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CYTOLOGICAL STUDIES OF THE OPISTOBRANCH MOLLUSKS.[1]

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(Abstract)

In recent years, detailed investigations have been made on the chromosomes of basommatophoran and stylommatophoran mollusks, but few opisthobranchs have been studied, partly because of the difficulties they present in collection and identification. Makino (1956) has listed the chromosome numbers of 16 species of opisthobranchs, but the work of Inaba and Hirota (1958), Inaba (1959, 1961), and our studies at the University of Michigan show that the earlier records are not reliable. The Japanese authors deal with 26 species of opisthobranchs belonging to 18 families and 6 orders, revealing the prevailing cytological conditions in these various orders. Nevertheless, there is need for further studies on the chromosomes of opisthobranchiate mollusks since relatively few species have been studied in this large group.

The present investigation deals with the chromosomes of ten species of opisthobranchs from three islands of the Eniwetok Atoll in the South Pacific. The species studied presently include three species of the order Nudibranchia, two species of the order Anaspidea, four species of the order Cephalaspidea, and one species of Soleolifera. In the Nudibranchia the three species studied all had 13 pairs of chromosomes. This was the only number found for 16 other species of nudibranchs belonging to 8 families studied by Inaba, and Inaba and Kirota, pointing to a striking conservatism in chromosome numbers in this order.

Recently, Inaba (1961), in discussing the cytotaxonomy of mollusks, has pointed out that cytologically, Thiele's (1931) and Boettger's (1954) systems of classification and phylogeny of opisthobranchs seem to be more valid than that of Odhner's (1939). However, Burch (1964) has expressed the opinion that from a cytological viewpoint, the order Nudibranchia with a haploid

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number of 13 might be considered as one of the more primitive opisthobranch groups since the general evolutionary trend in mollusks is towards an increase in the number of chromosomes rather than a decrease. Also, on anatomical grounds, some European malacologists consider the Nudibranchia to be one of the primitive opisthobranch groups. Therefore, it would seem that perhaps a reevaluation of current concepts of the phylogeny of the opisthobranch orders is desirable. It must also be pointed out that there exists a gap between the groups Notaspidea and Nudibranchia on the one hand, with a haploid chromosome number of 12 or 13, and the orders Sacoglossa, Anaspidea, Entomotaeniata, Cephalaspidea, and Soleolifera, on the other hand, where the haploid numbers are 16, 17, and 18.

In the Anaspidea only two species of the family Aplysiidae have been studied previously; both had 17 pairs of chromosomes. In the present study two more species of the same family also were found to have that same number. In the Cephalaspidea, two species of the Atyidae were found to have a haploid chromosome number of 17 whereas two species of the Philinidae had a haploid number 18. The occurrence of the haploid chromosome number of 18 in the order Cephalaspidea is very interesting and perhaps may prove to be significant. It would seem to strengthen Pelseneer's and Boettger's views regarding the origin of Basommatophora from Cephalaspidea, since the haploid chromosome number of 18 is basic for the Basommatophora.

In the Soleolifera the one species of the family Onchidiidae that we studied also had a haploid chromosome number of 18. The haploid number 18 has been recorded previously in only one member of the order Soleolifera. Other members of this order show chromosome numbers of 16 and 17.