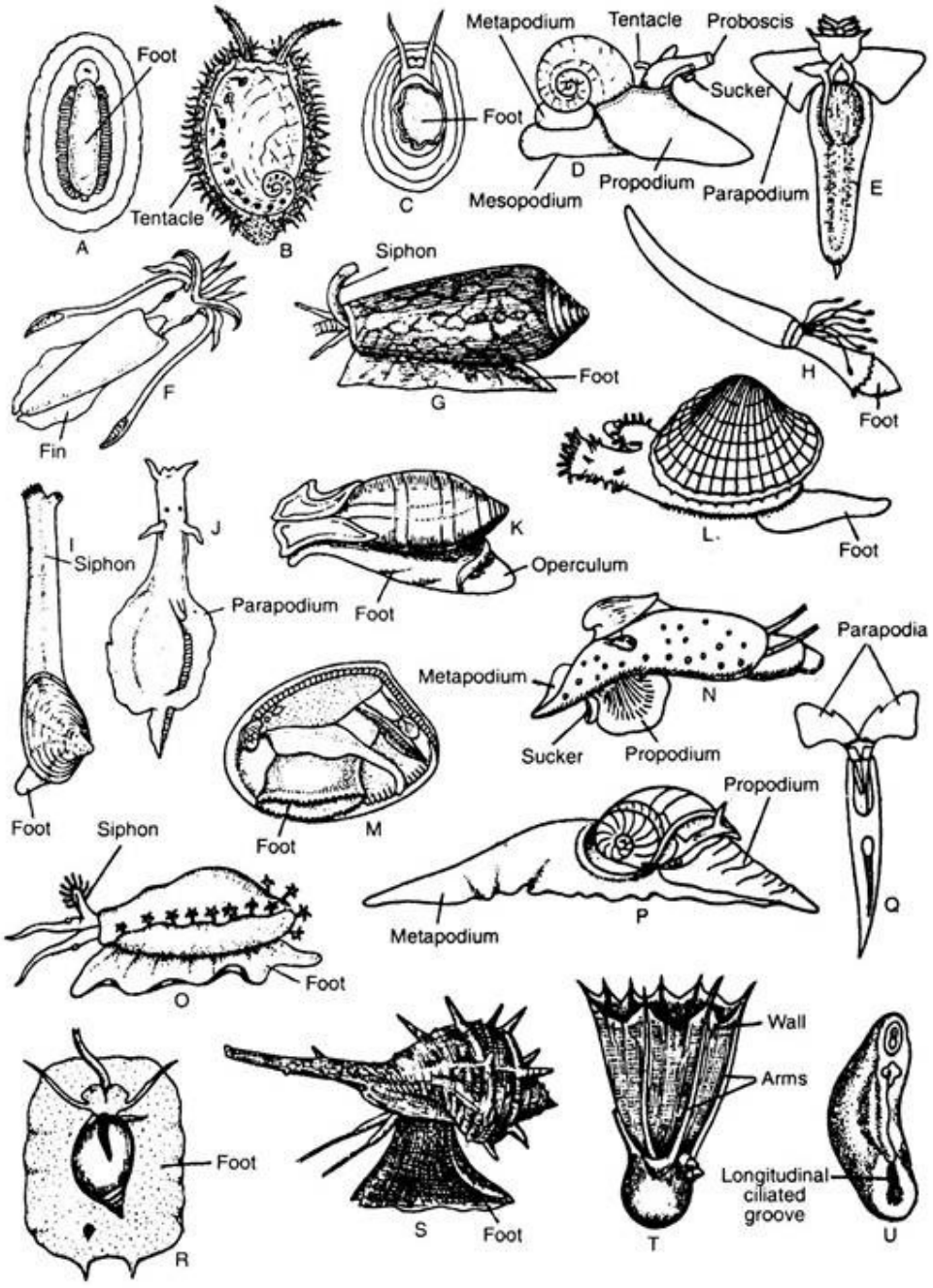

Fig. 16.65: Various types of foot in molluscs. A. *Chiton*. B. *Haliotis*. C. *Patella*. D. *Natica*. E. *Clione*. F. *Loligo*. G. *Conus*. H. *Dentalium*. I. *Mya*. J. *Aplysia*. K. *Acteon*. L. *Gardium*. M. *Nucula*. N. *Carinaria*. O. *Cypraea*. P. *Sigaretus*. Q. *Pteropoda*. R. *Bullia*. S. *Murex*. T. *Amphitretus*. U. *Neomenia*.

In most bivalves, the foot is laterally compressed and blade-like, and the anterior part of the foot acts as a burrowing organ in the soft substratum where they live.