Three eucnemid genera and species are recognized for the first time from Korea: *Euryptychus vicinus* Fleutiaux, 1923, *Fornax consobrinus* Hisamatsu, 1963, and *Feaia nipparensis* (Hisamatsu, 1957) new combination (= *Heterotaxis nipparensis* Hisamatsu, 1957). A key to species, diagnoses, redescriptions, and photographs of diagnostic characters are provided for known Korean species.

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### Keywords:
- Taxonomy
- Macraulacinae
- Eucneminae
- *Feaia*
- New combination
- Korea

### Introduction

The subfamily Macraulacinae *Fleutiaux*, 1923 (Coleoptera: Eucnemidae) is comprised of 942 species belonging to 103 genera in eight tribes worldwide (Muona, 1993, 2011). Among them, 35 species of 15 genera in four tribes have been presented in Palaearctic region (Muona, 2007). Up to now, only one species of Macraulacinae, *Dromaeolus marginatus* Hisamatsu, 1965, has been known from the Korean peninsula (Suzuki, 2014). Another subfamily Eucneminae *Eschscholtz*, 1829 consists of 178 genera and 36 species worldwide, including 12 Palaearctic species of four genera (Muona, 1993, 2007, 2011). No Eucnemine beetle was previously known from Korea.

Macraulacinae is characterized by deep basally open lateral antennal grooves and rows of spines on lateral surfaces of meso- and metatibiae. The great majority of Macraulacine genera have males with basal sex-combs on first protarsomere. All Korean species belong to such genera. Eucnemine species have deep lateral antennal grooves and superficially they resemble Macraulacinae species. Contrary to these, they never have sex-combs on first protarsomere of male and lack tibial spine-rows. Also, they can be differentiated from Macraulacine species by basally closed or constricted, often very deep lateral antennal grooves. Both the male and female genitalia and the larval structure are very different from those of Macraulacinae (Muona, 1993, 2000; Muona and Teräväinen, 2008; Otto and Gruber, 2016).

In this study, we review Korean Macraulainae with two unrecorded species, *Euryptychus vicinus* Fleutiaux, 1923 and *Fornax consobrinus* Hisamatsu, 1963. Also, we add *Feaia nipparensis* (Hisamatsu, 1957) new comb., originally placed in the genus *Heterotaxis* Bonvouloir, 1871 of Macraulacinae. *H. nipparensis* should be transferred to the genus *Feaia*, based on following characters: basally constricted antennal grooves; meso- and metatibia without rows of spines; male protarsomere 1 without sex-comb; fifth abdominal ventrite pointed in male, truncate in female; highly modified aedeagus. Because of the original descriptions for each species are insufficient, they are redescribed in the present study. A key to species of Korean Macraulacinae and Eucneminae, diagnoses, redescriptions, and photographs of diagnostic characters are provided.

### Materials and methods

Most samples examined for this study were collected by the flight intercept trap (FIT, window trap) or with naked eye from 2015 to 2016, and stored in the insect collection of Seoul National University (SNU, Seoul, Korea). Additional materials are also available from the Korea National Arboretum (KNA, Pocheon, Korea). The abbreviations for collection localities are as follows: SL, Seoul; GG, Gyeonggi-do; GW, Gangwon-do.
Collected samples were preserved in 95% alcohol (EtoH) and made into dried specimens by double mounted method. Antennae, tarsi, of hind leg, and aedeagus were dissected with micro-pin for examination. The dried specimens were observed under a microscope, Leica SBAPO. Photographs were taken by a digital camera, CANON EOS 6D00D, through MP-E 65 mm lens. Several layers of pictures were stacked by software, Zerene Stacker 1.04, for improving the resolution.


**Systematic accounts**

**Family Eucnemidae Eschscholtz, 1829.**

**Key to the species of Korean Macraulacinae and Eucnemidae:**

1. Antennomeres 9–11 enlarged; hypomeral antennal grooves absent—**Euryptychus vicinus**
   - Antennomeres 9–11 simple; hypomeral antennal grooves well-developed laterally—2

2. Metacoxal plate strongly widened inward; apical margin of fifth abdominal ventrite more or less narrowly rounded in both sexes; male protarsomere 1 with basal sex-comb—3

   - Metacoxal plate subparallel-sided; apical margin of fifth abdominal ventrite sharply pointed in male, truncated or weakly concave in female; male protarsomere 1 without sex-comb—**Feaia nipparensis** new comb.

3. Body mostly chestnut to dark brown; basal width of metepisternum narrower than outer margin of metacoxal plate—**Fornax consobrinus**

   - Body mostly black; basal width of metepisternum wider than outer margin of metacoxal plate—**Dromaeolus marginitus**

**Subfamily Macraulacinae Fleutiaux, 1923.**

Macraulacinae Fleutiaux, 1923. Type genus: Macraulacus Bonvouloir, 1871.

**Diagnosis.** Body usually elongate; labrum attached underneath frontoclypeal region; pronotal lateral ridges complete; hypomeron with lateral antennal groove or simple; mesepimeron fused with mesepisternum; protibia with one apical spur; meso- and metatibia anteriorly tapered and oblique posteriad; hypomeron punctate as metasternum; punctate as metasternum; mostly with cirri antenna.

**Tribe Macraulacini Mamaev, 1976.**

Mamaev, 1976. Type genus: Macraulacus LeConte, 1852.

**Diagnosis.** Body elongate, slightly convex; antennomeres 9–11 enlarged, mostly longer in male than those of female; hypomeral antennal grooves absent; first protarsomere with sex-comb in male; fourth tarsomere simple; abdominal ventrites connate; median lobe of aedeagus bicuspidated at apex (Muona, 1993, 2000).

**Genus Euryptychus LeConte, 1852.**

Euryptychus LeConte, 1852. Type species: Euryptychus Say, 1836.

**Euryptychus vicinus Fleutiaux, 1923** (Fig. 1).

**Euryptychus vicinus Fleutiaux, 1923:** 324.

**Redescription. Female** 7.7–9.4 mm long and 2.2–2.8 mm wide; Body elongate, slightly convex; mostly black with orange brownish tarsi; fairly glossy and covered with yellowish gray hairs on dorsum; dull and densely pubescent with golden pubescence on ventral surface. Head transversely, moderately inserted into prothorax; mostly with circular and regular punctures, denser at frontoclypeal region; compound eyes undivided; frons with a short longitudinal groove at middle; clypeus simply rounded at apical margin, width of clypeal apex approximately twice wider than distance between antennal sockets (Fig. 1e).

Antennae enlarged apically, almost exceeding hypomeron, and covered with yellowish brown pubescence; first antennomere elongate and stout; second antennomere obconical, about 1.5 times longer than fourth; third antennomere elongate, rectangular, and as long as antennomeres 4–5 combined; antennomeres 4–8 subequal, wider than long; antennomeres 9–11 enlarged; ninth antennomere about 1.6 times longer than wide, about 1.1 times longer than tenth; apical antennomere oblong, about 1.2 times longer than previous (Fig. 1d).

Pronotum slightly convex, as long as wide, subparallel-sided, abruptly narrowed anteriad from basal three-fifth, and arcuate at anterior margin; with finer and sparser punctures than head; with a weak medio-longitudinal groove at basal half; a pair of weak dimples presented at middle of basal two-thirds; antiscutellar area slightly impressed and notched; pronotal posterior angles sharply produced posteriad, obviously exceeding antiscutellar area. Scutellum trapezoidal, as long as wide, gradually narrowed posteriad, and slightly rounded at apex; sparsely punctate; rarely pubescent. Elytra conjointly with width to length as about 1 to 2.3; parallel-sided, gradually narrowed near apices; fairly striated, with deep punctures; interstriae slightly convex; with several large and deep punctures near apices; simply rounded at apices.

Prosternum rectangular, with curved sides, and slightly widened anteriad; mostly with finer punctures than head, slightly rougher and denser at anterior and lateral regions; prosternal process narrow, gradually tapered and oblique posteriad; hypomeron punctate as prosternum; with rugose surface at posterior fossae; hypomeral antennal grooves absent (Fig. 1g). Mesosternum with rough and dense punctures; mesepimeron fused with mesepisternum, coarsely punctate, especially at posterior region. Metasternum with dense punctures than prothorax; metepisternum subparallel-sided, slightly widened posteriad, and widest width about 2.5 times wider than outer margin of metacoxal plate (Fig. 1h); metacoxal plate strongly expanded inward, mediately about five times wider than laterally (Fig. 1j). Legs fairly stout; tarsi slender; first metatarsomere about 1.2 times longer than second–fourth combined, second about 1.2 times longer than third, fifth about 1.1 times longer than second; claws simple (Fig. 1i). Abdomen strongly conrate; punctate as metasternum; fifth ventrite simply rounded at apical margin (Fig. 1f).


**Distribution.** Korea (new record), Japan, Russia (Far East).

**Remarks.** Euryptychus vicinus is similar to *E. lewisi,* but can be distinguished by length of third antennomere: third antennomere as long as antennomeres 4–5 combined in *E. vicinus,* while shorter in *E. lewisi.* A female individual was observed wandering at surface of dead tree in May.

**Tribe Macraulacini (Fleutiaux, 1923).**

Macraulacinae Fleutiaux, 1923. Type genus: Macraulacus Bonvouloir, 1871.

**Fornaxini Cobos, 1964.** Type genus: Fornax Laporte, 1835.

**Dromaeolini Leiler, 1976.** Type genus: Dromaeolus Kiesenwetter, 1858.

**Diagnosis.** Body elongate, slightly convex; antennomeres 4–10 subequal; hypomeral antennal grooves well-developed laterally, basally...
open; first protarsomere with sex-comb in male; fourth tarsomere dilated and bilobed; abdominal ventrites connate; median lobe fused with lateral lobes (Muona, 1993, 2000).

**Genus Dromaeolus Kiesenwetter, 1858.**

_Dromaeolus_ Kiesenwetter, 1858. Type species: *Eucnemis barnabita* A. Villa and J. B. Villa, 1838.

_Megathambus_ Reitter, 1911. Type species: *Dromaeolus moronita* Bonvouloir, 1871.

_Melanus_ Broun, 1881. Type species: *Melanus sculptus* Broun, 1881.  

**Diagnosis.** Body oblong or elongate, fairly convex; antennae slightly exceeding pronotum, various in form, filiform to serrate; second antennomere shortest or as long as fourth; antennomeres 3–10 weakly toothed at least in male; apical antennomere oblong; pronotum slightly wider than long, strongly sinuated at base; hypomeral antennal grooves well-developed laterally or simple; basal width of metepisternum wider than outer margin of metacoxal plate; metacoxal plate strongly expanded inward; legs slender; fourth tarsomere dilated, slightly shorter than third, and about twice wider fifth; fifth abdominal ventrite simply rounded or pointed at apical margin (Bonvouloir, 1871; Fleutiaux, 1923; Hisamatsu, 1985; Muona, 2000).

**Dromaeolus marginatus** Hisamatsu, 1965.  

**Diagnosis.** Body elongate and slightly convex; head moderately convex; clypeus strongly narrowed basally, clypeal base about one-third as wide as distance to eye; antennae weakly serrate, exceeding pronotal posterior angles; pronotum with indistinct medio-longitudinal groove at basal half; elytral ratio of width to length as about 1 to 2.1–2.2; hypomeral antennal groove well-developed laterally; metacoxal plate strongly expanded inward; fifth abdominal ventrite weakly pointed or rounded (Hisamatsu, 1965, 1985).

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**Fig. 1.** _Euryptychus vicinus_ Fleutiaux, 1923. a–j, female. a, dorsal habitus; b, ventral habitus; c, lateral habitus; d, antenna; e, frons; f, fifth abdominal ventrite; g, hypomeron; h, metepisternum; i, metatarsi; j, metacoxal plate (scale bar for a–d: 1 mm; e–j: 0.5 mm).
Specimens examined. Korean specimens were not available for this study.

Distribution. Korea (Mt. Seorak, Ganwon-do), Japan (Hachijo Island), Taiwan.

Remarks. Suzuki (2014) reported *D. marginatus* from Korea, but we couldn’t identify this species in the present study.

Genus *Fornax* Laporte, 1835.
Filiformax Fleutiaux, 1945. Type species: *Fornax leseleuci* Fleutiaux, 1899.
Moniliformax Fleutiaux, 1945. Type species: *Fornax lambertoni* Fleutiaux, 1926.

Diagnosis. Body elongate, slightly convex, narrowed anteriad and posteriad; clypeus simply rounded or sinuate at apical margin; antennae filiform; second antennomere shortest; third antennomere elongate; antennomeres 4–10 gradually slenderized toward apex; apical antennomere strongly elongate; hypomeral antennal grooves well-developed laterally; basal width of metepisternum narrower than outer margin of metacoxal plate; metacoxal plate strongly expanded inward; fourth tarsomere short, bilobed; median lobe of aedeagus fused with lateral lobes; lateral lobes with basally attached secondary lateral lobes (Laporte, 1835; Bonvouloir, 1871; Hisamatsu, 1985; Muona, 2000).

*Fornax consobrinus* Hisamatsu, 1963 (Fig. 2).

Redescription. Male 7.1–8.9 mm long and 2.0–2.3 mm wide; Body elongate, subcylindrical, and slightly convex; wholly castaneous; with fairly glossy surface; covered with dense golden pubescence. Head transverse, moderately inserted into prothorax; mostly with circular and regular punctures, finer at frontoclypeal region; compound eyes large, well-developed, and undivided; clypeus broadly rounded at apical margin, width of clypeal apex about 2.6 times wider than distance...
between antennal sockets (Fig. 2g). Antennae filiform, almost exceeding posterior margin of metepisternum, covered with short yellowish pubescence; first antennomere elongate and stout; second antennomere obconical, shortest; third antennomere elongate, about twice longer than wide, approximately 1.5 times longer than second, and about 1.3 times longer than fourth; antennomeres 4–10 gradually lengthened and slenderized toward apex; apical antennomere strongly elongate, about five times longer than wide, and approximately 1.85 times longer than previous (Fig. 2e). Pronotum slightly convex, as long as wide, gradually narrowed anteriad, and weakly arculate at anterior margin; mostly punctate as head, finer and denser at anterior and posterior regions; antiscutellar area slightly impressed and straight; pronotal posterior angles sharply produced, distinctly exceeding posterior margin of antiscutellar area. Scutellum trapezoidal, about 1.2 times wider than long, gradually narrowed posteriorly, and almost truncated at apex; roughly punctate; densely pubescent. Elytra conjointly with width to length as about 1.2:5; subparallel-sided, gradually narrowed posteriorly; weakly striated, with irregular and shallow punctures; interstriae almost flattened; with several large and deep punctures near apices; simply rounded at apices. Prosternum quadrate, subparallel-sided, and slightly widened anteriad; with regular and sparse punctures; prosternal process stout, parallel sided, gradually tapered and declined near apex; hypomeron with more shallow and irregular punctures than pronotum; with wrinkled surface at posterior fossae; hypomeral antennal grooves well-developed laterally, basally open, slightly wrinkled, and fairly glabrous (Fig. 2j). Mesosternum roughly punctate; mesepimeron fused with mesepisternum, with scattered punctures, especially at posterior region. Metasternum with punctures as prosternum; with two pairs of longitudinal grooves at both sides of anterior margin; with a weak medio-longitudinal groove at middle, not reaching anterior margin; metepisternum subparallel-sided, gradually widened posteriorly, and widest about 1.3 times wider than outer margin of metacoxal plate (Fig. 2k); metacoxal plate strongly expanded inward, medially approximately eight times wider than laterally (Fig. 2h). Legs moderate in length; femur robust; tibiae and tarsi fairly lengthened and slenderized toward apex; apical antennomere strongly twice longer than wide, approximately 1.5 times longer than second, antennomere obconical, shortest; third antennomere elongate, about 1.1 times longer than third; antennomeres 4–10 subequal, with apical tooth, with laterally attached secondary lateral lobes; secondary antennae serrate or trilobed; antennae nearly straight; with a medio-longitudinal groove at middle, not reaching anterior margin; hypomeral antennal grooves well-developed laterally, basally closed or constricted; tarsi often delicate, male first protarsomere without sex-comb; abdominal ventrites conolate; median lobe modified (Muona, 1993; Muona & Malinen, in press).

Genus Feia Fleutiaux, 1896. Feia Fleutiaux, 1896: 540. Type species: Feia dubia Fleutiaux, 1896. Diagnosis. Body oblong, cylindrical, and strongly convex; clypeus trapezoidal, feebly trilobed or simply rounded at apical margin; antennae serrate or filiform, not exceeding pronotum; second antennomere slightly shorter than third; elytra strongly striated; hypomeral antennal grooves well-developed laterally; metepisternum strongly expanded posteriorly; metacoxal plate subparallel-sided; lateral surfaces of meso- and meta tibiae with setae; fifth ventrite truncated or beaked at apical margin (Fleutiaux, 1896; Muona, 1993; Otto, 2016).

Feia nipparesis (Hisamatsu, 1957) NEW COMBINATION (Fig. 3). Heterotaxis nipparesis Hisamatsu, 1957: 45.

Redescription. Female. 5.7–6.2 mm long and 1.9–2.1 mm wide. Body oblong, cylindrical, and strongly convex; mostly black; antennae dark brown; mouthparts, pronotal anterior margin, posterior angles, pronotal process, elytral base, and fifth abdominal ventrite tinged with ferruginous; tibiae yellowish brown; with dull surface; covered with golden pubescence. Head strongly inserted into prothorax, barely visible in dorsal view; mostly with circular and irregular punctures, finer and coarser near clypeus; frons strongly serrate; with extensive longitudinal grooves, width of clypeal apex about 1.6 times wider than distance between antennal sockets (Fig. 3e). Antennae strongly serrate, almost reaching anterior margin of metepisternum, covered with yellowish brown pubescence; first antennomere oblong, robust, and produced at apex; second antennomere obconical and shortest; third antennomere trapezoidal, as long as wide, and about 1.3 times longer than second; fourth antennomere about 1.1 times longer than third; antennomeres 4–10 subequal in length, gradually strongly toothed toward apex; apical antennomere oblong, about 2.3 times longer than wide, and about 1.7 times longer than tenth (Fig. 3d). Pronotum strongly convex, as long as wide, abruptly narrowed antennomere from basal half, and arculate at anterior margin; mostly with rougher and coarser punctures than head, slightly larger at lateral and posterior regions; with a medio-longitudinal groove in full length of pronotum, more or less indistinct near anterior margin; metasternum strongly transverse; metepisternum narrowly transverse, and widened anteriad; mostly with larger, sparser, and more regular punctures than head; prosternal process narrow, parallel-sided, and gradually declined
and pointed near apex; hypomeron with larger and rougher punctures than pro sternum; with rugose surface at posterior fossae; hypomeral antennal grooves well-developed laterally, open at posterior margin, barely punctate, and glabrous (Fig. 3g). Mesosternum with regular and dense punctures; mesepimeron fused with mesepisternum, coarsely punctate, especially at posterior region. Metasternum mostly with finer, denser, and more regular punctures than pro sternum, gradually sparser at lateral region; with a medio-longitudinal groove in full length of metasternum; metepisternum triangular, distinctly widened posteriad, and widest width about three-fifth of outside of metac oxal plate (Fig. 3h); metacoxal plate parallel-sided, slightly concave at middle (Fig. 3i). Legs moderate in length; tarsi slender; first metatarsomere as long as second–fourth combined, second about 1.3 times longer than third and as long as fifth (Fig. 3j); claws simple. Abdomen strongly con nate; with fine punctures than metasternum; each ventr ites distinctly convex at middle; fifth ventrite truncated at apical margin (Fig. 3f).

Specimens examined. <GW> 2 ♀ (SNU), Suha-ri, Daegwanryeong-myeon, Pyeongchang-gun, 14. vii. 2015, leg. J. B. Seung.

Distribution. Korea (new record), Japan.

Remarks. Feaia Fleutiaux has remained obscure ever since its description. Muona (1987) established its identity by fixing the type species. Muona (1991: 172) included five species in Feaia, but without any supporting data. Later Muona (1993: 50) discussed the question in more detail, but inadvertently did not mention Heterotaxis nip parensis.

The Korean female specimen of Feaia nip parensis differs slightly from studied Japanese ones. It has a slightly more elongated frontoclypeal region, being higher than wide, and slightly slenderer antennae. These differences can be judged better only after studying more material, especially also the males.

Adults and cadavers of F. nip parensis were observed under bark of dead Betula davurica.

Fig. 3. Feaia nip parensis (Hisamatsu, 1957). a–j: female. a, dorsal habitus; b, ventral habitus; c, lateral habitus; d, antenna; e, frons; f, fifth abdominal ventrite; g, hypomeron; h, metepisternum; i, metatarsi; j, metacoxal plate (scale bar for a–d: 1 mm; e–j: 0.5 mm).
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