

Table 1. Phylogenetic relationships among species of the three Japanese *Aphaenogaster* based on the comparison of external morphologies.

Morphological characters		Female		Male
		Worker	Queen	
Shape	Head	o∞f//s	o∞f∞s	o//f∞s
	Frontal area	o∞f//s	o∞f//s	o∞f∞s
	Frontal edge of clypeus	o∞f∞s	o∞f//s	o//f∞s
	Alitrunk	o→f→s	o∞f∞s	o//f∞s
	Petiole	o∞f∞s	o∞f∞s	o∞f∞s
	Gaster	o∞f∞s	o∞f∞s	o∞f∞s
	Wing venation	—	o→f	o→f→s
Rugosity	Head	o→f→s	o→f→s	o∞f∞s
	Alitrunk	o→f→s	o→f→s	o∞f∞s
	Petioles	o//f∞s	o∞f∞s	o∞f∞s
	Gaster	o∞f∞s	o∞s//f	o∞f∞s
Size	Body	o∞f//s	o∞f//s	o∞s//f
	Leg	o∞f//s	o∞f//s	o∞s//f

o: *osimensis*, f: *famelica*, s: *smythiesi*, ∞: Similar character states, //: Remarkably different character states, →: Transient character states.

f∞s, 3) o∞f//s, 4) o//f∞s, 5) o∞s//f. (o: *osimensis*, f: *famelica*, s: *smythiesi*). These five cases are shown in Table 1, and the other types of theoretical possibilities were not observed.

The most remarkable difference is observed in the rugosity patterns which cover head and alitrunk of worker and queen castes. The rugosity is shown to be a character of type o→f→s. Rugae are weak in the worker of *osimensis* (Plate 1, figs. 7, 8), in which the head is impressed with fine striations only in the anterior half, with the posterior half being smooth and shining. Pro- and mesonotum are also smooth and shining in *osimensis*.

On the other hand, in the worker of *famelica* (Plate 1, figs. 9, 10) the striations of head are deeply engraved to make a rugoreticulum on the posterior part. The puncturation of pronotum is increased in *famelica*, and the pronotum is smooth only on the sides. The mesonotum is densely engraved by deep branched rugae in this species. This rugosity is developed remarkably in *smythiesi* (Plate 1, figs. 11, 12), in which the head is completely covered with densely reticulate rugae, and the pronotum is also fully punctate and opaque. The most remarkable character of *smythiesi* is a steep prominence of the anterior part of mesonotum which projects in an angle higher than the pronotum. The rugosity can be also observed in the queens (Plate 1, figs. 1-3). In general, the queen caste has a more developed rugosity than that of the workers.