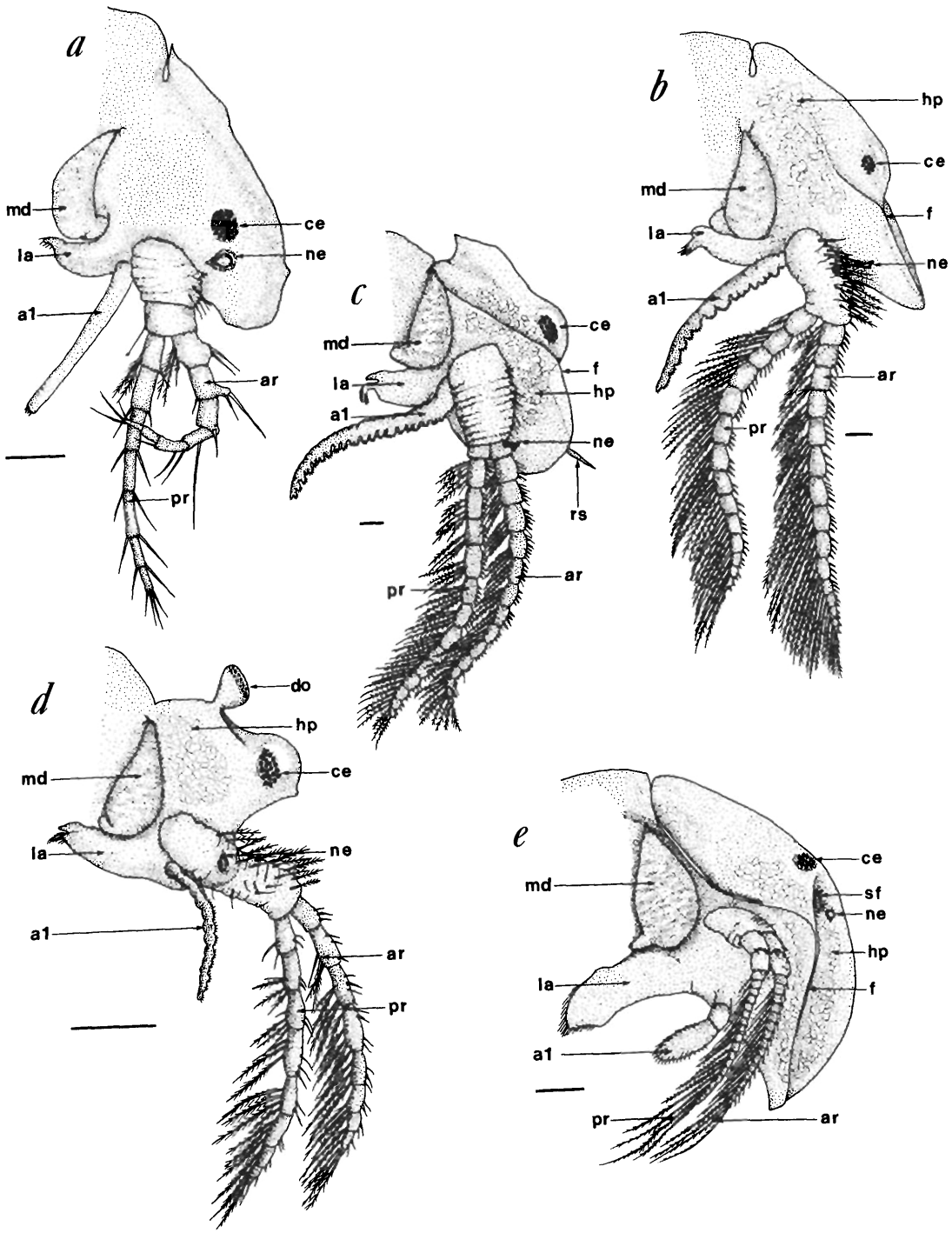

Fig. 16. Lateral view of head region of members of the 5 conchostracan families. a, *Cyclestheria hislopi*, female, from Paraguay (family Cyclestheriidae). b, *Canestheriella setosa*, male, from Arizona (family Cyzicidae). c, *Leptestheria complexiманus*, female, from Arizona (family Leptestheriidae). d, *Limnadia lenticularis*, female, from Florida (family Limnadiidae). e, *Lynceus gracilicornis*, male, from Florida (Laevicaudata, family Lynceidae). Scale bar = 0.25 mm.

claspers' (2), by a 'lobed antennule with sensillae along the sides' (8) — instead of an antennule with sensillae confined to the tip, which we see as a plesiomorphy found in anostracans and typical branchiopod nauplii — and by the presence of 'palps on the non-clasping legs' (7), which must be assumed lost in a couple of spinicaudates.

Also, in accordance with Martin and Cash-Clark (1995), we find that there is support for the Cladocera as a monophyletic group (see Fryer, 1987a, b on the same subject). As supporting characters we use 'reduction to six pairs of legs' (13), as did Martin and Cash-Clark (1995). In addition we propose the 'laterally/dorsally placed gonopores' (12) (see above) and 'eggs in dorsal brood chamber with no connection to the exopods' (3) (see above) as apomorphies for the Cladocera. Other apomorphies (fused eyes, direct develoment, ephippium) depend on the position of *Cyclestheria* (see Fig. 15 and above). The reduction of the carapace (secondary shield) to enclose the trunk of the animal only — instead of the whole animal as in the Conchostraca — is probably also an apomorphy for the Cladocera. The status of this character depends on the ancestral diplostracan condition. If the ancestral diplos-

tracan had the whole body (including the head) enveloped by the shield then the reduction of the shield (to not enclose the head) should be treated as an apomorphy for the Cladocera. If the opposite is true — the ancestral diplostracan shield did not cover the head also — then the enlargement of the shield (to enclose the head also) should be treated as a potential apomorphy for the Conchostraca. It is important to note that only one of these interpretations is possible at the same time.

The position of the Laevicaudata. The phylogenetic position of the Laevicaudata has long been a puzzling question. We believe that it belongs to the monophyletic group the Diplostraca, since it posses both secondary shield and claspers. Beyond that, a large number of possibilities exist. No convincing apomorphies that unite the Laevicaudata with the Spinicaudata (position 'b' in Fig. 15a) could be located. The same way of carrying the eggs in the two groups can be interpreted as a plesiomorphy for the Conchostraca (see above). A shield that comprises the whole body (including the head) is most likely also a conchostracan plesiomorphy being ancestral to the Diplostraca, the reduction (to not enclose the head) being apomorphic to the Cladocera (as already suggested by Martin and Cash-Clark, 1995). Therefore, the Conchostraca might be a monophylum, but we see no convincing evidence pointing in that direction (see Fryer, 1987b on the same subject). There are two other possibilities: the Laevicaudata as sistergroup to the rest of the Diplostraca (position 'a' in Fig. 15) or as sister group to the Cladocera (position 'c' in Fig. 15). The Laevicaudata as sister group to the rest of the Diplostraca would to a certain degree be supported by a number of similarities between the Laevicaudata and the Notostraca. The latter is probably the sister group to the Diplostraca [often together termed the Phyllopoda, based on a number of synapomorphies which includes 'nauplius eye composed of 4 ocelli', internalisation of the compound eyes', 'a pair of 'post abdominal' setae' (see Linder, 1945 and Martin and Cash-Clark, 1995) and 'egg bearing exopod' (see above); see also Walossek, 1993 Walossek, 1995]. The similarities could therefore be interpreted as the plesiomorphic condition preserved in the Notostraca and in the Laevicaudata and lost in the remaining diplostracans. These similarities, mentioned by Linder (1945), include mandibles with similar triturating surfaces and some vague similarity of the trunk legs (some endites prolonged) (see Martin and Belk, 1988 on the same subject). Another possible position of the Laevicaudata would be as sister group to the Cladocera. This may be supported by a similarity in the arrangement of the antennary muscles. According to Fryer (1987b) and repeated by Martin and Cash-Clark (1995) all the antennary extrinsic muscles originate in the same side of body as the appendage they serve in the Spinicaudata, whereas in the Laevicaudata and in the cladoceran orders some of them originate in the opposite side.

Relationships among the Spinicaudata. Ignoring, for a moment, the position of the Laevicaudata and Cyclestheriidae, the relationships among the three 'true' spinicaudate families are easier to postulate. The families Cyzicidae and Leptestheriidae are much more similar to one another than either is to the Limnadiidae. Shared characters include a unique frontal spine, found only in adults of the Lepstheriidae but present in juveniles of at least some cyzicids (Fig. 15, character 14). Additionally supporting the grouping of these two families is the presence and shape of the fornix, a supportive ridge of cuticle on either side of the head (Fig. 16b, c) (Fig. 15, character 15). The Laevicaudata also have a fornix (Fig. 16e) but the homology to that of the spinicaudates is uncertain. Indeed, if the frontal spine is removed, it becomes much more difficult to separate leptestheriids from cyzicids, so similar are they in other ways. The limnadiids possess no such spine, and bear no fornix, instead possessing a thin blade-like head, that displays similarities to that of *Cyclestheria*. The phylogenetic arrangement is depicted in Fig. 15.

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