

## Song thrush *Turdus philomelos* winter diet in Mediterranean habitats: a case study in Greece

NIKOLAOS PARALIKIDIS, NIKOLAOS PAPAGEORGIOU, APOSTOLOS TSIOMPANOU DIS\*  
AND VASILIOS KONTSIOTIS

Aristotle University of Thessaloniki, Department of Forestry and Natural Environment, Laboratory of Wildlife –  
54124 Thessaloniki, Greece.

\* (atsiempa@for.auth.gr)

**Riassunto** – *Dieta invernale del tordo bottaccio* *Turdus philomelos* in habitat mediterraneo: un caso di studio in Grecia. Il lavoro riguarda l'alimentazione del tordo bottaccio in ambiente mediterraneo, basandosi su dati raccolti in Grecia. La forte diversità floristica degli ambienti fornisce grandi opportunità alimentari per i numerosi tordi che giungono a metà autunno e svernano in Grecia. In questo periodo i tordi sono generalmente frugivori, mostrando forte preferenza per i frutti coltivati. Le informazioni sulla dieta sono state raccolte in due aree di studio in Grecia centrale. Durante la stagione venatoria i tordi sembrano preferire effettivamente i frutti, ma si nutrono anche di insetti. Le olive sono la principale risorsa trofica del tordo bottaccio durante l'inverno. I nostri risultati mostrano la capacità del tordo di adattarsi ad habitat antropogeni.

### Introduction

During the winter, the survival of most migratory birds depends largely on the availability of both food for migration and foods that allow fat to be deposited for the migration. Areas surrounding the Mediterranean Sea comprise some of the most important overwintering spots for migratory birds. Ideal dietary conditions for Song Thrushes *Turdus philomelos* occur in Greece, and Song Thrushes from northern Europe and especially Russia arrive in Greece in large numbers each year (Milwright 2006). The hunting season for all four species of thrush occurring in Greece (Fieldfare *Turdus pilaris*, Redwing *Turdus iliacus*, Mistle Thrush *Turdus viscivorus* and Song Thrush) is between 20 August and 28 February, and the largest number of birds that are allowed to be killed is 25 per hunter. Even though hunting of the Song Thrush is allowed in Greece and other countries in the Mediterranean basin, this ac-

tivity causes a dramatic reduction of the populations in countries outside this region, such as the UK (Thomson and Cotton 2000).

Knowledge of the diet of migratory game-birds during the winter is essential for their management, protection and conservation. Similar studies have been conducted for European Quail (Tsachalidis *et al.* 2007) in Greece and for Song Thrushes (Paralikidis *et al.* 2005) in Cyprus. The effect of Song Thrush predation on fruit was investigated in Spain by Rey (1995) and Rey and Gutiérrez (1996). The Song Thrush has also been recognised as one of the main seed dispersers for the olive tree (Jordano 1987, Gonzalez-Solis and Ruiz 1990) and other fruits (Debusche and Isenmann 1985), and is a significant consumer of gastropods (Gonzalez-Solis *et al.* 1996) and earthworms (Gruar *et al.* 2003).

The aim of this research was to investigate the diet of the Song Thrush during autumn and winter stopovers in two study areas within central Greece.

### Study areas and methods

Two regions of central Greece (Sterea Ellada) were selected for this research (Fig. 1): the prefectures of Evia and Aitolokarnania. Olive groves are an important part of the local economy, comprising 6.93% of the total land in Evia and 5.01% for Aitolokarnania. Additionally, land uses for the two areas (Aitolokarnania & Evia) are presented in Table 1.

Stomach content analysis was conducted using a stereoscope (1:6 zoom). Seeds and fruits were identified using a reference collection from the study areas and identification guides (Hanf 1983, Flood and Gates 1986), while insects from Chinery (2007) and Ponce (2000). Diet results are

Ricevuto 8 giugno 2006, accettato dopo revisione  
21 gennaio 2008

**Table 1.** Land use (% cover) in Aitoloakarnania and Evia prefectures during the study period – *Tipologie di uso del suolo nelle due aree di studio, e relativa copertura percentuale, durante il periodo di indagine.*

Land-use type	Aitoloakarnania	Evia
Forests	60.68	61.37
Shrublands	8.67	7.90
Cultivated areas	22.19	28.81
Barren or rocky substrates	2.23	1.23
Urban areas	0.84	0.61
Lakes or Rivers	5.39	0.07
Total	100.00	100.00

presented as the percent occurrence (the number of samples in which a particular food type appears), as described by Rosenberg and Cooper (1990).

### Results and discussion

In total, 222 stomachs of Song Thrushes (120 from Evia and 102 from Aitoloakarnania) were obtained from the two study areas during the 2004-2005 hunting season (Table 2).

Figure 2 indicates that the main food item for the Song Thrush was olive fruit in both study areas. Olive fruit provides a large amount of energy for thrushes during autumn migration (Gonzalez-Solis and Ruiz 1990) and also provides nutritious components for winter survival. Other supplementary foods found in the Song Thrush stomachs from Evia included *Lotus* sp. (5.09%), *Amaranthus* sp. (4.67%) and *Solanum nigrum* (4.5%), while in Aitoloakarnania the

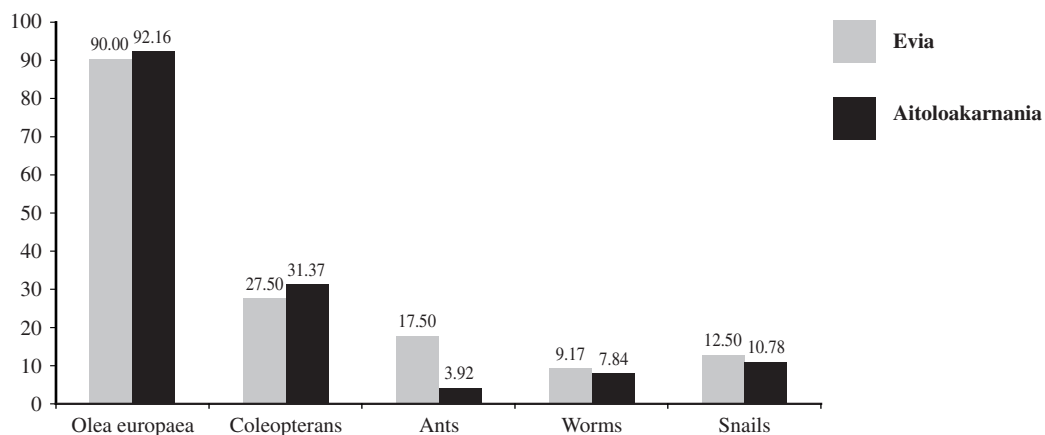


**Study areas**  
 1. Aitoloakarnania  
 2. Evia

**Figure 1.** Locations of the study areas (1: Aitoloakarnania; 2: Evia) – *Localizzazione delle due aree di studio (1: Aitoloakarnania; 2: Evia).*

most important supplementary food were Graminae seeds (2.85%).

The Song Thrush plays a major role in the dissemination of fleshy-fruited plants in the entire Mediterranean region (Debussche and Isenmann 1985). Coleoptera and snails are the basic supplemental items in the Song Thrush diet. Animal materials and especially snails, play a sig-



**Figure 2.** Winter diet composition of the Song Thrush in two areas of continental Greece – *Dieta invernale del tordo bottaccio in due aree della Grecia continentale.*

**Table 2.** Monthly and study-area distribution of Song Thrushes shot during the hunting season, whose stomachs were analysed – *Numeri di tordi abbattuti durante la stagione venatoria, di cui abbiamo esaminato i contenuti stomacali, suddivisi per mese e per area di studio.*

Study areas	December	January	February	Total
Evia	35	44	41	120
Aitoloakarnania	34	35	33	102
Total	69	79	74	222

nificant role in the diet of the Song Thrush in other European countries (Spain: Gonzalez-Solis *et al.* 1996, France: Debussche and Isenmann 1985, Cyprus: Paralikidis *et al.* 2005, England: Gruar *et al.* 2003, Austria: Schnack 1991).

The diet of the Song Thrush in central Greece is the result of the extensive cultivation of olive groves; Greece is one of the most productive countries in the world in terms of olive oil production. This observation reveals the adaptation of the Song Thrush to anthropogenic habitats (see also Ray 1995) and that Song Thrushes were hunted within olive groves, during the day, when they were feeding on. Moreover, the use of olive groves can be considered to be the result of a lack of natural available food in our study areas due to agricultural practices (extensive cultivations, loss of hedgerows, etc.). However, further research is necessary in order to estimate the impact of the Song Thrush on olive groves in Greece, although Gonzalez-Solis and Ruiz (1990) found that in Spain economic costs produced by Song Thrushes wintering in olive groves were irrelevant.

## REFERENCES

- Chinery M 2007. Insects of Britain and Western Europe. A & C Black, England.
- Debussche M, Isenmann P 1985. The autumn and winter diet of the song thrush *Turdus philomelos* in the "garrigues" of southern France: its role in seed dispersal. *Revue Ecologie (Terre Vie)* 40: 379-388.
- Flood RJ, Gates GC 1986. Seed Identification Handbook. National Institute of Agriculture Botany, Cambridge, England.
- Gonzalez-Solis J, Ruiz X 1990. Feeding habits of the Song Thrush (*Turdus philomelos*) in the Iberic Mediterranean olive groves, during its autumnal migration. *Miscellanea Zoology* 14: 195-206 [In Spanish with English abstract]
- Gonzalez-Solis J, Abella J, Aymi R 1996. Shell size relationships in the consumption of gastropods by migrant Song thrush *Turdus philomelos*. *Avocetta* 20: 147-149.
- Gruar D, Peach W, Taylor R 2003. Summer diet and body condition of Song thrushes *Turdus philomelos* in stable and declining farmland populations. *Ibis* 145: 637-649.
- Hanf M 1983. The Arable Weeds of Europe. BASF. Lady Lane, Hadleigh, Suffolk, UK.
- Jordano P 1987. Avian fruit removal: effects of fruit variation, crop size and insect damage. *Ecology* 68: 1711-1723.
- Milwright R 2006. Post-breeding dispersal, breeding site fidelity and migration/wintering areas of migratory populations of Song thrush *Turdus philomelos* in the Western Palearctic. *Ring and Migration* 23: 21-32.
- Paralikidis N, Papageorgiou N, Katelaris I, Kordatos C, Kotsiotis V 2005. The body mass measurements and diet of the Song thrush (*Turdus philomelos*) on the island of Cyprus. In: Pohlmeier K. (ed). Extended Abstracts of the XXVIIth Congress of the International Union of Game Biologists, Hannover 2005. DSV Verlag, Hamburg, pp. 431-432.
- Ponce F 2000. Atlas d'aide a la determination pour tes études de régime alimentaire. Office national de la chasse et de la faune sauvage, France.
- Rey P 1995. Spatio-temporal variation in fruit and frugivorous bird abundance in olive orchards. *Ecology* 76: 1625-1635.
- Rey P, Gutiérrez J 1996. Pecking of olives by frugivorous birds: a shift in feeding behaviour to overcome gape limitation. *Journal of Avian Biology* 27: 327-333.
- Rosenberg KV, Cooper RJ 1990. Approaches to avian diet analysis. *Studies in Avian Biology* 13: 80-90.
- Schnack S 1991. The breeding biology and nestling diet of the blackbird *Turdus merula* L. and the Song Thrush *Turdus philomelos* C.L. Brehm in Vienna and in an adjacent wood. *Acta Ornithologica* 26: 85-106.
- Thomson D, Cotton P 2000. Understanding the decline of the British population of Song thrushes *Turdus philomelos*. In: Aebischer NJ, Evans AD, Grice PV, Vickery JA (eds). Ecology and Conservation of Lowland Farmland Birds, British Ornithologists' Union, Tring, UK, pp. 151-155.
- Tsachalidis E, Paralikidis N, Tsiompanoudis A, Trikyas K 2007. Morphometry, body mass and autumn diet of European quail (*Coturnix coturnix coturnix*) in Evros and Chios, Greece. *Wildlife Biology in Practice* 3: 9-17.