

But if the food-groove on the ventral surface of the arm or pinnule remains undeveloped (Pl. LXI. fig. 3), not only are the ambulacral epithelium, nerve, and blood-vessel absent altogether, but the water-vessels are simple tubes like the integumentary water-vessels of the Molpadidæ, and have no lateral extensions, as tentacles are absent (fig. 4 on p. 113, *w*).

This condition may occur in a majority of the arms and even on the disk of *Actinometra* (Pl. LVI. fig. 7); on more or fewer of the lower pinnules of *Antedon acoela* and *Antedon angusticalyx* (Pl. LIV. figs. 1-3, 5); and on the proximal pinnules of *Antedon eschrichti* and *Antedon rosacea*, which receive no branches from the brachial ambulacra.

In *Metacrinus*, on the other hand, the ambulacra, and with them the water-vessels, of the large basal pinnules may start directly from the primary ambulacra of the disk, or even from the peristome itself (Pl. XXXIX. fig. 2; Pl. XLIII. fig. 3; Pl. L. fig. 2).

The radial water-vessels which underlie the disk-ambulacra of the Comatulæ pass off from the angles of the somewhat pentagonal water-vascular ring as single trunks, situated beneath the median lines of the ambulacra. But in *Pentacrinus*, at any rate in *Pentacrinus decorus* and *Pentacrinus wyville-thomsoni*, there is a radial extension of the labial blood-vascular plexus in this position (Pl. LVII. figs. 1, 3, 4, *lv*); and the two trunks which ultimately unite into the single water-vessel of the ambulacrum are thus kept separate from one another to a considerable distance, 1.5 mm. or more, from the edge of the peristome; that is to say, the angles of the water-vascular ring are produced in the direction of the rays, so that its outline is that of a short-armed *Asterias* rather than the more regularly pentagonal figure of a *Goniaster*.

The ciliated water-tubes ("Steincanäle," Ludwig) by which the water-vascular system communicates with the body-cavity, and thence with the exterior, vary very greatly in their development. The early Pentacrinoid has but one, situated in the same interradius as the fore-gut. In the later stages of Pentacrinoid life and in the young *Comatula* just free there are five, one in each interradius; and the same is the case in *Rhizocrinus lofotensis*. They are multiple in *Bathycrinus*, though not abundant; while in the adult *Antedon rosacea* there are about thirty in each interradius; and in *Antedon eschrichti* and in *Pentacrinus* the number becomes still larger (Pl. LVII. figs. 1, 3, 4; Pl. LIX. fig. 5—*wt*).

The radial water-vessels of *Comatula* commence as single trunks arising from the water-vascular ring at the edge of the peristome; and in a large *Comatula* like *Antedon eschrichti* the water-tubes may be found depending from the bases of the radial vessels beneath the middle line of the ambulacrum in the first two or three sections beyond the edge of the peristome.

In *Pentacrinus*, however, the middle line of the commencing ambulacrum is occupied