tendril-like structures *(Scyllium)* which serve to anchor it to sea­weeds.

In a large number of Selachians the adoption of internal fertiliza­tion has been followed by the retention of the embryo within the oviduct (uterus) for a prolonged period. In such cases we find interesting adaptive arrangements for aiding the nutrition and respiration of the young individual. The highly vascular wall of the yolk sac may come into intimate relation with the uterine lining, so as to form a simple yolk sac placenta (*Mustelus laevis,* &c.). In other forms the uterine lining secretes a nutritive fluid or uterine milk which apparently is taken into the alimentary canal of the embryo through the spiracles *(Myliobatis* sp., *Taeniura* sp.). In certain Ray *(Pteroplataea micrurα)* this secretory activity of the uterine lining is concentrated in long villous processes known as t*rophonemata,* which pass through the wide spiracles of the young fish and pour their secretion directly into the cavity of its alimentary canal.

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|  | Classification |
| The following table gives a convenient classification (taken from Bridge (5)) of those Selachians at present known:— | |
| Order I. Pleuropterygii (Extinct: palaeozoic).  „ II. Acanthodii (Extinct: palaeozoic mainly). | |
| „ III. íchthyotomi (Extinct: palaeozoic mainly).  „ IV. Plagiostomi. | |
|  | Suborder I. *Squali* (Selachii *s.s.*). |
| Fam. | I. Notidanidae *(Notidanus = Hexanchus* and Heptanchus). |
| " | 2. Chlamydoselachidae *(Chlamydoselachus).* |
| " | 3. Heterodontidae *(Heterodontus = Cestracion).* |
|  | 4. Cochliodontidae (Extinct: palaeozoic). |
| " | 5. Psammodontidae (Extinct: palaeozoic). |
|  | 6. Petalodontidae (Extinct: mainly palaeozoic). |
| »> | 7. Scylliidae *(Scyllium, Pristiurus, Stegostοma).* |
| " | 8. Carchariidae *(Carcharias, Galeus, Galeocerdo, Mustelus).* |
| " | 9. Sphyrnidae (*Sphyrna* = Zygaena). |
| " | 10. Lamnidae *(Lamna, Carcharodon, Alopecias, Mitsukurina).* |
| " | II. Cetorhinidae *(Cetorhinus).* |
| " | 12. Rhinodontidae *(Rhinodon).* |
| " | 13. Spinacidae *(Acanthias, Spinax, Scymnus, Laemαrgus,* |
|  | *Echinorhinus).* |
| " | 14. Rhinidae *(Rhina).* |
| " | 15. Pristiophoridae *(Pristiophorus).* |
|  | Suborder II. *Batoidei.* |
| Fam. | **I.** Pristidae *(Pristis).* |
| " | 2. Rhinobatidae *(Rhinobatus).*  3. Raiidae *(Raia).* |
| "  »» | 4. Tamiobatidae (Extinct: palaeozoic).  5. Torpedinidae *(Torpedo: Narcine).* |
| " | 6. Trygonidae *(Trygon, Pteroplataea, Taeniura).*  7. Myliobatidae *(Myliobatis, Aëtobatis, Ceratoptera).*  Order V. Holocephali. |
| " |
| Fam. | I. Ptychodontidae (Extinct: palaeozoic). |
| " | 2. Squaloraiidae (Extinct: mesozoic). |
| " | 3. Myriacanthidae (Extinct: mesozoic). |
|  | 4. Chimaeridae *(Chimaera, Callorhynchus, Harriotta).* |

*Existing Forms.—*The Selachians known to survive to the present day are confined to orders IV. and V., the former in­cluding the Sharks (Squab) and Rays (Batoidei), and the latter including the remarkable *Chimaera* and its allies. For the more interesting members of the Plagiostomi see Shark and Rλy.

The general morphological features of the Plagiostomi arc dealt with in the article Ichthyology. It remains now to refer shortly to one or two of the subdivisions which contain forms of special morphological interest from their in many respects primitive character. Such families are the Notidanidae, the Chlamydoselachidae and the Heterodontidae. The second of these is of very special interest: it contains the single living genus *Chlamydoselachus,* specimens of which have been obtained in considerable numbers from deep water off the coast of Japan, while isolated specimens have been taken off the coasts of Australia and Norway and near Madeira.

The general shape of *Chlamydoselachus* is elongated, almost eel- like (fig. 2). The mouth is nearly terminal, instead of being well back on the ventral surface as in other sharks. The teeth are very characteristic, flattened in shape, pointing backwards and overlapping one another in longitudinal rows. Each tooth has three slender pointed cusps and closely resembles the teeth of various members of the extinct group Ichthyotomi. The small placoid elements which cover the general body surface are seen to become enlarged at the margin of the mouth, especially posteriorly, these enlarged placoid elements functioning as accessory teeth and in fact being practically teeth in an early stage of evolution. It is interesting to note also that the lining of the mouth still develops a covering of placoid elements. (In the typical gnathostome the placoid elements have of course disappeared from the mouth lining,

except in the case of the functional teeth.) There is no oronasal groove in the adult, and the spiracle is greatly reduced. The valvular flaps guarding the external openings of the gill (6) cletts are much larger than in other sharks, particularly the most anterior (hyoidean) which meets

its fellow ventrally and is prolonged backwards for some distance as an incipient operculum. The tail is practically proto- cercal, although the median fin-fold is con- siderably more developed on its ventral side than dorsally. The lateral line organs on the sides of the body are situated at the bottom of an open groove; only in the head region has this become covered in.

The Notidanidae, like *Chlamydoselachus,* show more than the ordinary number of gill clefts. *Notidanus griseus (Hexanchus)* has six, while *N. cinereus (Heptanchus)* has seven postspiracular gill- clefts. In both Notidanidae and Chlamydoselachidae the vertebral column shows very primitive features with either very slight calcification or none at all.

The Heterodontidae include the recent genus *Heterodontus ( = Ces- tracion),* the Port Jackson shark or Bullhead shark, widely distri­buted through the Pacific. Numerous Mesozoic and possibly also Palaeozoic forms belong to this family. The small and nearly terminal mouth, the amphistylic skull, and the egg cases with an external spiral lamina are characteristic features.

*Palaeontological History* (6).—It must be borne in mind that the sharply delimited groups into which animals appear to be divided are due to our imperfect knowledge, to the fact that our knowledge is limited to short isolated periods of geological time. Were our knowledge of palaeontology complete, it would be found that the various groups graded into one another by insensible gradations, so that it would be quite impossible to set definite limits to any one group. Already even in the extraordinarily imperfect condition of palaeontological knowledge this difficulty is making itself felt, and in the remains from the older deposits it becomes difficult to decide which of the recognized groups the various forms are most closely allied to.

Amongst the most ancient forms of fishes known at present are the remarkable *Ostracodermi* of the Upper Silurian and Devonian. The general form of these creatures gives the impression that they were ground-feeding fishes which had become highly specialized along much the same lines as the rays amongst existing Selachians. In the highly interesting Coelolepidae described by Traquair (7) from the Upper Silurian and Devonian and comprising the genera *Thelodus* and *Lanarkia* a placoid skeleton is present, the individual elements being in the form of small hollow spines without any basal plate of bone. The main organ of propulsion seems to have been the heterocercal tail, while the broad anterior region passes out on each side into a flap-like portion which may represent a pectoral fin. On the under surface of *Thelodus* there occur transverse markings which probably are caused by the presence of a branchial apparatus of the ordinary Selachian type. In the *Drepanaspidae* (Lower Devonian) and *Pteraspidae* (Upper Silurian and Lower Devonian) the isolated placoid elements of the *Coelolepidae* have undergone fusion to a less or greater extent into large plates which ensheath the anterior body region, the posterior portion possessing rhombic scales. The Ostracoderms so far mentioned are grouped together under the name Heterostraci. The Osteostraci form another main division of the Ostracoderms, distinguished from the Heterostraci by the presence of true unmodified bone in their skeletal plates. The orbits are more dorsal in position and a dorsal fin is known to occur, while none has as yet been recognized in the Heterostraci. The most familiar members of the group are the *Cephalaspidae* of the Silurian and Devonian with their highly characteristic crescentic shield covering the dorsal side of the head region. From behind the posterior horns of this shield there project in some specimens paddle-like structures which may be pectoral fins, or possibly structures serially homologous with limbs and not represented in modern Selachians.

Among the less doubtful members of the Selachii among fossil forms first place must be given to the *Pleurοpterygii* represented by the genus *Cladoselache* (8) from the Upper Devonian of Ohio. This was a shark-like creature with the mouth apparently terminal. The body was covered with shagreen placoid elements : there were a series (five or seven) of gill slits on each side and the skull was probably hyostylic. The notochord was apparently persistent. The chief interest of *Cladoselache,* however, lies in its paired fins which are held by upholders of the “ lateral fold ” theory to be remarkably primitive. The unpaired fins arc obviously highly developed—tne tail being almost homocercal with a lateral keel on each side as in various existing sharks, and it seems on the whole unlikely that the paired fins should be very primitive while the unpaired fins are so highly developed. Moreover, the facts of structure of the paired fins so far as at present known seem to fit in quite well with the view that they are modifications of the uniserial archipterygial type (see Ichthyology, fig. 2).