

alternately distending and contracting with the respiratory movements, will easily understand how variations in form may arise. Nevertheless, when a number of specimens of the same species are compared which have been subjected to pretty much the same treatment, a certain similarity is usually to be remarked among them.

The relative length of the arms, both with respect to each other and to the body, was regarded by d'Orbigny as a point of the greatest importance, and although it has again and again been shown that he greatly exaggerated this,<sup>1</sup> nevertheless he has been followed by many authorities, such as Gray and Tryon. The arms of an *Octopus* being almost wholly muscular, and entirely devoid of any hard or even cartilaginous parts whatsoever, are capable of a very considerable degree of contraction and extension, and as, when killed by being placed in fresh water or alcohol or poisonous solutions, they twist their arms about in the most lively manner, it follows that they may die with them in very varied states of contraction. There are, of course, cases in which the dimensions of one or more pairs of arms are so preponderant that no hypothesis of irregular contraction will account for the difference, which must then be regarded as a matter of systematic importance; such instances are to be seen in *Octopus macropus*, Risso, where the first pair, and in *Octopus aranea*, d'Orbigny, where the fourth pair of arms greatly exceed the others. When, however, d'Orbigny places his *Octopus fontanianus* in the division "Bras inférieurs les plus longs," because the length of the upper arms is 165 mm. and of the lower 166 mm., he carries out the principle to an extent which is almost too ridiculous to require criticism.

The degree to which the arms are united by a web or umbrella is a valuable character, though it must be borne in mind that here, as in the case of the arms, small variations must be regarded as probably due to different degrees of contraction.

The colour has commonly been regarded as of but little systematic value, owing to the manifold variations in this respect which these animals undergo owing to the play of the chromatophores. It seems, however, reasonable to suppose that in animals which have been killed and preserved in the same way, the chromatophores will be similarly affected, and thus the differences which are due to their action eliminated. Certainly in examining the Challenger material I have remarked that specimens which seemed on other grounds to be referable to the same species have generally agreed also in regard to colour. There are some cases (e.g., *Octopus pictus*, Brock, and *Octopus lunulatus*, Quoy and Gaimard) in which the colour is disposed in definite bands or patches, and in these its distribution is quite diagnostic.

The nature of the surface of the body, namely, whether smooth or provided with warts or cirri, is also regarded by d'Orbigny with disfavour, on the ground that variations in this respect occur in correlation with the position and state of irritation or repose of the animal. The remarks just made regarding the colour apply to a large extent here

<sup>1</sup> See Verrill, Ceph. N. E. Amer., p. 381, and pp. 86, 93, 100 of the present Report.