A critical examination of the status of the families *Cephaloidae* and *Melandryidae* based on larval and imaginal similarities and differences including comments on *Stenocephaloon metallicum* Pic.

(Coleoptera)

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Dr. Nodoka Hayashi has been kind enough to send me some reprints of his papers on the larvae of Japanese Coleoptera, and in one of them he describes the larva of a monotypic genus, *Stenocephaloon* Pic and *S. metallicum* Pic, and states, "... this genus has been confused in its systematic position, being placed in the *Cephaloidae* or in the *Melandryidae*. Having examined the larvae of both genera *Cephaloon* and *Stenocephaloon* I am inclined to the opinion that *Stenocephaloon* might as well be placed in the *Melandryidae*" (Hayashi, 1963, pág. 110). This is not, however, the view held by Crowson (1966) or myself.

In this paper, I shall review the distinctions between the two families — *Cephaloidae* Le Conte, 1862 and *Melandryidae* Leach, 1815 including *Serropalpidae* Latreille, 1825 — and their distinguishing characters in both the adult and larval stages with a view to help solving or settling the problem, besides calling attention to the existing gaps in our knowledge on the subject.

Characters of Adults.

1. Habits. Known Cephaloids are floricolous, while Melandryids are usually found under bark.

2. Shape. Usually Cephaloids are elongate, convex, somewhat fusiform — resembling a Cerambycid beetle, while Melandryids are described as elongate, convex, slender to somewhat broadened.


10. Antennae inserted under lateral expansions or ridges of frons in *Cephaloidae* but not in *Melandryidae*.

11. Apex of mandible. *Cephaloidae*: acute, sub-serrate internally with broad membrane from along the basal half. *Melandryidae*: simple or bifid, acute or blunt.


14. Eyes small in both, also markedly lateral in *Cephaloidae*.

15. Eyes both entire and emarginate in them.

16. Eyes finely-faceted in *Cephaloidae*. *Melandryidae*: ?

17. Neck wide in both.

18. Cervical sclerites not recorded in both.

19. Pro-coxal or front coxal cavity externally or visibly open in both.

20. Pro-coxal cavity internally open in *Cephaloidae* but closed in *Melandryidae* —with rare exceptions—.

21. Pro-coxae without substantial concealed lateral expansions in *Melandryidae*. *Cephaloidae*: ?

22. Pro-coxae transverse and non-projecting in both.
23. Pro-coxae prominent, conical and not separated by a flat intercoxal process with lateral extensions behind coxae in Melandryidae. Cephaloidae:  
24. Pro-coxae externally contiguous in Cephaloidae and not in Melandryidae. 
25. Pro-coxae internally contiguous in Melandryidae. Cephaloidae:  
26. Prothorax non-Bostrichoid in both. 
27. Prothorax with distinct side borders in Melandryidae but without in Cephaloidae. 
28. Pronotum not apically flanged in both. 
29. Pro-pleura without grooves for receiving antennae in both. 
30. Trochantins of pro-coxae exposed in Cephaloidae and concealed in Melandryidae. 
31. Trochantins of meso-coxae exposed in both. 
32. Meso-coxal cavities open in both. 
33. Meso-coxae completely separated by intercoxal process of sternum in Melandryidae but not in Cephaloidae. 
34. Mes-episterna meeting or not in front of mesosternum in both. 
35. Tarsal formula 5-5-4 in both. 
36. Penultimate segment of tarsi simple in both—but in some Melandryidae front tarsus has it bilobed—. 
37. Ante-penultimate segment of tarsi simple in both. 
38. Tarsal claws with Meloid-like ventral blade or fleshy lobe in Cephaloidae but not in Melandryidae. 
39. Tibial spurs simple in Cephaloidae and serrate in Melandryidae. 
40. All trochanters heteromeroid in both. 
41. Legs rarely with groups of spinules in Melandryidae but never in Cephaloidae. 
42. Elytra without vein-like ribbings in both. 
43. Apices of elytra simple and similar in the two sexes in both. 
44. Elytra without distinct pseudopleura or epipleural fold in Melandryidae. Cephaloidae:  
45. Meta-sternum not spinous in the male in both. 
46. Meta-coxae contiguous and not widely separated in both. 
47. Internal keel of hind or meta-coxa both reduced and long in Melandryidae. Cephaloidae:  
48. Hind-wings with sub-cubital flecks in Melandryidae but not in Cephaloidae.
49. Wings with closed radial cells in *Cephaloidae*. *Melandryidae*: ?

50. Wings with closed anal cells in *Cephaloidae*. *Melandryidae*: ?

51. Apparent number of anal veins 5 in both.

52. Mes-endosternite with the arms distinctly branched or not in *Melandryidae*. *Cephaloidae*: ?

53. Type of furca or met-endosternite: Hylecoetoid in both.

54. Met-endosternite with long stalk in both.

55. Met-endosternite with laminae in *Cephaloidae*, but both with and without one in *Melandryidae*.

56. Met-endosternite with the anterior tendons far apart in both.

57. Met-endosternite with the anterior tendons arising from the body of furca in *Cephaloidae*, but on arms or body in *Melandryidae*.

58. Met-endosternite without an anterior median projection in front of arms in *Cephaloidae*, both with and without in *Melandryidae*.

59. Number of visible abdominal sternites 5 in both.

60. All abdominal sternites free in both.

61. Aedeagus usually normal Heteromeroid in *Melandryidae*. *Cephaloidae*: ?

62. Tegmen with the parameres or lateral lobes fused in *Melandryidae*. *Cephaloidae*: complex in *Nematopus* and ? possibly free in all.

63. Number of median struts in the median lobe: 1 in *Melandryidae*. *Cephaloidae*: ?

64. Ovipositor long and tubular in both.

65. Number of segments in the coxite of ovipositor: 1 in *Cephaloidae*, 2 in *Melandryidae*.

66. Abdominal appendages absent in both.

67. Last abdominal tergite not produced into a posteriorly directed Mordellid-like spine in both.

It is suggested that particular attention be paid to characters numbered 1, 2, 10, 12, 13, 20, 24, 27, 30, 33, 38, 39, 48 and 65 listed above in all doubtful cases to distinguish Cephaloids from Melandryids. This will also apply to *Stenocephaloon*.

Primitive and derivative alternatives of the above (and other) characters need to be discovered in almost all the families of *Heteromera* for adults as well as larvae (*vide infra*).
CHARACTERS OF LARVAE.

1. Habits. Cephaloids are found in logs of conifers and some hardwood trees, chiefly in forested areas, and in rotten wood. Melandryids are commonly found under bark of trees chiefly deciduous species, and in tree stumps or decayed logs.

2. Shape. Cephaloids: sub-cylindrical, and usually orthosomatic or weakly depressed. Melandryids: sub-cylindrical, usually orthosomatic and elongated with the abdominal region 2-3 times the length of thorax.


5. Setae —chaetotaxy—. Cephaloids: few, scattered, and fairly conspicuous on various body segments. Melandryids: few, scattered.


7. Coronal suture and frontal sutures, latter lyriform or not —together = median epicranial suture—. Cephaloids: coronal suture usually present; and frontal sutures lyriform. Melandryids: coronal suture present or absent; and frontal sutures lyriform or V-shaped.

8. Clypeal or epistomal or frontoclypeal suture. Cephaloidae: absent. Melandryidae: present or absent, so that in some Melandryids frons and clypeus are not fused.

9. Clypeolabral suture present in Cephaloids and Melandryids.


14. Sensory appendix or sensorium or tactile papilla or accessory

15. Third antennal segment usually half or less longer than second segment in both.

16. Number of antennal segments 3 in both.

17. Antennal insertion not separated from base of mandible by a visible strip in Melandryidae and ? Cephaloidae.

18. Mandibles symmetrical and asymmetrical in both.

19. Mandibular mola present in Cephaloidae; present or absent in Melandryidae.

20. Mola neither asperate nor with tubercles in both.

21. Armament of mola not extending ventrally in both.

22. Mola usually with fine transverse ridges in Cephaloidae, absent in Melandryidae.

23. Fleshy or setose post-molar appendage and penicillus absent in both.

24. Retinaculum present and absent in both.

25. Mandible without multi-dentate or multi-lobed cutting edge along inner dorsal margin in Melandryidae and ? Cephaloidae.

26. Maxillary cardo divided or bi-partite in Cephaloidae and some Melandryidae (not all).


28. Mala with uncus —non dentate, spine or hook-like— both present and absent in Cephaloidae and Melandryidae.

29. Ligula present in both.

30. Gula not distinct from submentum, the two being fused in both.

31. Number of leg segments and claws normal in both.

32. Prothorax longer than meso- and meta-thorax in both.

33. Prothorax not wider than other thoracic segments in both.

34. Abdominal segments 10 in both.

35. Ninth abdominal sternite without asperities in both.

36. Ninth sternite not composed of a series of small plates in both.

37. Ninth sternite not broad and flat plate-like in both.


39. Urogomphi simple and unbranched in both.

40. Urogomphi widely separated at base in Cephaloidae. Melandryidae: both widely and narrowly separated at base.
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41. Tenth sternite not produced into pseudopods in both, with some exceptions already known in Melandryidae.
42. Spiracles annular-biforous in both.
43. Spiracles not cribiform in both.
44. Spiracles not provided with a series of small peripheral tubes in both.

From the above analysis of the characters of known larvae of Cephaloidae and Melandryidae, it is obvious that the two families can not be satisfactorily distinguished in the larval stage at present. This means that on the basis of the known larval characters alone Stenocephaloon can not be placed in Melandryidae (as was done by Hayashi, 1963, pág. 110) or in Cephaloidae as implied by Crowson (1966, pág. 508): "The larva of Stenocephaloon according to the description of Hayashi, and the adult of S. metallicum Pic, of which I have examined the type from the Paris Museum, agree with Synchroidae and Cephaloidae in the characters which I regard diagnostic, though Hayashi referred the genus to Melandryidae". Crowson (1966), however, did not mention the characters which he regards as diagnostic, and I have shown you in the above analysis that there are none in the larvae discovered so far that could be satisfactorily used to distinguish the two families.

Under the circumstances, it is a matter of common sense and wisdom to give more weight to the imaginal distinguishing characters discussed earlier [vide supra]. If Crowson (1966, pág. 508) is correct in observing the first 4 ventrites (or abdominal sternites) connate in Synchroidae, then that alone is an important diagnostic character absent in all known Cephaloidae and Melandryidae. Assuming that all the visible abdominal sternites are free in Stenocephaloon, its natural place will be sought in Cephaloidae or Melandryidae now. I have already mentioned about 14 imaginal characters [numbered as 1, 2, 10, 12, 13, 20, 24, 27, 30, 33, 38, 39, 48, and 65] that could be considered diagnostic and distinguishing when taken together to separate all Cephaloids from all known Melandryids. I shall particularly mention one of them which I observed in 1959 working in America on Nematooplus —formerly wrongly placed in Anthicidae, Pedilinae— and immediately suspected it to be a member of Cephaloidae which was subsequently confirmed by other observations: all Cephaloids have a Meloid-like ventral blade or fleshy appendage below the claw (which is absent in all known Melandryids and Synchroids). I suspect that this fleshy lobe is present be-
low the tarsal claw in *Stenocephaloon*, and hence it is a member of *Cephaloidea* and not *Melandryidae*, which could be confirmed (*vide* Abdullah, 1965, *Entomologist*, 98, pág. 54). The distinguishing characters of all the families of *Heteromera* (*Cucujoidea*) and a key for the world will be presented elsewhere (*vide* Abdullah, 1974).

**Resumen.**

Se han revisado las semejanzas y diferencias entre *Cephaloidea* y *Melandryidae* y se mantiene el status de familia separado, dando más importancia a los caracteres determinantes; al mismo tiempo se mencionan las semejanzas [especialmente entre las formas larvarias de las dos familias], pues son muy necesarias para todas las consideraciones y evaluaciones sobre homología o convergencia, relativas a los estudios futuros sobre su filogenia. El autor deduce que *Stenocephaloon meta
talicum* Pic [o cualquier otra dudosa especie de coleóptero] puede ser situada satisfactoriamente en una familia o en otra, basándose sólo como diagnóstico en los caracteres del adulto mencionados; también aventura [apoyándose en su experiencia con *Nematopus*] que *Stenocephaloon* es un coleóptero cefaloide, ya que los caracteres que él descubrió para diagnosticarlo o diferenciarlo están comprobados y aunque los caracteres larvarios conocidos no son decisivos a este respecto [si bien resulten útiles para poner de manifiesto posibles relaciones filogenéticas].

**Abstract.**

Similarities and differences between *Cephaloidea* and *Melandryidae* are reviewed, and separate family status maintained giving the imaginal distinguishing characters more weight while the similarities (particularly among the larval forms of the two families) are mentioned because they are highly needed in all considerations and evaluations of homology or convergence in all future studies on their phylogeny. The author concludes that *Stenocephaloon metallicum* Pic (or any other doubtful beetle species) can satisfactorily be placed in one family or the other only on imaginal characters listed as diagnostic by the author, who predicts (basing on his experience with *Nematopus*) that *Stenocephaloon* will also prove to be a Cephaloid beetle, provided that the characters that he discovered as diagnostic or distinguishing are checked, and that the known larval characters are indecisive in this respect (although they are much useful in discovering possible phylogenetic relationship).

**References.**

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