Sponges, as we have already seen possess no special nervous system and no special sense organs, and the power of response to stimuli appears to be very limited. ' Many sponges probably have the power of contracting as a whole, which may in some cases be due, in part at any rate, to the presence of bands of muscular fibres, and Sollas observes that in *Pachymatisma* irritation of the oscular margin is invariably followed after a short interval by a slow closure of the sphincter. The power of movement in adult sponges is, however, chiefly confined to individual cells acting independently. The young larvae, on the other hand, swim vigorously about by means of their cilia or flagella, whose movements must obviously be co-ordinated in order to ensure the progress of the entire organism in definite directions.

The rate of growth of sponges appears to be very rapid. A British species of *Hymeniacidon* is said to form a crust measuring a foot in diameter in so short a period as five months. With this rapidity of growth must be associated the fact that many sponges, marine as well as fresh-water, appear to be annual.

*Distribution.*

The vast majority of sponges are marine, only a single sub-family, the Spongillinae, having acquired the habit of living in fresh water. The Spongillinae are, however, very widely distributed, being found in lakes and rivers in all parts of the world. Marine sponges occur everywhere, from low-water mark to the greatest depths, but certain localities, such as the Gulf of Manaar, Port Phillip and Port Jackson, appear to be much richer than others both in individuals and species. The Hexactinellida are essentially a deep-water group and are there­fore much more rarely met with than other forms. The Tetraxonida and Euceratosa abound in shallow and in moderately deep water, and a comparatively small number of species of Tetraxonida occur at great depths. Both are dominant groups at the present day, represented by very large numbers of species and individuals. The Myxospongida are comparatively rare and represented by very few species. The Calcarea are common in the littoral region, especially in sheltered situations amongst rocks and seaweed.

Most families and even genera of sponges enjoy a very wide geographical range, very many being cosmopolitan. Species arc usually much more restricted in distribution, but even here there are some noteworthy exceptions, and future researches will probably show that many species from different localities which are at present regarded as distinct are connected by intermediate forms living in intermediate situations.

There appears to be a well-marked relation between temperature and the power of spongin-secretion, and as a result we find that sponges with a really well-developed horny skeleton (whether *Euceratosa* or *Pseudoceratosa)* are usually only met with in com\* Caratively warm waters. This fact brings about a striking contrast between the sponge-faunas of different latitudes.

*Classification,*

The classification of the Phylum Porifera, the characters of which have already been given, is as follows:—

Sub-phylum and Class Calcarea.—Sponges with a skeleton composed of carbonate of lime, commonly in the form of isolated spicules whose most usual shape is triradiate.

*Order 1. Homocoela.—*Calcarea in which the gastral cavity and its outgrowths are lined throughout by collared cells. This order is sometimes divided into two families, Clathrinidae. and Leucosoleniidae, but it is doubtful if this distinction can be maintained, and by some writers only a single genus *(Leucosolenia)* is recognized.

*Order 2. Heterocoela.—*Calcarea in which the original lining of the gastral cavity is partly replaced by pavement epithelium, so that the collared cells are confined to separate flagellated chambers. This order includes the living families Leucascidae, Sycettidae, Grantidae, Heteropidae, Amphoriscidae and Pharetronidae (with only two living representatives but numerous fossil forms). The relationships of the anomalous *Astrosclera* (fig. 25), for which the family *Astroscleridae* has been proposed by J. J. Lister, must still be regarded as problematical.

Sub-phylum Non-Calcarea.—Sponges without any calcareous skeleton.

Class and Order Myxospongida.—Sponges with no skeleton ; with simple canal system and usually large flagellate chambers. (The absence of skeleton is primitive and not due to degeneration.) This class is sometimes divided into two families—Halisarcidae, with elongated, sac-shaped chambers, and Oscarellidae, with more or less spherical chambers.

Class Triaxonida ( = Hexactinellida).—Sponges with a skeleton composed of siliceous spicules, either isolated or cemented together by silica, and either triaxonid and hexactinellid in form or derivable from the triaxonid and hexactinellid type. The canal system is simple and the flagellated chambers are large and sac- shaped, and more or less radially arranged in a network of trabecular tissue. Spongin is never formed.

*Order 1. Amphidiscophora.*—Triaxonida with characteristic amphidisc spicules, but no hexasters, and with a root-tuft of anchoring spicules. The family Hyalonematidae, including the well-known glass-rope sponges of the genus *Hyalonema,* is the only family recognized in this order.

*Order 2. Hexasterophora.—*Triaxonida whose most characteristic spicules are hexasters. To this order belong the living families Euplectellidae, Asconematidae, Rossellidae, Euretidae, Melittionidae, Coscinoporidae, Tretodictyidae and Maeandrospongidae, and a number of extinct families such as the *Ventriculitidae* so commonly met with in the Jurassic and Cretaceous rocks.

Class Tetraxonida.—Sponges with a skeleton composed of siliceous spicules, either isolated or cemented together (by silica or by spongin), and either tetraxonid and tetractinellid in form or derivable from the tetraxonid and tetractinellid type. The canal system is usually complex, with small, more or less spherical flagellated chambers.

Grade Tetractinellida.—Tetraxonida in which some, at any rate, of the megascleres retain the primitive tetractinellid form. No desmas are developed.

*Order 1. Homosclerophora.—*Tetractinellida in which microscleres and megascleres are not yet sharply differentiated from one another and no triaenes are developed. The canal system is comparatively simple. This order includes the family Plakinidae (see *Plakina, ante)* which forms the starting-point of the evolution of the class.

*Order 2. Astrophora.—*Tetractinellida with triaenes and with astrose microscleres, without sigmata. This order includes the families Pachastrellidae, Theneidae, Stellettidae, Geodiidae.

*. Order 3. Sigmatophora.—*Tetractinellida with triaenes, with sigmata for microscleres (when present), without asters. This order includes the families Tetillidae and Samidae.

Grade (? order) Litiiistida.—Tetraxonida in which the mega­scleres form desmas, typically united with each other by siliceous cement to form a continuous skeleton, often of stony hardness. This group indudes both tetractinellid and monaxonellid forms and may possibly be of polyphyletic origin. The Lithistida bear the same relation to the other Tetraxonida that the dictyonine Hexac- tinellids bear to the lyssacine forms, but in the present state of our knowledge it is hardly possible to trace the natural affinities of the numerous members of the group, many of which are only known in the fossil state. The following are the principal families: Tetra- ladidae, Desmanthidae, Corallistidae, Pleromidae, Neopeltidae, Scleritodermidae, Cladopeltidae, Azoricidae, Anomocladidae.

Grade Monaxonellida.—Tetraxonida in which the primitive tetraxonid and tetractinellid condition of the megascleres has been entirely lost through suppression of some of the spicule rays, so that none but monaxonellid megascleres remain. No desmas are developed. Owing to the extreme reduction or modification of the skeleton, leading in many cases to convergence, the classification of this group is extraordinarily difficult and the group is obviously not monophyletic.

*Order 1. A stromonaxomllida.—*Monaxonellida in which the microsclere, when present, is some form of aster. The members of this order are to be regarded as descended from aster-bearing tetractinellid ancestors.

Families.—Epipolasidae, Tethyidae, Spirastrellidae (including Placospongiidae), Clionidae (the boring sponges), Suberitidae, Chondrosiidae. (In *Chondrosia* the skeleton is entirely suppressed, so that it simulates the Myxospongida.)

*Order 2. Sigmatomonaxonellida.—*Monaxonellida in which the typical microscleres are sigmata, or other diactinal forms. Normal astrose microscleres are absent (though secondary pseudasters are occasionally present). The members of this order are to be regarded as descended from sigma-bearing tetractinellid ancestors.

Families.—Haploscleridae (chief sub-families: Gelliinae, Renierina Chalininae, Spongillinae), Desmacidonidae (chief sub-families: Esperellinae, Ectyoninae), Axinellidae.

Class and Order Euceratosa.—Non-calcareous sponges without siliceous spicules, but with a skeleton composed of horny fibres developed independently, *i.e.* not in relation to any pre-existing spicular skeleton. The skeleton is often supplemented, or even largely replaced, by foreign bodies. This group includes the bath sponges and their very numerous relations.

Families.—Aplysillidae, Spongeliidae, Spongiidae.

/There are two groups of palaeozoic fossil siliceous sponges which apparently do not fit into the above system, viz. the Octactinellida and Heteractinellida of G. J. Hinde. The former, represented by the genus *Astraeospongia,* have oc­tactinal megascleres. The latter, represented by the genera *Tholiaslerella* and *Asteractinella,* have poly­axon megascleres with an indefinite number of rays. These may indicate the former existence of two distinct classes of siliceous sponges