Varied Tit Yamagara (Jpn) *Poecile varius*

Morphology and classification

Classification: Passeriformes Paridae

Total length:	Ca. 14cm	
Wing length:	♂ 75.33 ± 1.46mm (n = 31)	♀ 69.36 ± 2.24mm (31)
Tail length:	♂ 54.54 ± 2.33mm (31)	♀ 50.05 ± 2.44mm (30)
Culmen length:	♂ 10.93 ± 0.89mm (31)	♀ 11.15 ± 0.76mm (31)
Tarsus length:	♂ 19.12 ± 1.20mm (31)	♀ 18.82 ± 0.51mm (31)
Weight:	♂ 16.33 ± 1.07mm (31)	♀ 15.33 ± 0.60mm (30)

Total length after Yoshii (ed. 1988), the other measurements of the breeding period in the Aburayama Citizen's Forest in Fukuoka City, Fukuoka Prefecture (mean ± SD) by the authors. The sex was judged by DNA assessment..

Appearance:

Adult males and females are similar in plumage coloration. The head is black with a fine cream streak from the crown to the nape. The forehead and cheek are creamy white. The wings and tail are bluish gray. The throat and chest are black. The belly and back is orange brown. However, Varied Tits vary considerably in plumage coloration between the subspecies. More southern subspecies tend to be darker in plumage. Juveniles are drab in plumage color. They are milk-white on the abdomen, cheek and forehead, and dark gray on the back.

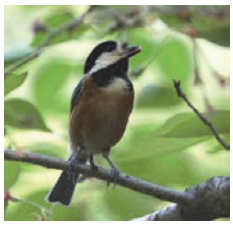

Photo 1. Varied Tit [Hideo Tani]

Vocalization:

Varied Tits utter a nasal call like "Nee, nee", "Tsweee", etc. Their song sounds like "Tsoo-tsoo-bee, tsoo-tsoo-bee" with the accent on the third syllable. However, the vocalization varies considerably from one subspecies to another.

Distribution and Habitat

Distribution:

Varied Tits are distributed in Taiwan and the southern part of the Korean Peninsula as well as throughout Japan.

Habitat:

They primarily occur in broad-leaved evergreen forests (laurel forests in particular) from hills to mountains, but also inhabit a broad-leaved deciduous forest and a mixed forest of conifers and broad-leaves.

Life history

Breeding system:

Varied Tits are socially monogamous. They maintain the pair-bond throughout the year, but frequently divorce and mate again. When they breed more than once in a season, they sometimes change their partners.

Nest:

Varied Tits nest in a tree cavity, but do not excavate their own nest hole and use an existing tree cavity. They often use artificial structures such as a nest box. They pile up moss in the bottom of a nest hole and lay fine plant fibers and fur for the inner cup. They sometimes use synthetic fibers as an inner cup lining in suburban areas. There was a nest whose inner cup was lined with wild boar's fur in the study site, but the nest stank of a beast and the inner cup seemed uncomfortable because the fur was bristly.

Photo 2. Varied Tit nestlings in a nest box.

Egg:

The typical egg is milk-white with reddish brown flecks, but some birds lay eggs without flecks. According to the study conducted from 1998 to 2000 in Fukuoka City, southern Japan, the clutch size was 3-8 eggs with a mode of 4 eggs. However, life history characters, such as a clutch size are known to vary between populations or subspecies in Varied Tits.

Incubation and nestling periods and fledging rate:

The male does not incubate the eggs and feeds the female during the incubation period. It is assumed that the female mostly broods the nestlings as well right after hatching. The incubation period is about two weeks. The nestlings fledge about 16 days after hatching. Both parent birds feed the nestlings. The feeding frequency is not very high. The author's observation showed that the parents fed the young every 15 minutes even when they were 7-10 days old. In other words, a male or female parent feeds the nestlings every 30 minutes. The food consists primarily of the larvae and adults of lepidoptera, and the sexes are roughly equal in feeding contribution. The nestlings rarely die of starvation and the breeding success was mostly determined by the predation of snakes, etc.

Topics of ecology, behavior and conservation

Subspeciation

Varied Tits include nine subspecies (*Poecile varius varius*, *P. v. namiei*, *P. v. owstoni*, *P. v. orii*, *P. v. sunsunpi*, *P. v. yakushimensis*, *P. v. amamii*, *P. v. olivaceus*, and *P. v. castaneoventris*). However, *P. varius orii* is assumed to be extinct. It is probably because the range consists mostly of many islands and the species is sedentary that the species has diverged into so many subspecies in a comparatively limited range composed of the Japanese Islands, the southern part of the Korean Peninsula and Taiwan. As a matter of fact, no different subspecies occur sympatrically in large islands, such as the main islands of Japan, and therefore there is no doubt that the geographical isolation is principally responsible for Varied Tit subspeciation.

Varied Tit subspecies have a tendency to become darker in plumage coloration in southern areas. The subspecies distributed along the Izu islands (*P. v. varius*, *P. v. namiyei* and *P. v. owstoni*) become darker in plumage color, and larger in body size and smaller in clutch size in southern areas. It is still unknown, however, what evolutionary mechanism or effect of population genetics has given rise to geographic inclines of morphological and life-historical characters.

A result of introgression? Individual variation among subspecies *P. v. namiyei*

The author has studied the ecology of *P. v. namiyei* in Kozushima of the Izu Islands since 2003. This subspecies is distributed only in Toshima, Niijima and Kozushima of the Izu Islands, and sandwiched between *P. v. varius* distributed north of Oshima and *P. v. owstoni* distributed south of Miyakejima Island. This subspecies is said to bear intermediate characteristics in morphology and life history between *P. v. varius* and *P. v. owstoni*, as if it reflects the geographic distribution. That is the case, but no study of the ecological and evolutionary mechanisms has been carried out yet.

Among the results the author has found, it was especially interesting that *P. v. namiyei* varied in plumage coloration between individuals. The typical plumage color is intermediate between those of *P. v. varius* and *P. v. owstoni*. The cheek is usually dark brown

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and the back is dark gray. However, the individual variation in cheek color was very large in Kozushima Island. (Photo 3). The cheek ranged in color from creamy white as that of *P. v. varius* to dark brown. But no *P. v. namiyei* had a cheek as dark as that of *P. v. owstoni*. *P. v. namiyei* with a pale cheek is not *P.v. varius* that has come to Kozushima from the neighboring islands because the pale birds are larger than *P. v. various* and fall into the body size range of *P. v. namiyei* (Fig. 1).

It must be because *P. v. namiyei* is geographically sandwiched between *P. v. various* and *P. v. owstoni* that *P. v. namiyei* has these color variations in plumage. There are possible explanations for this phenomenon. (A) Hybridization between different subspecies has frequently occurred between Varied Tit subspecies in Kozushima, or (B) the genetic introgression has taken place between *P. v. namiyei* and *P. v. varius* and/or *P. v. owstoni*. Probably hybridization between different subspecies has not frequently occurred because the breeding of the typical *P. v. owstoni* and *P. v. varius* has not been confirmed in Kozushima. On the other hand, if *P. v. varius* and/or *P. v. owstoni* even infrequently comes to Niijima or Kozushima and they breed with *P. v. namiyei*, then the genes of both or one of these subspecies will infiltrate into the population of *P. v. namiyei*. The infiltrated genes will spread into the population of *P. v. namiyei* through the breeding of this subspecies. This phenomenon is called introgressive hybridization and has been reported from various animals. I suspect that this mechanism is partly responsible for the abundance of plumage color variations in *P. v. namiyei*. (as of Dec. 2005).

Photo 3. Plumage color variations of *Poecile varius namiyei*.

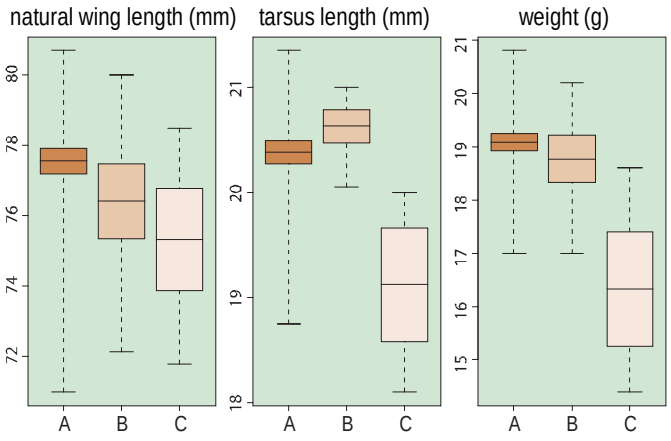

Fig. 1. Comparison of male body sizes of Varied Tit subspecies. (A) *Poecile varius namiyei* (n = 24), (B) Birds with an especially white cheek captured in Kozushima (n = 6) and (C) *P. v. varius* (n = 31). (Box: mean and S.E., whisker: maximum and minimum). drawn after Yamaguchi (2005).

Caching for the nestlings

Varied Tits are well-known for food caching behavior. When Varied Tits come to a bird feeder with sunflower seeds, they sometimes take the seed to a nearby branch and eat it there and sometimes fly away with the seed into a forest. When they take the seed into the forest, they probably cache it there. It is known that birds with a habit of caching food can clearly remember where they have hidden their food. *P. v. owstoni* is assumed to have a more retentive memory because it is reported that this subspecies fed cached seeds to the nestlings the next spring (Higuchi 1977). In Aburayama Citizen's Forest, Fukuoka Prefecture, southern Japan, on the other hand, many sunflower seedlings come out along a trail in the forest in spring. These seedlings suggest that although Varied Tits had cached sunflower seeds, they forgot to eat them or did not need to eat them because other food was in plentiful supply. How heavily they depend on their cached food will be related to the abundance and constancy of food supply. It may be interesting to compare the relations between these habitat factors and food caching behavior as well as spatio-temporal memories in various Varied Tit populations.

Varied Tits as a trick artist

Some of the senior citizens may remember Varied Tits as a "bird that draws a written fortune (Omikujihiki)". The artist Varied Tits would ring the bell of a little shrine, open the door, take a sacred fortune out of the shrine and then poke the string that bind the rolled fortune to cut it open. Wild Varied Tits drag insects and nuts out of secluded places, beat them open using their bill and feet and carry them in the bill. Using their innate behavior, the trainers probably conditioned them to take an appropriate action in an appropriate order. Since Varied Tits are inherently curious and tame, it is easy to get them to take food from people, which probably opened the door to a trick artist as well.

Literature

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Eight years have already passed since I started to study Varied Tits. I owe it all to Varied Tits that I have received a doctorate and am getting along somehow as a research worker. The study of Varied Tits is becoming increasingly interesting in Kozushima Island, and I would like to continue the study in the island in the future, but as a post-doctoral fellow, it is quite uncertain where I will be and what I will be doing the following year. I hope I will be taking a nap peacefully in spring, Oh-no, I will be indulged in studying Varied Tits in Kozushima Island. noriyuki@nagasaki-u.ac.jp