

A key to the eggs of stick and leaf insects (Phasmida)

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ABSTRACT. An illustrated key is provided for the identification of the eggs of fifty-eight genera of Phasmida.

Introduction

The eggs of stick and leaf insects are large and of very varied form. It was suggested over a century ago (Kaup, 1871) that these eggs might be taxonomically valuable and the suggestion has been re-echoed a number of times since, but has not yet been seriously taken up. A reason for this is that so many species of this order are known from museum specimens only and only very rarely are these associated with eggs. A number of obviously phasmid eggs are known in various collections which cannot be associated with any adult (although I have examined a number of these they have been omitted from the key).

In the course of studying this order I have been able to examine the eggs of seventy-five known species, and these together with descriptions and figures of fifty-three other species from the literature have been used as the basis for the key. The key contains sixty genus forms, representing fifty-eight genera as constituted at present. In nearly all cases the eggs associated with any one genus are remarkably constant in their form and it seems reasonable to suggest that eventually the morphology of the egg will form part of the criteria of the various genera in this order. Only in the cases of *Phyllium* and *Baculum* were more than one egg form found in the genus. The two *Phyllium* forms match up with the subgenera *Phyllium* and *Pulchriphyllium*. The six species of *Baculum* whose eggs are known fall into two groups, the egg morphology suggesting that

two separate genera are involved, but as yet no suggestion is made for splitting this genus.

The descriptive terminology in the key is based on three earlier papers (Clark, 1976a, b, 1978) and the essential elements are illustrated in Fig. 1. Before each genus name is given the lowest taxonomic group (family, subfamily or tribe) from the most recent summary of the classification of this order (Bradley & Galil, 1977), with the exception of retaining Phibalosomatinae (for their Cladomorphinae), the genus *Phibalosoma* being also retained. Each genus form is illustrated (Figs. 2-60) by outline drawings of selected species. These drawings are original except where indicated. In constructing the key, where a discrepancy has appeared between an earlier published description and personal observation of the same alleged species the earlier description has been taken to be in error.

Key to eggs

- 1 Capsule clearly adhesive on ventral surface: opercular angle strongly positive 2
 Capsule non-adhesive (no distinct difference in texture of ventral surface) 8
- 2 Capsule length and width roughly equal; adhesive to adjacent eggs anteriorly and posteriorly: operculum displaced to dorsal surface . . (Prisopodini)
 Prisopus (Fig. 2)
 Capsule length to width ratio high; each egg separate: operculum still anterior 3
- 3 Micropylar plate raised above dorsal surface . . . 4
 Micropylar plate not raised 7
- 4 Micropylar plate elongate, more than half of capsule length (Necrosiinae)
 Pseudosemyle (Fig. 3)
 Micropylar plate small, roughly lozenge-shaped . 5

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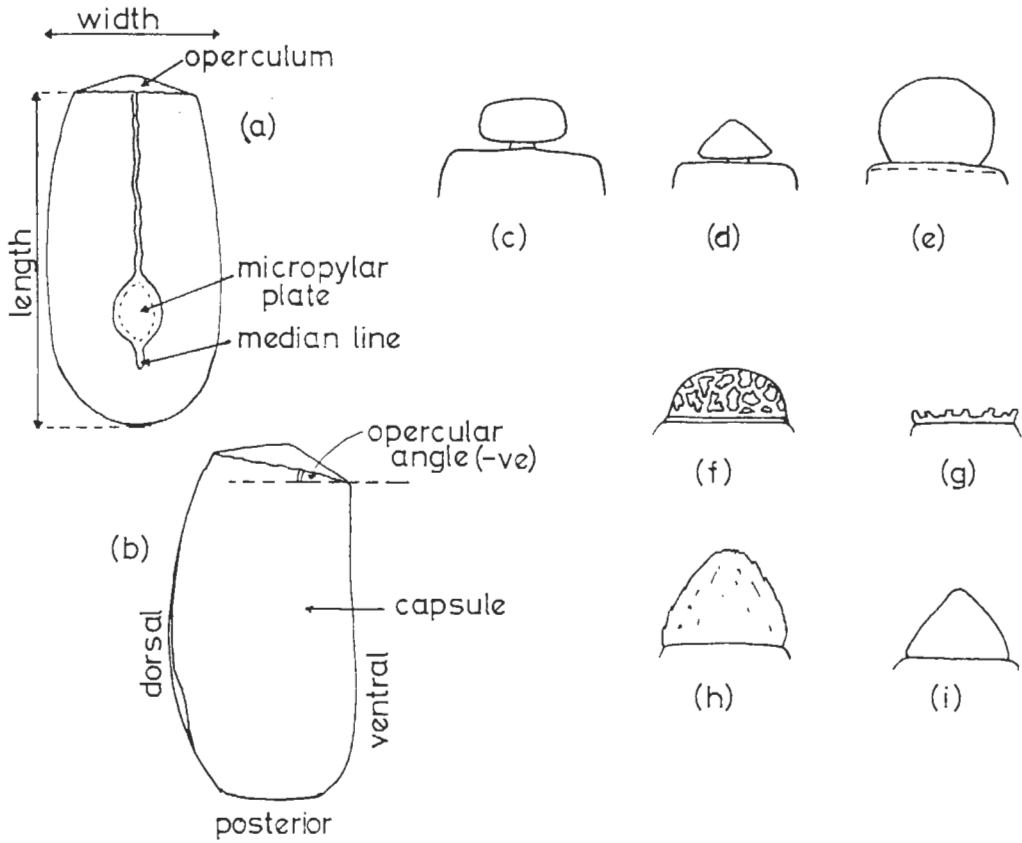
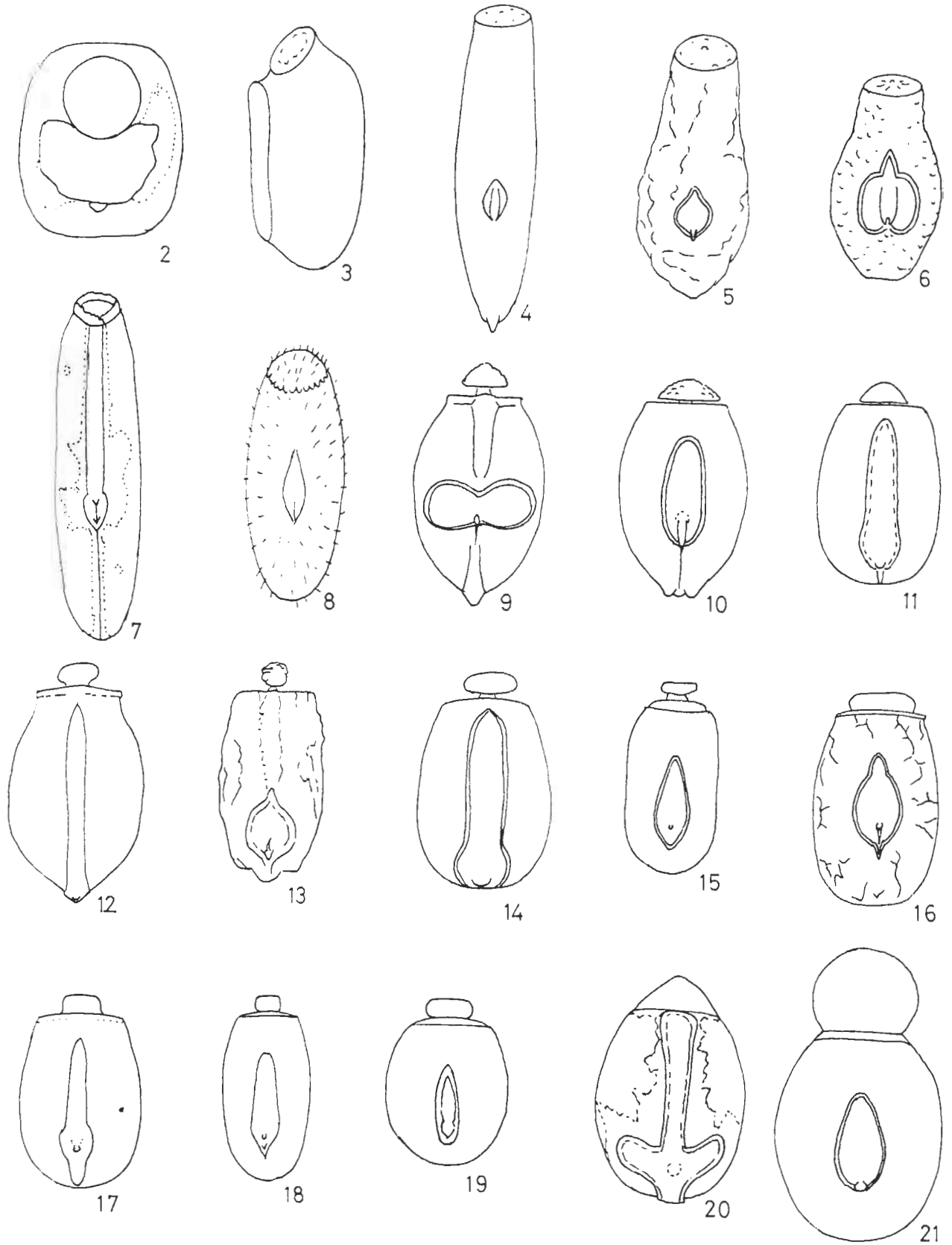


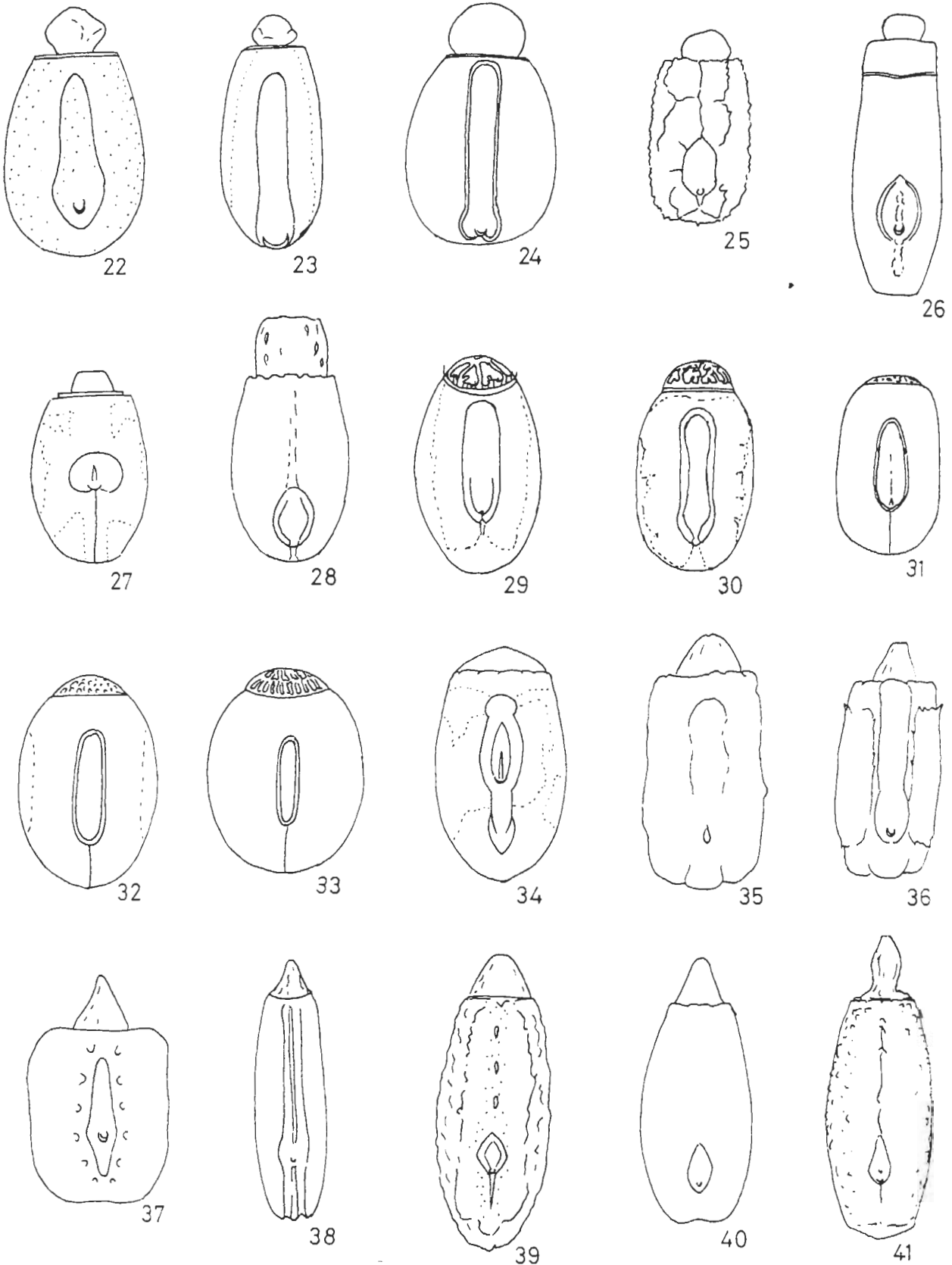
FIG. 1 (a, b) General views of egg (*Micrarchus*): (a) dorsal view, (b) lateral view. (c-i) Various anterior shapes: (c) stalked discoidal capitulum (*Anchiale*), (d) stalked conical capitulum (*Myronides*), (e) unstalked spherical capitulum (*Euryncema*), (f) open capitulum covering entire opercular surface (*Calynda*), (g) raised opercular rim (*Entoria*), (h) conical operculum (*Graeffea*), (i) conical hollow closed capitulum (*Clitarchus*).

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|---|---|
| <p>5 Capsule surface smooth; length/width ratio c. 5:1 (Palophinae) <i>Ischnopoda</i> (Fig. 4)
 Capsule surface corrugated; length/width ratio below 5:1 6</p> <p>6 Capsule length greater than 6 mm; micropylar plate pointed posteriorly (Palophinae) <i>Palophus</i> (Fig. 5)
 Capsule length less than 5.5 mm; micropylar plate notched posteriorly (Palophinae) <i>Bactrododema</i> (Fig. 6)</p> <p>7 Micropylar plate extending to opercular rim, which is raised; capsule smooth (Ramulini) <i>Phthoa</i> (Fig. 7)
 Micropylar plate shorter; operculum and capsule with fine spines (Necroschiinae) <i>Sipyloidea</i> (Fig. 8)</p> <p>8 Distinct capitulum, either stalked or otherwise clearly separate from operculum 9
 Capitulum absent or, if present, extends over whole of operculum 26</p> <p>9 Capitulum on distinct stalk 10
 Capitulum attached directly to operculum 16</p> <p>10 Capsule with strong dorsal and ventral ribs; micropylar plate figure-8 shaped . . . (Pharnaciini) <i>Pharnacia</i> (Fig. 9)</p> | <p>Capsule without obvious ribs or micropylar plate this shape 11</p> <p>11 Capitulum roughly conical 12
 Capitulum discoid or spherical 13</p> <p>12 Posterior polar mound with prominent pits (Lonchodini) <i>Lonchodes</i> (Fig. 10)
 No polar mound (Lonchodini) <i>Myronides</i> (Fig. 11)</p> <p>13 Capsule with raised ribs 14
 Capsule not ribbed 15</p> <p>14 Capsule with prominent dorsal and ventral ribs, each indented; micropyle very near posterior pole (Phasmatini) <i>Anchiale</i> (Fig. 12)
 Capsule with a number of raised rib-like lines; micropyle clearly dorsal (Phasmatini) <i>Ctenomorpha</i> (Fig. 13)</p> <p>15 Micropylar plate broad at posterior end . . . (Phasmatini) <i>Cyphocrania</i> (Fig. 14)
 Micropylar plate pointed anteriorly and posteriorly (Tropidoderini) <i>Didymuria</i> (Fig. 15)</p> <p>16 Capitulum with central pit or button 17
 Capitulum lacking central structure 20</p> <p>17 Distinct central capitular button . . . (Pharnaciini) <i>Hermarchus</i> (Fig. 16)
 Central capitular pit or depression 18</p> |
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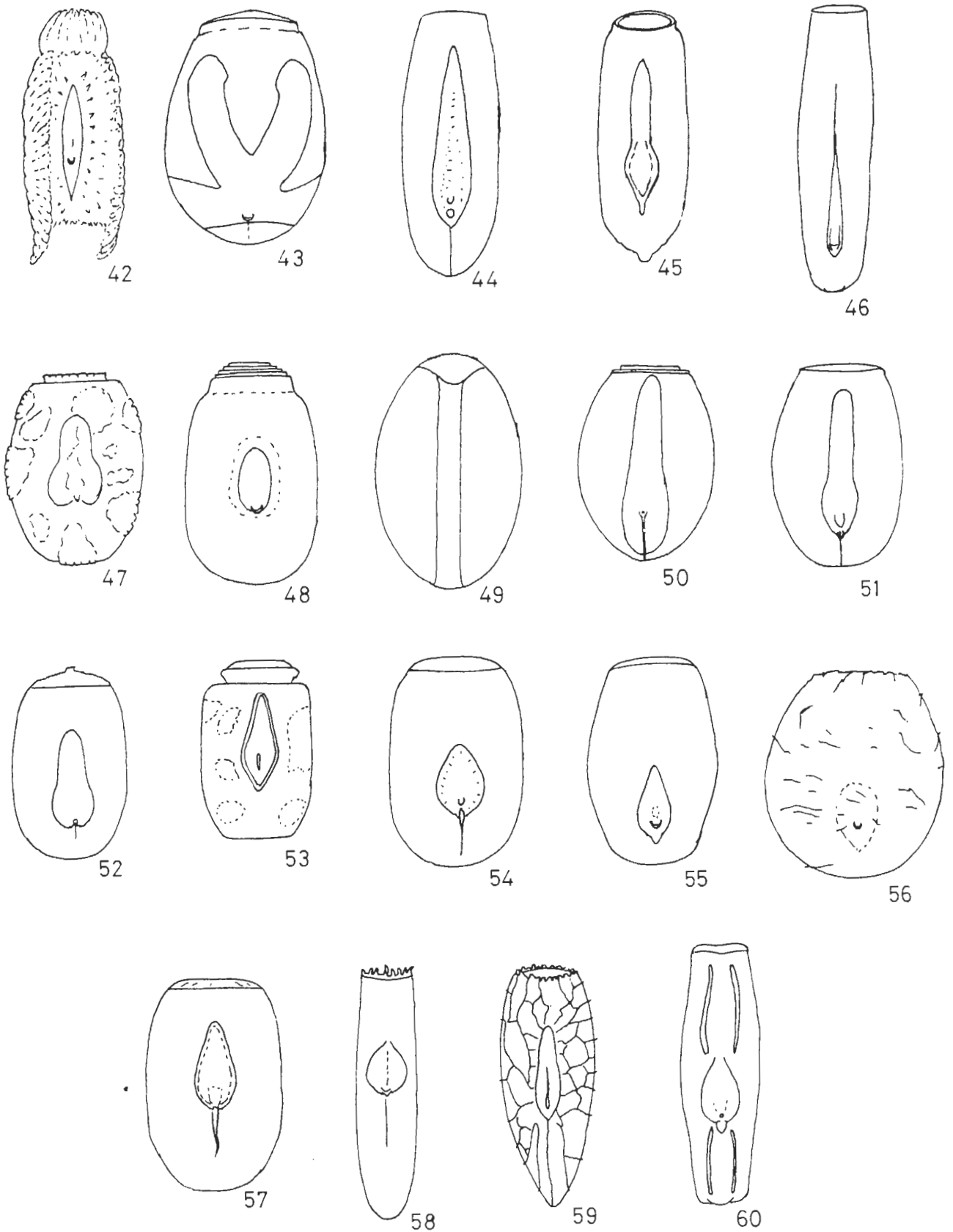
- 18 Capitulum meets operculum perpendicularly (Pharnaciini) *Gigantophasma* (Fig. 17)
 Capitulum constricted where it meets operculum 19
- 19 Capsule length/width ratio c. 2:1 . . . (Lonchodini) *Phraortes* (Fig. 18)
 Capsule length/width ratio much below 2:1 (Lonchodini) *Carausius* (Fig. 19)
- 20 Micropylar plate abruptly expanded at micropyle; capitulum hollow, often collapsed; capsule surface glossy black/yellow pattern. (Tropidoderini) *Extatosoma* (Fig. 20)
 Micropylar plate not abruptly expanded 21
- 21 Capitulum large (greater than 1 mm), smooth and spherical . . . (Phasmatini) *Eurycnema* (Fig. 21)
 Capitulum not spherical, or if so then small and corrugated 22
- 22 Capitulum corrugated 23
 Capitulum smooth 24
- 23 Capsule and operculum pitted. (Phasmatini) *Acrophylla* (Fig. 22)
 Capsule and operculum not obviously pitted (Phasmatini) *Ctenomorphodes* (Fig. 23)
- 24 Micropylar plate less than half capsule length, roughly biconvex 25
 Micropylar plate over half capsule length, roughly parallel-sided. . . . (Phasmatini) *Vetilia* (Fig. 24)
- 25 Capsule with raised lines (Tropidoderini) *Podacanthus* (Fig. 25)
 Capsule without conspicuous raised lines (Tropidoderini) *Tropidoderus* (Fig. 26)
- 26 Black cylindrical pseudocapitulum . . . (Baculini) *Baculum* (i) (Fig. 27)
 No black opercular structure 27
- 27 Operculum entirely covered by open capitular structure 28
 No hollow open structure 33
- 28 Capitulum almost cylindrical (Hemipachymorphini) *Tectarchus* (Fig. 28)
 Capitulum dome-shaped 29
- 29 No obvious median line; capsule with distinctly marked patches either side of micropylar plate. 30
 Obvious median line; capsule not so marked 31
- 30 Fine cirri at edge of operculum . (Heteronemiini) *Diapheromera* (Fig. 29)
 No cirri. . . . (Heteronemiini) *Calynda* (Fig. 30)
- 31 Capsule almost parallel-sided . (Phibalosomatini) *Clonistria* (Fig. 31)
 Capsule sides rounded 32
- 32 Distinct shiny patches on side of somewhat flattened capsule (Phibalosomatini) *Phibalosoma* (Fig. 32)
 No shiny patches; capsule without flattening (Phibalosomatini) *Bacteria* (Fig. 33)
- 33 Operculum or capitulum conical, or with centre raised at least half the opercular width 34
 Operculum or capitulum otherwise 41
- 34 Lateral view of capsule shows dorsal notch; hollow closed capitular structure 35
 No clear dorsal notch; cellular opercular structure 37
- 35 Micropyle in notch 36
 Micropyle on raised micropylar plate (Acanthoxylini) *Clitarchus* (Fig. 34)
- 36 Micropylar plate obscure. (Acanthoxylini) *Argosarchus* (Fig. 35)
 Micropylar plate distinct, continuous with dorsal rib. . . . (Acanthoxylini) *Acanthoxyla* (Fig. 36)
- 37 Capsule with 5 ribs; large pits (Phylliidae) *Phyllium* (i) (Fig. 37)
 Capsule with 0–3 ribs; pits when present are small 38
- 38 Capsule very flattened (Platycraninae) *Acanthograeffea* (Fig. 38)
 Capsule not obviously flattened. 39
- 39 Capsule with three ribs; pitted. . . (Platycraninae) *Graeffea* (Fig. 39)
 Capsule without ribs; pits may be present 40
- 40 Operculum smoothly conical; capsule smooth (Platycraninae) *Megacrania* (Fig. 40)
 Operculum rod-like; capsule rough-surfaced (Platycraninae) *Ophicrania* (Fig. 41)
- 41 Operculum and capsule covered with long feathery processes . . . (Phylliidae) *Phyllium* (ii) (Fig. 42)
 No feathery processes 42
- 42 Micropylar plate extended into X-shaped cross (Heteropterygini) *Heteropteryx* (Fig. 43)
 Micropylar plate not cross-shaped. 43
- 43 Capsule length/width ratio greater than 2:1 44
 Capsule length/width ratio less than 2:1 49
- 44 Operculum with raised toothed rim 45
 Operculum without raised rim 46
- 45 Capsule almost cylindrical; micropylar plate almost circular. . . . (Baculini) *Entoria* (Fig. 58)
 Capsule bullet-shaped; micropylar plate elongated (Necrosiinae) *Orxines* (Fig. 59)
- 46 Capsule with marked longitudinal grooves on either side of dorsal and ventral midlines (Baculini) *Baculum* (ii) (Fig. 60)
 Capsule without such grooves 47
- 47 Strongly negative opercular angle . . . (Ramulini) *Leptynia* (Fig. 44)
 Opercular angle near zero 48
- 48 Capsule constricted behind operculum (Menexini) *Ilyrtacus* (Fig. 45)
 Capsule almost cylindrical (Menexini) *Brachyrtacus* (Fig. 46)
- 49 Operculum with raised toothed rim (Hesperophasmatini) *Diapherodes* (Fig. 47)
 Operculum without toothed rim 50
- 50 Capsule constricted behind operculum; operculum a series of raised rings. . . . (Cladoxerini) *Bactridium* (Fig. 48)
 Capsule not constricted 51



FIGS. 2–21. Dorsal outlines of Phasmid eggs (Fig. 3 dorso-lateral): 2, *Prisopus*; 3, *Pseudosermyle* (after Caudell); 4, *Ischnopoda*; 5, *Palophus*; 6, *Bactrododema*; 7, *Phthoa*; 8, *Sipyloidea*; 9, *Pharnacia*; 10, *Lonchodes*; 11, *Myronides*; 12, *Anchiale*; 13, *Ctenomorpha* (after Key); 14, *Cyphocrania*; 15, *Didymuria* (after Key); 16, *Hermarchus*; 17, *Gigantophasma*; 18, *Phraortes* (after Yasumatsu); 19, *Carausius*; 20, *Extatosoma*; 21, *Eurycnema*.



FIGS. 22-41. Dorsal outlines of Phasmid eggs. 22, *Acrophylla*; 23, *Ctenomorphodes*; 24, *Vetilia*; 25, *Podacanthus* (after Key); 26, *Tropidoderus* (after Key); 27, *Baculum* (type i); 28, *Tectarchus*; 29, *Diapheromera*; 30, *Calynda*; 31, *Clonistria*; 32, *Phibalosoma*; 33, *Bacteria*; 34, *Clitarchus*; 35, *Argosarclus*; 36, *Acanthoxyla*; 37, *Phyllium* (type i); 38, *Acanthograeffea* (after Yasumatsu); 39, *Graeffea*; 40, *Megacrania*; 41, *Ophicrania*.



FIGS. 42–60. Dorsal outlines of Phasmid eggs. 42, *Phyllium* (type ii); 43, *Heteropteryx*; 44, *Leptynia*; 45, *Hyrtacus* (after Key); 46, *Brachyrtacus*; 47, *Diapherodes*; 48, *Bactridium*; 49, *Aschiphasma*; 50, *Bacillus*; 51, *Clonopsis*; 52, *Pachymorpha* (after Key); 53, *Micadina* (after Yasumatsu); 54, *Eurycantha*; 55, *Karabidion*; 56, *Cotylosoma*; 57, *Anisomorpha*; 58, *Entoria* (after Yasumatsu); 59, *Orxines*; 60, *Baculum* (type ii).

- 51 Micropylar plate extending most or all of capsule length; micropylar plate almost parallel-sided . 52
 Micropylar plate much shorter than capsule length, not parallel-sided 54
- 52 Operculum very elongated dorso-ventrally; no median line; micropylar plate may extend ventrally (Aschiphasmatinae)
Aschiphasma (Fig. 49)
 Operculum circular; micropylar plate with median line 53
- 53 Operculum with raised pattern (Bacillini)
Bacillus (Fig. 50)
 Operculum without such a pattern . . . (Bacillini)
Clonopsis (Fig. 51)
- 54 Operculum raised to a central point 55
 Operculum not centrally pointed 56
- 55 Micropylar plate almost circular (Pachymorphini)
Micrarchus (Fig. 1)
 Micropylar plate indented at rear
 (Pachymorphini) *Pachymorpha* (Fig. 52)
- 56 Operculum stepped up beyond rim (Necrosiinae)
Micadina (Fig. 53)
 Operculum smoothly continuous with capsule 57
- 57 Large egg, at least 6 mm long 58
 Smaller egg, less than 5 mm long 59
- 58 Over 8 mm long; obvious median line
 (Eurycanthinae) *Eurycantha* (Fig. 54)
 Less than 7 mm long; obscure median line
 (Eurycanthinae) *Karabidion* (Fig. 55)
- 59 Almost globular; surface with matted hairs; obscure micropylar plate. (Xeroderinae)
Cotylosoma (Fig. 56)
 Length/width ratio at least 4:3; no surface hairs; obvious micropylar plate. (Anisomorphini)
Anisomorpha (Fig. 57)

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