

FIG. 5. — **a**, *Dynomene hispida* Guérin-Méneville, 1832, ♀ 14.0 x 10.8 mm, Hawaii, Oahu, (BPBM 658): transverse section through gill. — **b**, *Dynomene hispida* Guérin-Méneville, 1832, ♀ 10.3 x 8.9 mm, Cocos Keeling Ids. (WAM 751-89): apex of gill. — **c**, *Dynomene filholi* Bouvier, 1894, ♀ 10.0 x 8.7 mm, Cape Verde Ids., CANCAP, stn 7.125, 85-130 m: transverse section through gill. — **d**, *Dynomene pugnatrix* de Man, 1889, ♂ 9.8 x 7.2 mm, Mauritius (SMF 4857): transverse section through gill. — **e**, *Hirsutodynomene spinosa* (Rathbun, 1911), ♀ 11.3 x 8.9 mm, Madagascar, Tuléar, stn 14-11-2, 5 m (MNHN-B 22077): transverse section through gill. — **f**, *Hirsutodynomene spinosa* (Rathbun, 1911), ♂ 14.2 x 10.8 mm, Cocos-Keeling Ids., 0-37 m, (WAM 139-94): lateral view of whole gill. (All pictures taken with scanning electron microscope.)

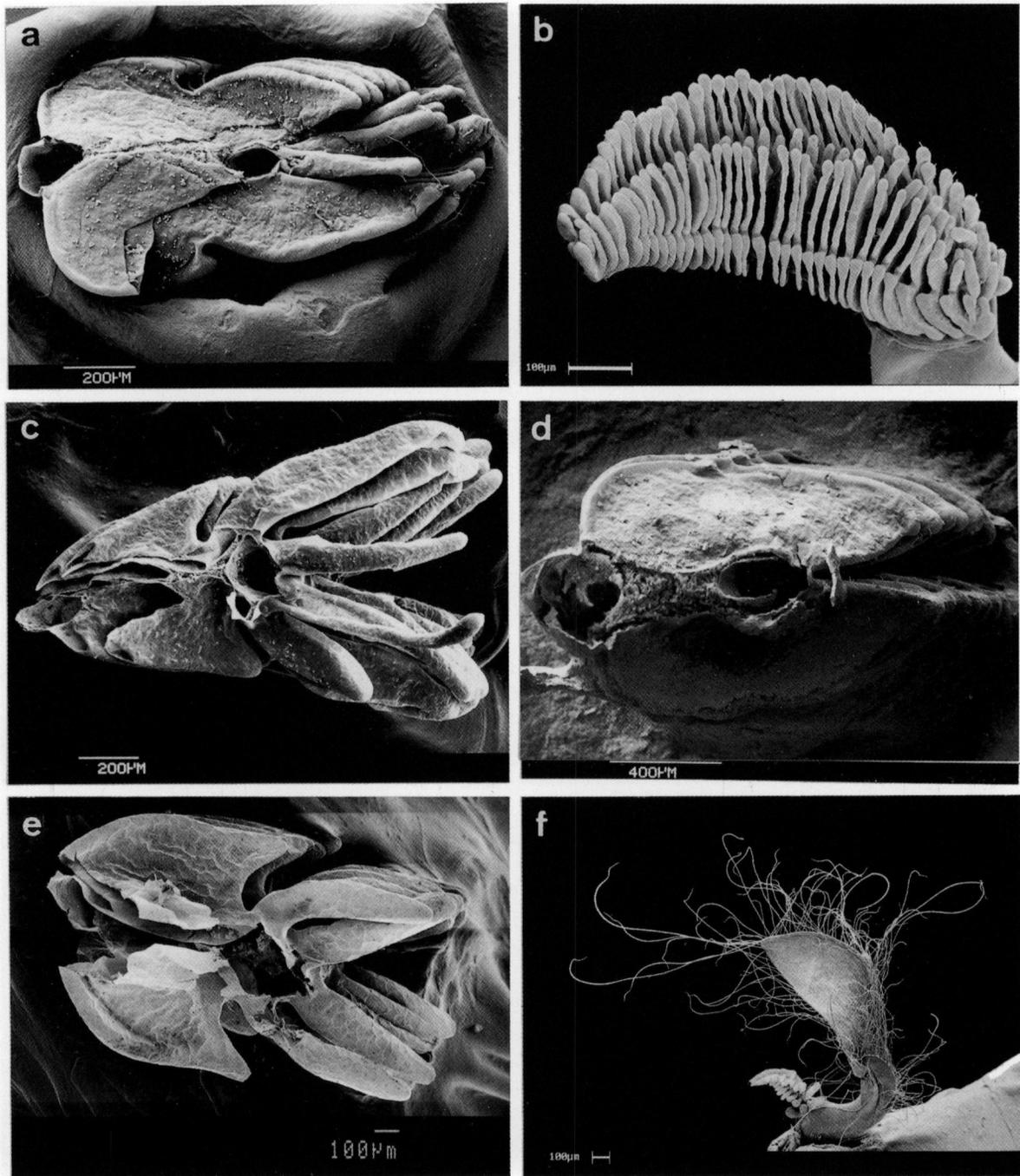


FIG. 6. — a, *Hirsutodynomene ursula* (Stimpson, 1860), ♀ ovig. 19.4 x 14.7 mm, ARGOSY 34 (USNM 247230): transverse section through gill. — b, *Hirsutodynomene ursula* (Stimpson, 1860), ♀ ovig. 15.0 x 12.2 mm, Ecuador, La Plata Id, "Askoy", stn 80 (LACM): lateral view of whole gill. — c, *Metadynomene tanensis* (Yokoya, 1933), ♀ 19.2 x 18.9 mm, New Caledonia, MUSORSTOM 4, stn 215, 485-520 m: transverse section through gill. — d, *Acanthodromia erinacea* A. Milne Edwards, 1880, ♀ 16.7 x 17.7 mm, Yucatan, "Blake", stn 166, 275 m (MCZ 6509): transverse section through gill. — e, *Paradynomene tuberculata* Sakai, 1963, ♂ 21.0 x 21.9 mm, New Caledonia, SMIB 8, stn DW 189, 400-402 m: transverse section through gill. — f, *Paradynomene tuberculata* Sakai, 1963, ♀ 21.5 x 21.2 mm, Loyalty Ids, MUSORSTOM 6, stn DW 406, 373 m (MNHN-B 25249): epipod and podobranch from left third pereopod. (All pictures taken with scanning electron microscope.)

more complex with the task being divided amongst eight appendages (second maxilla plus the seven epipods) as well as the body wall hypobranchial setae, compared to only three appendages (the maxillipeds). At least in part, this must be regarded as a consequence of having more gills. Besides the podobranchs, which are always small, dynomenids have thirteen large gills versus only eight or nine in other Brachyura. In order to transform the method of gill cleaning seen in dynomenids into that seen in more derived Brachyura, it is necessary to remove all the pereopodal epipods, elongate the epipod of the first maxilliped to clean the hypobranchial region, and remove the epipod of the third maxilliped from between the second and third arthrobranchs, and elongate it so that it covers the epibranchial gill surface. This is sufficient to clean the reduced number of gills and no change in the relative size of the second maxilliped epipod is necessary. Since gills are lost from the posterior part of the thorax, the field of setae on the hypobranchial wall is no longer necessary. The relationships between gill structure and gill cleaning mechanisms have been explored by SUZUKI & McLAY (1998). Dynomenids have retained several plesiomorphic gill and gill cleaning characters.

In cross section the gills are basically violin-shaped, with afferent and efferent vessels in the 'body' of the gill and a notch on each side. Dynomenids show a great deal of variation in the shape of their gills, chiefly in the number of lobes (or filaments) on the epibranchial surface. BOUVIER (1896: 26, footnote) has already noted the variation in number of filaments along the length of each gill. Therefore in order to make comparisons between species it is necessary to standardize the point at which a cross section is taken and the gills which are used. Comparisons were made using a section across an arthrobranch or pleurobranch from the first two pereopods at approximately half the length from the point of attachment. Lobes on the gills are arranged in rows lengthwise, but they do not always lie in the same plane in cross section. This means that while the hypobranchial half of each gill is composed of a series of plates, the lobes do not always correspond exactly to each pair of plates. Furthermore, the lobes on the posterior side of the gill are usually longer than those on the anterior side.

In the type species *Dynomene hispida* and in *D. praedator* the gill cross section shows a pair of plates (or flattened lobes) on the epibranchial surface. In *D. pugnatrix* an additional short median lobe is added to make three. In *D. pilumnoides* there are four long lobes while in *D. filholi* there are six lobes decreasing in size medially. [My interpretation of the gills of *D. filholi* differs from that of BOUVIER (1896) who gave the number of filaments as being eight because he included the portion of the lateral notch as a filament, whereas I have treated them as part of the 'body' of the gill.] In both species of *Hirsutodynomene* there are six lobes decreasing in size medially. In *Metadynomene* the number of lobes increases from four (*M. tanensis*), five (*M. devaneyi*) to six (*M. crosnieri*). The gills of *Paradynomene tuberculata* have four lobes. In both species of *Acanthodromia* the epibranchial extensions consist of two flattened lobes. Thus within the Dynomenidae we have gills ranging from the multi-lobed trichobranchiate-like condition seen in *Hirsutodynomene* and *D. filholi*, through *D. hispida* and *D. praedator* in which the number of lobes is reduced to only two (which are flattened) and finally to the phyllobranchiate-like condition seen in *Acanthodromia*. But even in *Acanthodromia* the distinctive lateral notch is evident on each lamella of the gill so that they still differ from the condition found in dromiids, such as *Epigodromia*, *Hypoconcha*, and *Conchoecetes*, where the gill plates are rounded in outline, and not interrupted by notches. Dynomenid gills show little variation in numbers but great variation in shape, while gills of the Dromiidae show greater variation in numbers but almost no variation in shape.

BOUVIER (1896, figs 19, 23) compared the gill structure of *Dynomene filholi* which has several rows of "filaments" with *Acanthodromia erinacea* which has only two plates. He made comparisons with *Homarus vulgaris* as well as *Homolodromia paradoxa*, *Dicranodromia ovata*, and *D. mahieuxii*. Like the dynomenids, the latter two homolodromiid species have different numbers of epibranchial "filaments". BOUVIER regarded *D. mahieuxii* as being a little less primitive because it has fewer filaments which are more plate-like and he suggested that these gill plates might have originated by the concrescence of several short "filaments". In making the same comparison between the two dynomenids BOUVIER discussed the interesting problem of how a species such as *D. filholi* could have evolved a more advanced crab-like form and yet still retain such primitive homarid-like gills. He considered that *D. filholi*, more than any other dromiacean, showed close links with the homarids. BOUVIER argued that *D. filholi* cannot be considered as deriving from *Dicranodromia ovata* (BOUVIER used "*Acanthodromia ovata*", but this must be an error for "*Dicranodromia ovata*") which is, in many respects, more