

Introduction

Girdles are basal supporting structures to which the two pairs of appendages—a pectoral pair and a pelvic pair remain attached in most vertebrates. Consequently, they are termed as **pectoral girdl** and **pelvic girdle** respectively. Evolution in the pectoral girdle seems to have been more rapid than in the pelvic girdle.

I. Pectoral Girdle

Pectoral girdle is a duplex structure (except elasmobranchs). It is made up of several cartilaginous bones such as a **scapula**, a **suprascapula**, a **pre-coracoid** and a **coracoid** in each half. Two dermal bones, the **clavicle** and **interclavicle** are also added in each half.

Pectoral girdle in different groups of vertebrates.

A. In Fishes

(i) The pectoral girdle of shark is peculiar as it lacks any dermal element, like clavicle and the interclavicle. It consists of **cartilaginous**

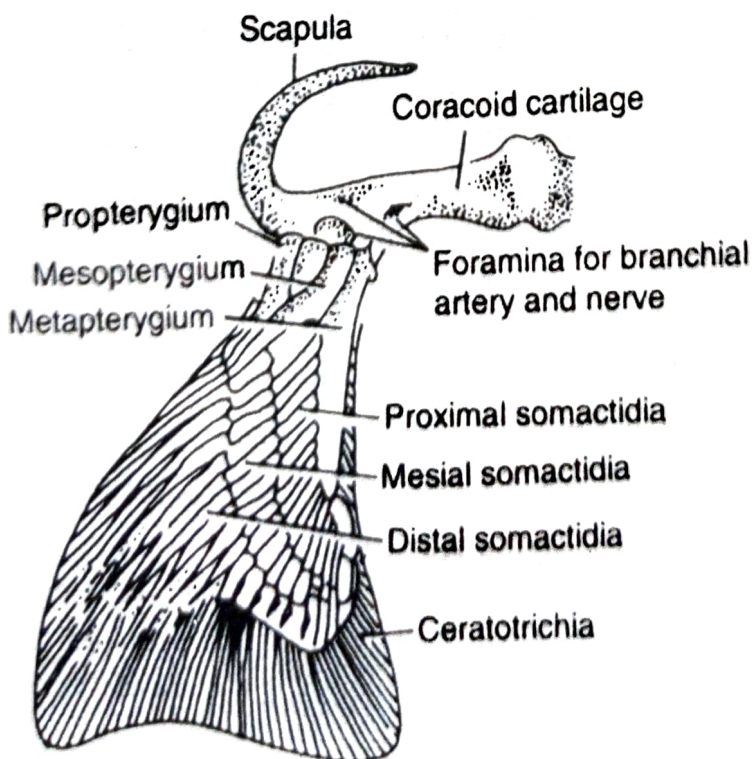


Fig. 1 Left pectoral girdle and fin of *Scoliodon*

scapulocoracoid which supports the fin. In *Squalus* and *Chlamydoselachus* the scapulocoracoid has a small 'suprascapula' extending mesially from its dorsal end.

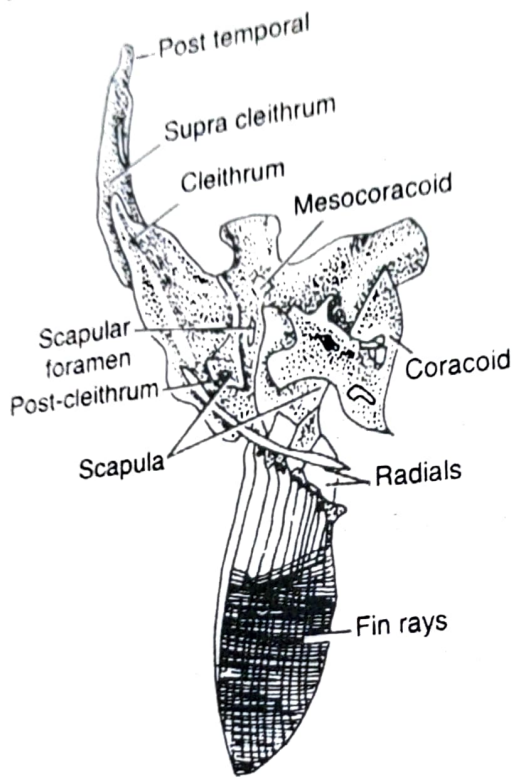


Fig. 2. Left half of pectoral girdle and fin of *Labeo*

(ii) In actinopterygian fishes the pectoral girdle generally consists of five dermal elements. From above down they are the **post-temporal**, a **supracleithrum**, a **postcleithrum**, **cleithrum**, and **clavicle**.

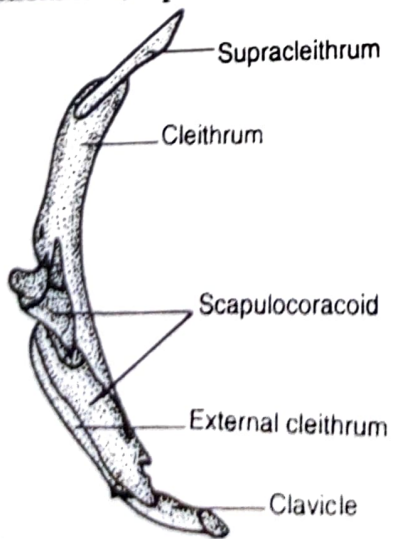


Fig. 3 Pectoral girdle of *Latimeria* (lateral view)

The clavicle is present in some forms, e.g., *Acipenser* and *Polypterus* but absent in others. The postcleithrum is present in the primitive forms but generally absent in teleosts. The **scapulocoracoid** is cartilaginous in *Amia* but it has three ossifications in *Salmo*, a dorso-lateral **scapula**, a ventrolateral **coracoid** and a dorsomedial **mesocoracoid**.

(iii) The pectoral girdle of **crossopterygian** fishes is essentially like that of the

actinopterygian fishes except that an interclavicle is usually present. In *Latimeria* the supracleithrum and interclavicle are absent but there is an **extracleithrum** which is a unique feature. The scapulocoracoid is partly ossified. The dipnoin has a highly modified pectoral girdle in which the post-temporal, supracleithrum and interclavicle are lacking. The cleithrum is reduced and the scapulocoracoid is small.

B. In Amphibians

During the evolutionary history of vertebrates a tripartite pectoral girdle first appeared in Amphibia. It is with a pair of glenoid cavity into which fits the head of humerus.

In **anurans**, like frog, each half of the pectoral girdle consists of a **coracoid**, **pre-coracoid**, **epicoracoid**, **clavicle**, **paraglenoid cartilage**, **scapula** and **suprascapula**. The clavicle is perhaps the only dermal bone and is fused to precoracoid. The **omosternum** probably represents the converted remnant of the interclavicle. **Glenoid cavity** is situated at the junction of coracoid and scapula. There is an epicoracoid on the inner margin of the coracoid.

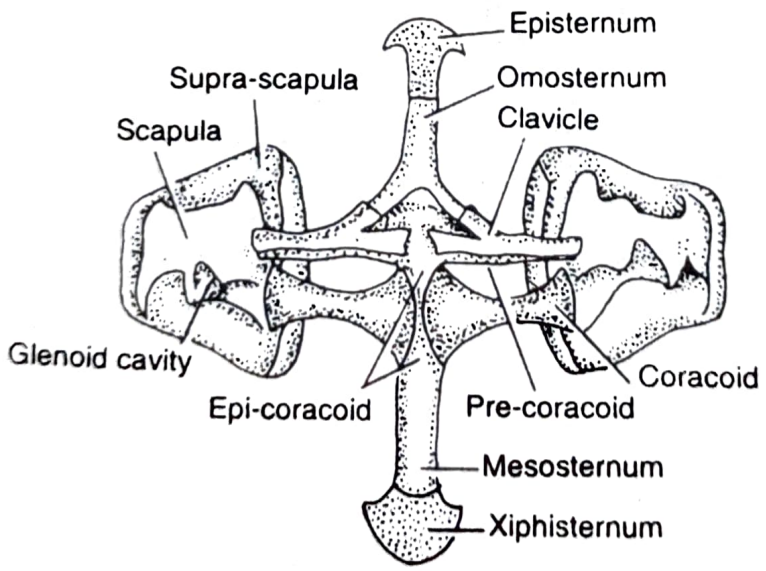


Fig. 4. Pectoral girdle of frog

Anura have either **firmisternal** or **arciferal** pectoral girdles when the two epicoracoid cartilages are fused mesially throughout its length it is called firmisternal type. When the two epicoracoids are fused along their anterior edges only it is called arciferal. The pectoral girdle is reinforced by an **omosternum** anteriorly and by a **mesosternum** posteriorly. The sternum is fused to the middle of the pectoral girdle.

C. In Reptiles

The pectoral girdle of reptiles is essentially like those of amphibians.

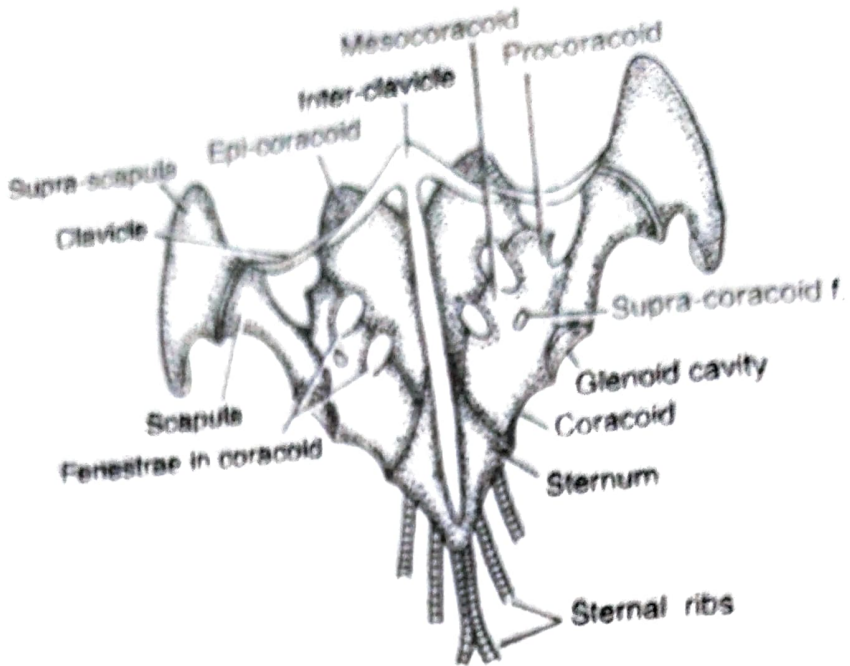


Fig. 6. Pectoral girdle of *Varanus*

(i) In lizards there are two dermal elements in the girdle, **clavicle, and interclavicle.** The two clavicles are joined by a median interclavicle. On either side is a **dorsal scapula fused with a ventromedial procoracoid.** The scapula is a **bony oblong and flat plate which is narrow in the middle.** Suprascapula is a thin plate of calcified cartilage. The coracoid is a **large, flat and fenestrated bone.** The **epicoracoid is cartilaginous** situated along the anterior border of the coracoid. **Glenoid cavity is present at the joint of scapula and coracoid.**

(ii) In alligator dermal elements are absent and scapula and procoracoid have a simple outline.

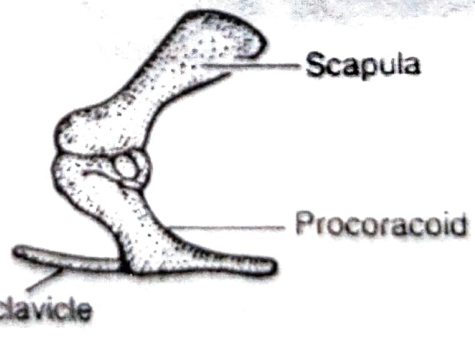


Fig. 6. Pectoral girdle of alligator

(iii) In turtles clavicles and interclavicle are incorporated in the plastron.

D. In Birds

(i) The pectoral girdle of birds has undergone modification necessary for flight. It is completely fused and pushed back to the central part of the body.

(ii) Each half has a large, stout coracoid attached to the sternum by means of an immovable articulation. The upper end of the coracoid is connected at right angle to the scapula.

(iii) Scapula is a long, flattened-sword-like bone which extends dorsally over the ribs.

(iv) **Suprascapula** is lacking.

(v) **Glenoid cavity** is formed by an imperfect union of scapula and coracoid.

(vi) **Clavicle** is a thin, rod-like bone. The two clavicles are joined ventrally to small, flat interclavicle forming a fork-shaped bone called **furcula** or **wishbone**. The upper ends of the clavicles join the junctions of coracoid and scapula. Furcula is well developed in flying birds but reduced or absent in non-flying birds.

(vii) At the junction of coracoid, scapula and clavicle is a **foramen triossum** through which the tendon of the pectoralis minor muscle (a flight muscle) runs to be attached to the humerus.

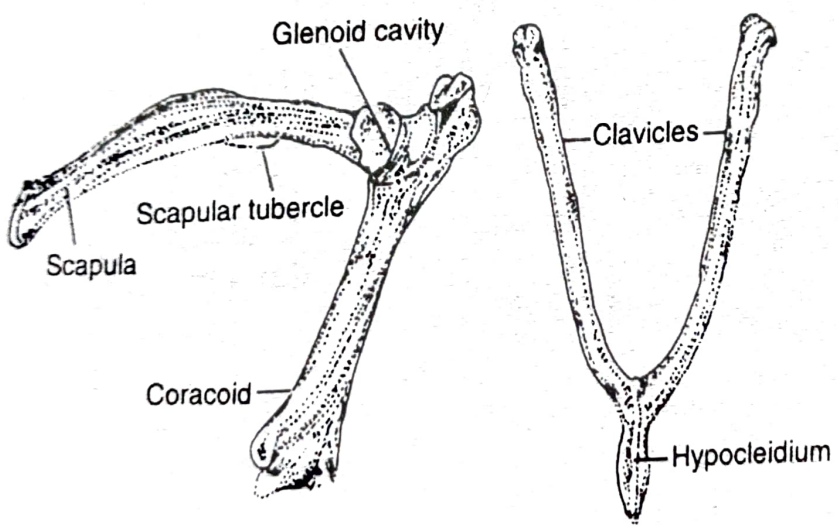


Fig. 7 Pectoral girdle of bird (*Columba*).
Furcula is shown on the right side

E. In Mammals

The mammalian pectoral girdle is reduced except in the monotremes (egg-laying mammals) which retain the reptilian type.

In *Ornithorhynchus* (a monotreme) it consists of a scapula, coracoid, a small cartilaginous pro-coracoid. A large interclavicle (episternum) forms the connection with the sternum. On each side there is a glenoid cavity between coracoid and scapula. The clavicles rest on the interclavicle.

Marsupials and **placental mammals** retain nothing but the scapula and clavicle. At the end of the scapula is a glenoid cavity. Near the glenoid cavity there is **coracoid process** which according to **Romer** is the

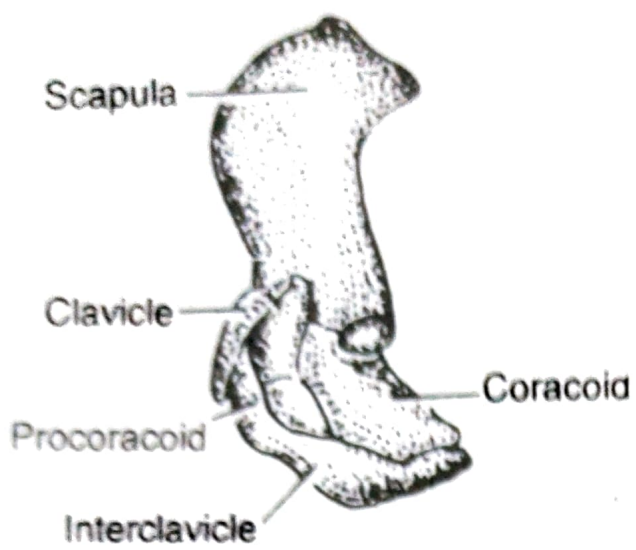


Fig. 8 Lateral view of the pectoral girdle of *Ornithorhynchus*

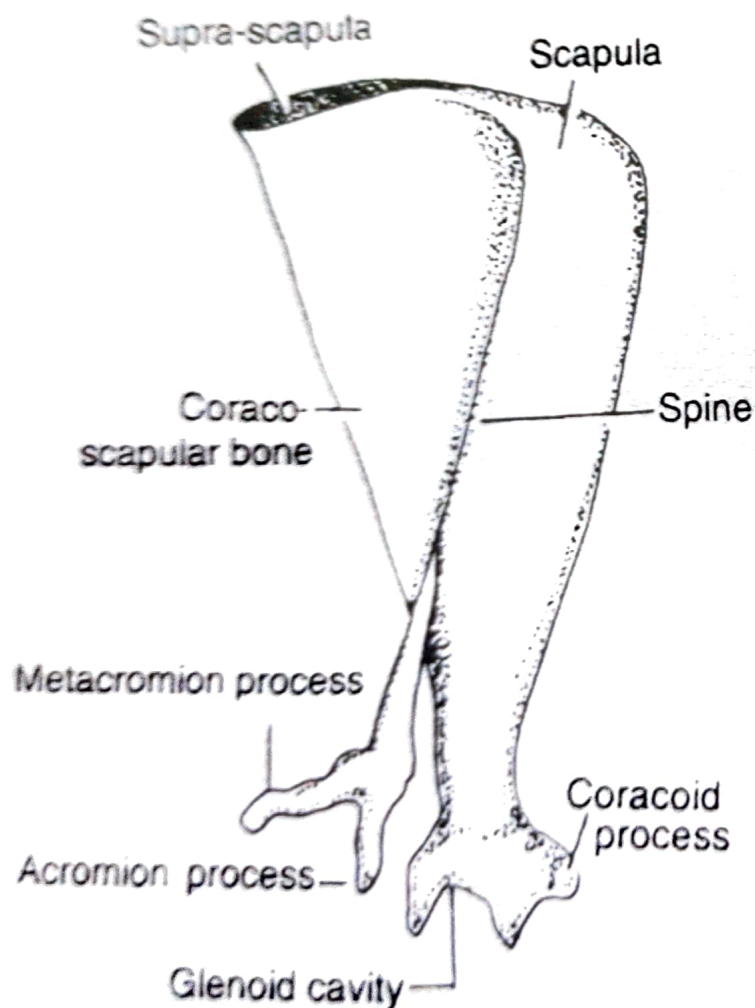


Fig. 9. Pectoral girdle of mammal

procoracoid. The surface of the scapula has a spine having two projections—an acromian process and a metacromian process for the attachment of muscles. Along the border margin of the scapula is a thin strip of cartilaginous suprascapula.

The scapulae of different groups of mammals are quite characteristic and their shape depends upon the work that they do. For example, the scapula is extremely elongated in the insectivores, rounded in the carnivores, rounded and flat with no spine in dolphins, or long with small spine in the ungulates.