The food of Treecreeper *Certhia f. familiaris* nestlings in southern Finland

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The food of Treecreeper nestlings *Certhia familiaris* was studied in southern Finland by capturing adults that were feeding their young. The birds were flushed into a plastic bag attached to one of two entrances in specially designed nest-boxes.

Ca 99 % of the food items were arthropods. Small phorid flies were the most numerous items, but spiders were the most important by weight (77 %). Taxonomically, the nestling food was very diverse. The average food load comprised 9.6 items and had a dry weight of 23.5 mg. Only 13 % of the food items were slow-moving or sessile.

The Treecreeper is a distinct microhabitat specialist, but within its microhabitat it is an obvious food generalist. The properties of trunk bark as a foraging substrate are discussed.

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Introduction

In Finland the bark-foraging guild consists of woodpeckers and the Treecreeper *Certhia familiaris*. Members of the foliage-gleaning (Alatalo 1980) and flycatcher (Alatalo & Alatalo 1979) guilds very seldom use trunks for foraging. The foraging habitats and sites of strong-billed woodpeckers are more variable (Alatalo 1978) than those of the Treecreeper, which occurs in mature, mainly spruce-dominated coniferous forests and is restricted to bark gleaning (e.g. Nilsson & Alerstam 1976). Gleaning is of secondary importance to woodpeckers, which feed mainly by pecking (Alatalo 1978, Conner 1979, Grubb 1979). All this implies that the Treecreeper must be relatively free from interspecific food competition within its microhabitat in Finland.

The ecology of the Treecreeper in Eurasian taiga forests is poorly documented. No published data are known to us about the food of the nestlings, excepting a very general statement in Dementiev et al. (1970). In this report we give information about the food carried to nestlings by adult Treecreepers in southern Finland, where the ecology of the species has been investigated since 1974 (Kuitunen 1981, unpubl.).

Study area, material and methods

A total of 162 nest-boxes with two entrances, specially designed for the Treecreeper (Moilanen & Kuitunen 1977), were installed in 1974 and 1975 in a 80-km^2 study area in the commune of Hauho (61°10'N, 24°40'E). The habitat is MT- and OMT-type forest mainly composed of ca. 70-year-old spruces. The annual number of Treecreeper pairs breeding in the nest-boxes varied from 58 to 121 (mean = 1.2 pairs/km^2).

Samples of nestling food were collected when adult birds were ringed in late May or early June 1977–79; one sample was taken in early July 1977. A plastic bag was attached to one of the two entrances of the nest-box. When an adult Treecreeper went into the nest, the ringer rushed from a hide to the nest and flushed the bird into the plastic bag. The bird dropped the food from its bill into the bag, from which it could be collected. It is possible that in some cases the bird had enough time to give some of the food to the nestlings or dropped part of it into the nest cavity.

The 31 samples contained 299 food items. Samples from two nests were accidentally pooled in the field and these data were not used in calculating the frequency of occurrence of different food items. The samples were taken from 24 males and 7 females. They were preserved in 70 % ethanol.

The food items were measured to the nearest millimetre (body length) and weighed with a microbalance after drying in an oven (100°C) for 24 hours. To compensate for losses during preservation in alcohol, 20 % was added to the weights. The arthropods were mainly determined to the family level.

Results

The nestling food consisted almost exclusively of arthropods (Table 1). The proportion of vegetable matter (seeds) was only 1.0 % by number and 2.5 % by weight. Small (mean length 2.2 mm) phorid flies (Phoridae) were the most numerous food items, whilst the most significant contribution (77 %) to the biomass and energy content was made by spiders and harvestmen.

The arthropod prey carried to the nestlings was very diverse. For instance, one sample consisted of 23 food items belonging to 9 taxa. Spiders were most frequent (90 %) in the food loads carried to the nestlings.

The length of the food items (Fig. 1) ranged from 1 to 15 mm. The largest prey items belonged to the Tipulidae. The mean for the whole material is 3.7 mm. The dry biomass of the food items ranged from 0.1 mg to 25 mg (mean = 2.4 mg). Small insects (2—3 mm) were the most abundant prey, but their contribution to the biomass or energy content was small compared with that of the bigger (4—8 mm) but less numerous spiders.

The number of food items carried by an adult in one load to nestlings averaged 9.6 (range 1—45), and the weight of one load ranged between 1 and 100 mg (mean = 23.5 mg). The number of food items per load decreased with increasing mean prey weight ($r = -0.49$, $P<0.05$, $df = 27$). In a nest on 25 May 1976, the average rate at which the nestlings (age 8—11 days) were fed by the adults was 14.0 times per hour. According to the above data, the prey items carried to the nestlings in an hour number ca. 135 and have a dry weight of ca. 0.4 mg.

Only 13 % of the food items were slow-moving or sessile (e.g. seeds, coleopterous and lepidopterous larvae); flying (41 %), running (29 %), and jumping (16 %) items were more numerous.

Table 1. Composition of food carried to nestlings by adult Treecreepers in Hauho, southern Finland. The total number of food items was 299 in 31 loads.

Taxon	Percentage by number	Percentage by weight	Frequency in loads %
Seeds	1.0	2.5	10
Phalangida	0.7	2.5	7
Salticidae	0.3	0.4	3
Thomisidae	7.7	30.0	34
Clubionidae	8.0	15.6	48
Theridiidae	0.3	0.3	3
Argiopidae	4.4	23.8	31
Linyphiidae	3.3	2.2	28
Blattodea	1.3	1.8	10
Heteroptera nymphs	2.7	0.2	10
Cicadellidae	2.0	0.5	17
Cicadellidae nymphs	13.0	1.4	24
Aphidina	5.7	0.2	3
Cantharidae	0.3	0.6	3
Helodidae	0.3	0.4	3
Elateridae	0.3	0.5	3
Elateridae	0.3	0.5	3
Serropalpidae	0.3	0.8	3
Coleoptera larvae	0.3	0.2	3
Noctuidae	0.7	3.8	3
Lepidoptera larvae	6.0	3.5	3
Tipulidae	0.7	3.9	3
Mycetophilidae	0.7	0.3	7
Cecidomyidae	0.7	0.1	7
Chironomidae	0.7	0.0	7
Phoridae	37.1	3.5	21
Muscidae	1.0	0.3	10
Stylommatophora	0.3	0.8	3

Discussion

The Treecreeper, a distinct microhabitat specialist, is a food generalist during the nestling period. It probably preys upon the (arthropod) food items it encounters while searching on the tree bark. None the less, soft-bodied and long-legged spiders were clearly the most important source of energy for the nestlings. In the foodweb on the bark subsystem, the Treecreeper can be classified as a top-level carnivore during the breeding season, because of the high proportion of predatory spiders in its diet. The Treecreeper is moreover a skilful predator: its food included great number of highly mobile arthropods.

The food of adult Treecreepers tends to vary from one area to another. In the Kola peninsula the summer food consisted mainly of Diptera and Hymenoptera, while in Hungary Coleoptera were the most numerous food items, but the food selection was very diverse in both localities (Szijj 1955). Psyllidae appear to be important summer food in some parts of the USSR (Dementiev et al. 1970). All the above data are based on prey numbers in stomachs. Dementiev et al. (1970) report that the nestlings are fed, particularly during the first few days, on small insects and spiders, often brought together with cocoons or cobweb, but they do not give any quantitative data or references.

Certhia familiaris also occurs in northern America. Williams (1979) studied the dietary overlap in the bark-foraging guild in Illinois in winter. The Treecreeper had the greatest overlap with a small woodpecker, *Picoides pubescens*, and a nuthatch *Sitta carolinensis*. The overlap with larger woodpeckers was very small. In Finland, nuthatches do not occur regularly and a small woodpecker, *Dendrocopos minor*, is effectively segregated from the Treecreeper by habitat and foraging sites (Alatalo 1978).

What are the advantages and disadvantages of the trunk bark microhabitat, which the Treecreeper utilizes under very low interspecific competition pressure in Finland? Compared with foliage, bark is a relatively unproductive microhabitat. Prey density and availability also depend on the structure of the bark, which varies according to tree species and age (Jackson 1979). The surface area of bark is also small compared with that of the foliage in a forest. This may be a reason for the exceptionally large size of the Treecreeper territory (about 10 ha/pair, Kuitunen unpubl.). On the other hand, bark is relatively free of snow all the winter, unlike the upper surface of branches and foliage. This is certainly advantageous to the very early breeding Treecreeper. Nor will rain hamper the foraging of the Treecreeper as much as that of the members of the foliage-gleaning and flycatcher guilds.

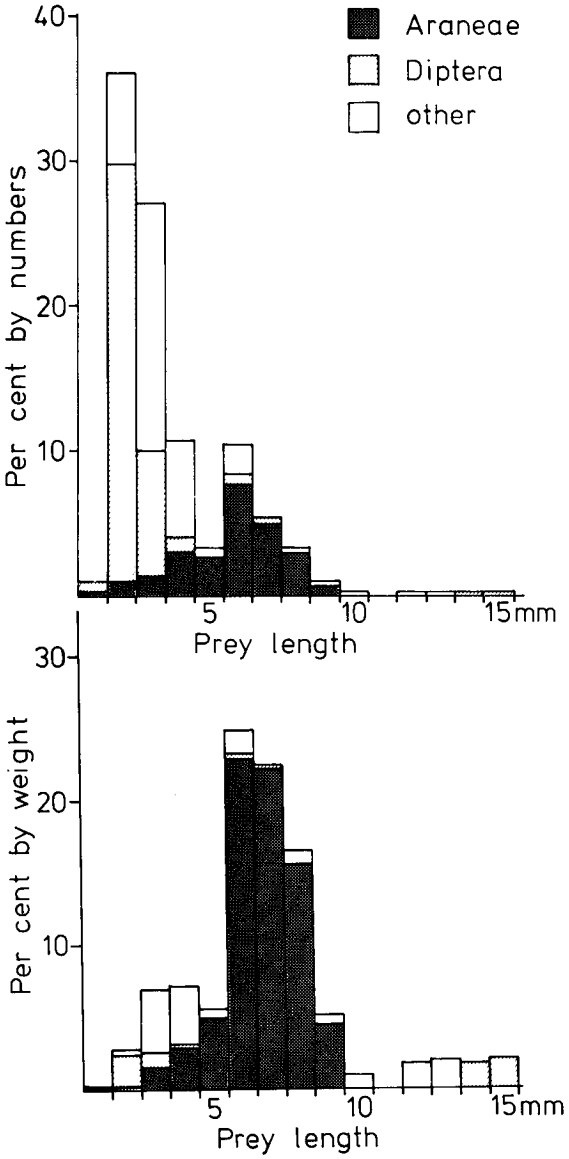

Fig. 1. Contribution of different size classes to numbers and weight of the nestling food of Treecreepers in southern Finland.

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Selostus: **Puukiipijän poikasravinto**

Puukiipijän poikasilleen tuomaa ravintoa tutkittiin Hauhon kunnassa Etelä-Hämeessä. Ravintonäytteet kerättiin pyydystämällä emolinnut muovipussiin, joka oli kiinnitetty V-mallisen erikoispöntön toiselle aukolle. Linnun mentyä ruokkimaan poikasiaan se pelästytettiin muovipussiin ja sen pussiin pudottama ravinto poimittiin 70 %:een etanoliin. Ravintonäytteet määritettiin pääosin heimotasolle, mitattiin ja punnittiin.

Ravinto käsitti lähes yksinomaan selkärangattomia (taul. 1). Hämähäkkien osuus (77 %) oli merkittävin biomassasta laskettuna. Taksonomisesti poikasravinto oli huomattavan vaihteleva. Yhden ruokintakerran annos sisälsi keskimäärin 9.6 yksilöä ja painoi 23.5 mg (kuivapaino). Koska puukiipijä ruokki yhdeltä pesältä laskettuna 7 vuorokauden ikäisiä poikasia päivän aikana 14.0 kertaa tunnissa, tuovat emot ravintoa 0.3 g tunnin aikana.

Puukiipijä on erikoistunut käyttämään ainoastaan puunrunkoja saalistuspaikkanaan, mutta pesimäaikana sen ravinto on sekä kooltaan (kuva 1) että lajivalikoimaltaan hyvin vaihtelevaa. Puukiipijät ovat ilmeisen taitavia saalistajia (vain 13 % ravinnosta oli hitaasti liikkuvia tai paikallaan pysytteleviä). Koska ravinnon pääosa (painon perusteella) on hämähäkkejä (petoja), voidaan lajia pitää rungon ravintoketjun ylimpänä petona.

Puukiipijän poikasravinnosta ei liene aiemmin julkaistu tietoja. sen sijaan aikuisten puukiipijöiden mahanäytteitä on analysoitu Neuvostoliitossa, Unkarissa ja USA:ssa. Kuolan niemimaalla Neuvostoliitossa ravinto käsitti runsaasti kaksisiipiäisiä ja pistiäisiä, mutta Unkarissa kovakuoriaiset muodostivat tärkeimmän osan.

Rungolla ruokailevien lintulajien välinen kilpailu ravinnosta lienee vähäistä, mutta toisaalta saalistiheydet lienevät suhteellisen alhaisia. Puukiipijän pienelle lintulajille poikkeuksellisen laaja reviiri (noin 10 ha) johtunee osittain tästä.

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