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TERMINOLOGY OF THE EARLY DEVELOPMENTAL STAGES OF  
MARINE FISHES

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A perusal of literature shows that over the years various authors have used different terminologies for the various early developmental stages or phases of marine fishes. Some of these authors are: Hubbs (1943), Jones (1950), Ahlstrom and Counts (1955), Ahlstrom (1968 b) and Balon (1971, 1976). From all these papers, four principal phases are recognisable, which are: (a) Egg (b) Larva (c) Postlarva and (d) Juvenile.

(a) Egg: The term egg is applied to the stage from the time of fertilisation to the one at which the embryo hatches out of the chorion (egg capsule). The egg stage is characterised by an exclusively endogenous nutrition from the yolk of the ovum. Balon 1976) has divided the egg stage into three phases, viz., cleavage phase, embryonic phase and eleutheroembryonic phases. It may be noted in this connection that as per the definition given by Balen (1976), the eleutheroembryonic phase commences only with hatching and is not a phase undergone within the egg. Hence, the inclusion of this phase as part of the egg life is highly questionable. On the other hand Ahlstrom and Counts (1955) have divided the egg or embryonic period into three stages, i.e. (i) the early egg, from fertilisation to closure of blastophore, (ii) the middle egg, from the closure of blastophore to the

time when the tail begins to separate and curves laterally from the embryonic axis and (iii) the late egg, from the time the tail is curved away from the embryonic axis to the time of hatching. These terminologies for the egg period are quite canning and hence are adapted for the purpose of the present studies.

- (b) Larva: The term larva is generally used for the post-embryonic period from the time of hatching onwards until the yolk is absorbed, the mouth is formed and the eyes are pigmented, as was defined by early workers on marine fish eggs and larvae. Hubbs (1943), Jones (1950) and a few other later workers have subdivided the larval phase into "prolarva" or "yolk-sac larva" to denote the presence of yolk and the term "larva" to subsequent stages. But, Russell (1976) has pointed out that restricting the use of the term "larva" to the yolk-sac stage is convenient, at the end of which the mouth is formed and the eyes are pigmented. This usage by Russell (1976) is followed for the present purpose. Among the larval stages one distinct stage is the newly hatched larva; and if the larval development is followed every hour, convenient stages can be formulated such as 3 hours, 6 hours, 9 hours old larvae, etc.,

- (c) Postlarva: The stage extending from the absorption of yolk, formation of mouth and pigmentation of eyes is denoted as "postlarva". Over the years different terminologies have been proposed for the various stages during postlarval development of marine fishes, such as protopterygiolarvae, pterygiolarva, prejuvenile, etc. vide Balen (1976). But Russell (1976) draws attention to the fact ever since the termination of the larval period, in the vast majority of marine fishes, the postlarval sequence of development has no sharply demarkated termination. This is because different adult

characters such as the numbers of fin rays or vertebrae are already developed before the fish has lost other larval characteristics such as pigmentation pattern. Russell (1976) further emphasises the fact that in view of the above reason it is impossible to determine a point at which the fish definitely becomes a juvenile. In view of this reason, Russell (1976) states that the term "postlarva" can be applied to the stage from the termination of the larval stage during which there is a sequence of development to juvenile stage. The use of the term "prejuvenile" in a broad sense by certain authors has been criticised by Ahlstrom (1968 b) who points out that it can be used only in a narrower sense to certain strikingly modified or specialised pelagic life history stages possessed by only a few fishes such as Tholichthyes stages of Chaetodontids, Rhynchichthys stages of Holocentrids etc. and can not be applied to the early developmental stages of marine teleosts.

Within the postlarval phase of development, three principal stages are reckoned by Moser and Ahlstrom (1970), Ahlstrom et al (1976) and Moser et al (1977). These stages are associated with the development of the caudal fin and its supporting elements, before, during and after the upward flexing of the posterior tip of the notochord, which are termed as (i) Preflexion, (ii) Flexion and (iii) Post flexion stages in the postlarval development. Of these three stages the postflexion stage is of longest duration, leading to juvenile stage.

- (d) Juvenile: As per the considerations observed in the previous section, during postlarval development one or the other early developmental characters still persist while some characters resembling those of the adults have formed. In other words, during

juvenile phase of development also the specimens may differ from adults. For instance although in general body form and in meristic characters the developing stage may resemble the adults, in details of morphometric proportions and pigmentation (colouration) it may show a marked difference. Hence, juvenile phase of development in vast majority of marine teleosts also may not have a sharply marked termination at an early size or age. But, developmental processes of certain characters may be delayed till the specimen becomes older and reaches a fairly large size. In view of this reason, the term juvenile for most teleosts may be said to be defined as the stage at which the specimen has developed all the vital meristic characters and general morphometric and pigmentation pattern.

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