latter serpentiform and devoid of ventrals. We now know ten species of *Polypterus,* from the Nile, the Congo, the rivers of West Africa, and lakes Chad, Rudolf and Tanganyika, and one of *Colamichlhys,* which inhabits West Africa from the Niger delta to the Chiloango. The largest species of *Polypterus* reach a length of nearly 4. ft. The young are provided with an external opercular gill very similar to the gills of larval salamanders. The air-bladder acts as an accessory breathing organ, although these fishes are not known ever to leave the water. The development is stated by the late J. S. Budgett to be even more Batrachian-like than that of the Dipneusti, but the results of the study of the material collected by him shortly before his death have not yet been published.

Order II.—DIPNEUSTI

Often called Dipnoi, a term proposed for this order by J. Müller in 1845, but which had already been used for the Batrachians (F. Leuckart, 1821) before the discovery of *Lepidosiren.* The sub­stitute Dipneusti (E. Haeckel, 1866) is, therefore, preferable.

Paired fins lobate, or reduced to a jointed endo-skeletal axis. Upper segment of the mandibular arch confluent with the skull (autostylic skull). Praemaxillary and maxillary bones absent, dentary absent or small and toothless; teeth on the palato-ptery- goid and splenial bones, sometimes also on the vomers. No supraoccipital bone. Heart trilocular, with a contractile, multi- valvular conus arteriosus; intestine with a spiral valve; air-bladder transformed into a single or double lung, opening at the glottis on the ventral side of the pharynx.

The cranial roof-bones include median as well as paired plates, which cannot easily be homologized with those of other Teleo- stomes; in the older forms, these bones are small and numerous, and, coated with ganoine, appear on the surface of the head, whilst in the later forms they are reduced in number as well as in the degree of ossification, and have sunk below the skin. Pectoral arch with both clavicle and cleithrum. Ventral fins inserted far back. Vertebrae acentrous. Dermal rays of vertiçal fins much more numerous than their supports, which correspond in number to the neural and haemal arches. Nostrils on the lower side of the snout, the posterior within the mouth. Scales cycloid (almost quadrate in *Sagenodus,* a genus of Ctenodontidae).

Families: Dipteridae, Ctenodontidae, Uronemidae, Ceratodon- tidae, Lepidosircnidae.

The Dipteridae are heterocercal and have two dorsal fins, as in the Crossopterygian Holoptychidae; in the other families the dorsal fin is elongate and single, and extends to the extremity of the tail, which belongs to the diphycercal type. In the three first families, which are entirely Palaeozoic, ranging from the Devonian to the Permian, the dental plates nearly always exhibit more or less clearly the points of the separate denticles of which, as shown by the development of *Neoceratodus,* they were originally composed, but vomerine teeth, such as exist in the Ceratodontidae and Lepido- sirenidae, do not appear to have existed. In the Dipteridae alone the scales were covered with dense, punctate ganoine, which has become much reduced or disappeared entirely in the other members of this order. The two first families had well-developed gular plates.

In the Ceratodontidae, which first appeared in the Trias and have persisted to the present day, the skull is more feebly ossified than in the earlier forms, and this may well be looked upon as a degen­eration, since the head of the Triassic *Ceratodus sturi,* whilst exhibit­ing the same arrangement of bones as in the living form, differs in. its higher degree of ossification ; and as the dermal rays of the caudal fin also exhibit distinctive features in a fossil of the same period, it is advisable to refer the existing *Ceratodus forsteri* to a distinct genus, which has been named *Neoceratodus* by Castelnau (1876) and *Epiceratodus* by Teller (1891). But there can be no question that *Neoceratodus* is very closely related to *Ceratodus.* Its only known species, *N. forsteri,* variously known as the barra- munda, flat-head, and Dawson or Burnett salmon, inhabits the Burnett, Dawson and Mary rivers in Queensland, and was first discovered in 1870. Its anatomy was made known by the memoir of A. Günther, and numerous contributions by T. H. Huxley, E. R. Lankester, J. E. V. Boas, W. B. Spencer and others, whilst its development has been elaborately worked out by R. Semon. This fish, which grows to a length of 6 ft., has the body moderately elongate and compressed, covered with large thin scales, and the paired fins are acutely lobate, consisting of a median jointed axis fringed on each side by a series of radialia supporting fine dermal rays (archipterygium of C. Gegenbaur). Although provided with a lung, which is single, *Neoceratodus* never leaves the water. It feeds on both animal and vegetable matter, the specimens kept in the London Zoological Gardens readily eating lettuce in addition to frogs and bits of raw meat. The early development resembles very closely that of Batrachians, but there are no metamorphoses properly speaking, and at no period does the young possess external gills or a holder or cement organ.

The South American *Lepidosiren* and the tropical African *Protopterus,* which constitute together the family Lepidosirenidae, were discovered long before *Neoceratodus,* the former in 1836, the latter in 1839. These fishes are much more specialized than are the Ceratodontidae; the body is more or less eel-shaped, the scales are thinner, the paired fins are reduced to slender styliform append­ages formed of a jointed axis with or without a unilateral fringe of cartilaginous rays bearing fine dermal rays, and the lung is paired. The development is even more Batrachian·like than that of *Neoceratodus,* and the larvae are provided with a cement organ and four *(Lepidosiren)* or five *(Protopterus)* fringed external gills, traces of which may persist throughout life in *Protopterus.* The habits and development of *Lepidosiren* have been investigated by J. Graham Kerr, and those of *Protopterus* by J. S. Budgett. In both the eggs are deposited in nests in the water and the male keeps guard over the eggs and young. The food is both animal and vegetable, as in *Neoceratodus.* During the dry season, *Pro­topterus* burrows in the mud of drying marshes and, surrounded by a cocoon formed of hardened mucus secreted by glands of the skin, it spends weeks or months in a dormant condition, breathing exclusively by its lungs; dry clay balls containing such cocoons have often been brought over to Europe, and when soaked in water, the *Protopterus* is released in a most lively condition. Three species of *Protopterus* are known from different parts of Africa, the type species being *P. annectens,* an inhabitant of West Africa, from the Senegal to the Niger, and Lake Chad. Of *Lepidosiren* only one species is known, *L. paradoxa,* living in the Amazon and Paraguay basins.

Great uncertainty, and much difference of opinion among palaeichthyologists, still prevail as to the position in the system of a group of Devonian fishes, of which *Coccosteus* and *Dinichthys* are the best-known representatives. Long placed with the Ostra- cophores is a group instituted by Sir F. McCoy in 1848 under the name of Placodermi; they were removed from their vicinity by A. S. Woodward in 1889, and referred to the Dipnoans as an order which he proposed to call Arthrodira. This view was based mainly on the assumption that the skull was autostylic and that maxil­lary bones were not developed, and also on the resemblance, pre­viously noticed by J. S. Newberry, between the dentition of *Dinichthys* and that of *Protopterus.* Woodward’s proposal has not met with general acceptance, but it is strongly supported by the recent investigations of C. R. Eastman, who has added fresh argu­ments in favour of the autostylic condition of the skull and the homology of the cranial roof-plates with those of the Dipnoans, the Ceratodontidae in particular. On the other side, B. Dean and L. Hussakof deny such homologies, and even regard the dental mechanism of the Arthrodira as something quite different from the jaws and teeth of other vertebrates, and revert to the view of McCoy in placing the Arthrodira in a group Placodermata, which they regard as a class co-ordinate in rank with such divisions as Cyclostomi and Pisces.

In the present state of our knowledge it is perhaps best to leave the Arthrodira with or near the Dipneusti. They are thus defined by Woodward:—Fishes with both head and trunk armoured, in the more specialized genera the shield of the abdominal region articulating with the head-shield in ginglymoid facettes (Gr. *ylyy∖υμos,* a hinge) which admit of free motion (hence the name *Arthrodira,* joint-neck). No trace of a hyomandibular bone. Jaws paralleled by those of the existing Dipneusti. Notochord per­sistent. Pectoral fins unknown; ventral fins rudimentary.

Two families: Coccosteidae and Dinichthyidae, from the Devonian of Europe and North America.

Some of the species of *Dinichythys* reached a great size, the head sometimes measuring a metre across.

Order III.—GANOIDEI

Paired fins not lobate. Mandibular arch suspended from the upper segment of the hyoid arch (hyostylic skull). Splenial bone present. No supraoccipital bone. Unpaired fins often with fulcra. Heart with a contractile, multivalvular conus arteriosus; intestine with a spiral valve; air-bladder with pneumatic duct communi­cating with the dorsal side of the oesophagus.

Sub-order I.—CHON DROSTEI

Pectoral arch with both clavicle and cleithrum. Ventral fins inserted far back, with well-developed endo-skeletal rays (base- osts); dermal rays of the dorsal and anal fins more numerous than their endo-skeletal supports. Heterocetcal. Vertebrae acentrous.

Families: Palaeoniscidae, Platysomidae, Catopteridae, Belono- rhynchidae, Chondrosteidae, Polyodontidae, Acipenseridae.

In the three first families (Devonian to Jura), the mouth is toothed, praemaxillary bones are present, and the maxillaries are large, the bones of the upper surface of the head are paired, branchiostegal rays are present, and the body is covered with rhomboidal, typically ganoid bony scales. In the fourth family (Trias to Lias), the snout is much elongate, and longitudinal series of scutes extend along the body, one on the back, one on the belly, and one on each side. The Liassic Chondrosteidae show an approach to the sturgeons, and form a sort of connecting link between them and the Palaeoniscidae. The mouth was edentulous, praemaxillary bones were absent, but the maxillary bone was well developed, though small; the membrane bones of the skull were paired;