AFFINITIES WITH CHORDATES

The echinoderms, especially their larval forms, attract the attention of many Zoologists due to the presence of many striking similarities between themselves and between different other groups of animals.

Relationship with Chordata:
The most convincing affinities are noted between the echinoderms and the chordates. Hence many workers regarded the echinoderms to be the nearest group to the chordates. However, modern workers do not support the contention and they hold that the echinoderms and the chordates diverged separately from a common basic ancestor.

The affinities are discussed below:
1. Mesodermal skeletal substance is present in both.

2. Presence of infra-epidermal nervous system in hemichordata.

3. The perforations on the calyx of carpoid echinoderms are compared with pharyngeal gill-slits of Amphioxus.

4. Needham (1932) has tried to show a relationship between these two groups by analysing biochemical evidences. Invertebrates have the phosphogen in the form of arginine phosphate whereas chordates usually have creatine phosphate. But the echinoids among echinodermata and hemichor-dates among Chordata have both arginine phosphate and creatine phosphate.

5. Wilhelmi (1942) has shown similarities between the two groups by serological tests as well.

6. Cleavage is radial, holoblastic.

7. Blastopore changes into anus.

8. Enterocoelous mode of coelom formation.

9. The similarities between adult echinoderms and chordates are very few, but the affinities between the larval forms are highly notable.

Metschnikoff (1869) tried to show the following affinities between the tornaria larva of Balanoglossus and the bipinnaria and auricularia larvae of the echinoderms:
1. free-swimming and bilateral symmetrical larvae in both,

2. transparent body with similar ciliated bands,

3. enterocoelous coelom with similar disposition,

4. similar location of mouth and anus,

5. the madreporic vesicles in bipinnaria are thought to be homologous with heart vesicle of Balanoglossus.

De Beer and Garstang hold that the tornaria larva, the dipleurula and pluteus larvae are living relics from a very remote period when the echinoderms and chordates were not diverged.

The neotenous theory propounded by Garstang in 1894, 1928 holds that the chordates arose from some neotenous form of auricularia larvae. The sequence is—Auricularia larva (Echinodermata) → Tornaria larva (Hemichordata) → Tadpole (Ascidia) → Neoteny → Free swimming Chordates. The tornaria larva of Hemichordate is much more similar to the larvae of echinoderms but differs in its mode of origin and its structure. Young (1981) supported the neotenous larval theory of Garstang.

Therefore, from the above discussion it may be concluded that the phylogenetic relationship between echinoderms, hemichordates and chordates is more convincing, and chordates may have evolved from non-chordates, probably the echinoderms.

But Fell (1963), Pawson and others deny the ancestry of chordates from any form of echinoderms arid they also deny the relationship between the tornaria larva and the echinoderm larvae. Some of the dissimilarities put forward by them are:

1. Protocoel is unpaired in Balanoglossus, but paired in echinoderms.

2. Extant echinoderms lack pharyngeal gill-slits.

3. Bipinnaria larva lacks telotroch.

4. The tornaria larva has a characteristic apical plate with eye-spots.

Thus, Echinodermata shows close affinity with Chordata. Barrington has summarised the work of other workers like Berrill (1955), Bone (1960), Carter (1957), Marcus (1958) and Whitear (1957) and has proposed that the echinoderms, the pogonophores, the hemichordates and the rest of the chordates arose separately but directly from a common bilaterally symmetrical sessile or semi-sessile ancestor with tripartite body and coelom, ciliated larval stage and ciliary mode of feeding from external source.