Chapter 16.3

c0019 Arthropoda: Ostracoda

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Chapter Outline

s0010 INTRODUCTION

p0015 Nonmarine ostracods are small, benthonic or nektobenthonic crustaceans with a calcified bivalved carapace, mostly 0.4–2.0 mm long in the adult stage but with some smaller interstitial taxa and a few temporary pond taxa up to 8.0 mm; the Palaearctic genera range from 0.2 mm (e.g., *Nannokliella*) to around 5.0 mm (e.g., *Hungarocypris*). They typically have nine instars consisting of eight juvenile and one adult stage (postmaturation molting is virtually unknown), although the Entocytheridae have only eight instars. All extant nonmarine Ostracoda belong to the superfamilies Cypridoidea, Darwinuloidea, or Cytheroidea, within the order Podocopida of the subclass Podocopa. Nonmarine ostracods are found throughout the Palaearctic in most aquatic environments including freshwater and saline lakes, streams and rivers, springs, wetlands, temporary ponds, and groundwater; they are sometimes even found in

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(semi-) terrestrial habitats. The great majority of nonmarine genera are free living, typically benthonic (all Cytheroidea and Darwinuloidea), crawling and burrowing in sediments or climbing on aquatic plants, although many members of the Cypridoidea (excluding the Candoninae) can swim and are best regarded as nekto-benthonic. The exception is the Entocytheridae, which are commensal on larger crustaceans such as crayfish. Over 700 freshwater ostracod species have been described in the Palaearctic region, more than twice as many as in the Nearctic (Martens et al., 2008).

s0015 LIMITATIONS

p0020 These keys to podocopid ostracod superfamilies, families, and genera use morphological characteristics of the carapace and appendages of adult female specimens. Adult males are common in some taxa, but rare or completely unknown in others (e.g., Smith et al., 2006). Some species show geographical parthenogenesis, for example, European sexual populations of the cypridoidean *Eucypris virens* and the cytheroidean *Limnocythere inopinata* are restricted to circum-Mediterranean areas, whereas female only, parthenogenetic populations are much more widely distributed (Horne et al., 1998; Horne & Martens, 1999; Schmit et al., 2013). Although the keys may also work for adult males (if found) of many taxa, it is advisable to be aware that sexual dimorphism (in some appendages as well as in carapace shape) may mislead (e.g., Fig. 16.3.27 O−P).

p0025 Juvenile specimens have fewer pairs of appendages (depending on growth stage), and their carapaces are typically more posteriorly tapered than those of adults, as well as lacking such well-developed calcified inner lamellae. The unwary may also be confused by the phenotypic variation in the development of spines, hollow tubercles, or solid nodes on the carapaces of some taxa (e.g., Figs. 16.3.27 M−P). Where possible, we have used characters that can be determined without the need for full dissections.

p0030 We have not attempted to provide keys to species level because many taxa need revision and there are likely to be many as yet undiscovered species, particularly in regions that have so far received little attention from ostracod specialists. Those who wish to identify species will need to refer to specialist publications. As an excellent starting point for studies of Palaearctic freshwater ostracods, Meisch's (2000) monograph provides keys and illustrations for more than 150 species from western and central Europe. Karanovic's (2012) *Recent Freshwater Ostracods of the World* includes keys to genera and species. Martens & Savatenalinton's (2011) comprehensive checklist of free-living freshwater ostracods of the world provides a good introduction to the specialist literature and lists Palaearctic species.

The drawings of carapaces and appendages (Figs. 16.3.1−26) are all originals drafted specially for this chapter, based on published illustrations or our own specimens of typical species, with the aim of showing key characteristics of the genera. As such they are best regarded as cartoons to aid the use of the keys and are not intended to be used for species-level identification. Therefore, we have deliberately not indicated which species they represent. p0035

TERMINOLOGY AND MORPHOLOGY s0020

Two spellings of the informal name for the Ostracoda are in common use: ostracode and ostracod; in this chapter, we use the latter. The essential anatomy and terminology of appendages of the three freshwater superfamilies, Darwinuloidea, Cypridoidea, and Cytheroidea, are shown in Figs. 16.3.1−3, respectively. Additional key details of appendage and carapace morphology are illustrated and labeled in Figs. 16.3.4−26, and finally some scanning electron microscope (SEM) images of ostracod shells together with colour images (from high resolution video microscopy) of living specimens are shown in Fig. 16.3.27. Arrows on the figures indicate the anterior direction. A general introduction to the morphology of freshwater ostracod carapaces and appendages can be found in Smith et al. (2015). p0040

The following are abbreviations used in our keys: p0050

CIL Calcified inner lamella
LV Left valve
RV Right valve
AMS Adductor muscle scars
A1 Antennula
A2 Antenna
Md Mandibula
Mx1 Maxillula (first maxilla)
L5 Fifth limb (first thoracic leg/second maxilla/maxilliped)
L6 Sixth limb
L7 Seventh limb
UR Uropodal ramus
PA Post-abdomen

MATERIAL PREPARATION AND PRESERVATION s0025

Field collection techniques for freshwater ostracods are described by Martens and Horne (2016); further details can p0120 be found in Scharf et al. (2014) and Smith et al. (2015). If a net has been used for collecting then further sieving may not be necessary, but samples may be washed through sieves with a gentle jet of water to concentrate the size fraction that includes ostracods. A mesh size of 0.25 mm will retain adults of most species but not small juveniles, while a 125μm mesh will retain most identifiable juveniles; a large-mesh sieve can be used above the finer sieve to remove stones and plant material. Specimens can be picked out with a pipette under a low-power stereo microscope from small amounts of sample spread in water on a tray or a petri dish. Doing this within a few hours of collection can make it easy to see and catch living, moving ostracods, but the same technique can be applied to preserved material. Specimens can be also picked from dry sieved residues scattered on a tray using a wetted artist's fine paintbrush (forceps or tweezers are not recommended as shells may easily be broken). It is worth bearing in mind that samples may contain empty carapaces and separated valves that constitute a time-averaged assemblage of identifiable shells and thus may include representatives of additional taxa that inhabit the waterbody but were not found as living specimens on that particular occasion of sampling. Ethanol is recommended for fixing and preserving ostracods caught alive with appendages intact. Initial treatment with 10–30% ethanol helps to ensure that the valves are preserved in an open, gaping condition, which makes subsequent separation for dissection purposes much easier. If live ostracods are placed immediately in more concentrated ethanol they tend to close their shells tightly and they can be difficult to open subsequently for study; Scharf et al. (2016) explain methods for opening closed ostracod carapaces. For long-term preservation 70% ethanol is recommended. If specimens are required for DNA analysis, preservation in 95–99% pure ethanol is necessary. Specimens can be preserved in ethanol on small sealable containers; alternatively they can be dried and mounted on standard micropaleontological slides, an option that is also useful for empty ostracod shells. Shells intended for geochemical analyses are best stored dry and loose on micropaleontological slides or in small sealable containers; fossil shell assemblages can be sorted (e.g. into species, adults, and juveniles) and mounted on micropalaeontological slides using water-soluble glue (so that they can be moved again if necessary). A microscope with higher magnifications (at least to 100× and ideally with phase contrast) is generally necessary for examining the morphology of dissected appendages. The general morphology of shells (whether dry or wet) can be examined in incident light, in which case staining with a dark water soluble dye (such as food coloring) may be helpful in revealing fine details of surface ornament or hinge structure. Features such as adductor muscle scars and marginal pore canals are more easily seen in transmitted light, preferably with specimens immersed in water, ethanol or glycerine for clearer views.

Full or partial dissections of appendages can be carried out under a stereo microscope at 20x to 50x magnification in combined incident and transmitted light, ideally using specimens preserved in ethanol (dry specimens can be soaked in water or ethanol and dissected, but trapped air bubbles can be problematic). A specimen can be placed in a drop of water or ethanol on a glass slide to begin dissection. Using a pair of fine needles (e.g. entomological pins mounted in pin chucks), carapaces can be opened, the valves being separated and removed to be preserved separately (e.g. dry on a micropaleontological slide); a drop of a suitable mounting medium (e.g. Glycerine or Hydro-Matrix; PolyVinyl Lactophenol is no longer recommended, due to its carcinogenic properties) is placed over the body before appendages are teased apart and arranged on the slide, the dissection finally being protected by the addition of a glass cover slip. Valves can be left on the same slide as the appendages but may be broken when the cover slip is added. Dissection takes patience and practice; it is best to start with relatively large specimens if such are available. Partial dissections or simple "squash" mounts in which the appendages are left attached to the body are easier and can still be useful. After a few days it is a good idea to seal the edges of the cover slip with nail varnish to prevent gradual drying of the mounting medium and invasion of the dissection by air bubbles if Glycerine is used. Namiotko et al. (2011) provide an excellent illustrated guide to dissection techniques. p0125

ACKNOWLEDGMENTS s9000

We thank the editors, Christopher Rogers and James Thorp, for their advice, their encouragement, and above all their patience during the writing of this chapter. p1120

s0030 KEYS TO OSTRACODA

p0140 These keys use adult female characters of freshwater ostracods in the class Podocopa, order Podocopida.

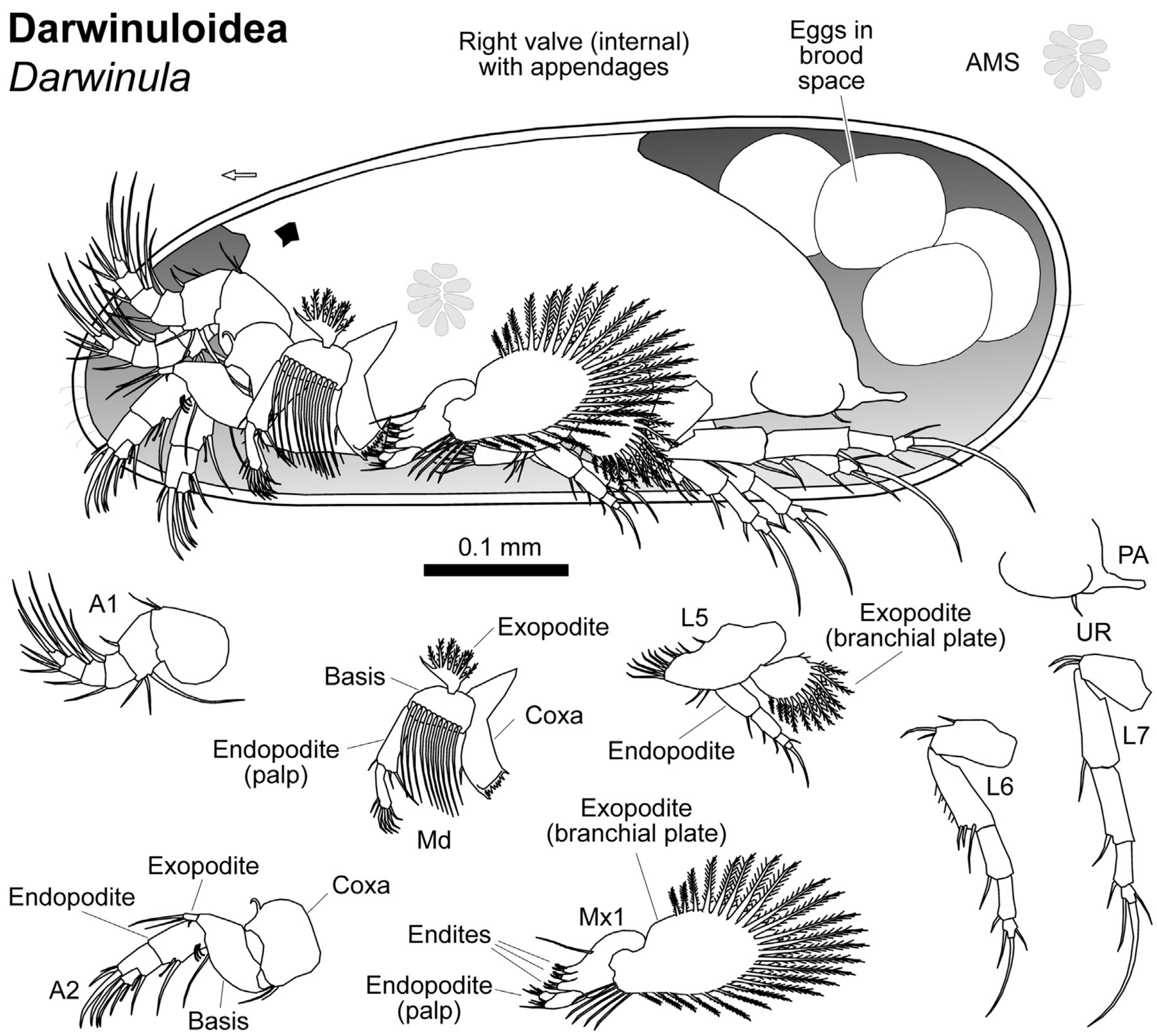
s0035 Ostracoda: Superfamilies

u0010 1 AMS pattern not a circular to ovate rosette; valves with CIL narrow or wide, body with 1−3 pairs of walking legs 2

u0015 1′ AMS pattern a distinct circular or ovate rosette; carapace with CIL very narrow; body with two pairs of walking legs (L6 & L7) (Fig. 16.3.1) .... Darwinuloidea, one family: **Darwinulidae**

u0020 2(1) AMS pattern a cluster arranged like a "pawprint," with scars tightly clustered or more openly arranged; carapace usually with a moderately wide CIL; body with one pair of walking legs (L6); L7 an inverted cleaning limb (Fig. 16.3.2) .... **Cypridoidea**

u0025 2′ AMS pattern a vertically stacked arrangement of four scars (some occasionally subdivided in two); carapace with moderately wide CIL; body with three pairs of walking legs (L5, L6, & L7) (Fig.16.3.3) .... **Cytheroidea**



0010 **FIGURE 16.3.1** General anatomy of a typical darwinuloidean ostracod (adult female).

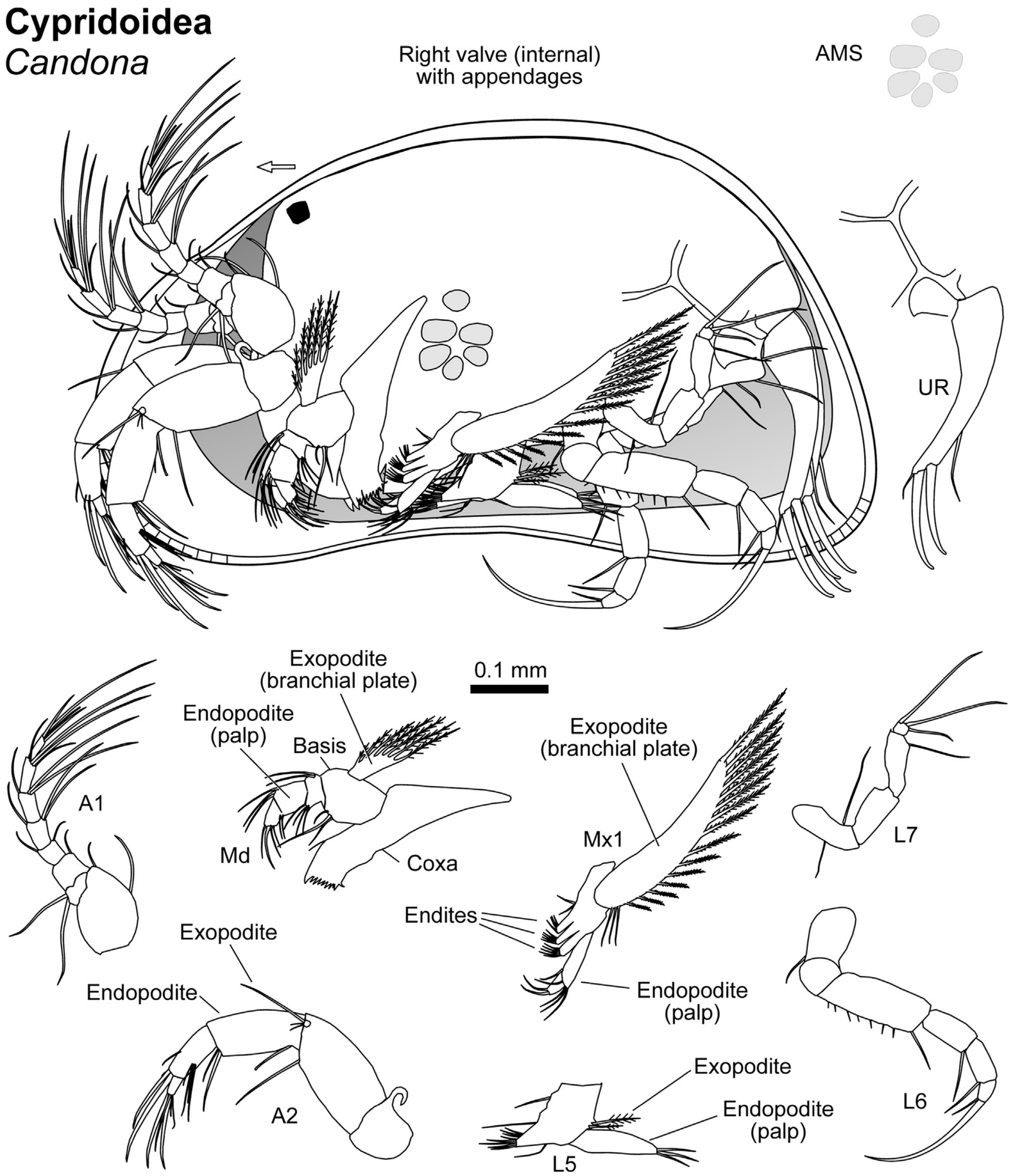


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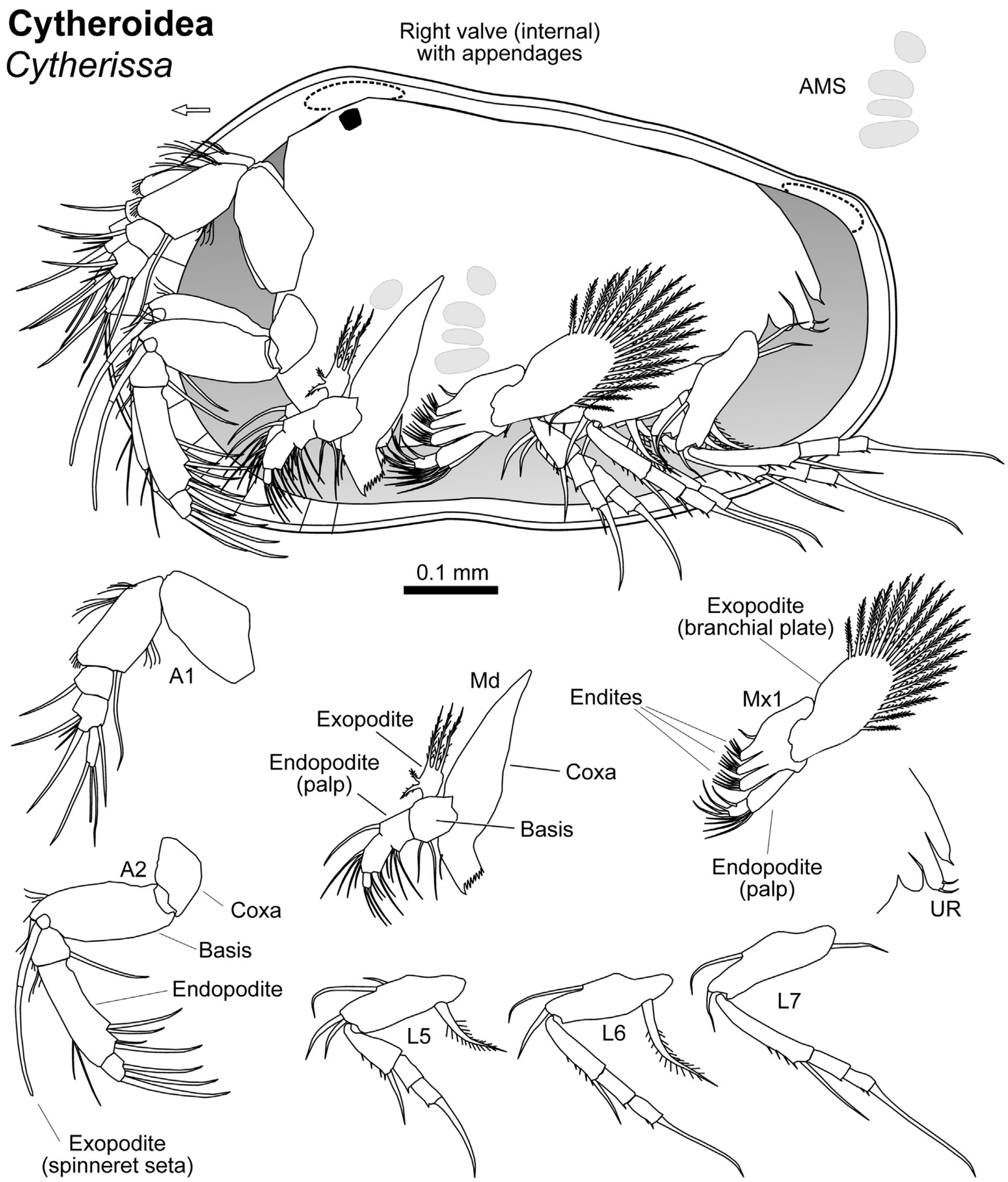
FIGURE 16.3.2 General anatomy of a typical cypridoidean ostracod (adult female).



0020 **FIGURE 16.3.3** General anatomy of a typical cytheroidean ostracod (adult female).

s0040 Ostracoda: Darwinuloidea: Darwinulidae: Genera

p0170 Darwinulids are benthonic, infaunal or interstitial, nonswimming ostracods, found in most aquatic settings (and some terrestrial habitats), sometimes in abundance. Six extant darwinulid genera are known, four of which occur in the Palaearctic (*Darwinula, Microdarwinula*, *Penthesilenula*, and *Vestalenula*). The genera *Alicenula* (Neotropical −Afrotropical − Oriental) and *Isabenula* (Oriental) have not yet been identified living in the Palaearctic.

p0175 The carapace is small (0.4−0.8 mm length), smooth, white, thinly calcified, CIL very narrow, with vestibules absent, and a distinctive rosette-shaped AMS pattern. Valve overlap may be LV>RV or RV>LV. The larger valve may have internal teeth in anteroventral, posteroventral, or posterior positions, which function as "stop-ridges" against which the free margin of the smaller valve rests when the carapace is closed. A posteroventral external keel with a similar function may be present in the smaller valve. The normal pores are simple, and a median eye is present. The A1 has six articulated podomeres. Whereas the A2 endopodite has three articulated podomeres, without swimming setae; the exopodite is a reduced podomere with two long and one very short setae. The Md palp has a row of eight rake-like setae and a small branchial plate with up to eight rays. Mx1 has a large branchial plate with four reflexed, forward-pointing rays. L5 is a maxilliped with a small branchial plate and a leg-like palp comprising three endopodite podomeres. L6 and L7 are both walking legs similar in structure and direction. Uropodal ramus (UR) is reduced to a seta or is lacking and is situated anteriorly to an elongate post-abdomen (PA). Ovaries do not originate within a duplicature. Females carry eggs or early stage juveniles in a posterior brood space of the carapace and are usually visible through shell. Males are exceptionally rare, known only in one species.

u0030 1 Smaller valve without posteroventral external keel 2

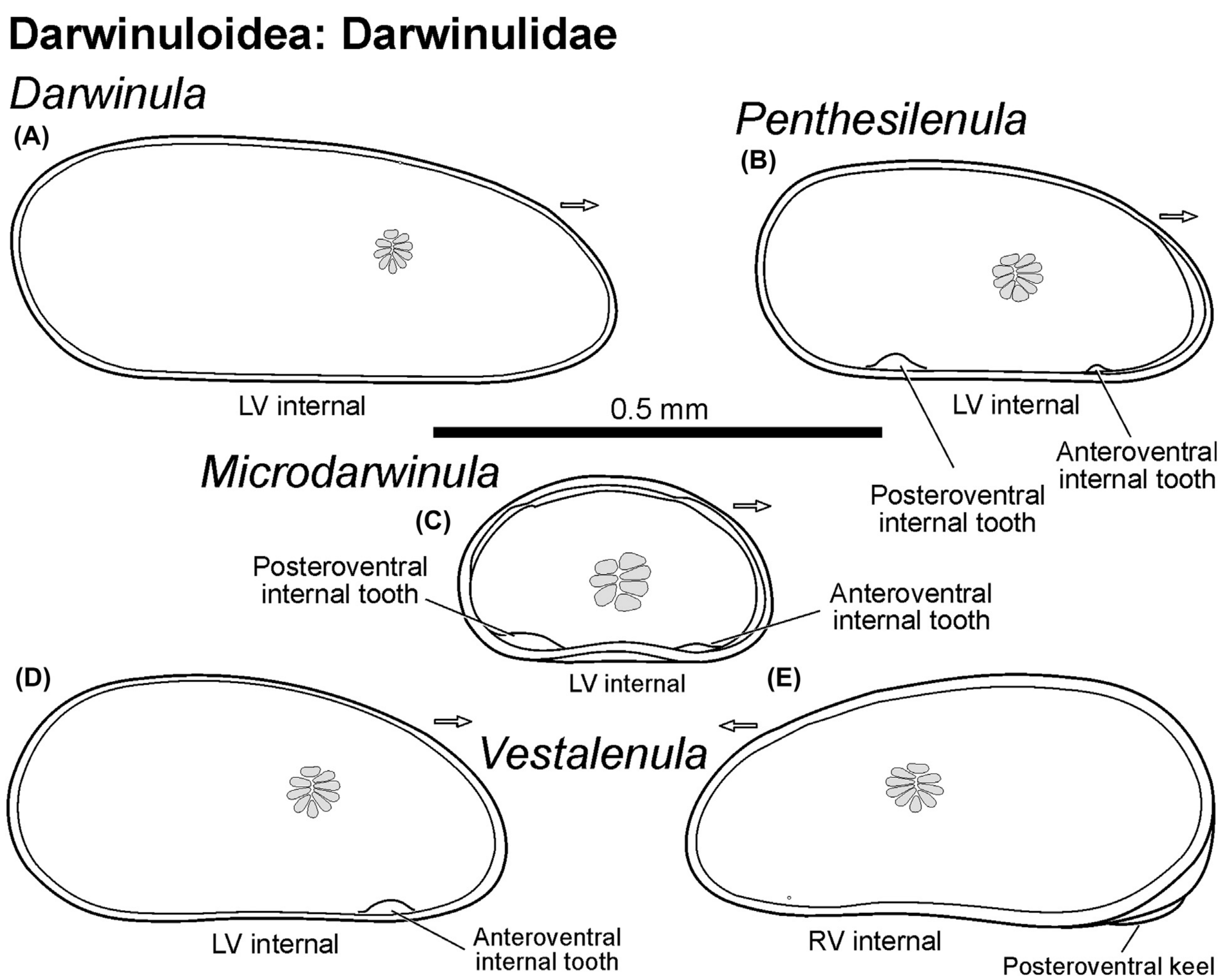
u0035 1′ Smaller valve (RV) with posteroventral external keel (Figs. 16.3.4 D, E) .... *Vestalenula*

u0040 2(1) Larger valve with at least one internal tooth; LV>RV 3

u0045 2′ Larger valve without internal teeth; RV>LV (Figs. 16.3.1 and 16.3.4 A) .... *Darwinula*

u0050 3(2) AMS situated at approximately mid-length; valves in lateral view ovate (Fig. 16.3.4 C) .... *Microdarwinula*

u0055 3′ AMS situated well in front of mid-length; valves in lateral view elongate (Fig. 16.3.4 B) .... *Penthesilenula*



f0025 FIGURE 16.3.4 Key characteristics of genera of the Darwinulidae.

ARTHROPODA: OSTRACODA

s0045 Ostracoda: Cypridoidea: Families

p0210 The superfamily Cypridoidea contains the majority of living nonmarine species, many of which are active nekto-benthonic swimmers with well-developed long swimming setae on the first and second antennae (A1 and A2). In crawlers and burrowers, these setae are reduced or absent and such animals live infaunally, interstitially, or as part of the epibenthos, for example, members of the Candoninae. Four families are represented in the Palaearctic: the Ilyocyprididae, Notodromadidae, Cyprididae, and Candonidae.

p0215 The carapace surface is usually smooth or finely ornamented, and the dorsal margin has weak or simple hinge teeth. Carapace size and shape are variable, with strong sexual dimorphism in some genera. CIL is usually well developed. The basic AMS pattern is a "pawprint" with three to four scars in an arcuate row in front of two scars in a vertical row. Normal pores are simple. Lateral ocelli of median eye sometimes feature corresponding eyespots developed in the valves. A1 has six to eight podomeres. A2 endopodite has three or four podomeres, with the exopodite reduced to a small scaliform protuberance bearing at most three setae. Md palp has a small branchial plate with up to six rays. Mx1 has a large branchial plate with up to three reflexed, forward-pointing rays. L5 usually features a small branchial plate, sometimes reduced to one or two setae; the endopodite has one or two podomeres, forming a small palp in the female but enlarged to form a clasper in the male. L6 is a walking leg with a strong terminal claw. L7 is bent dorsally as a cleaning leg, usually with three terminal setae; the small terminal podomere may be modified as a pincer. UR typically is well developed with terminal claws but may be reduced to a flagellum. The gonads are located within the duplicature of the valves. In the male, a portion of the vas deferens is modified to form an ejaculatory duct, the Zenker's organ, separate from the copulatory appendage (hemipenis), which can be large. Females never have a brood chamber.

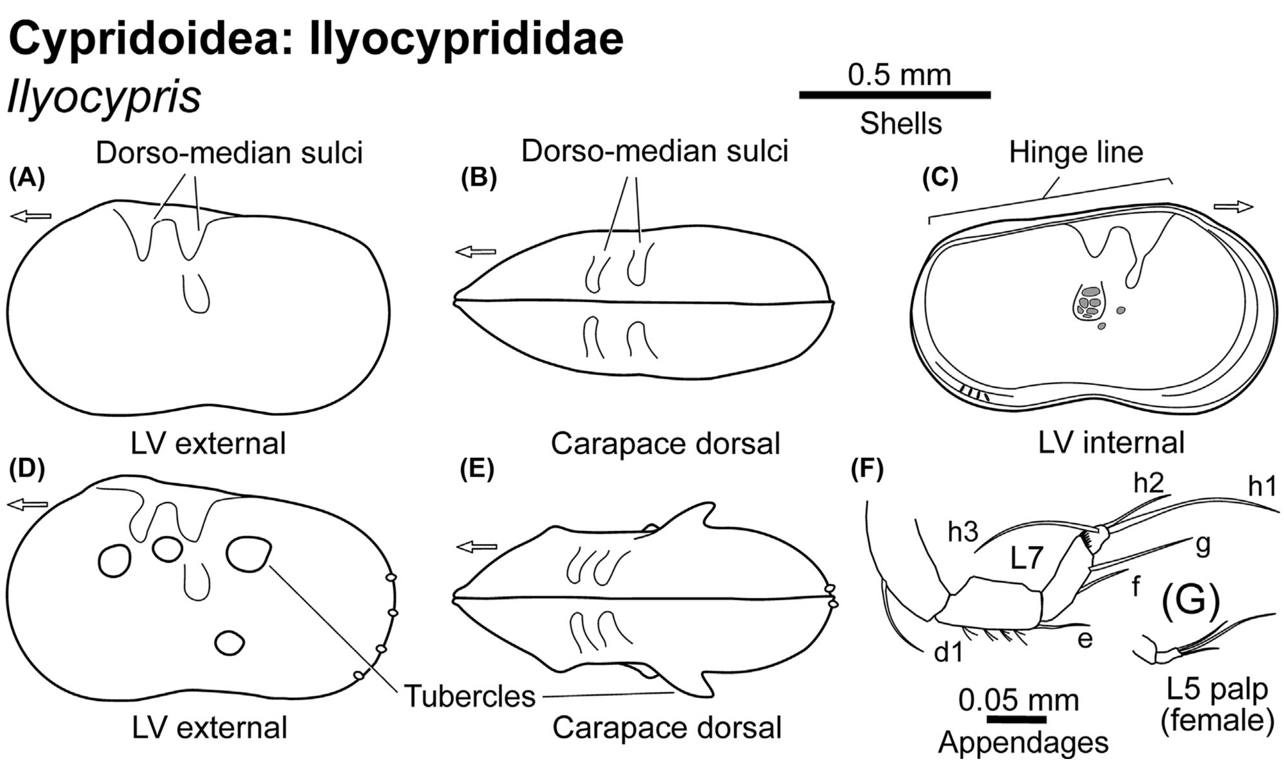
p0220 Ilyocyprids may be confused with limnocytherines (superfamily Cytheroidea), which also have long, straight hinges and dorsomedian sulci; they are easily separated by looking at the AMS, and furthermore many limnocytherids have laterally compressed, flattened areas near the anterior and posteroventral margins of the valves, never seen in ilyocyprids. Although the vast majority of Cyprididae have an L5 with one endopodite podomere, there are a few exceptions in which there are two. The position of the frontal and mandibular scars, which are always anterior to the AMS, is helpful in determining orientation. Some Cyprididae (e.g. Cypridopsinae) have quite tightly clustered, rounded AMS but without the separation of the uppermost one seen in the Candonidae.

u0060 1 Valves without dorsomedian sulci and with short straight (less than two-thirds the length of the carapace) or arched hinge lines; L5 endopodite with one podomere, L7 with a terminal pincer or with simple terminal setae 2

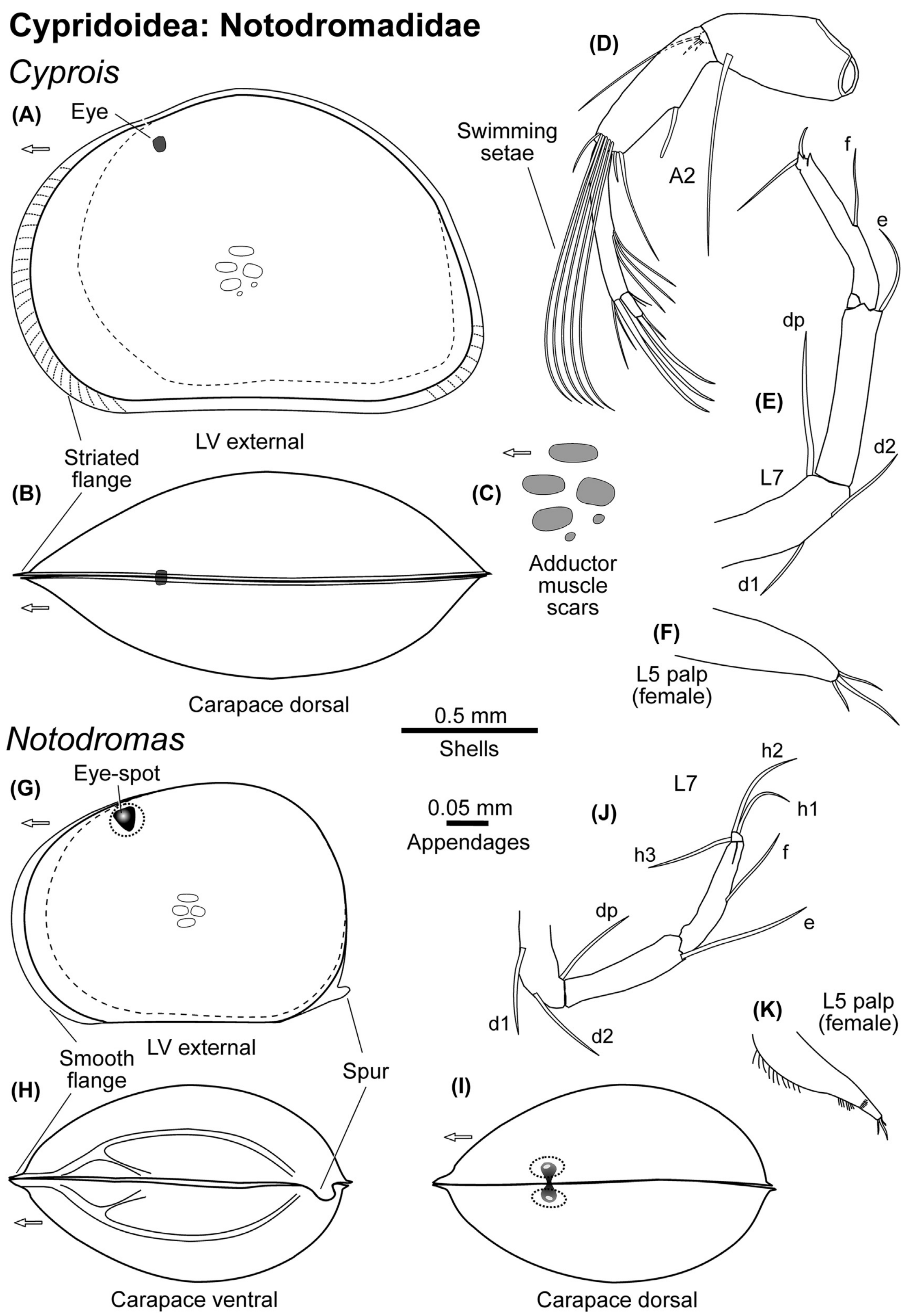
u0065 1′ Valves subrectangular with two dorsomedian sulci and a long, fairly straight dorsal hinge line, more than three-quarters of the length; L5 endopodite with two podomeres, L7 with simple terminal setae (Fig. 16.3.5) .... Ilyocyprididae, one genus: *Ilyocypris*

u0070 2(1) Carapace ovoid, elongate ovoid or reniform, ventral margin in lateral view convex or sinuous, rarely straight; valve margins without an external flange; A2 swimming setae well developed, reduced, or absent 3

u0075 2′ Carapace ovoid with a straight ventral margin in lateral view; valve margins rimmed with a flat external flange, widest anteriorly; A2 with well-developed swimming setae (Fig. 16.3.6) .... **Notodromadidae**



0030 **FIGURE 16.3.5** Key characteristics of the Ilyocyprididae, genus *Ilyocypris*.



f0035 **FIGURE 16.3.6** Key characteristics of genera of the Notodromadidae.

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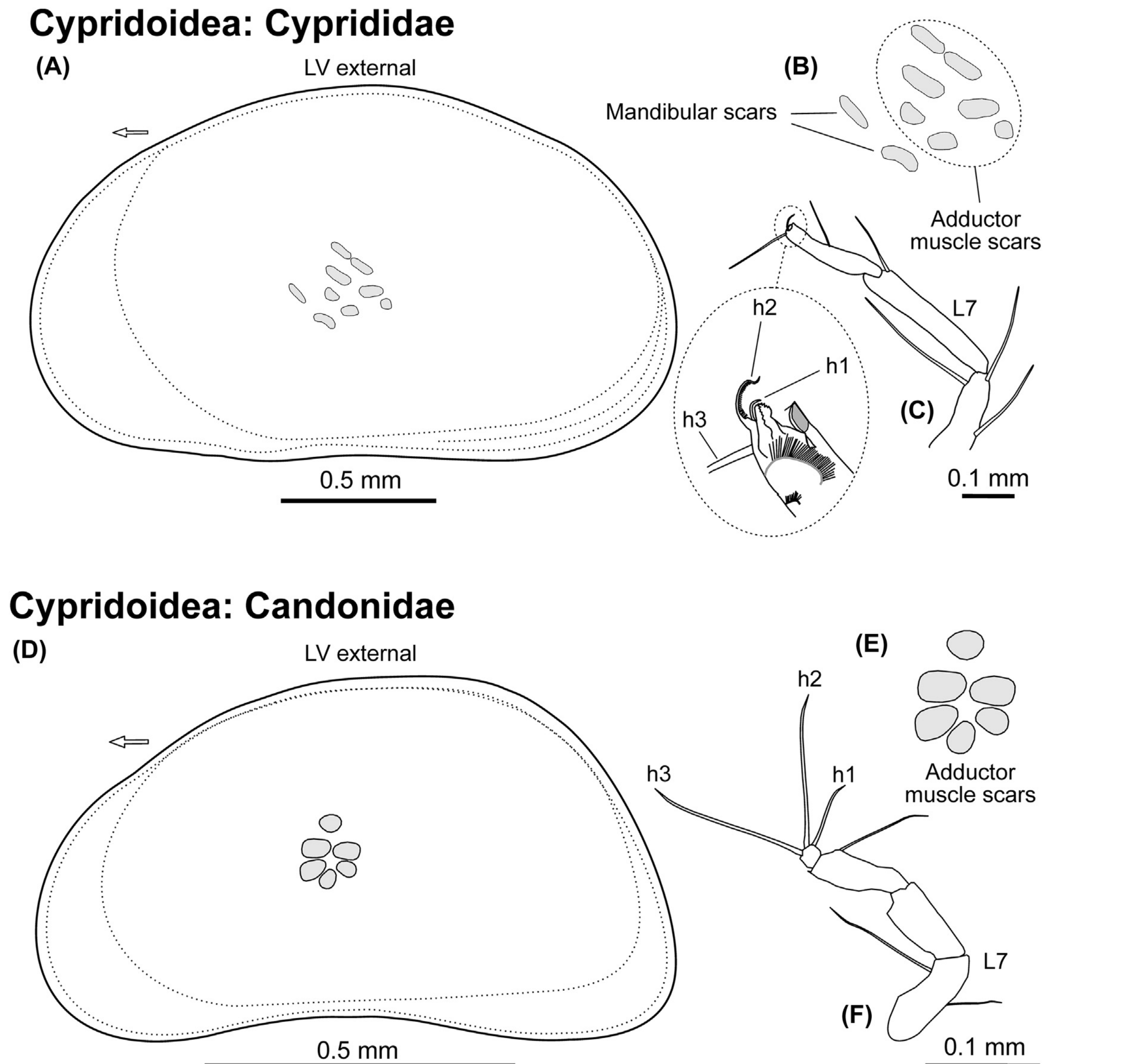


f0040 **FIGURE 16.3.7** Key characteristics of the Cyprididae and Candonidae.

u0080 3(2) AMS a "pawprint" of rounded, often elongate, and sometimes subdivided scars; carapace typically with maximum height close to or well in front of midpoint; L7 with a terminal pincer (Figs. 16.3.7 A−C) .... **Cyprididae**

u0085 3′ AMS a tight "pawprint" cluster of rounded wedge-shaped scars, the uppermost is slightly separated from the rest in some genera; carapace typically with maximum height close to or well behind midpoint; L7 without terminal pincer (Figs. 16.3.7 D−F) .... **Candonidae**

)050 Ostracoda: Cypridoidea: Notodromadidae: Genera

)090 1 Valves with prominent striated marginal flanges; carapace compressed in dorsal/ventral view; cleaning leg (L7) with a terminal pincer; eye central with ocelli fused (Figs. 16.3.6 A−D) .... *Cyprois*

)095 1′ Valve flanges not striated; carapace inflated in dorsal/ventral view, with a flattened ventral area rimmed with ridges; cleaning leg (L7) without a terminal pincer; eye with lateral ocelli separate and corresponding to an eyespot in each valve (Figs. 16.3.6 E−I) .... *Notodromas*

ARTHROPODA: OSTRACODA

s0055 Ostracoda: Cypridoidea: Cyprididae: Subfamilies and Genera

p0270 Care must be taken not to confuse marginal septa (internal walls between the inner and outer lamellae) with marginal pore canals (internal tubes that open externally on the outer margin and bear sensilla); both features must be viewed in transmitted light.

u0100 1 UR well developed with terminal claws ... 2

u0105 1′ UR (if present) reduced, flagelliform and without terminal claws, or absent (Fig. 16.3.8) ... **Cypridopsinae**

u0110 2(1) Endoskeletal UR attachment strut without a Triebel's Loop ... 3

u0115 2′ Endoskeletal UR attachment strut with a Triebel's Loop (Fig. 16.3.18) ... **Cypricercinae**

u0120 3(2) Endoskeletal UR attachment strut without a distal triangular reinforcement ... 4

u0125 3′ Endoskeletal UR attachment strut with a distal triangular reinforcement (Figs. 16.3.9 and 16.3.10) ... **Herpetocypridinae**

u0130 4(3) UR with one posterior seta ... 5

u0135 4′ UR with two posterior setae (Fig. 16.3.11) ... Hungarocypridinae, one genus: *Hungarocypris*

u0140 5(4) L6 with two terminal claws ... 6

u0145 5′ L6 with one terminal claw ... 8

u0150 6(5) L6 h1-seta unguiform, more than half the length of the terminal claw (h2), h3-seta short ... 7

u0155 6′ L6 h3-seta long, unguiform, more than half the length of the terminal claw (h2), h1-seta short (Figs. 16.3.12 A–D) ... Scottiinae, one genus: *Scottia*

u0160 7(6) L5 palp with two podomeres (Figs. 16.3.12 E–H) ... Limanocypridinae, one genus: *Limanocypris*

u0165 7′ L5 palp with one podomere (Figs. 16.3.12 I–K) ... **Eucypridinae** (in part)

u0170 8(5) A2 with swimming setae long, short, or reduced ... 9

u0175 8′ A2 swimming setae absent (Fig. 16.3.13 A) ... Herpetocyprellinae, one genus: *Herpetocyprella*

u0180 9(8) CIL present anteriorly and posteriorly ... 10

u0185 9′ CIL very broad anteriorly (with short radial marginal septa), absent posteriorly (Figs. 16.3.13 B–D) Isocypridinae, one genus: *Isocypris*

u0190 10(9) Marginal zone without radial septa; carapace in dorsal view rounded or elongate ... 11

u0195 10′ Marginal zone with prominent radial anterior marginal septa; carapace in dorsal view rounded, globular (Fig. 16.3.14 A–B) ... Cyprettinae, one genus: *Cypretta*

u0200 11(10) Carapace ovoid or subtriangular in lateral view, moderately inflated in dorsal/ventral view; selvage peripheral or inwardly displaced in either or both valves ... 12

u0205 11′ Carapace markedly elongate in lateral and dorsal/ventral views; RV selvage peripheral, LV selvage inwardly displaced anteriorly and posteriorly (Figs. 16.3.14 C–F) ... Dolerocypridinae, one genus: *Dolerocypris*

u0210 12(11) Anterior selvage peripheral or inwardly displaced in one valve only ... 13

u0215 12′ Anterior selvage inwardly displaced in both valves ... **Cypridinae**

u0220 13(12) Free margin of one valve typically rimmed with small blunt spines (sometimes absent) ... **Cyprinotinae**

u0225 13′ Free margins of both valves smooth or with small pointed marginal spines ... **Eucypridinae** (in part)

s0060 Ostracoda: Cypridoidea: Cyprididae: Cypridopsinae: Genera

u0230 1 LV overlapping RV ventrally ... 2

u0235 1′ RV overlapping LV ventrally ... 4

u0240 2(1) Posterior CIL in LV without a conspicuous inner list; A2 swimming setae well-developed or reduced ... 3

u0245 2′ Posterior CIL in LV with a conspicuous, oblique double inner list; A2 swimming setae well developed (Figs. 16.3.8 A–E) ... *Cypridopsis*

u0250 3(2) A2 swimming setae reduced; UR present (Figs. 16.3.8 F–H) ... *Cavernocypris*

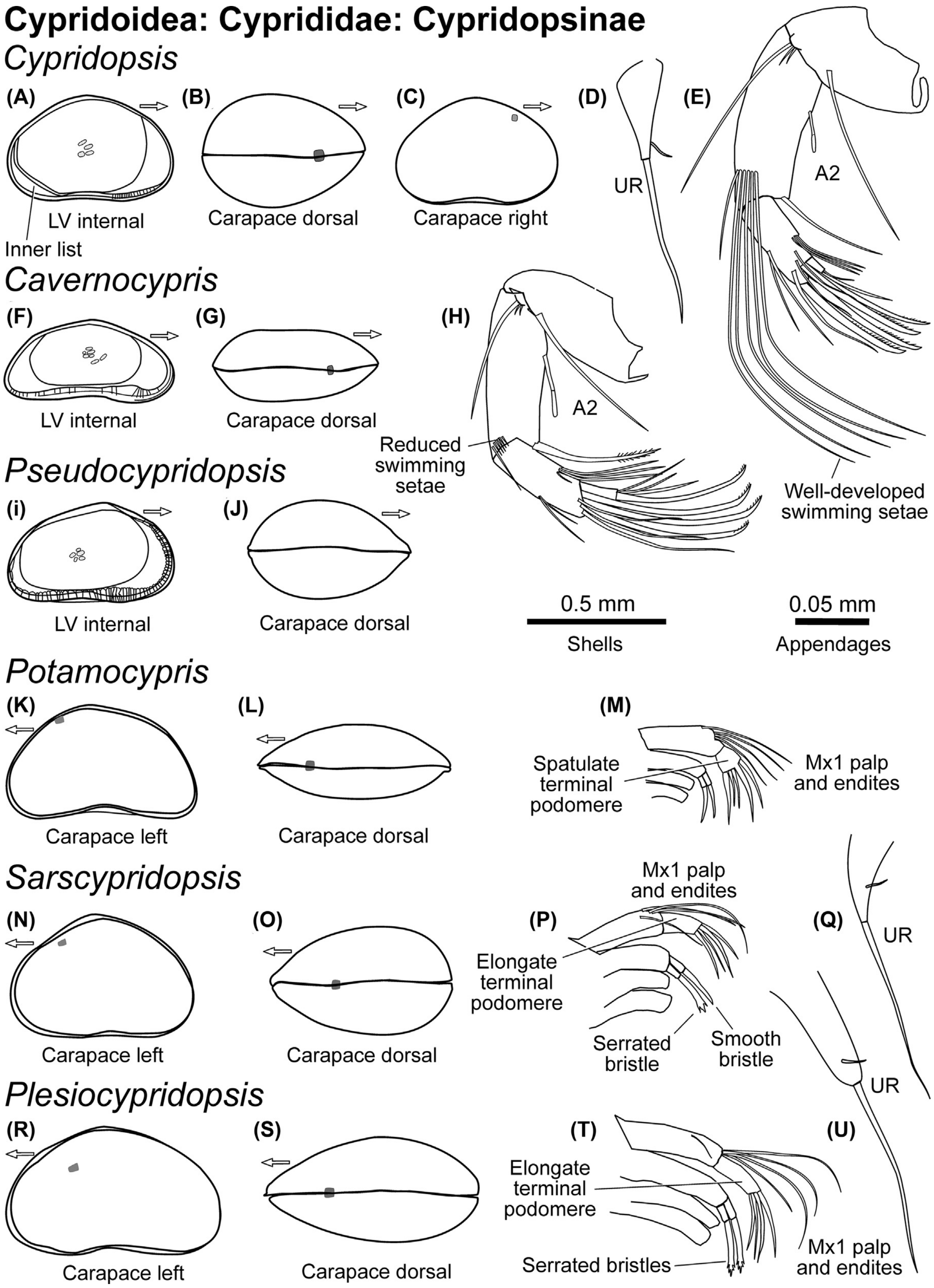
u0255 3′ A2 swimming setae well developed or reduced; UR absent (Fig. 16.3.8 I–J) ... *Pseudocypridopsis*

u0260 4(1) Mx1 palp terminal podomere elongate ... 5

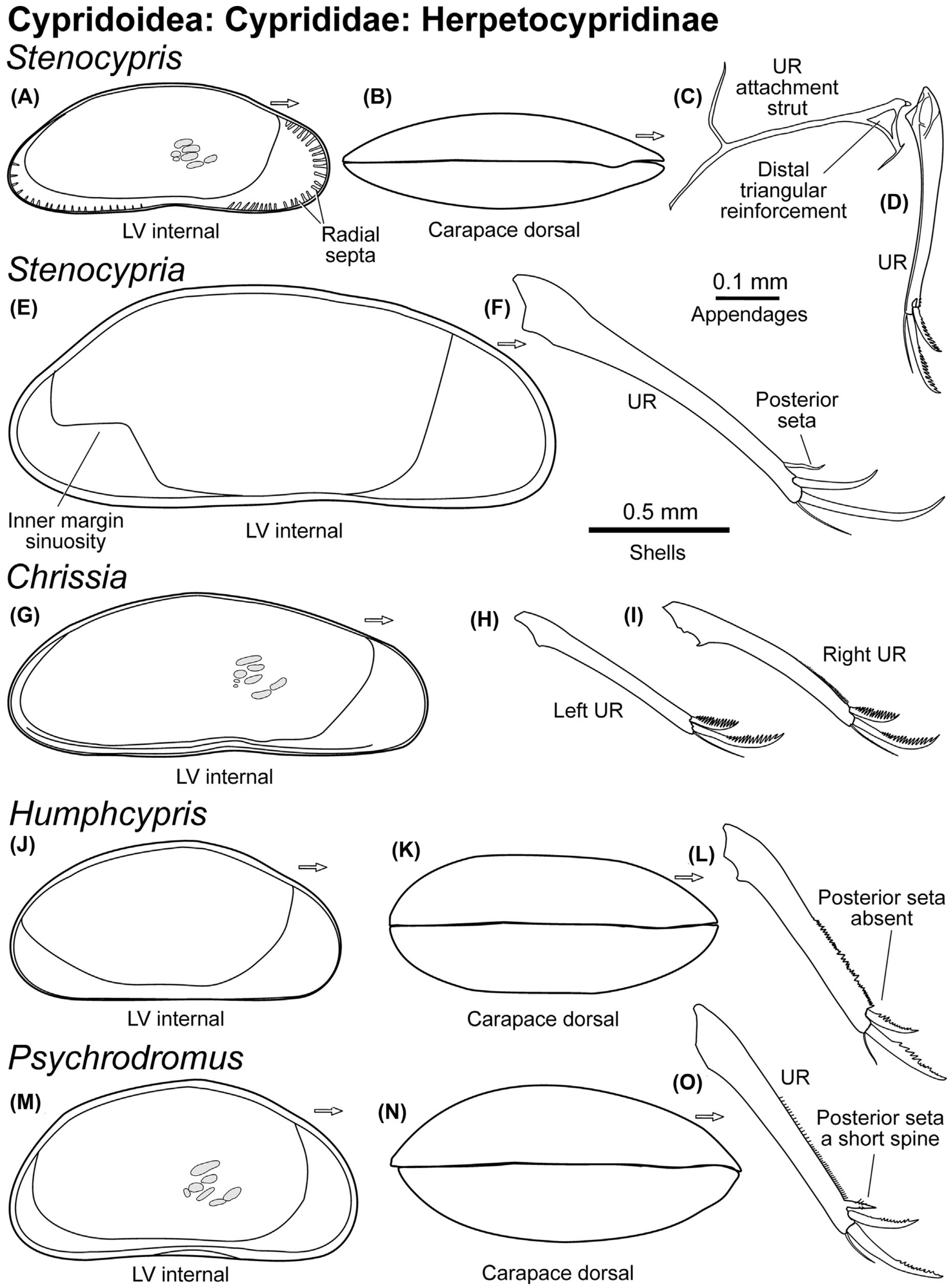
u0265 4′ Mx1 palp terminal podomere spatulate; A2 swimming setae well developed or reduced (Figs. 16.3.8 K–M) ... *Potamocypris*

u0270 5(4) Mx1 outer endite with one smooth and one serrated bristle; A2 swimming setae well developed; UR with evenly tapering, triangular proximal part (Figs. 16.3.8 N–Q) ... *Sarscypridopsis*

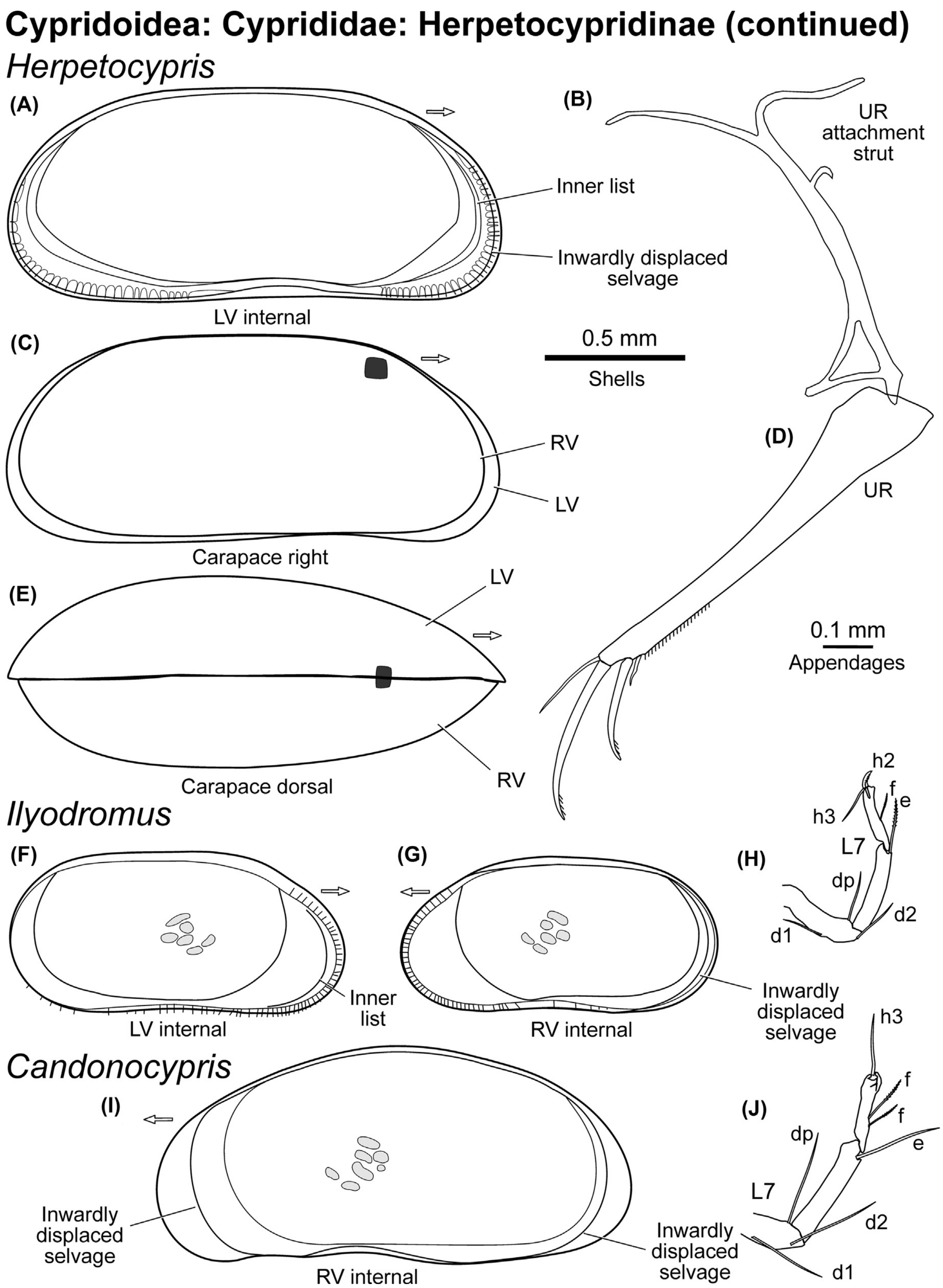
u0275 5′ Mx1 outer endite with two serrated bristles; A2 swimming setae well developed or reduced; UR proximal part cylindrical, narrowing abruptly to distal flagellum (Figs. 16.3.8 R–U) ... *Plesiocypridopsis*



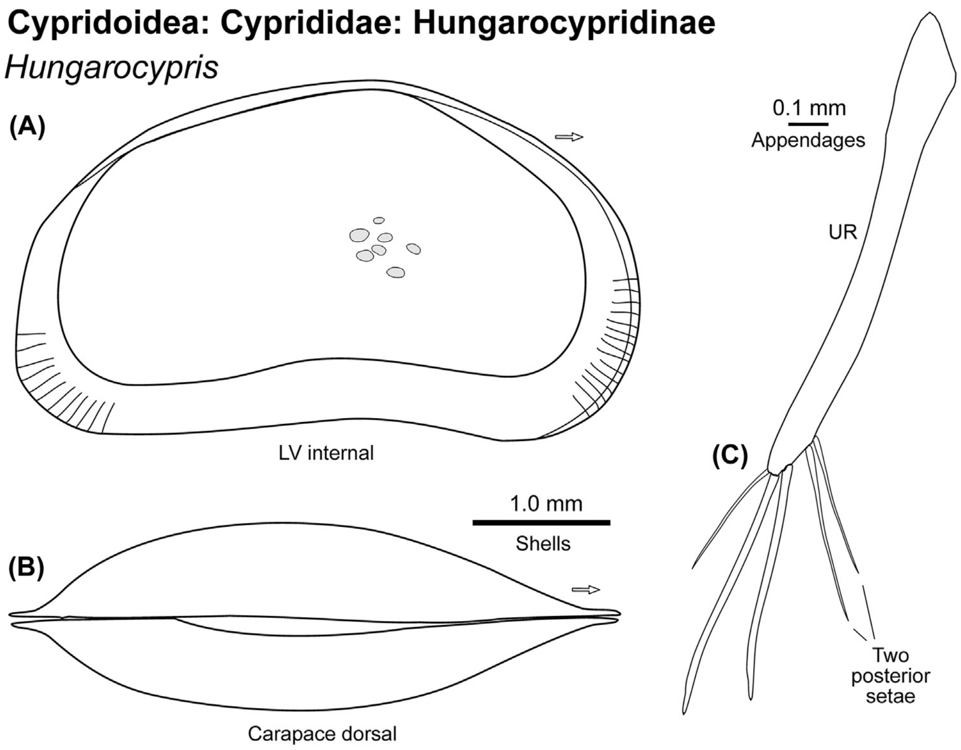
0045 **FIGURE 16.3.8** Key characteristics of genera of the Cyprididae, subfamily Cypridopsinae.



f0050 **FIGURE 16.3.9** Key characteristics of genera of the Cyprididae, subfamily Herpetocypridinae.



0055 **FIGURE 16.3.10** Key characteristics of genera of the Cyprididae, subfamily Herpetocypridinae (continued).



f0060 **FIGURE 16.3.11** Key characteristics of the Cyprididae, subfamily Hungarocypridinae, genus *Hungarocypris*.

s0065 Ostracoda: Cypridoidea: Cyprididae: Cypricercinae: Genera

p0460 Savatenalinton & Martens (2009) described a new genus, *Bradleytriebella*, based on material from Thailand, which they distinguished from the closely related *Bradleystrandesia* by the absence of a d-seta on L5 (present in *Bradleystrandesia*), presence of a Wouters' Organ on A1 (absent in *Bradleystrandesia*) and a stouter, better-developed ventral branch on the UR attachment strut. However, Meisch (2000) showed the type-species of *Bradleystrandesia* as having the ventral branch well developed with a clavate distal end, while Savatenalinton & Martens (2009) showed it slender with a flattened, T-shaped distal end; in both cases the figured specimens were from Europe. In view of the difficulty in verifying the first two characters, both of which are very small when present, and uncertainty about (or variation in) the UR attachment strut, we have not included *Bradleytriebella* in the key.

u0280 1 Carapace ovoid in lateral view, inflated in dorsal/ventral view 2

u0285 1′ Carapace markedly elongate, laterally compressed (Figs. 16.3.18 A, B) .... *Tanycypris*

u0290 2(1) Carapace approximately symmetrical in anterior or posterior view 3

u0295 2′ Carapace markedly asymmetrical in anterior or posterior view, LV overhanging RV ventrally (Figs. 16.3.18 C−E) .... *Bradleycypris*

u0300 3(2) Triebel's Loop situated centrally in the proximal fork of the UR attachment strut (Figs. 16.3.18 F, G) .... *Strandesia*

u0305 3′ Triebel's Loop situated on dorsal proximal branch of the UR attachment strut (Figs. 16.3.18 H−J) .... *Bradleystrandesia*

s0070 Ostracoda: Cypridoidea: Cyprididae: Herpetocypridinae: Genera

u0310 1 Marginal zone without radial septa 2

u0315 1′ Marginal zone with conspicuous radial septa (Figs. 16.3.9 A−D) .... *Stenocypris*

u0320 2(1) Selvage peripheral/absent, inner list absent, in both valves 3

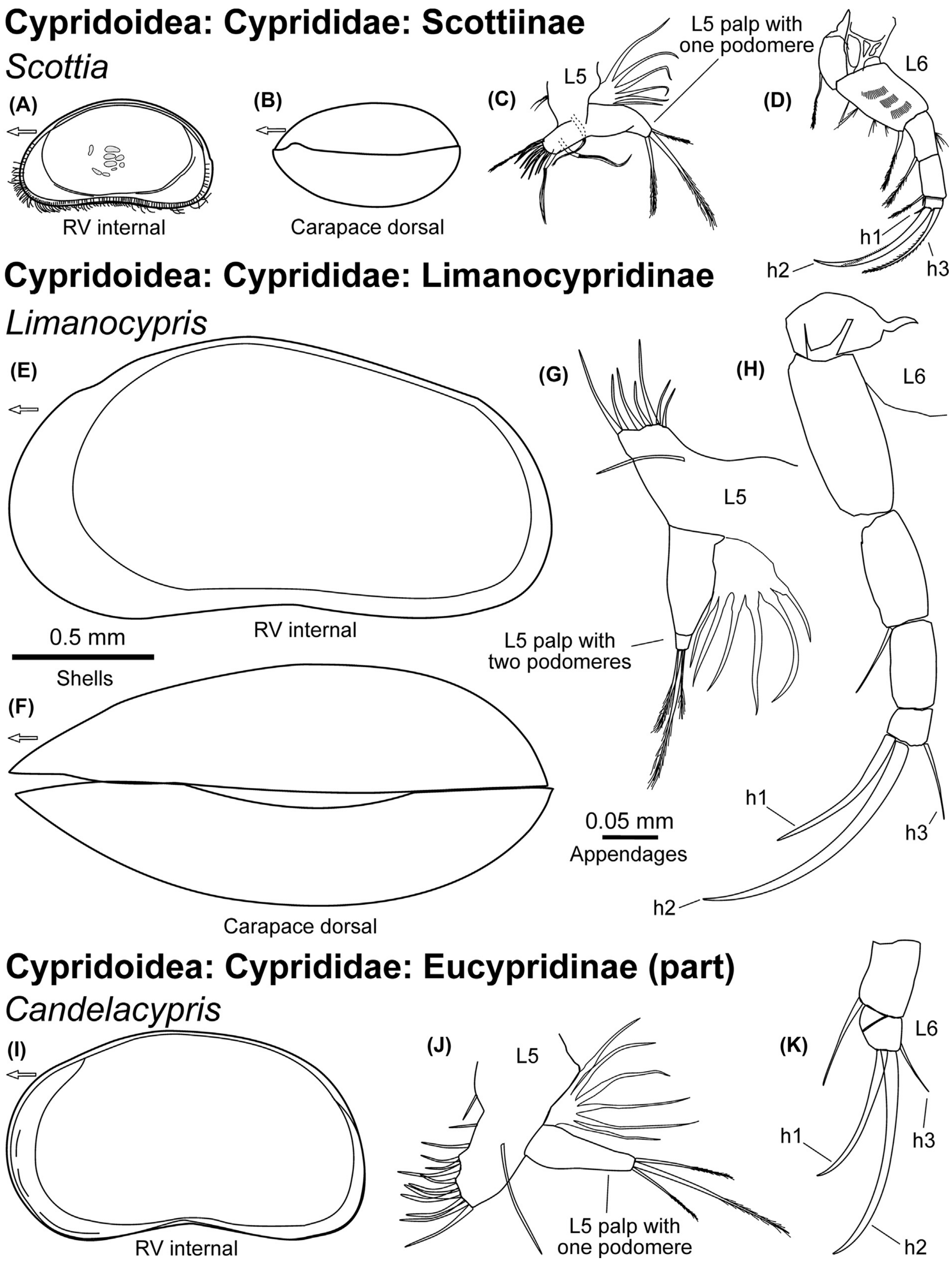
u0325 2′ Inwardly displaced selvage and/or inner list in at least one valve 6

u0330 3(2) Posterior inner margin of CIL simply curved; UR posterior seta a short spine or inconspicuous seta or absent 4

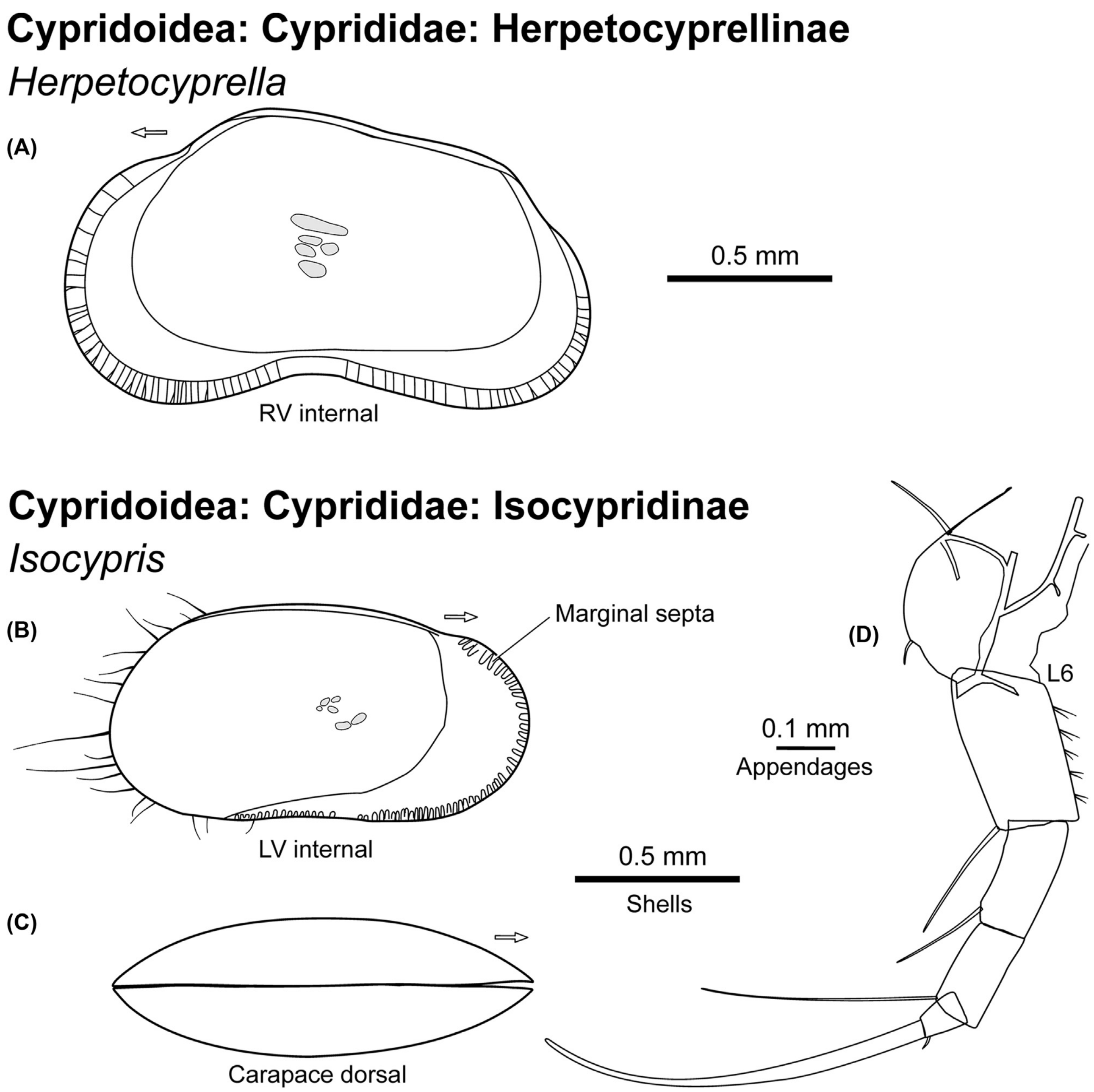
u0335 3′ Posterior inner margin of CIL conspicuously sinuous; UR posterior seta long, conspicuous (Figs. 16.3.9 E, F) .... *Stenocypria*

u0340 4(3) UR weakly asymmetrical or symmetrical, posteriorly smooth or fringed with fine setules or spines 5

u0345 4′ UR conspicuously asymmetrical, posteriodistally fringed with prominent spines (Figs. 16.3.9 G−I) .... *Chrissia*



0065 **FIGURE 16.3.12** Key characteristics of genera of the Cyprididae, subfamilies Limanocypridinae, Scottiinae, and Eucypridinae (part).



f0070 **FIGURE 16.3.13** Key characteristics of genera of the Cyprididae, subfamilies Herpetocyprellinae and Isocypridinae.

u0350 5(4) UR posterior seta absent (Fig. 16.3.9 J–L) .... *Humphcypris*

u0355 5′ UR posterior seta small or transformed into a short spine (Figs. 16.3.9 M–O). .... *Psychrodromus*

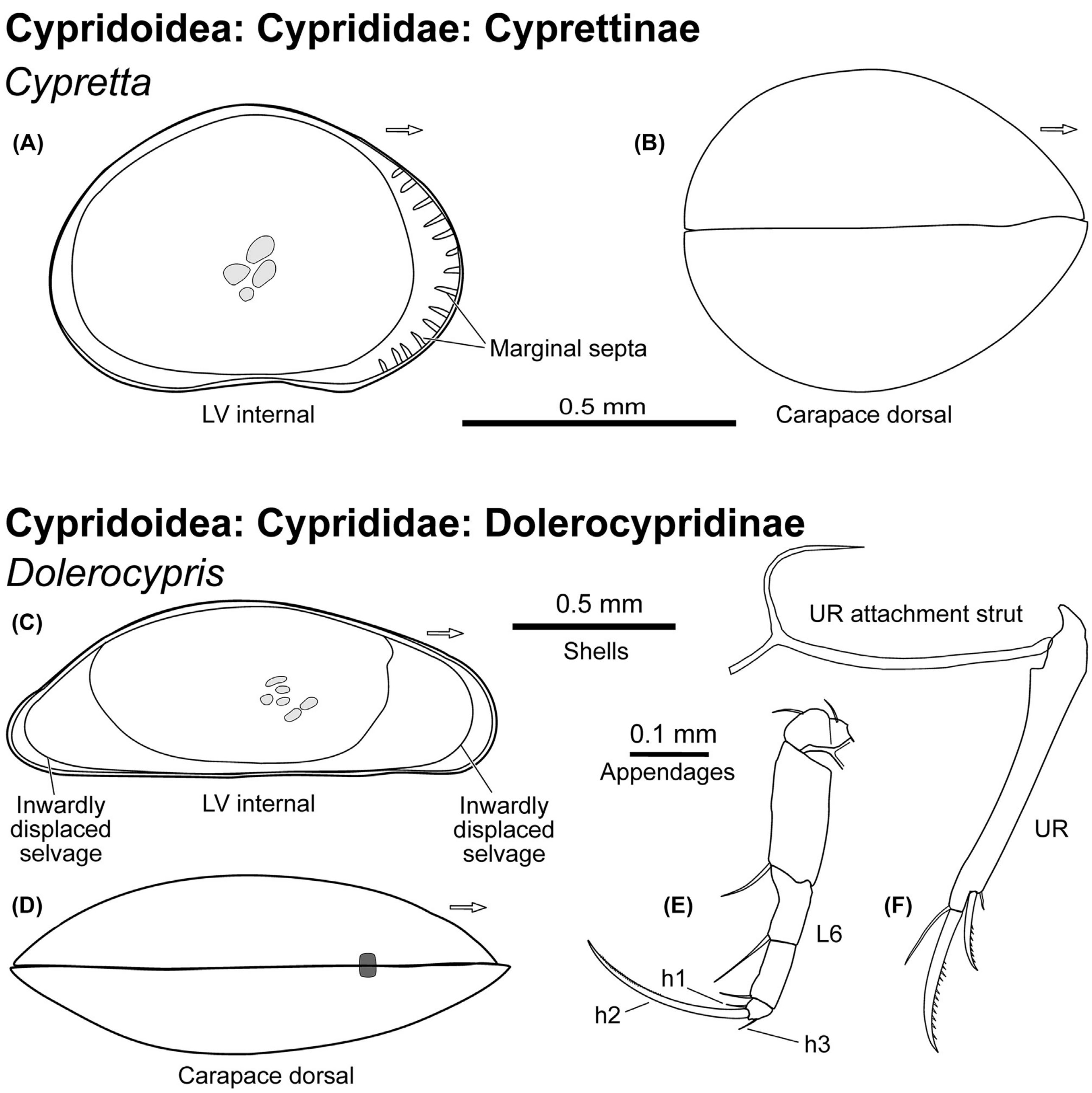
u0360 6(2) Posterior selvage inwardly displaced in both valves or RV only 7

u0365 6′ Selvage inwardly displaced in LV, anteriorly and posteriorly; LV CIL with conspicuous inner list (Figs. 16.3.10 A–E) .... *Herpetocypris*

u0370 7(6) RV anterior selvage peripheral; LV anterior CIL with continuous inner list; L7 with one f-seta (Figs. 16.3.10 F–H) .... *Ilyodromus*

u0375 7′ Anterior selvage inwardly displaced in RV only; LV anterior CIL with short inner list ventrally, truncated anteriorly; L7 with two f-setae (Figs. 16.3.10 I, J) .... *Candonocypris*

ARTHROPODA: OSTRACODA



f0075 **FIGURE 16.3.14** Key characteristics of genera of the Cyprididae, subfamilies Cyprettinae and Dolerocypridinae.

075 Ostracoda: Cypridoidea: Cyprididae: Cypridinae: Genera

0380 1 L6 with five podomeres and two e-setae (Figs. 16.3.15 A, B) .... *Chlamydotheca*

0385 1′ L6 with four podomeres and one e-seta (Figs. 16.3.15 C, D) .... *Cypris*

080 Ostracoda: Cypridoidea: Cyprididae: Cyprinotinae: Genera

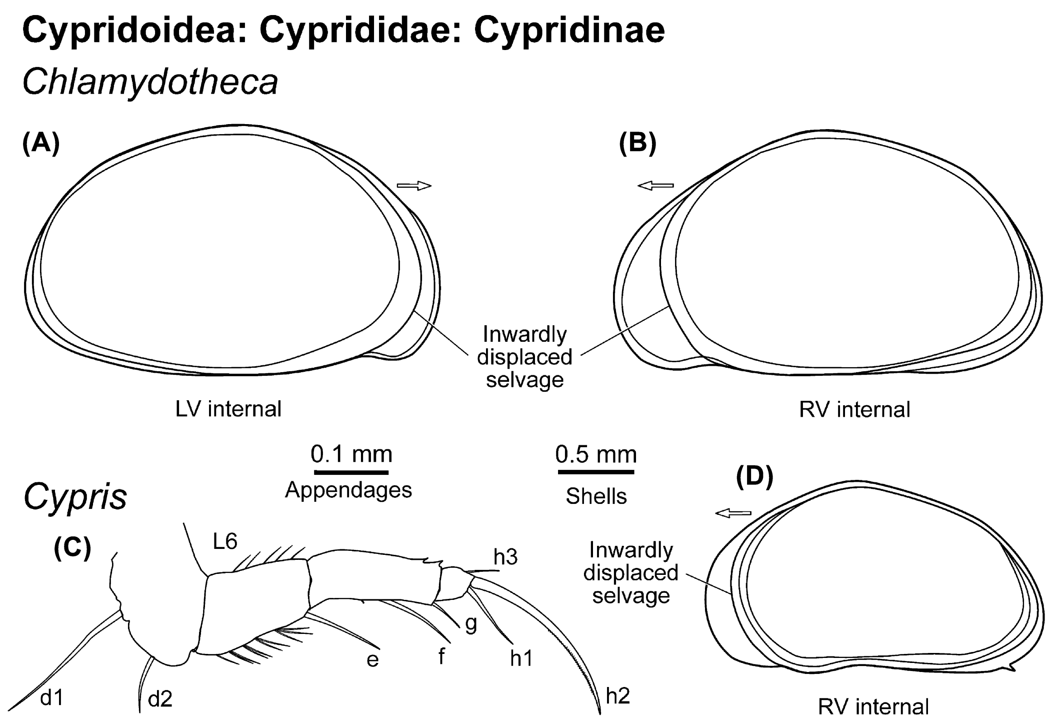
0585

0390 1 RV with marginal blunt spines 2

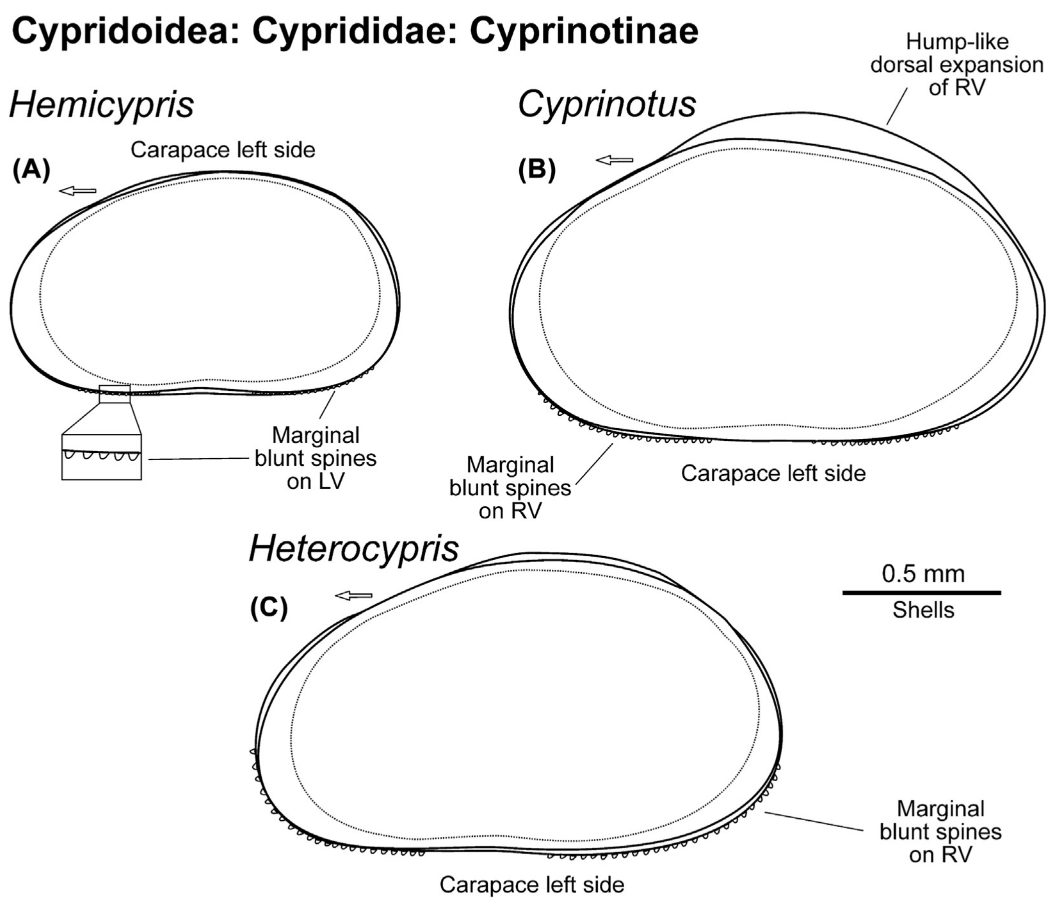
0395 1′ LV with marginal blunt spines (Fig. 16.3.16 A) .... *Hemicypris*

0400 2(1) RV with a hump-like dorsal expansion (Fig. 16.3.16 B) .... *Cyprinotus*

0405 2′ RV without a hump-like dorsal expansion (although the LV may have one) (Fig. 16.3.16C) .... *Heterocypris*



f0080 **FIGURE 16.3.15** Key characteristics of genera of the Cyprididae, subfamily Cypridinae.



f0085 **FIGURE 16.3.16** Key characteristics of genera of the Cyprididae, subfamily Cyprinotinae.

s0085 Ostracoda: Podocopida: Cypridoidea: Cyprididae: Eucypridinae: Genera

u0410 1 L6 with one terminal claw 2

u0415 1′ L6 with two terminal claws .... *Candelacypris*

u0420 2(1) LV CIL without an anteroventral internal tooth/peg; Mx1 outer endite with smooth or serrated bristles 3

u0425 2′ LV CIL with an anteroventral internal tooth/peg; Mx1 outer endite with serrated bristles (Figs. 16.3.17 A–C) .... *Tonnacypris*

u0430 3(2) Mx1 palp terminal podomere short or spatulate 4

u0435 3′ Mx1 palp terminal podomere elongate 6

u0440 4(3) L6 with both d1-and d2-setae present 5

u0445 4′ L6 with only d1-seta present (Fig. 16.3.17 D) .... *Amphicypris*

u0450 5(4) RV anterior selvage inwardly displaced; LV selvage absent, CIL with prominent anterior inner list (Fig.16.3.17 E–F) .... *Trajancypris*

u0455 5′ Selvage peripheral in both valves, CIL without inner lists (Fig. 16.3.17 G) .... *Prionocypris*

u0460 6(3) Selvage subperipheral, peripheral, or absent in both valves 7

u0465 6′ RV anterior selvage anteriorly inwardly displaced, LV selvage peripheral (Figs. 16.3.17 H, I) .... *Koencypris*

u0470 7(6) Anterior CIL with an inner list in the approximate middle, prominent in one or both valves 8

u0475 7′ Anterior CIL with an inner list, if present, not in the middle but distinctly closer to outer margin (Figs. 16.3.17 J, K) .... *Eucypris*

u0480 8(7) Mx1 outer endite with smooth bristles (Fig. 16.3.17 L) .... *Eucyprinotus*

u0485 8′ Mx1 outer endite with serrated bristles (Figs. 16.3.17 M, N) .... *Arctocypris*

s0090 Ostracoda: Cypridoidea: Candonidae: Subfamilies

p0695 Smith & Horne (2016) used the generic nomen *Candona sensu lato* because although other genera are widely employed (particularly *Fabaeformiscandona* and *Pseudocandona*), their diagnostic characters and the species that should be assigned to them are subjects of debate in the literature and it remains unclear where many species should be correctly assigned. For example, Karanovic (2012) regarded *Pseudocandona* as a subgenus of *Typhlocypris*, a point of view challenged by Namiotko et al. (2014), and placed in the genus *Eucandona* Daday, 1900 (not used herein) some of the species that were assigned by Meisch (2000) to *Fabaeformiscandona*. *Neglecandona* (not used herein) was introduced by Krstić (2006) to include a number of species extracted from *Candona s.l.* The key herein highlights *Candona s.l.* and then continues to key out *Candona sensu stricto* and other genera of the Candoninae, but it should be borne in mind that after couplet 6 the key is subject to unresolved taxonomic issues. The key does not include members of a candonine species flock endemic to Lake Baikal (Mazepova, 1990), many of which have externally ornamented shells, are currently assigned to the genera *Candona*, *Pseudocandona* and *Baicalocandona*, and are in need of revision.

u0490 1 Carapace short subovate in lateral view, with arched dorsal margin; length less than 1.5 times the height; A2 swimming setae present .... **Cyclocypridinae**

u0495 1′ Carapace subtrapezoidal, subovate, or subreniform in lateral view, often elongate, dorsal margin arched or with a straight segment; length more than 1.5 times the height; A2 swimming setae absent .... **Candoninae**

s0095 Ostracoda: Cypridoidea: Candonidae: Cyclocypridinae: Genera

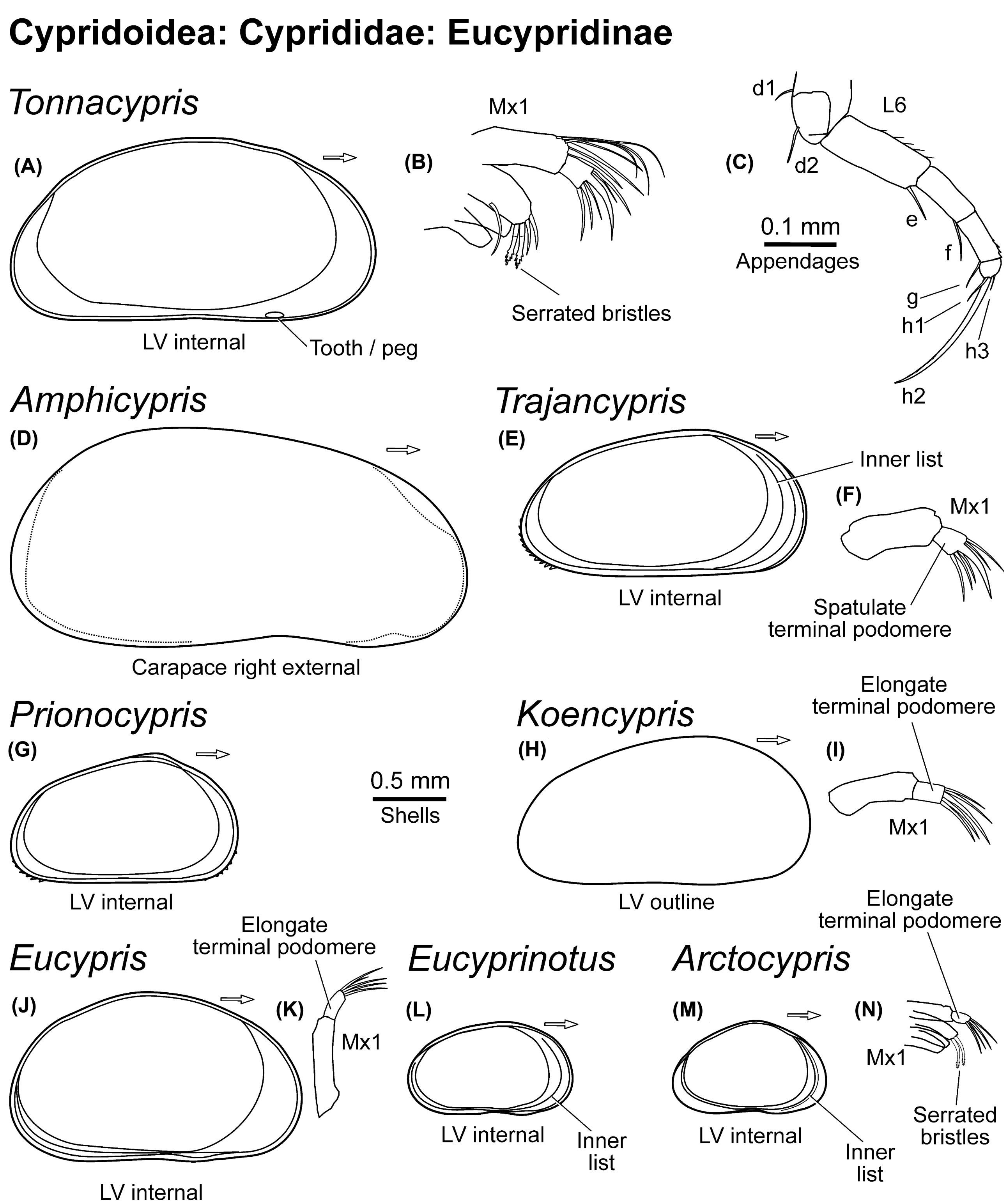
u0500 1 Carapace compressed or weakly inflated in dorsal/ventral view; L7 penultimate podomere distal seta (g) short or absent 2

u0505 1′ Carapace strongly inflated (tumid) in dorsal/ventral view; L7 penultimate podomere distal seta (g) well developed (Figs. 16.3.19 A–D) .... *Cyclocypris*

u0510 2(1) RV with marginal pustules or denticles anteriorly and posteroventrally (Fig.16.3.19 E–G) .... *Physocypria*

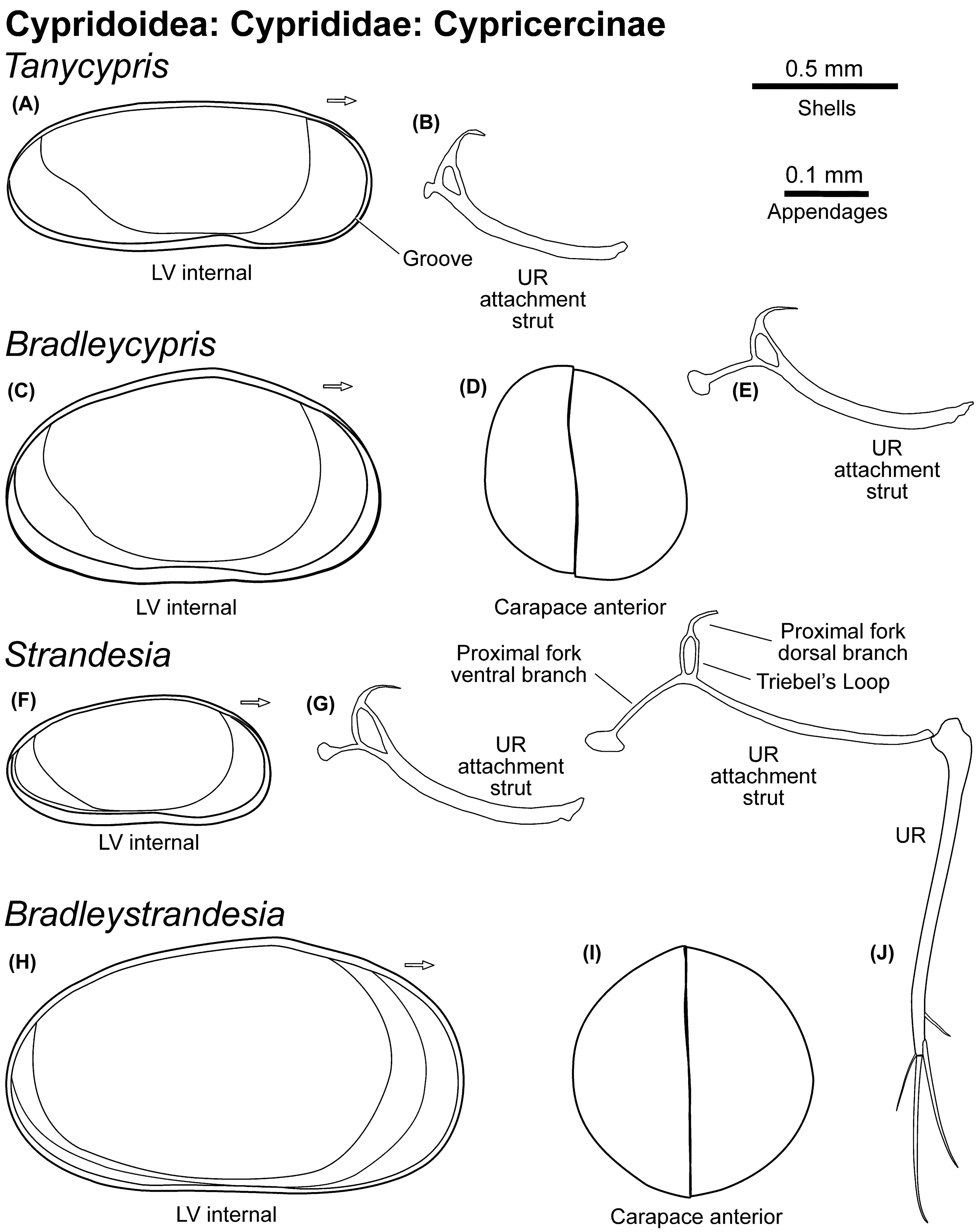
u0515 2′ Both valve margins smooth (Figs. 16.3.19 H–J) .... *Cypria*

ARTHROPODA: OSTRACODA

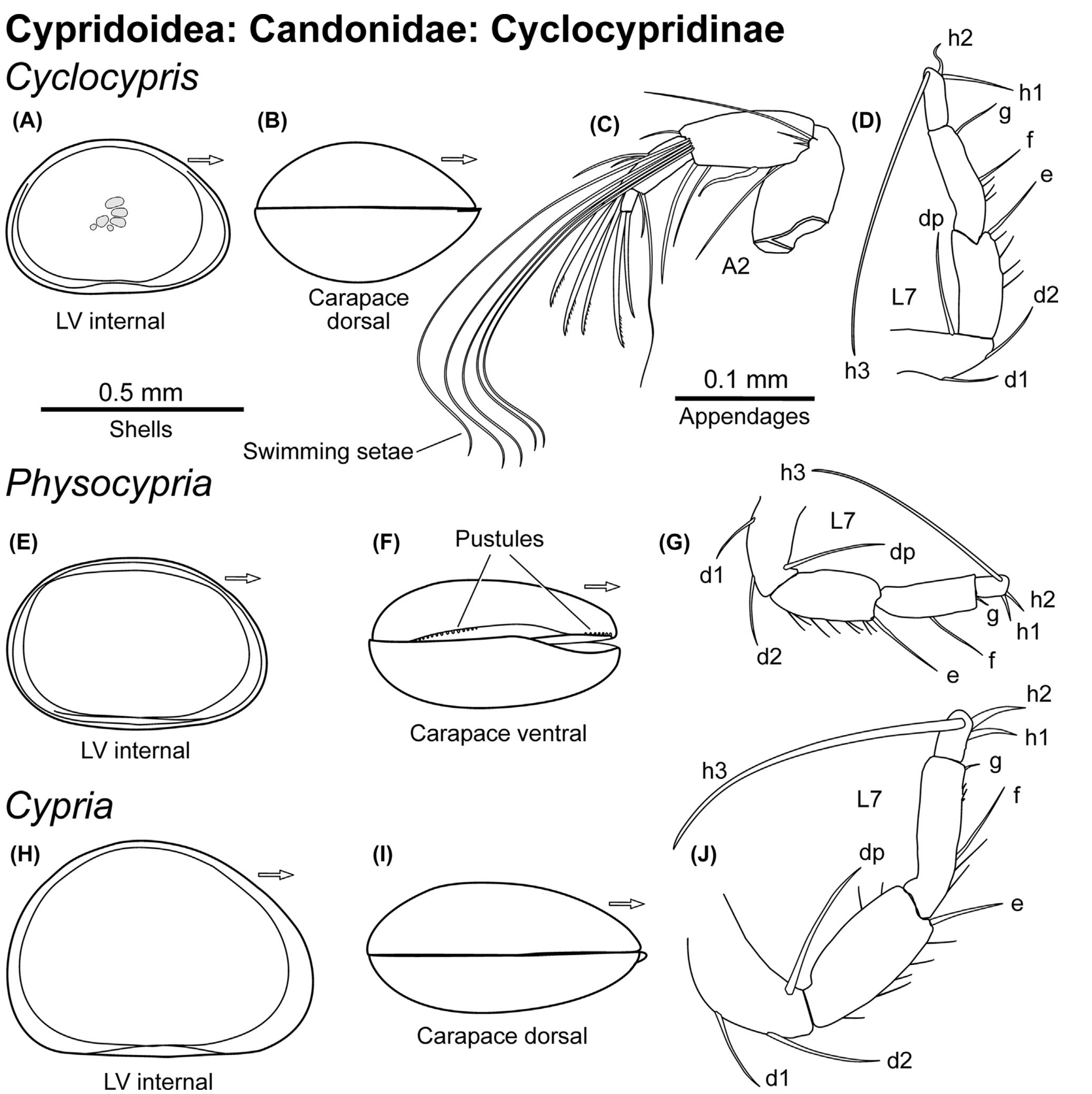


f0090

FIGURE 16.3.17 Key characteristics of genera of the Cyprididae, subfamily Eucypridinae.



0095 **FIGURE 16.3.18** Key characteristics of genera of the Cyprididae, subfamily Cypricercinae.



f0100 **FIGURE 16.3.19** Key characteristics of genera of the Candonidae, subfamily Cyclocypridinae.

s0100 Ostracoda: Cypridoidea: Candonidae: Candoninae: Genera

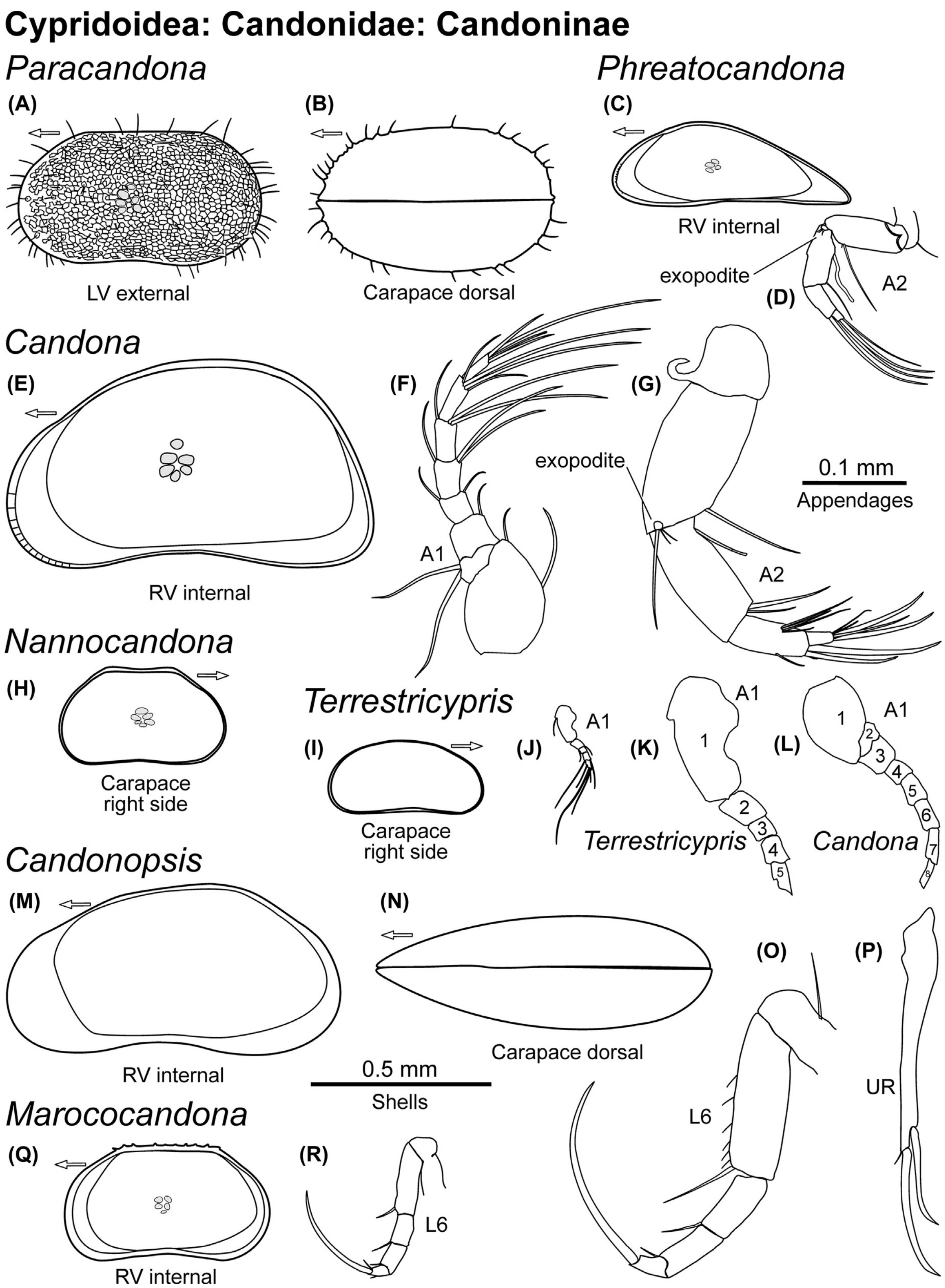
p0735 At least one species of *Marococandona* has a reduced A1 with only five articulated podomeres and a reduced UR with only one terminal claw (Marmonier et al., 2005). These differences may merit the description of a new genus.

p0740 *Earicandona* and *Schellencandona* are very difficult to separate morphologically and differ mainly in adult size, with length of the former being >0.70 mm compared to <0.65mm for the latter. The example of the latter illustrated herein, has a shorter, more trapezoidal valve outline, but some species assigned to *Schellencandona* by Meisch (2000) have elongate valve outlines similar to those of species assigned to *Earicandona* by Karanovic (2013). If they were to be considered synonymous, the name *Schellencandona* would take priority.

u0520 1 Carapace external surface smooth or partially ornamented 2

u0525 1′ Carapace external surface entirely ornamented with fine net-like reticulation and pore conuli; moderately inflated with approximately parallel dorsal and ventral margins (Figs. 16.3.20 A, B) .... *Paracandona*

ARTHROPODA: OSTRACODA



0105 **FIGURE 16.3.20** Key characteristics of genera of the Candonidae, subfamily Candoninae.

u0530 2(1) A2 exopodite with one long and 1–2 very short setae; L6 penultimate podomere distal seta (g) shorter or no longer than the podomere 3

u0535 2′ A2 exopodite with three very short setae; L6 penultimate podomere distal seta (g) twice as long as the podomere (Figs. 16.3.20 C, D) ..... *Phreatocandona*

u0540 3(2) A1 with five articulated podomeres (Figs. 16.3.20 K) 4

u0545 3′ A1 with 7–8 articulated podomeres (Figs. 16.3.20 E–G, L) ..... *Candona sensu lato* 5

u0550 4(3) Carapace subtrapezoidal in lateral view with a straight or weakly concave dorsal margin; Md palp second podomere with a group of three setae (Fig. 16.3.20 H). ..... *Nannocandona*

u0555 4′ Carapace subreniform in lateral view with a convex dorsal margin; Md palp second podomere with a group of four setae (Figs. 16.3.20 I, J) ..... *Terrestricypris*

u0560 5(3) UR posterior seta absent 6

u0565 5′ UR posterior seta present 7

u0570 6(5) Carapace subreniform in lateral view, L6 basal podomere with one seta (Figs. 16.3.20 M–P) ..... *Candonopsis*

u0575 6′ Carapace subrectangular in lateral view, L6 basal podomere without setae (Figs. 16.3.20 Q, R) ..... *Marocandona*

u0580 7(5) L7 terminal podomere with two long and one short distal setae 8

u0585 7′ L7 terminal podomere with one long and two very short setae (Figs. 16.3.21 A, B) ..... *Mixtacandona*

u0590 8(7) L7 penultimate podomere medial seta (f) absent 9

u0595 8′ L7 penultimate podomere medial seta (f) present (Figs. 16.3.21 C, D) ..... *Cryptocandona*

u0600 9(8) L7 basal podomere with three setae..... 10

u0605 9′ L7 basal podomere with two setae 12

u0610 10(9) Carapace subtriangular or subtrapezoidal in lateral view with maximum height close to mid-length 11

u0615 10′ Carapace subrectangular, subovate, or subreniform in lateral view, with maximum height well behind mid-length (Figs. 16.3.21 E, F) ..... *Pseudocandona*

u0620 11(10) Carapace subtriangular with an arched dorsal margin, conspicuously pitted in central dorsal area (Fig. 16.3.21 G) ..... *Typhlocypris*

u0625 11′ Carapace subtrapezoidal with arch of dorsal margin truncated forming a short straight or undulating section approximately parallel to the ventral margin (Figs. 16.3.21 H, I) ..... *Marmocandona*

u0630 12(9) Md palp with smooth γ-seta 13

u0635 12′ Md palp with plumose γ-seta (Figs. 16.3.22 A, B) ..... *Candona sensu stricto*

u0640 13(12) L6 basal podomere distal seta (d1) present 14

u0645 13′ L6 basal podomere distal seta absent (Figs. 16.3.22 C, D) ..... *Trajancandona*

u0650 14(13) Posterodorsal margin of one or both valves with a lobate expansion or flap which overlaps the opposing valve margin when closed (Figs. 16.3.22 E–G) ..... *Fabaeformiscandona*

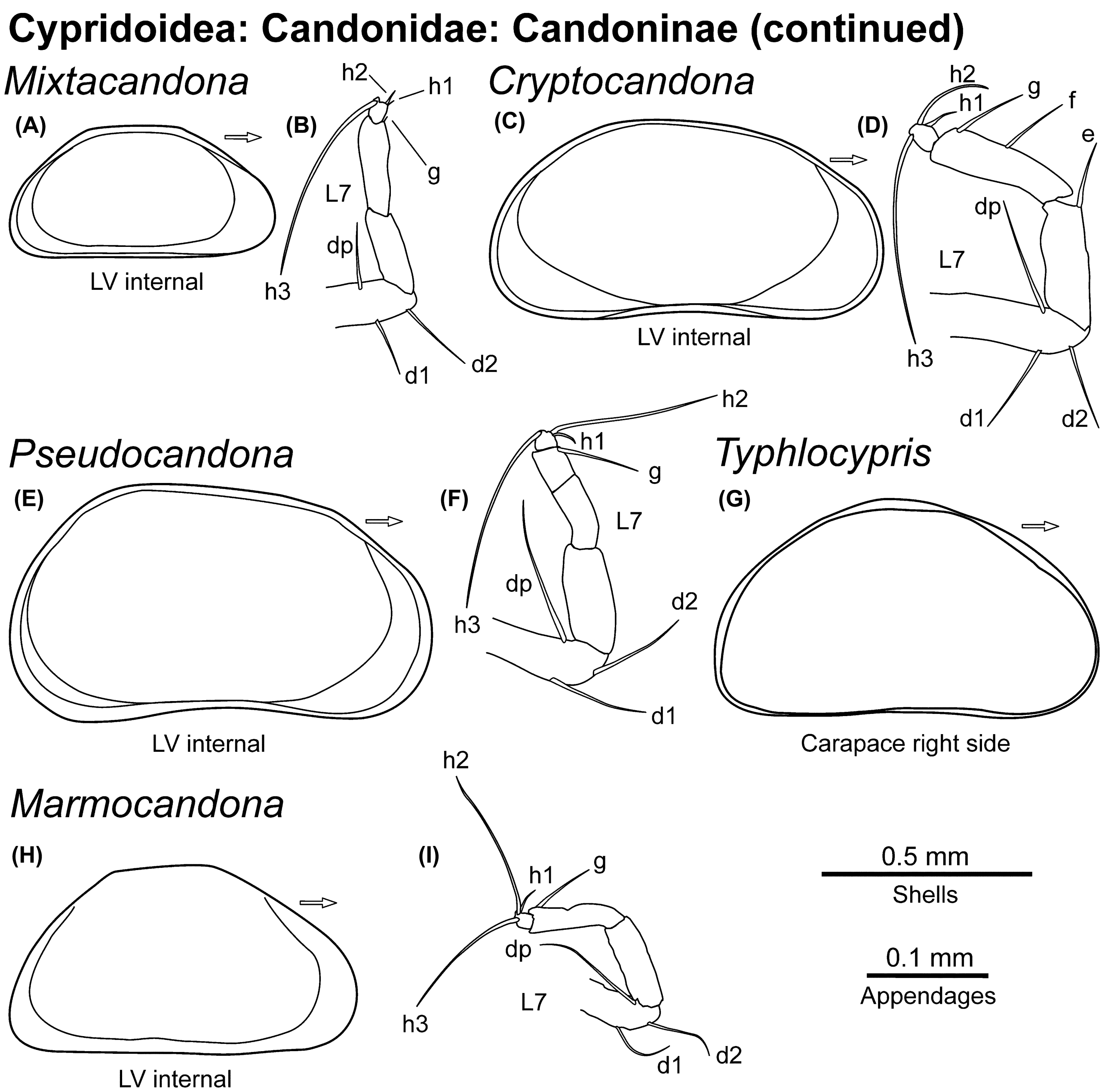
u0655 17′ Posterodorsal margins of valves simple, without lobate expansions (Figs. 16.3.22 H–J) ..... *Earicandona*/*Schellencandona*

s0105 Ostracoda: Cytheroidea: Families

p0885 The Cytheroidea is a diverse and predominantly marine group that also includes some nonmarine taxa. Only the Limnocytheridae and Kliellidae are exclusively nonmarine, but the Cytheridae, Cytherideidae, Leptocytheridae, Hemicytheridae, Loxoconchidae, and Xestoleberididae also have nonmarine representatives, occurring in fresh to hypersaline waters. In addition, the Entocytheridae (commensal on other crustaceans) are mainly nonmarine but include some marine/brackish taxa. Cytheroideans are benthonic nonswimming ostracods that crawl, climb, or burrow (epifaunal, infaunal, interstitial, or commensal).

p0890 While couplet 3 is effective for freshwater members of the families, most of the very diverse marine/brackish water members of the Hemicytheridae and Leptocytheridae would key out incorrectly here; for example the leptocytherid genus *Leptocythere* has branching marginal pore canals in bunches and the hemicytherid genus *Hemicythere* has simple ones, but neither occurs in fresh water.

p0895 The carapace is smooth or ornamented, sometimes strongly, with the dorsal margin often bearing a robust and complex hinge structure that is rarely adont. Carapace size and shape variable, with strong sexual dimorphism in some genera. Calcified inner lamella usually well developed. The basic AMS pattern is four or five scars in a vertical row. Lateral ocelli of median eye often with corresponding eyespots or eye tubercles developed in the valves. Normal pores are both simple and sieve-type (the latter present in most but not all families). A1 with five to seven articulated podomeres. A2 endopodite with three to four articulated podomeres; the exopodite is a jointed or unjointed spinneret seta connected to a gland at the base of the limb and is sometimes sexually dimorphic. Md palp is a small branchial plate with up to seven rays. Mx1 branchial plate has up to four reflexed, forward-pointing rays. L5, L6, and L7 are walking legs similar in structure and direction, each with three endopodite podomeres and a terminal claw (which is fused with the “missing” fourth podomere); these limbs are sometimes sexually dimorphic. The L5 branchial plate has up to four rays in some genera but typically reduced to one or two setae and sometimes absent. UR is reduced or absent. Male copulatory appendages have an incorporated sperm pump (no Zenker’s organ). Females of a few families or subfamilies have an expanded posterior brood chamber, but most do not.



f0110 **FIGURE 16.3.21** Key characteristics of genera of the Candonidae, subfamily Candoninae (continued).

0660 1 Carapace well or weakly calcified, externally smooth or ornamented; L5, L6, and L7 with long terminal claws (distinctly longer than terminal podomere) 2

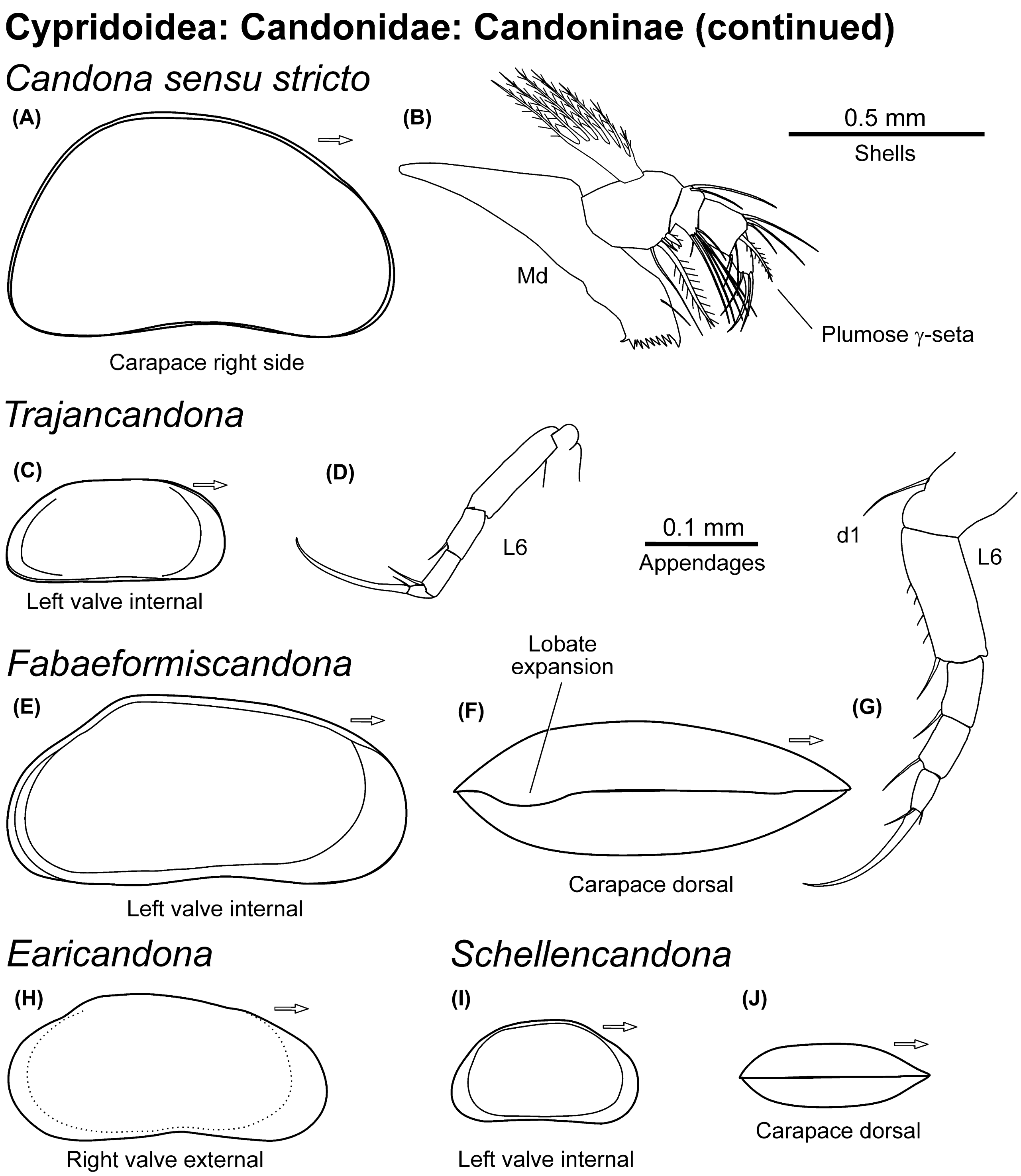
0665 1′ Carapace weakly calcified, sometimes flattened anteroventrally, unornamented; L5, L6, and L7 with short, hooked terminal claws (no longer than terminal podomere) bearing short spines; commensal or ectoparasitic on larger crustaceans .... **Entocytheridae**

0670 2(1) Carapace external surface smooth or ornamented, Xestoleberis-spot absent 3

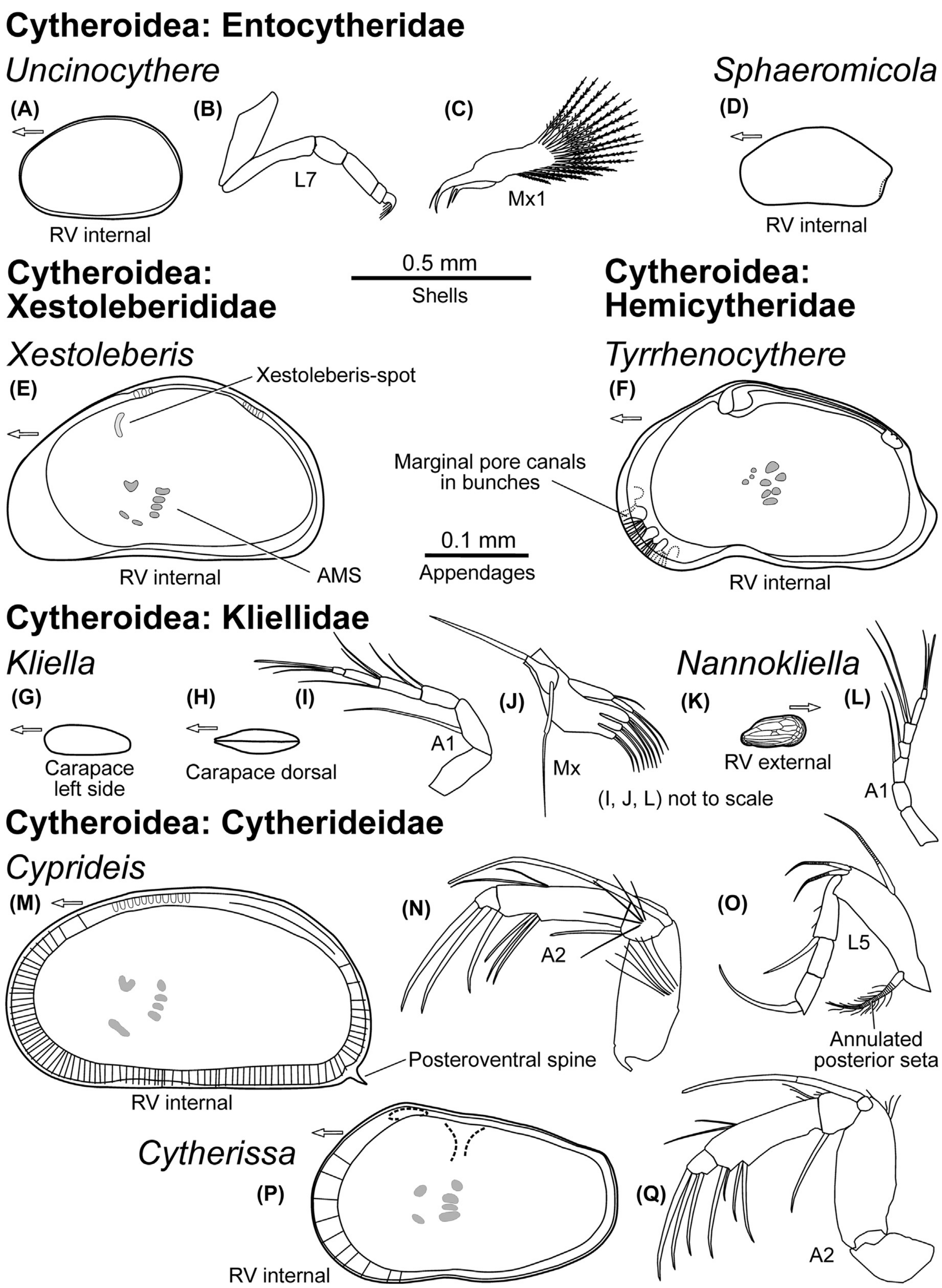
0675 2′ Carapace external surface smooth, Xestoleberis-spot present (Fig. 16.3.23 E) .... Xestoleberididae, one genus: *Xestoleberis*

0680 3(2) Anterior marginal pore canals mostly simple (a few may be bifurcated) or not discernable 4

0685 3′ Anterior marginal pore canals conspicuously arranged in brush-like bunches (Fig. 16.3.23 F) .... Hemicytheridae, one genus: *Tyrrhenocythere*



f0115 **FIGURE 16.3.22** Key characteristics of genera of the Candonidae, subfamily Candoninae (continued).



0120

FIGURE 16.3.23 Key characteristics of genera of Cytheroidea.

u0690 4(3) Mx1 branchial plate with >10 rays 5

u0695 4′ Mx1 branchial plate with only 1–2 rays .... **Kliellidae**

u0700 5(4) L5 and L6 basal podomere posterior setae (exopodites) slender or reduced, not annulated 6

u0705 5′ L5 and L6 basal podomere posterior setae (exopodites) stout, conspicuously annulated .... **Cytherideidae**

u0710 6(5) A2 with two terminal claws 7

u0715 6’ A2 with one to three terminal claws .... **Limnocytheridae**

u0720 7(6) Hinge gongylodont (RV posterior tooth bilobate) or henodont (RV posterior tooth simple) .... **Loxoconchidae**

u0725 7′ Hinge entomodont (RV posterior tooth with five cusps increasing in size toward posterior) (Fig. 16.3.26 I) .... Leptocytheridae, one genus: *Amnicythere*

s0110 Ostracoda: Cytheroidea: Entocytheridae: Genera

u0730 1 Mx1 with a branchial plate (Figs. 16.3.23 A–C) .... Entocytherinae, one genus: *Uncinocythere*

u0735 1′ Mx1 without a branchial plate (Fig. 16.3.23 D) .... Sphaeromicolinae, one genus: *Sphaeromicola*

s0115 Cytheroidea: Kliellidae: Genera

u0740 1 Carapace smooth, A1 with six articulated podomeres (Figs. 16.3.23 G–J) .... *Kliella*

u0745 1′ Carapace ornamented, A1 with seven articulated podomeres (Figs. 16.3.23 K, L) .... *Nannokliella*

s0120 Ostracoda: Cytheroidea: Cytherideidae: Genera

p1000 The genus *Cytherissa* has one Holarctic species and c. 60 Palaearctic species endemic to Lake Baikal.

u0750 1 RV with a small posteroventral spine; A2 with two terminal claws (Figs. 16.3 23 M–O) .... *Cyprideis*

u0755 1′ RV without a posteroventral spine; A2 with three terminal claws (Figs. 16.3.3 and 16.3.23 P–Q) .... *Cytherissa*

s0125 Ostracoda: Cytheroidea: Limnocytheridae: Subfamilies

u0760 1 Female carapace without a posterior brood chamber .... **Limnocytherinae**

u0765 1′ Female carapace swollen posteriorly to form a brood chamber for eggs and juveniles .... **Timiriaseviinae**

s0130 Ostracoda: Cytheroidea: Limnocytheridae: Limnocytherinae: Genera

p1030 Several genera (listed in Table 16.3.1) have been separated from *Limnocythere* by various authors, in some cases as subgenera that have later been elevated to full generic status by others. In cases where these taxa are distinguished only by adult male characteristics, we have been unable to devise a useful key based on adult female characters. For example, the subgenus *Limnocythere* (*Limnocytherina*) Negadaev-Nikonov, 1967, elevated to generic level by some authors (e.g., Martens, 1996; Meisch, 2000), is mainly distinguished from *Limnocythere* (*Limnocythere*) Brady, 1868 by structural features of the male copulatory appendages; consequently recognizing it can be difficult (and impossible in extinct fossil species for which appendages are unknown). Delorme (1971) used both subgenera for North American limnocytherid species, but did not explain the criteria used to separate them and subsequently (Delorme, 2001; Smith & Delorme, 2010) used only the genus *Limnocythere*. Similarly, *Potamocythere* Schornikov, 1986 and *Limnocythere* (*Galolimnocythere*) Schornikov, 1986 (the latter elevated to generic rank by Martens, 1996) are only separable from *Limnocythere* by details of male appendage morphology. For the purposes of the key, we use *Limnocythere s.l.* to accommodate these taxa.

p1035 *Leucocythere* Kaufmann, 1892 and *Athalocythere* Schornikov, 1986 can be separated from *Limnocythere* by details of the hinge structure, but may only be distinguished from each other by details of male appendage morphology, so we have accommodated them both in *Leucocythere s.l.*

u0770 1 All marginal pore canals short and simple 2

u0775 1′ Marginal pore canals long, some bifurcated (Fig. 16.3.24 F, G) .... *Paralimnocythere*

u0780 2(1) RV hinge with anterior and posterior teeth well developed; LV hinge with a smooth median bar (Fig. 16.3.24 A–E) .... *Limnocythere sensu lato*

u0785 2′ RV hinge with a trilobate posterior tooth, anterior tooth weakly developed; LV hinge with a crenulate median bar (Fig. 16.3.24 H–J) .... *Leucocythere sensu lato* t0010 **TABLE 16.3.1** Taxonomic Checklist of Palaearctic Free-living and Commensal Freshwater Ostracod Genera

Class Ostracoda Latreille, 1806 (=Ostrachoda Latreille, 1802)
Subclass Podocopa Sars, 1866
Order Podocopida Sars, 1866
Suborder Cypridocopina Jones, 1901
Superfamily Cypridoidea Baird, 1845
Family Cyprididae Baird, 1845
Subfamily Cyprettinae Hartmann, 1963
Genus *Cypretta* Vávra, 1895
Subfamily Cypricercinae McKenzie, 1971
Genus *Bradleycypris* McKenzie, 1982
Genus *Bradleystrandesia* Broodbakker, 1983
Genus *Bradleytriebella* Savatenalinton & Martens, 2009
Genus *Strandesia* Vávra, 1895
Genus *Tanycypris* Triebel, 1959
Subfamily Cypridinae Baird, 1845
Genus *Chlamydotheca* Saussure, 1858
Syn.: *Pachycypris* Claus, 1892
Genus *Cypris* O. F. Müller, 1776
Subfamily Cypridopsinae Kaufmann, 1900
Genus *Cavernocypris* Hartmann, 1964
Genus *Cypridopsis* Brady, 1867
Genus *Plesiocypridopsis* Rome, 1965
Genus *Potamocypris* Brady, 1870
Genus *Pseudocypridopsis* Karanovic, 1999
Genus *Sarscypridopsis* McKenzie, 1977
Subfamily Cyprinotinae Bronstein, 1947
Genus *Cyprinotus* Brady, 1886
Genus *Hemicypris* Sars, 1903
Genus *Heterocypris* Claus, 1892
Subfamily Dolerocypridinae Triebel, 1961
Genus *Dolerocypris* Kaufmann, 1900
Subfamily Eucypridinae Bronstein, 1947
Genus *Amphicypris* Sars, 1901
Genus *Arctocypris* Petkovski, Scharf & Keyser, 2016
Genus *Candelacypris* Baltanás, 2001
Genus *Eucyprinotus* Sywula, 1972
Genus *Eucypris* Vávra, 1891
?Syn.: *Candocyprinotus* Delorme, 1970

TABLE 16.3.1 Taxonomic Checklist of Palaearctic Free-living and Commensal Freshwater Ostracod Genera—cont'd

Genus *Koencypris* Meisch, 2000
Genus *Prionocypris* Brady & Norman, 1896
Genus *Tonnacypris* Diebel & Pietrzeniuk, 1975
Genus *Trajancypris* Martens, 1989
Subfamily Herpetocyprellinae Bronstein, 1947
Genus *Herpetocyprella* Daday, 1909
Subfamily Herpetocypridinae Kaufmann, 1900
Syn.: Stenocypridinae Ferguson, 1964
Tribe Herpetocypridini Kaufmann, 1900
Genus *Candonocypris* Sars, 1894
Genus *Herpetocypris* Brady & Norman, 1889
Syn.: *Erpetocypris* Brady & Norman, 1889
Syn.: *Siphlocandona* Brady, 1910
Genus *Ilyodromus* Sars, 1894
Tribe Psychrodromini Martens, 2001
Genus *Humphcypris* Martens, 1997
Genus *Psychrodromus* Danielopol & McKenzie, 1977
Tribe Stenocypridini Ferguson, 1964
Genus *Chrissia* Hartmann, 1957
Syn.: *Gesa* Hartmann, 1957
Syn.: *Parastenocypris* Hartmann, 1964
Genus *Stenocypria* G. W. Müller, 1901
Genus *Stenocypris* Sars, 1889
Subfamily Hungarocypridinae Bronstein, 1947
Genus *Hungarocypris* Vávra, 1906
Subfamily Isocypridinae Rome, 1965
Genus *Isocypris* G.W. Müller, 1908
Subfamily Scottiinae Bronstein, 1947
Genus *Scottia* Brady & Norman, 1889
Subfamily Limanocypridinae Hartmann & Puri, 1974
Genus *Limanocypris* Schornikov, 1961
Family Candonidae Kaufmann, 1900
Subfamily Candoninae Kaufmann, 1900
Tribe Candonini Kaufmann, 1900
Genus *Baicalocandona* Mazepova, 1976
Genus *Candona* Baird, 1845
Genus *Cryptocandona* Kaufmann, 1900
Genus *Eucandona* Karanovic, 2013

(*Continued*)

TABLE 16.3.1 Taxonomic Checklist of Palaearctic Free-living and Commensal Freshwater Ostracod Genera—cont'd

Genus *Fabaeformiscandona* Krstić, 1972
Genus *Marmocandona* Danielopol, Namiotko, & Meisch, 2012
Genus *Mixtacandona* Klie, 1938
Syn.: *Trapezicandona* Schornikov, 1969
Genus *Nannocandona* Ekman, 1914
Genus *Paracandona* Hartwig, 1899
Genus *Phreatocandona* Danielopol, 1973
Genus *Pseudocandona* Kaufmann, 1900
Genus *Schellencandona* Meisch, 1996
Genus *Trajancandona* Karanovic, 1999
Tribe Candonopsini Karanovic, 2004
Genus *Candonopsis* Vávra, 1891
Tribe Terrestricypridini Schornikov, 1980
Genus *Terrestricypris* Schornikov, 1980
Subfamily Cyclocypridinae Kaufmann, 1900
Genus *Cyclocypris* Brady & Norman, 1889
Genus *Cypria* Zenker, 1854
Syn.: *Bentocypria* Kovalenko, 1987
Genus *Physocypria* Vávra, 1897
Family Ilyocyprididae Kaufmann, 1900
Subfamily Ilyocypridinae Kaufmann, 1900
Genus *Ilyocypris* Brady & Norman, 1889
Family Notodromadidae Kaufmann, 1900
Subfamily Cyproidinae Hartmann, 1963
Genus *Cyprois* Zenker, 1854
Subfamily Notodromadinae Kaufmann, 1900
Genus *Notodromas* Lilljeborg, 1853
Suborder Darwinulocopina Sohn, 1988
Superfamily Darwinuloidea Brady & Norman, 1889
Family Darwinulidae Brady & Norman, 1889
Genus *Darwinula* Brady & Robertson, 1885
Genus *Microdarwinula* Danielopol, 1969
Genus *Penthesilenula* Rossetti & Martens, 1998
Genus *Vestalenula* Rossetti & Martens, 1998
Suborder Cytherocopina Gründel, 1967
Superfamily Cytheroidea Baird, 1850
Family Cytherideidae Sars, 1925
Subfamily Cytherideinae Sars, 1925
Tribe Cytherideini Kollmann, 1960
Genus *Cyprideis* Jones, 1857
Genus *Cytherissa* Sars, 1925
Family Entocytheridae Hoff, 1942
Subfamily Entocytherinae Hoff, 1942
Genus *Uncinocythere* Hart, 1962
Subfamily Sphaeromicolinae Hart, 1962
Genus *Sphaeromicola* Paris, 1916
Family Hemicytheridae Puri, 1953
Subfamily Hemicytherinae Puri, 1953
Genus *Tyrrhenocythere* Ruggieri, 1955
Family Kliellidae Schäfer, 1945
Genus *Kliella* Schäfer, 1945
Genus *Nannokliella* Schäfer, 1945
Family Leptocytheridae Hanai, 1957
Subfamily Leptocytherinae Hanai, 1957
Genus *Amnicythere* Devoto, 1975
Family Limnocytheridae Sars, 1928
Subfamily Limnocytherinae Sars, 1928
Tribe Leucocytherini Danielopol & Martens, 1989
Genus *Athalocythere* Schornikov, 1986
Genus *Leucocythere* Kaufmann, 1892
Tribe Limnocytherini Sars, 1928
Genus *Galolimnocythere* Schornikov, 1973
Genus *Limnocythere* Brady, 1867
Genus *Limnocytherina* Negadaev-Nikonov, 1967
Genus *Paralimnocythere* Carbonnel, 1965
Genus *Potamocythere* Schornikov, 1986
Subfamily Timiriaseviinae Mandelstam, 1960
Syn.: Metacypridinae Danielopol, 1960
Genus *Dolekiella* Gidó, Artheau, Colin, Danielopol & Marmonier, 2007
Genus *Frambocythere* Colin, 1981
Genus *Kovalevskiella* Klein, 1963
Genus *Metacypris* Brady & Robertson, 1870
Family Loxoconchidae Sars, 1925
Genus *Cytheromorpha* Hirschmann, 1909
Genus *Loxoconcha* Sars, 1866
Genus *Pseudolimnocythere* Klie, 1938
Family Xestoleberididae Sars, 1928
Genus *Xestoleberis* Sars, 1866

ARTHROPODA: OSTRACODA

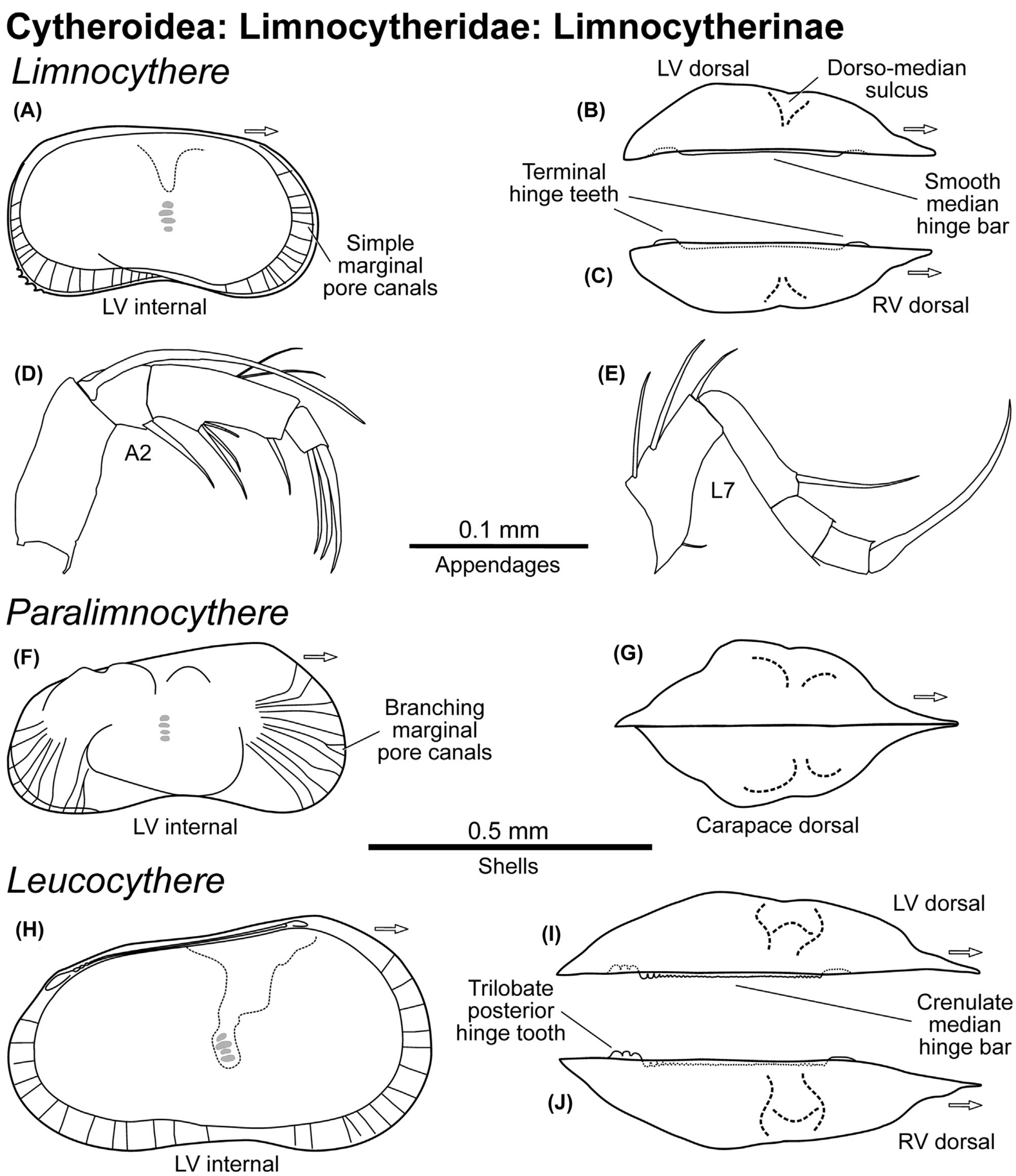


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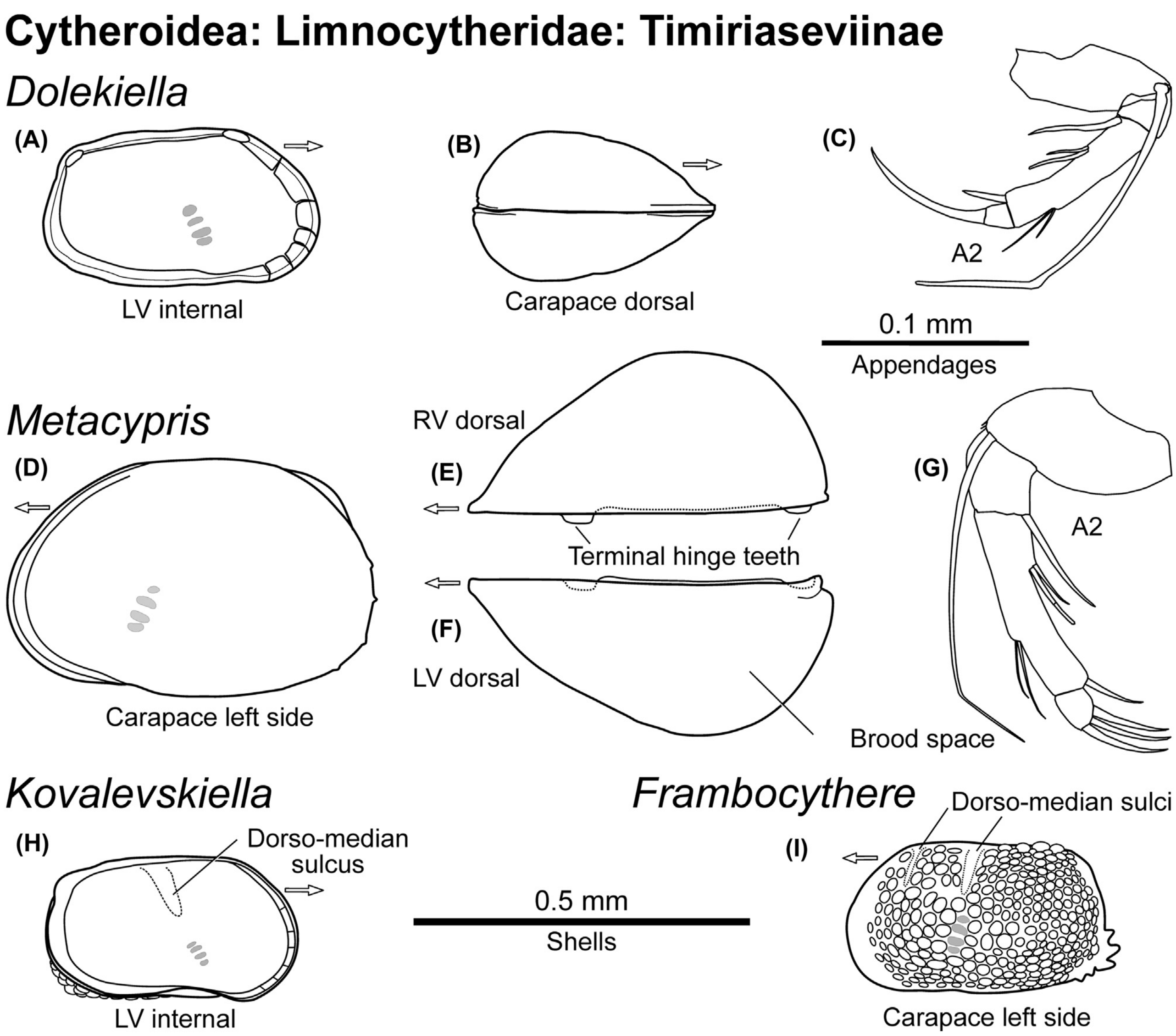
FIGURE 16.3.24 Key characteristics of genera of the Limnocytheridae, subfamily Limnocytherinae.



f0130 **FIGURE 16.3.25** Key characteristics of genera of the Limnocytheridae, subfamily Timiriaseviinae.

s0135 Cytheroidea: Limnocytheridae: Timiriaseviinae: Genera

p1060 The interstitial genera *Kovalvskiella* and *Frambocythere* are closely related and are separable only by the number of dorsomedian sulci, the anterior of which (in *Frambocythere*) may be weakly developed and difficult to observe (Smith et al. 2012).

u0790 1 A2 with three terminal claws 2

u0795 1′ A2 with one terminal claw (Figs. 16.3.25 A−C) .... *Dolekiella*

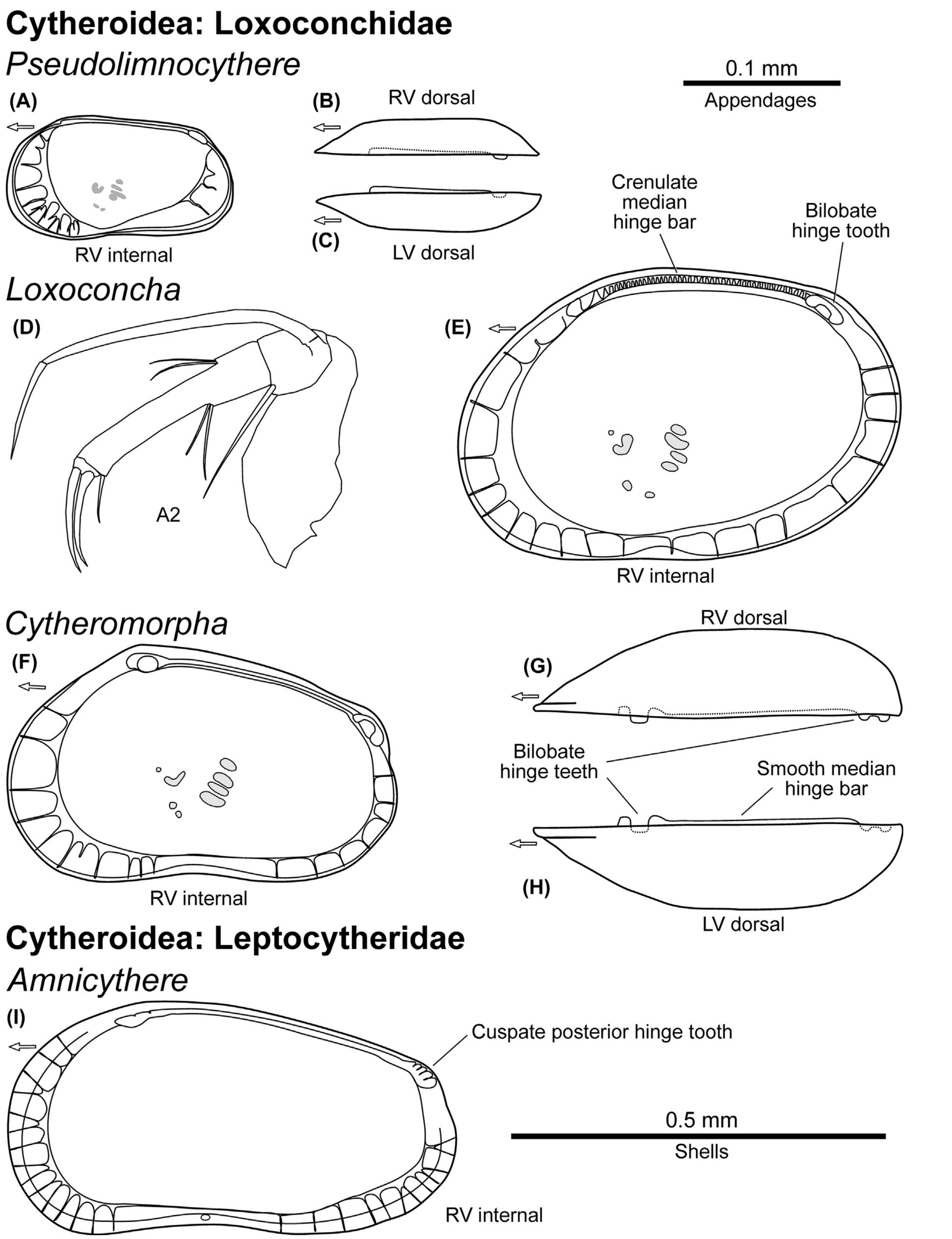
u0800 2(1) Hinge inverse lophodont (LV with terminal teeth), carapace external surface ornamented with small closely spaced pustules and with 1−2 dorsomedian sulci in each valve 3

u0805 2′ Hinge lophodont (RV with terminal teeth), carapace external surface smooth or finely pitted and without dorsomedian sulci (Figs. 16.3.25 D−G) .... *Metacypris*

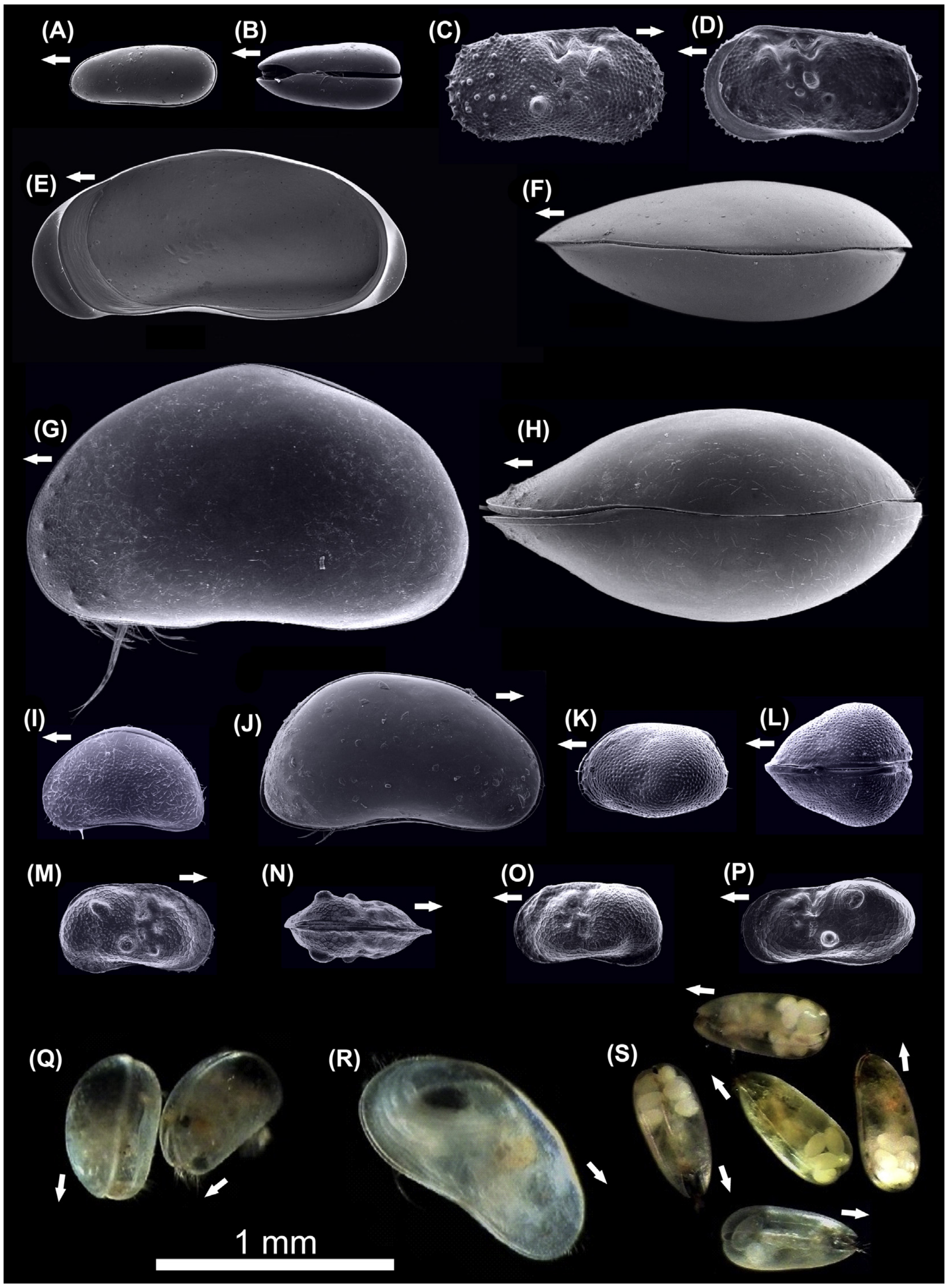
u0810 3(2) Each valve with one dorsomedian sulcus (Fig. 16.3.25 H) .... *Kovalevskiella*

u0815 3′ Each valve with two dorsomedian sulci (Fig. 16.3.25 I) .... *Frambocythere*

ARTHROPODA: OSTRACODA



0135 **FIGURE 16.3.26** Key characteristics of genera of the Loxoconchidae and Leptocytheridae.



f0140 **FIGURE 16.3.27** Scanning electron microscopy (A–P) and high resolution video microscopy (Q–S) images of freshwater ostracods. (A and B): *Darwinula*, adult female carapace left side (A) and ventral (B); (C and D): *Ilyocypris* adult female RV external: (C) and internal (D); (E and F): *Candonocypris*, adult female RV internal and carapace dorsal (F); (G and H): *Eucypris*, adult female carapace left side: (G) and dorsal (H); (I) *Potamocypris*, adult female carapace left side; (J) *Candona*, adult female carapace right side; (K and L): *Metacypris*, adult female carapace left side (K) and dorsal (L); (M–P): *Limnocythere*, tuberculate adult female RV external (M) and carapace dorsal (N), nontuberculate adult female LV external (O) and tuberculate male LV external (P); (Q): *Scottia*, two live adult females; (R) *Candonopsis*, live adult male; (S) *Darwinula*, five live adult females with eggs or juveniles in the brood chamber.

ARTHROPODA: OSTRACODA

s0140 Ostracoda: Cytheroidea: Loxoconchidae: Genera

u0820	1	Hinge gongylodont (bilobate teeth anteriorly in LV and posteriorly in RV)	2
u0825	1′	Hinge henodont (single posterior tooth in RV) (Figs. 16.3.26 A–C)	*Pseudolimnocythere*
u0830	2(1)	RV median hinge bar crenulate (Figs. 16.3.26 D, E)	*Loxoconcha*
u0835	2′	RV median hinge bar smooth (Figs. 16.3.26 F–H)	*Cytheromorpha*

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Non-Print Items

Abstract
An updated taxonomic review of Ostracoda present in the Palaearctic is presented in this chapter. Dichotomous identification keys to the lowest justifiable taxonomic level based on the most recent literature are provided. These are coupled with the necessary material preparation methods, defined relevant morphological terms, and current limitations in our knowledge of the group. Additional information on the "Ecology and General Biology" of this group can be found in Volume I of this book series.

Keywords:
Mussel shrimp; Ostracoda; Palaearctic; Seed shrimp.