

First records of bats from four Dodecanese islands, Greece (Chiroptera)

První nálezy netopýrů ze čtyř Dodekaneských ostrovů, Řecko (Chiroptera)

Petr BENDA^{1,2} & Marcel UHRIN³

¹ Department of Zoology, National Museum (Natural History), Václavské nám. 68, CZ–115 79 Praha 1, Czech Republic; petr_benda@nm.cz

² Department of Zoology, Faculty of Science, Charles University in Prague, Viničná 7, CZ–128 44 Praha 2, Czech Republic

³ Department of Zoology, Institute of Biology and Ecology, P. J. Šafárik University, Moyzesova 11, SK–040 01 Košice, Slovakia

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Abstract. Bats of four islands of the Dodecanese Archipelago (Astypalea, Kalymnos, Symi, Megisti) were studied for the first time. The bat fauna of these islands comprises eleven species and the faunas of the particular islands are composed of five (on Astypalea) to nine (on Symi) species. Three species of bats, *Rhinolophus blasii*, *Pipistrellus pipistrellus* and *P. kuhlii*, were found in all four islands, two species, *Hypsugo savii* and *Tadarida teniotis* in three islands, and *Eptesicus anatolicus* and *Plecotus kolombatovici* in two islands. The remaining four species, *Rhinolophus ferrumequinum*, *Myotis blythii*, *M. emarginatus*, and *Miniopterus schreibersii*, are known from only one island each.

Key words. Bats, distribution, Astypalea, Kalymnos, Symi, Megisti, Kastelorizo, Greece, Aegean Sea.

INTRODUCTION

Sea islands constitute a large part of the territory of Greece. All Greek islands including Crete comprise almost 25,000 km², i.e. 18.8% of the area of the country, and are home of 14.8% of the inhabitants of Greece (HSA 2011). One of the largest groups of islands in Greece are the Dodecanese, covering some 2,700 km² of dry land, which represents 10.9% of the area of all Greek islands, and 16.4% of the area of the Greek islands excluding Crete. The Dodecanese Archipelago is composed of almost 300 islands and islets (Fig. 1). Sixteen of these islands can be considered as large, having an area larger than 10 km², other fifteen islands are small, with the area of 1–10 km², and the rest includes a number of tiny islets less than 1 km², often only few hectares, in size. The Dodecanese Archipelago, being situated between Crete and the Cyclades in the west and Asia Minor in the east, represents a significant region from the biogeographical point of view; it creates a transition between the influences of Asian, African and European biotas at the south-eastern margin of Europe.

Bat fauna of the Greek islands remains only insufficiently known (in contrast to the knowledge of other mammals, see MASSETI 2012). HANÁK et al. (2001) summarised records of 27 bat species from 30 islands of Greece (Table 1). However, this does not mean that the fauna of bats of these islands was completely inventoried, only that a record of a bat, often just an accidental finding, is available from a certain island. Bat records have been reported only from three to

four islands of the Dodecanese, namely from Rhodes, Karpathos, Kos, and possibly also from Leros. Interestingly, most of the species remain known only from a single record from the particular island of this Archipelago.

The oldest records of bats from the Dodecanese come from Rhodes, from the times of the Italian occupation of the Archipelago; FESTA (1914) and DE BEAUX (1929) collected specimens of three bat species from this island, *Rhinolophus ferrumequinum*, *R. blasii* and *Pipistrellus pipistrellus*. PIEPER (1965, 1966) discovered additional four bat species in Rhodes, *Miniopterus schreibersii*, *Rhinolophus hipposideros*, *Pipistrellus kuhlii*, and *Tadarida teniotis*, however, the latter three species only from owl pellets. VOLLETH (1987) reported a record of *Hypsugo savii* from Rhodes and VON HELVERSEN (1998) several records of *Eptesicus anatolicus* from this island. Until now, Rhodes represents the only part of any European country, where the latter bat species has been documented. SPITZENBERGER et al. (2006) reported a specimen of *Plecotus kolombatovici* from Rhodes (originally mentioned as *P. austriacus* by VON HELVERSEN in MITCHELL-JONES et al. 1999 and by SPITZENBERGER et al. 2001). Finally, KAFKALETOU-DIEZ et al. (2015) found *Myotis myotis* in Rhodes.

Two other species of bats, *Pipistrellus pygmaeus* and *Nyctalus leisleri*, were reported by HANÁK et al. (2001) to occur in Rhodes, based on single records of echolocation calls obtained by a heterodyne bat detector. We suggest the occurrence of these bats should be confirmed by findings of individuals or at least recordings of their calls identifiable by an acoustic software analysis (similarly as it was confirmed for *Pipistrellus pipistrellus* from Rhodes by MAYER & VON HELVERSEN 2001).

Smaller numbers of bat species than from Rhodes are known from two other large Dodecanese islands, Karpathos and Kos (Tables 1, 2, 4), although from Karpathos the oldest record comes from the 1930s, similarly to the situation in Rhodes. VON WETTSTEIN (1942) first mentioned *Myotis blythii* from Karpathos, other records of this species from the island were later reported also by PIEPER (1965) and MERTENS (1967). The occurrence of *Pipistrellus pipistrellus* in Karpathos was mentioned by KANELLI & HADZISARANTOU (1963) and *Rhinolophus blasii* and *Teniotis teniotis* by PIEPER (1965). Finally, PIEPER (1977) reported two additional bat species from this island, *Myotis emarginatus* and *Hypsugo savii*, the latter species was found there also by VON HELVERSEN (1989).

Only three papers deal with the bats of Kos, all issued in the 1960s and 1970s; PIEPER (1966) briefly reported records of *Tadarida teniotis* and *Myotis myotis* from this island, and MARTENS (1967) of *Rhinolophus ferrumequinum* and *Miniopterus schreibersii*. Additionally, ILIOPOULOU-GEORGIOU (1977) reported a finding of a maternity colony of *Pipistrellus pipistrellus* from this island.

However, in the atlas of the geographical distribution of mammals in Europe edited by MITCHELL-JONES et al. (1999), several points, representing occurrence of certain species in the 50×50 km squares, appeared in the areas of the Dodecanese, where no records are available (for the Greek territory, these distribution reviews of bats were prepared by O. VON HELVERSEN, see MITCHELL-JONES et al. 1999: 14). In some cases, these records are acceptable without question, such as the occurrence of *Miniopterus schreibersii* in Karpathos and *Rhinolophus hipposideros* in Kos. On the other hand, there is also a point suggesting an occurrence of *Rhinolophus euryale* in Rhodes, which could be theoretically acceptable, but as in the only southern island of Greece; this species is not known from Crete (see BENDA et al. 2009) and was found only in Lesbos, Petala and Cephalonia among the eastern Mediterranean islands (see HANÁK et al. 2001). Moreover, a confusion with very similar *Rhinolophus blasii*, which is known from

many Greek islands, including Crete and the Dodecanese, cannot be excluded (Table 4; see also HANÁK et al. 2001, BENDA et al. 2009). Thus, this report needs a confirmation in a revised identification of a specimen.

A bit different case in the atlas by MITCHELL-JONES et al. (1999) is the occurrence spot suggesting a record of *Tadarida teniotis* at an approximate position of the island of Leros (but some other islands in its vicinity can be also considered, e.g. Patmos or Lipsi); so, it is not clear whether it is the accurate geographical affiliation of the respective point, or whether the unusual position of the point in fact represents a misprint (this is a case of e.g. the map of the distribution of *Rhinolophus ferrumequinum*, where two points are placed in the sea, see MITCHELL-JONES et al. 1999: 95).

In summary, from the Dodecanese Archipelago comprising thirty islands larger than one square kilometre, 13–16 bat species are known to occur only in 3–4 islands (Table 2). The most diverse fauna was reported from Rhodes, with 11–14 species, followed by Karpathos with 6–7 species and Kos with 5–6 species; one species is possibly known from Leros. With only six exceptions,

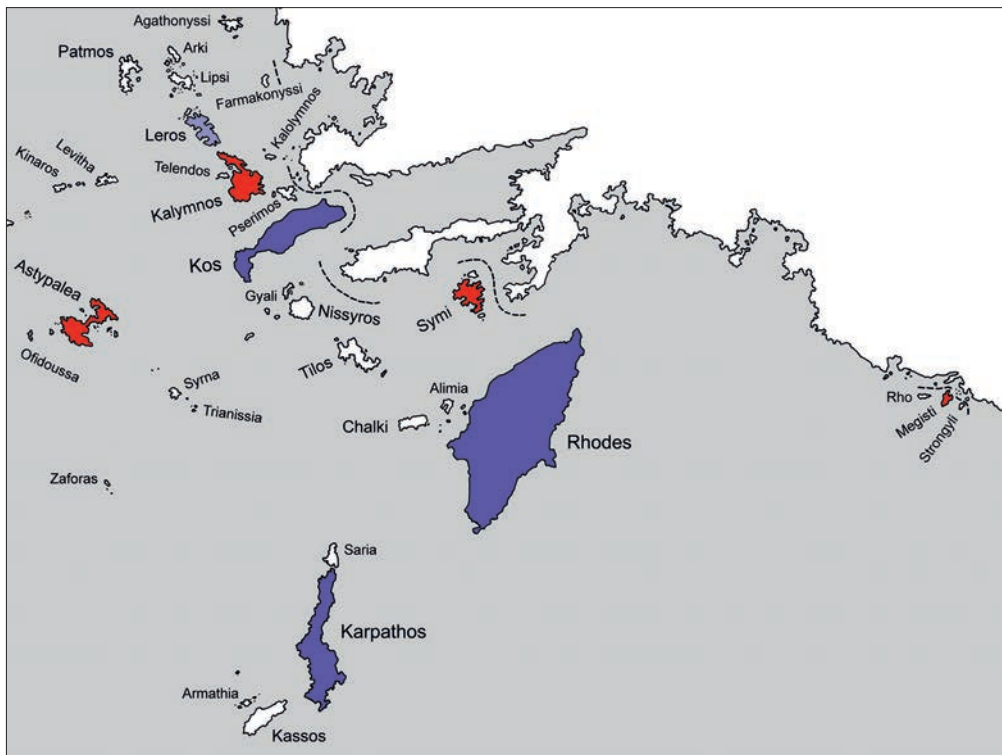


Fig. 1. The Dodecanese Archipelago; blue – islands where literature records of bats were available (Table 2); red – islands where bats were documented for the first time.

Obr. 1. Dodekaneské souostroví; modře – ostrovy, na nichž byli z literatury netopýři již známi (tab. 2); červeně – ostrovy, na nichž byli netopýři zjištěni poprvé.

Table 1. Review of geographical features of the Greek islands (after HSA 2011) and numbers of their known bat species (all 89 islands larger than 9 km² are included plus two smaller islands from which bat records are also available). Legend: AR = area ranking; GN = Greek name; RO = area; CL = coastline length; MA = maximum altitude; PO = population; BS = known number of bat species; [] = species known only from uncertain and/or doubtful records; VON HELVERSEN 1999 = VON HELVERSEN (in MITCHELL-JONES et al. 1999)

Tab. 1. Přehled geografických charakteristik řeckých ostrovů (podle HSA 2011) a známé počty jejich druhů netopýrů (zahrnuto je všech 89 ostrovů větších než 9 km² a dva menší ostrovy z nichž jsou také k dispozici nálezy netopýrů). Legenda: AR = pořadí ostrova podle velikosti; GN = řecké jméno; RO = rozloha; CL = délka pobřeží; MA = největší nadmořská výška; PO = počet obyvatel; BS = počet známých druhů netopýrů; [] = druhy známé pouze z neurčitých či pochybných nálezů; VON HELVERSEN 1999 = VON HELVERSEN (in MITCHELL-JONES et al. 1999)

| AR | island / ostrov | GN | RO | CL | MA | PO | BS | reference / zdroj |
|----------------------|-----------------|-----------|---------|-------|-------|---------|------|---|
| Crete | | | | | | | | |
| 1 | Crete | Κρήτη | 8,261.2 | 1,066 | 2,456 | 594,368 | 17 | BENDA et al. 2009 |
| 54 | Gavdos | Γάδος | 33.0 | 34 | 345 | 78 | – | – |
| 81 | Dia | Δία | 11.9 | 27 | 268 | 2 | 1 | KAHMANN 1959 |
| – | Dragonada | Δραγονάδα | 2.9 | – | 125 | 0 | 1 | KAHMANN 1959 |
| Sterea Ellada | | | | | | | | |
| 2 | Euboea | Ευβοία | 3,661.6 | 804 | 1,743 | 191,009 | 12 | LINDERMAYER 1855, KAFKALETOU-DIEZ et al. 2015 |
| Cyclades | | | | | | | | |
| 11 | Naxos | Νάξος | 389.4 | 129 | 1,001 | 17,357 | 1 | KAFKALETOU-DIEZ et al. 2015 |
| 13 | Andros | Άνδρος | 383.0 | 180 | 944 | 9,285 | 1[+] | HANÁK et al. 2001, [VON HELVERSEN 1999] |
| 20 | Tinos | Τήνος | 197.0 | 114 | 729 | 8,115 | – | – |
| 21 | Paros | Πάρος | 196.8 | 110 | 724 | 12,514 | 1 | HANÁK et al. 2001 |
| 23 | Milos | Μήλος | 158.4 | 132 | 748 | 4,736 | 1 | LATASTE 1885 |
| 24 | Kea | Κέα | 131.7 | 88 | 568 | 2,158 | – | – |
| 25 | Amorgos | Αμοργός | 121.5 | 124 | 823 | 1,851 | 2 | WETTSTEIN-WESTERSHEIM 1933, CHEKE & ASHCROFT 2017 |
| 27 | Ios | Ίος | 108.7 | 85 | 713 | 1,862 | – | – |
| 28 | Kythnos | Κύθνος | 99.4 | 111 | 336 | 1,538 | 1 | KANNELI & HADZISARANTOU 1963 |
| 33 | Mykonos | Μύκονος | 86.1 | 86 | 373 | 9,260 | 1 | HANÁK et al. 2001 |
| 34 | Syros | Σύρος | 84.1 | 84 | 442 | 19,793 | 1 | MILLER 1912 |
| 35 | Sifnos | Σίφνος | 77.4 | 74 | 682 | 2,574 | 1 | KANNELI & HADZISARANTOU 1963 |
| 37 | Santorini | Θήρα | 76.2 | 66 | 567 | 13,447 | 4 | DOUGLASS 1892, HANÁK et al. 2001 |

Table 1. (continued)
Tab. 1. (pokračování)

| AR island / ostrov | GN | RO | CL | MA | PO | BS | reference / zdroj |
|--------------------|-------------|---------|-----|-------|---------|--------|---|
| 38 Serifos | Σέρφος | 74.3 | 81 | 585 | 1,262 | - | - |
| 47 Sikinos | Σίκινος | 41.7 | 39 | 552 | 238 | - | - |
| 50 Anafi | Ανάφη | 38.6 | 37 | 584 | 272 | - | - |
| 51 Kimolos | Κίμωλος | 37.4 | 44 | 364 | 838 | 1 | KANNELI & HADZISARANTOU 1963 |
| 52 Antiparos | Αντίπαρος | 35.1 | 48 | 308 | 1,010 | - | - |
| 55 Folegandros | Φολέγανδρος | 32.4 | 40 | 455 | 676 | - | - |
| 66 Makronissos | Μακρόνησος | 18.4 | 37 | 281 | 4 | - | - |
| 67 Heraklea | Ηρακλεία | 18.1 | 29 | 420 | 133 | - | - |
| 68 Polyegos | Πολύαιγος | 18.1 | 26 | 370 | 0 | - | - |
| 70 Gyaros | Γυάρος | 17.5 | 32 | 489 | 0 | - | - |
| 72 Keros | Κέρος | 15.0 | 25 | 432 | 0 | - | - |
| 76 Rinia | Ρήνεια | 14.0 | 42 | 136 | 0 | - | - |
| 77 Donoussa | Δονούσα | 13.7 | 30 | 385 | 166 | - | - |
| 86 Thirassia | Θηρασία | 9.2 | 17 | 295 | 278 | - | - |
| Dodecanese Islands | | | | | | | |
| 4 Rhodes | Ρόδος | 1,401.5 | 251 | 1,216 | 115,334 | 11[+3] | HANÁK et al. 2001, SPITZENBERGER et al. 2006, ΚΑΦΚΑΛΕΤΟΥ- DIEZ et al. 2015, [VON HELVERSEN 1999] |
| 15 Karpathos | Κάρπαθος | 300.2 | 175 | 1,215 | 6,543 | 6[+1] | HANÁK et al. 2001, [VON HELVERSEN 1999] |
| 16 Kos | Κως | 287.6 | 122 | 843 | 30,828 | 5[+1] | HANÁK et al. 2001, [VON HELVERSEN 1999] |
| 26 Kalymnos | Κάλυμνος | 110.6 | 103 | 676 | 16,368 | 6 | this review |
| 29 Astypalea | Αστυπάλαια | 96.4 | 127 | 482 | 1,385 | 5 | this review |
| 39 Kassos | Κάσος | 66.4 | 28 | 601 | 1,013 | - | - |
| 41 Tilos | Τήλος | 61.5 | 76 | 612 | 521 | - | - |
| 42 Symi | Σύμη | 57.9 | 87 | 617 | 2,594 | 9 | this review |
| 43 Leros | Λέρος | 54.1 | 83 | 327 | 8,123 | [1] | [VON HELVERSEN 1999] |
| 48 Nisyros | Νίσυρος | 41.3 | 30 | 698 | 915 | - | - |
| 53 Patmos | Πάτμος | 34.1 | 71 | 269 | 2,997 | - | - |
| 57 Chalki | Χάλκη | 27.0 | 44 | 593 | 295 | - | - |

Table 1. (continued)
Tab. 1. (pokračování)

| AR island / ostrov | GN | RO | CL | MA | PO | BS | reference / zdroj |
|----------------------|-------------|---------|-----|-------|---------|-------|---|
| 62 Saria | Σαριά | 20.4 | – | 631 | 22 | – | – |
| 71 Lipsi | Λειψοί | 15.8 | 39 | 277 | 687 | – | – |
| 73 Pserimos | Ψέριμος | 14.6 | – | 268 | 124 | – | – |
| 79 Agathonissi | Αγαθονήσιον | 13.4 | 35 | 209 | 152 | – | – |
| 87 Levitha | Λέβιθα | 9.1 | 34 | 132 | 9 | – | – |
| 88 Megisti | Μεγίστη | 9.1 | 20 | 277 | 369 | 6 | this review |
| Ionian Islands | | | | | | | |
| 6 Cephalonia | Κεφαλονιά | 734.0 | 267 | 1,628 | 34,544 | 6 | HANÁK et al. 2001, GAISLER 2006, KAFKALETOU-DIEZ et al. 2015 |
| 7 Corfu | Κέρκυρα | 585.3 | 251 | 906 | 107,514 | 10 | NIETHAMMER 1962, HANÁK et al. 2001 |
| 10 Zakynthos | Ζάκυνθος | 406.6 | 156 | 756 | 38,825 | 2 | ILIOPOULOU-GEORDOUDAKI 1977 |
| 14 Lefkada | Λευκάδα | 301.1 | 139 | 1,158 | 20,295 | 1[+1] | VON WETTSTEIN 1942, [VON HELVERSEN 1999] |
| 17 Kythira | Κύθηρα | 277.7 | 122 | 507 | 3,532 | 3 | KANNELI & HADZISARANTOU 1963, MARTENS 1967, NIETHAMMER 1971 |
| 30 Ithaka | Ιθάκη | 95.8 | 104 | 809 | 3,210 | – | – |
| 58 Kalamos | Κάλαμος | 25.1 | 32 | 754 | 510 | – | – |
| 60 Paxi | Πάξοι | 24.6 | 37 | 248 | 2,405 | – | – |
| 64 Megamissi | Μεγανήσιον | 20.1 | 52 | 309 | 992 | – | – |
| 65 Antikythira | Αντικύθηρα | 19.8 | 31 | 378 | 39 | – | – |
| 69 Elafonissos | Ελαφώνησος | 17.9 | 30 | 276 | 746 | – | – |
| 80 Schiza | Σχίζα | 12.1 | 23 | 201 | 17 | – | – |
| 84 Othoni | Οθωνοί | 10.4 | 17 | 393 | 340 | – | – |
| 89 Sapienza | Σαπινέντζα | 9.0 | 22 | 219 | 7 | – | – |
| – Petalas | Πεταλάς | 5.5 | – | 251 | 0 | 3 | LANZA 1957 |
| North Aegean Islands | | | | | | | |
| 3 Lesbos | Λέσβος | 1,636.0 | 415 | 968 | 90,436 | 11 | HANÁK et al. 2001 |
| 5 Chios | Χίος | 842.8 | 229 | 1,297 | 51,773 | 4[+1] | KOCK 1974a, KAFKALETOU-DIEZ et al. 2015, [VON HELVERSEN 1999] |

Table 1. (continued)
Tab. 1. (pokračování)

| AR island / ostrov | GN | RO | CL | MA | PO | BS | reference / zdroj |
|--------------------|---------------|-------|-----|-------|--------|----|--|
| 8 Samos | Σάμος | 477.9 | 164 | 1,433 | 33,999 | 4 | HANÁK et al. 2001, ΚΑΦΚΑΛΕΤΟΥ-DIEZ et al. 2015 |
| 9 Lemnos | Λήμνος | 476.3 | 270 | 470 | 17,545 | - | - |
| 18 Ikaria | Ικαρία | 255.3 | 107 | 1,042 | 8,354 | 4 | KANNELI & HADZISARANTOU 1963, VAN LAAR & DAAN 1964 |
| 46 Ag. Efstiratos | Α. Ευστράτιος | 42.1 | 37 | 298 | 307 | - | - |
| 49 Psara | Ψαρά | 40.5 | 45 | 512 | 478 | - | - |
| 56 Fourni | Φούρνοι | 30.5 | 74 | 514 | 1,333 | - | - |
| 75 Oinousses | Οινούσες | 14.4 | 37 | 182 | 855 | - | - |
| 85 Thimena | Θύμαινα | 10.1 | - | 470 | 151 | - | - |
| North Sporades | | | | | | | |
| 19 Skyros | Σκύρος | 208.6 | 136 | 792 | 2,711 | 9 | POHLE 1953, GEORGIAKAKIS et al. 2012 |
| 31 Skopelos | Σκόπελος | 95.7 | 75 | 567 | 4,706 | - | - |
| 40 Alonnisos | Αλόνησος | 65.4 | 78 | 476 | 2,399 | - | - |
| 45 Skiathos | Σκιάθος | 47.2 | 49 | 433 | 5,788 | 3 | HANÁK et al. 2001 |
| 59 Kyra Panagia | Κυρά Παναγιά | 25.0 | 41 | 302 | 10 | - | - |
| 74 Peristera | Περιστέρα | 14.5 | 35 | 259 | 5 | - | - |
| 83 Gioura | Γιούρα | 11.1 | 28 | 177 | 0 | - | - |
| Saronic Islands | | | | | | | |
| 32 Salamina | Σαλαμίνα | 91.5 | 110 | 365 | 34,975 | - | - |
| 36 Aegina | Αίγινα | 77.0 | 58 | 531 | 12,716 | - | - |
| 44 Hydra | Ύδρα | 49.6 | 67 | 593 | 2,629 | - | - |
| 61 Poros | Πόρος | 22.8 | 44 | 358 | 4,282 | - | - |
| 63 Spetses | Σπέτσαι | 20.3 | 31 | 248 | 3,772 | - | - |
| 78 Dokos | Δοκός | 13.5 | 24 | 308 | 13 | - | - |
| 82 Agistri | Αγκίστριον | 11.7 | - | 294 | 886 | - | - |
| Thracian Islands | | | | | | | |
| 12 Thassos | Θάσος | 383.7 | 116 | 1,204 | 13,447 | 9 | HANÁK et al. 2001, LANE & ALIVIZATOS 2006 |
| 22 Samothrace | Σαμοθράκη | 180.4 | 59 | 1,611 | 2,712 | 5 | CRUCITI 1987, HANÁK et al. 2001 |

all published records of particular bat species from the particular island represent single findings. Thus, despite the wide popularity of the Dodecanese islands as a destination for travellers, the biota of this Archipelago (or at least its parts) still remains rather understudied.

Here we bring the first data on bat occurrence from four other Dodecanese islands, viz. Astypalea, Kalymnos, Symi, and Megisti (Kastelorizo). Although these islands belong to small to medium-sized among the islands of the Archipelago (Table 1), eleven bat species were documented from them.

MATERIAL AND METHODS

We visited four islands of the Dodecanese Archipelago, viz. Astypalea, Kalymnos, Symi, and Megisti (Kastelorizo), for a standardised week long period during the summer-autumn transition (late August to early October); see Tables 1 and 2 for description data on the respective islands. Data on bats were collected by standard methods (direct observation, netting, detection of echolocation calls) from 26 localities, see Appendix and Figs. 2–9. The lists of records (arranged in alphabetical and/or chronological orders) include, for each item, the following information: name of the locality (each record is primarily listed by a name of the nearest settlement or notable physical feature), and/or description of the record site, date, type of record (det. = detected, exam. = examined, obs. = observed, rec. = recorded), and a number of recorded bats with indication of their sex and age (ad = adult, sad = subadult); the numbers in brackets typed in bold and italics [***X***] denote the number of recorded call sequences.

Acoustic recordings were made using a portable ultrasound detector D-240x (Pettersson Elektronik AB, Uppsala, Sweden) set on the time-expansion mode and connected to the Edirol R-09HR recorder (Roland Corp., Japan). The analysed bat calls were recorded in free flight under natural conditions. The recordings were analysed with the BatSound Pro 4.1.4 software (Pettersson Elektronik AB, Uppsala, Sweden). Time-expanded sequences (expansion factor 10) were digitised at the sampling rate of 48 kHz with 16-bit precision and saved as *.wav files. A 1024 pt. FFT with Hanning window was used for the analyses; oscillograms, power spectra and spectrograms were evaluated. For each echolocation call, the following parameters were measured: pulse duration (PDUR), start frequency (SF), end frequency (EF, both SF and EF at –30 dB below the peak power spectral intensity), frequency of maximum energy (FMAXE) and inter-pulse interval (IPI, the time between two consecutive calls).

In most cases, we used only high quality recordings for the analyses. Only the search phase calls were measured. In total, we analysed 72 call sequences (373 calls) of seven bat species (Table 3). The species identification was made in accordance to the data by PAPADATOU et al. (2008) and BENDA et al. (2010, 2012); in some cases, the recording was found useless for the call analysis and was used just for the species identification.

RECORDS

Astypalea

***Rhinolophus blasii* Peters, 1866**

Agios Konstantinos, gardens, 28 September 2017: det. & rec. calls of at least 1 foraging ind. [***1***]; – Livadia, Fragma, northern bank, 26 September 2017: det. & rec. calls of 1 foraging ind. [***1***]; – Vatses, Negrou caves, lower cave, 28 September 2017: obs. 5 inds., det. & rec. calls of 1–2 inds. [***2***].

***Hypsugo savii* (Bonaparte, 1837)**

Agios Konstantinos, gardens, 28 September 2017: det. & rec. calls of several foraging inds. [***2***]; – Ftera Mt., Stavros, at a spring, 29 September 2017: det. & rec. calls of several passing inds. [***2***]; – Livadia, village, 24 September 2017: det. & rec. calls of several foraging inds. [***3***]; – Livadia, Fragma, northern bank, 26 September 2017: det. & rec. calls of several foraging inds. [***4***]; – Hora, castle, 25 September 2017: net. 1 ♀ ad, det. & rec. calls of several foraging inds. [***4***].

Table 2. List of bat species known from the Dodecanese islands. For legend see Table 1.

Tab. 2. Přehled druhů netopýrů známých z Dodekaneských ostrovů. Legenda viz tab. 1.

Species acronyms / zkratky jmen druhů: *Rfer* = *Rhinolophus ferrumequinum*; *Rhip* = *Rhinolophus hipposideros*; *Reur* = *Rhinolophus euryale*; *Rbla* = *Rhinolophus blasii*; *Mmyo* = *Myotis myotis*; *Mbly* = *Myotis blythii*; *Mema* = *Myotis emarginatus*; *Eana* = *Eptesicus anatolicus*; *Hsav* = *Hypsugo savii*; *Ppip* = *Pipistrellus pipistrellus*; *Ppyg* = *Pipistrellus pygmaeus*; *Pkuh* = *Pipistrellus kuhlii*; *Nlei* = *Nyctalus leisleri*; *Pkol* = *Plecotus kolombatovici*; *Msch* = *Miniopterus schreibersii*; *Tten* = *Tadarida teniotis*

| AR isl. / ost. | BS | bat species / druhy netopýrů | original reference / původní zdroj |
|----------------|-------|--|---|
| 1 Rhodes | 11–14 | <i>Rfer</i> , <i>Rhip</i> , [<i>Reur</i>], <i>Rbla</i> , <i>Mmyo</i> , <i>Eana</i> , <i>Hsav</i> , <i>Ppip</i> , [<i>Ppyg</i>], <i>Pkuh</i> , [<i>Nlei</i>], <i>Pkol</i> , <i>Msch</i> , <i>Tten</i> | FESTA 1914, DE BEAUX 1929, PIEPER 1965, 1966, VOLLETH 1987, VON HELVERSEN 1989, 1998, 1999, HANÁK et al. 2001, MAYER & VON HELVERSEN 2001, SPITZENBERGER et al. 2001, 2006, KAFKALETOU-DIEZ et al. 2015 |
| 2 Karpathos | 6–7 | <i>Rbla</i> , <i>Mbly</i> , <i>Mema</i> , <i>Hsav</i> , <i>Ppip</i> , [<i>Msch</i>], <i>Tten</i> | VON WETTSTEIN 1942, KANELLI & HADZISARANTOU 1963, PIEPER 1965, 1977, MARTENS 1967, VON HELVERSEN 1989, 1999 |
| 3 Kos | 5–6 | <i>Rfer</i> , [<i>Rhip</i>], <i>Mmyo</i> , <i>Ppip</i> , <i>Msch</i> , <i>Tten</i> | PIEPER 1966, 1977, MARTENS 1967, ILIOPOULOU-GEORGUDAKI 1977, VON HELVERSEN 1999 |
| 4 Kalymnos | 6 | <i>Rbla</i> , <i>Hsav</i> , <i>Ppip</i> , <i>Pkuh</i> , <i>Pkol</i> , <i>Tten</i> | this review |
| 5 Astypalea | 5 | <i>Rbla</i> , <i>Hsav</i> , <i>Ppip</i> , <i>Pkuh</i> , <i>Tten</i> | this review |
| 8 Symi | 9 | <i>Rbla</i> , <i>Mbly</i> , <i>Mema</i> , <i>Eana</i> , <i>Hsav</i> , <i>Ppip</i> , <i>Pkuh</i> , <i>Pkol</i> , <i>Msch</i> | this review |
| 9 Leros | [1] | [<i>Tten</i>] | VON HELVERSEN 1999 |
| 18 Megisti | 6 | <i>Rfer</i> , <i>Rbla</i> , <i>Eana</i> , <i>Ppip</i> , <i>Pkuh</i> , <i>Tten</i> | this review |

***Pipistrellus pipistrellus* (Schreber, 1774)**

Livadia, Fragma, northern bank, 26 September 2017: det. & rec. calls of at least 1 foraging ind. [1].

***Pipistrellus kuhlii* (Kuhl, 1817)**

Ftera Mt., Stavros, at a spring, 29 September 2017: det. & rec. calls of 1 passing ind. [1]; – Livadia, village, 24 September 2017: det. & rec. calls of at least 1 foraging ind. [1]; – Livadia, Fragma, northern bank, 26 September 2017: det. & rec. calls of numerous foraging inds. [11]; – Hora, castle, 25 September 2017: det. & rec. calls of several foraging inds. [3].

***Tadarida teniotis* (Rafinesque, 1814)**

Agios Konstantinos, gardens, 28 September 2017: det. & rec. calls of at least 1 passing ind. [3]; – Ftera Mt., Stavros, at a spring, 29 September 2017: det. & rec. calls of several passing inds. [4]; – Hora, castle, 25 September 2017: det. & rec. calls of at least 1 foraging ind. [1], 30 September 2017: det. & rec. calls of at least 1 passing ind. [1]; – Livadia, village, 24 September 2017: det. & rec. calls of 1 passing ind. [1]; – Livadia, Fragma, northern bank, 26 September 2017: det. & rec. calls of several foraging inds. [2].

K a l y m n o s

***Rhinolophus blasii* Peters, 1866**

Skalia, Skalia cave, 3 October 2017: obs. 3 inds. inside the cave, net. 1 ♂ ad at the cave entrance.

***Hypsugo savii* (Bonaparte, 1837)**

Rina, corniche, 6 October 2017: det. & rec. calls of at least 1 foraging ind. [1].

***Pipistrellus pipistrellus* (Schreber, 1774)**

Arginonta, corniche, 6 October 2017: det. & rec. calls of several foraging inds. [5]; – Kantouni, village, 1 October 2017: det. & rec. calls of numerous foraging inds. [25]; – Pothia, at the Epta Parthenon cave, 2 October 2017: det. & rec. calls of numerous foraging inds. [5]; – Rina, corniche, 6 October 2017: det. & rec. calls of numerous foraging inds. [11].

***Pipistrellus kuhlii* (Kuhl, 1817)**

Kantouni, village, 1 October 2017: det. & rec. calls of several foraging inds. [2]; – Pothia, at the Agia Varvara cave, 5 October 2017: det. & rec. calls of 1 foraging ind. [1]; – Pothia, at the Epta Parthenon cave, 2 October 2017: det. & rec. calls of several foraging inds. [1]; – Rina, corniche, 6 October 2017: det. & rec. calls of several foraging inds. [4]; – Skalia, at the Skalia cave, 3 October 2017: det. & rec. calls of 1 foraging ind. [1].

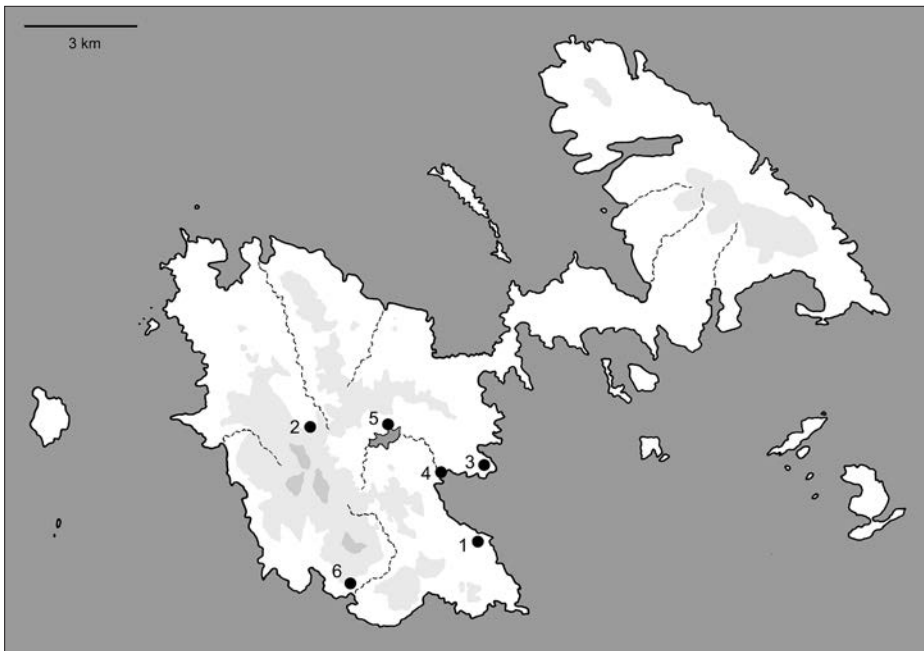


Fig. 2. Map of Astypalea with localities of bat occurrence; although the bat research was carried out in the whole island, bats were documented only in the south-western part of Astypalea, Exo Nisi; pale grey – area above 200 m a. s. l., dark grey – area above 400 m a. s. l.

Obr. 2. Mapa Astypaley s lokalitami výskytu netopýřů; i když byl výzkum netopýřů prováděn na celém ostrově, jejich výskyt byl dokumentován jen v jihozápadní části Astypaley zvané Exo Nisi; světle šedě – území nad 200 m n. m, tmavě šedě – území nad 400 m n. m.

Legend / legenda: 1 – Agios Konstantinos; 2 – Stavros, Ftera, spring / pramen; 3 – Hora, castle / Chora, hrad; 4 – Livadia; 5 – Livadia dam / přehrada Livadia; 6 – Vatses, Negrou caves / jeskyně Negru.

Table 3. Descriptive parameters of echolocation calls of seven bat species from four Dodecanese islands. Legend: n – number of individual calls analysed (in parentheses: number of call sequences from which the calls were obtained); SF – start frequency; Fmaxe – frequency of maximum energy (peak frequency); EF – end frequency; Pdur – pulse duration; IPI – inter-pulse interval; upper lines – mean±SD, lower lines – range

Tab. 3. Popisné parametry echolokačních hlasů sedmi druhů netopýřů ze čtyř Dodekaneských ostrovů. Legenda: n – počet jednotlivých analysovaných signálů (v závorce počet echolokačních sekvencí z nichž byly signály získány); SF – počáteční frekvence; Fmaxe – frekvence s nejvyšší energií (vrcholová frekvence); EF – koncová frekvence; Pdur – trvání pulsu (signálu); IPI – mezipulsní doba; horní řádek – průměr ± směrodatná odchylka, spodní řádek – rozsah hodnot

| species / druh | island / ostrov | n | SF | Fmaxe | EF | Pdur | IPI |
|----------------------------------|-----------------|--------|-----------|-----------|-----------|-----------|-------------|
| <i>Rhinolophus ferrumequinum</i> | Megisti | 10(1) | 80.2±0.3 | 79.2±0.8 | 78.6±0.7 | 65.8±11.5 | 57.7±8.3 |
| | | | 79.7–80.5 | 77.5–80.1 | 77.7–79.4 | 37.7–77.1 | 45.5–67.3 |
| <i>Rhinolophus blasii</i> | Astypalea | 23(4) | 95.6±0.4 | 95.2±0.8 | 93.6±0.9 | 47.8±8.3 | 40.9±26.7 |
| | | | 95.2–96.5 | 94.2–96.1 | 92.0–95.2 | 38.0–64.4 | 19.5–101.7 |
| | Kalymnos | 14(1) | | 95.5±0.1 | | | |
| | | | | 95.4–95.6 | | | |
| | Megisti | 10(2) | 93.9±0.5 | 92.7±0.6 | 91.6±0.4 | 59.6±5.2 | 18.5±2.9 |
| | | | 93.0–94.4 | 91.5–93.3 | 91.1–92.3 | 52.6–66.8 | 16.5–24.1 |
| <i>Eptesicus anatolicus</i> | Symi | 10(1) | 36.6±0.1 | 35.0±1.1 | 33.6±0.6 | 13.0±3.4 | 79.6±8.7 |
| | | | 36.5–36.7 | 33.7–36.8 | 33.2–34.0 | 8.5–17.9 | 68.7–89.4 |
| | Megisti | 10(2) | 38.1±1.1 | 31.6±2.1 | 29.7±1.8 | 9.5±2.0 | 172.6±50.9 |
| | | | 37.0–39.9 | 29.3–34.5 | 28.3–32.9 | 7.1–12.4 | 116.5–245.8 |
| <i>Hypsugo savii</i> | Astypalea | 47(10) | 41.2±6.4 | 37.8±1.2 | 36.2±1.1 | 9.3±2.0 | 149.3±58.9 |
| | | | 10.9–52.1 | 35.8–40.3 | 34.1–39.6 | 5.3–16.3 | 78.0–263.8 |
| | Kalymnos | 5(1) | 38.0±0.7 | 36.3±0.7 | 35.1±0.3 | 12.8±0.8 | 275.9±81.8 |
| | | | 37.0–38.5 | 36.0–37.6 | 34.7–35.5 | 11.4–13.1 | 208.0–376.6 |
| | Symi | 29(5) | 40.3±1.7 | 37.5±1.1 | 36.4±1.1 | 7.4±1.2 | 120.2±43.2 |
| | | | 36.7–44.8 | 35.3–39.8 | 34.6–38.5 | 5.8–10.6 | 71.7–218.6 |
| <i>Pipistrellus pipistrellus</i> | Kalymnos | 59(11) | 58.5±6.1 | 48.2±2.4 | 47.0±2.3 | 6.2±0.9 | 84.8±21.5 |
| | | | 49.0–72.9 | 44.4–53.3 | 43.6–51.6 | 4.7–9.2 | 53.9–166.3 |
| <i>Pipistrellus kuhlii</i> | Astypalea | 20(4) | 43.3±2.1 | 38.9±1.4 | 37.8±1.3 | 9.7±2.2 | 110.0±35.4 |
| | | | 40.4–48.0 | 36.8–41.2 | 35.6–39.9 | 6.6–14.1 | 71.9–178.7 |
| | Kalymnos | 32(6) | 51.5±5.4 | 40.6±1.3 | 38.9±1.1 | 6.8±0.8 | 121.4±43.4 |
| | | | 44.7–61.8 | 38.2–43.5 | 37.2–41.3 | 5.4–8.4 | 59.2–244.8 |
| | Megisti | 65(11) | 48.6±6.6 | 41.5±1.2 | 40.3±1.0 | 7.4±1.7 | 112.6±44.9 |
| | | | 41.4–64.9 | 39.0–45.9 | 38.2–42.8 | 4.4–11.5 | 54.7–299.6 |
| <i>Tadarida teniotis</i> | Astypalea | 9(4) | 14.6±2.0 | 12.3±0.7 | 10.9±0.8 | 17.0±2.2 | 708.0±116.1 |
| | | | 12.9–17.8 | 11.0–13.4 | 10.0–12.0 | 14.2–20.0 | 576.0–794.0 |
| | Kalymnos | 24(8) | 17.8±2.1 | 14.4±1.6 | 12.5±1.4 | 20.5±3.5 | 427.6±166.4 |
| | | | 15.1–22.1 | 12.3–17.7 | 11.2–16.7 | 11.2–26.0 | 273.2–735.0 |
| | Megisti | 6(1) | 13.9±1.1 | 14.2±1.5 | 11.6±0.5 | 17.4±3.6 | 132.3±61.1 |
| | | | 13.1–14.6 | 11.9–16.0 | 11.2–11.9 | 13.5–21.3 | 83.9–239.0 |



Fig. 3. Astypalea. a – view of the gardens at Agios Konstantinos and the castle of Hora. b – view of the fertile Vathi plain and Vathi bay (Mesa Nisi). c – the Vatses valley with the Negrou caves. d, e – entrances to the Negrou caves. f – *Rhinolophus blasii* roosting in the lower Negrou cave. Photos by M. UHRIN.

Obr. 3. Astypalea. a – pohled na zahrady u kostela Svatého Konstantina a hrad v Choře. b – úrodná rovina Vathi a zátoka Vathi (Mesa Nisi). c – údolí Vatses s jeskyněmi Negru. d, e – vchody do jeskyní Negru. f – *Rhinolophus blasii* odpočívající v dolní jeskyni Negru. Foto M. UHRIN.

***Plecotus kolombatovici* Đulić, 1980**

Kefala cave, at the cave entrance, 4 October 2017: obs. 1 foraging ind.; – Pothia, at the Agia Varvara cave, 5 October 2017: net. 1 ♂ ad, det. calls of 2 foraging inds. [I]; – Rina, Daskalio cave, 4 October 2017: obs. & exam. 1 ♂ ad, 1 ♀ ad.

***Tadarida teniotis* (Rafinesque, 1814)**

Arginonta, corniche, 6 October 2017: det. & rec. calls of 1 passing ind. [1]; – Kantouni, village, 1 October 2017: det. & rec. calls of 1–2 foraging inds. [1]; – Kefala cave, at the cave entrance, 4 October 2017: det. & rec. calls of at least 2 foraging inds. [6]; – Pothia, corniche, 6 October 2017: det. & rec. calls of at least 2 passing inds. [1]; – Pothia, at the Agia Varvara cave, 5 October 2017: det. & rec. calls of at least

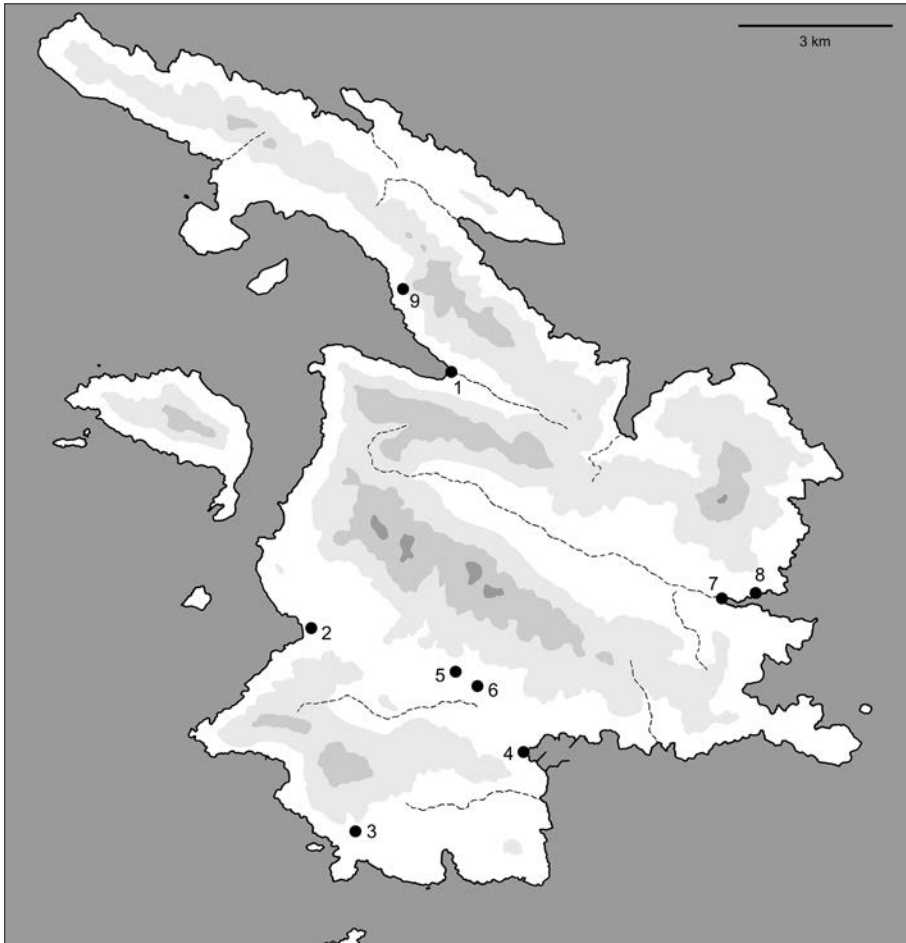


Fig. 4. Map of Kalymnos with localities of bat occurrence; pale grey – area above 200 m a. s. l., medium grey – area above 400 m a. s. l., dark grey – area above 600 m a. s. l.

Obr. 4. Mapa Kalymnu s lokalitami výskytu netopýřů; světle šedě – území nad 200 m n. m., prostředně šedě – území nad 400 m n. m., tmavě šedě – území nad 600 m n. m.

Legend / legenda: 1 – Arginonta; 2 – Kantouni; 3 – Kefala cave / jeskyně Kefala; 4 – Pothia; 5 – Pothia, Epta Parthenon cave / jeskyně Sedmi pannen; 6 – Pothia, Agia Varvara cave / jeskyně Svaté Barbory; 7 – Rina; 8 – Rina, Daskalio cave / jeskyně Daskalio; 9 – Skalia, Skalia cave / jeskyně Skalia.



Fig. 5. Kalymnos. a – view of Pothia from the west. b – view of the Emboreos bay from the entrance to the Skalia cave. c – entrance to the Skalia cave. d – the Vathys valley from the east, the Rina bay. e – entrance to the Daskalio cave above the Rina bay. f – *Plecotus kolombatovici* roosting in the Daskalio cave. Photos by M. UHRIN.

Obr. 5. Kalymnos. a – pohled na Pothii od západu. b – pohled na zátoku Emboreos od vchodu jeskyně Skalia. c – vchod jeskyně Skalia. d – údolí Vathys od východu, zátoky Rina. e – vchod jeskyně Daskalio nad zátokou Rina. f – *Plecotus kolombatovici* odpívající v jeskyni Daskalio. Foto M. UHRIN.

1 foraging ind. [1]; – Pothia, at the Epta Parthenon cave, 2 October 2017: det. & rec. calls of several foraging inds. [3]; – Rina, corniche, 6 October 2017: det. & rec. calls of 1–2 foraging inds. [3]; – Skalia, at the Skalia cave, 3 October 2017: det. & rec. calls of at least 2 foraging inds. [5]

S y m i

Rhinolophus blasii Peters, 1866

Ampeli, Kourkouniotis, at a cistern, 23 August 2012: det. & rec. calls of 1 foraging ind. [1], 26 August 2012: det. & rec. calls of 1–2 foraging inds. [4]; – Karo, 300 m W of Agioi Anargyroi monastery, at a cistern, 24 August 2012: det. calls of 1 foraging ind.

Myotis blythii (Tomes, 1857)

Karo, 300 m W of Agioi Anargyroi monastery, above a cistern, 24 August 2012: net. 2 ♂♂ ad.

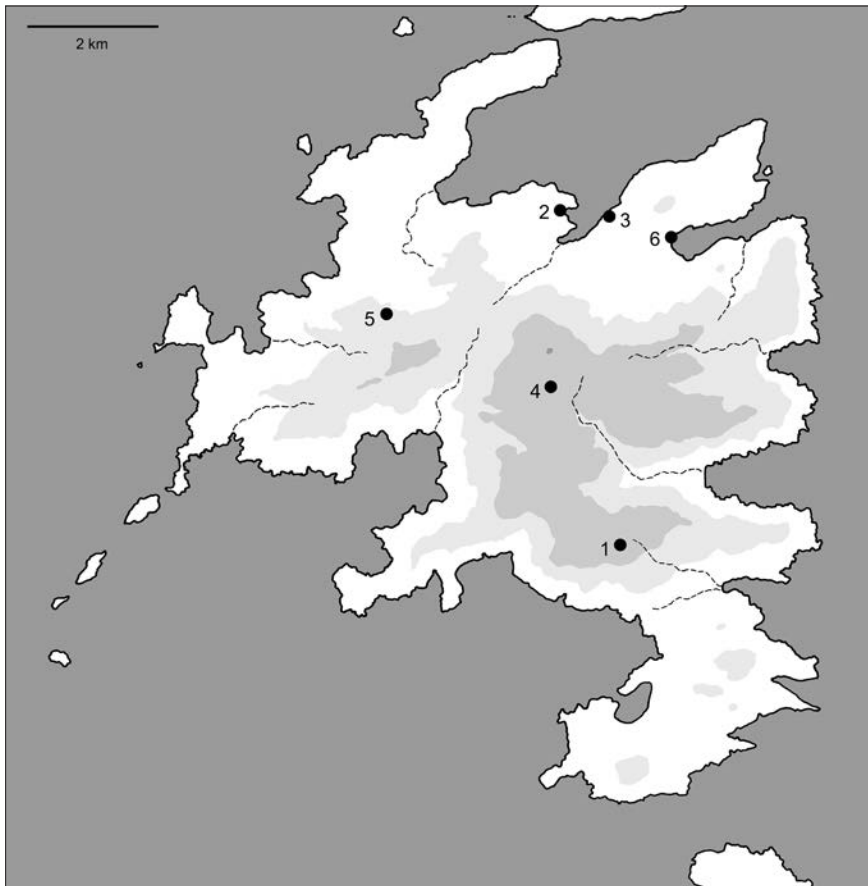


Fig. 6. Map of Symi with localities of bat occurrence; pale grey – area above 200 m a. s. l., medium grey – area above 400 m a. s. l., dark grey – area above 600 m a. s. l.

Obr. 6. Mapa Symi s lokalitami výskytu netopýřů; světle šedě – území nad 200 m n. m., prostředně šedě – území nad 400 m n. m., tmavě šedě – území nad 600 m n. m.

Legend / legenda: 1 – Ampeli, Kourkouniotis / Kurkuniotis; 2 – Gialos, Harani / Charani; 3 – Gialos, Xynidas; 4 – Glyfonies; 5 – Karo, Agioi Anargyroi / Svatý Anargyros; 6 – Pedio.



Fig. 7. Symi. a – view of the Noulia ridge with Gialos in the foreground and Pedio valley on the right. b – coniferous forest at Kourkouniotis; Symi is the most forested island of the four visited. c – cistern of Kourkouniotis, the site of documented occurrence of seven bat species. d – cistern at Karo, west of the Agioi Anargyroi monastery. Photos by Z. BENDOŤÁ.

Obr. 7. Symi. a – pohled na hřeben Nulia s městečkem Jalos v popředí a údolím Pedia napravo. b – jehličnatý les u Kurkuniotisu; Symi je nejlesnatějším ostrovem ze čtyř navštívených. c – jímka u Kurkuniotisu, místo dokumentace sedmi druhů netopýřů. d – jímka v Karu u kláštera Svatého Anargyra. Foto Z. BENDOŤÁ.

***Myotis emarginatus* (Geoffroy, 1806)**

Ampeli, Kourkouniotis, above a cistern, 23 August 2012: net. 3 ♂♂ ad, det. & rec. calls of several foraging inds. [2].

***Eptesicus anatolicus* Felten, 1971**

Karo, 300 m W of Agioi Anargyroi monastery, above a cistern, 24 August 2012: det. & rec. calls of 1 foraging ind. [1].

***Hypsugo savii* (Bonaparte, 1837)**

Ampeli, Kourkouniotis, above a cistern, 23 August 2012: net. 3 ♂♂ ad, det. & rec. calls of several foraging inds. [12], 26 August 2012: net. 3 ♂♂ ad, det. calls of several foraging inds.; – Gialos, Harani, corniche, 20 August 2012: det. & rec. call of 1 foraging ind. [1]; – Gialos, Xynidas bay, 20 August 2012: det. & rec. calls of 1 foraging ind. [1]; – Glyfonies, above a cistern, 25 August 2012: net. 2 ♂♂ ad, det. & rec. calls of several foraging inds. [6]; – Karo, 300 m W of Agioi Anargyroi monastery, above a cistern, 24 August 2012: net. 1 ♂ ad, 1 ♀ sad, det. & rec. calls of several foraging inds. [13]; – Pedio, corniche, 22 August 2012: det. calls of 1 foraging ind. [1].

***Pipistrellus pipistrellus* (Schreber, 1774)**

Ampeli, Kourkouniotis, at a cistern, 23 August 2012: det. & rec. calls of several foraging inds. [1]; – Glyfonies, at a cistern, 25 August 2012: det. & rec. calls of at least 1 foraging ind. [1]; – Karo, 300 m W of Agioi Anargyroi monastery, at a cistern, 24 August 2012: det. calls of 1 foraging ind. [1].

***Pipistrellus kuhlii* (Kuhl, 1817)**

Ampeli, Kourkouniotis, at a cistern, 23 August 2012: det. & rec. calls of at least 1 foraging ind. [2].

***Plecotus kolombatovici* Đulić, 1980**

Ampeli, Kourkouniotis, above a cistern, 23 August 2012: net. 1 ♂ ad, 26 August 2012: net. 1 ♂ ad, 1 ♀ ad.

***Miniopterus schreibersii* (Kuhl, 1817)**

Ampeli, Kourkouniotis, above a cistern, 23 August 2012: net. 1 ♀ ad.

Megisti (Kastelorizo)

***Rhinolophus ferrumequinum* (Schreber, 1774)**

Mandraki, pine wood, 24 August 2012: det. & rec. calls of at least 1 foraging ind. [1]; – Megisti, at a cistern above a rocky cliff, 22 August 2012: det. & rec. calls of 1 foraging ind. [1].

***Rhinolophus blasii* Peters, 1866**

Agios Georgios tou Vounou, at a cistern, 25 August 2012: det. & rec. calls of several foraging inds. [2].

***Eptesicus anatolicus* Felten, 1971**

Agios Georgios tou Vounou, at a cistern, 25 August 2012: det. & rec. calls of several foraging inds. [4]; – Megisti, rocky cliff, 20 August 2012: det. & rec. call of 1 foraging ind. [1].



Fig. 8. Map of the Megisti (Kastelorizo) Archipelago with localities of bat occurrence; pale grey – area above 100 m a. s. l., dark grey – area above 200 m a. s. l.

Obr. 8. Mapa souostroví Megisti (Kastelorizo) s lokalitami výskytu netopýřů; světle šedě – území nad 100 m n. m., tmavě šedě – území nad 200 m n. m.

Legend / legenda: 1 – Agios Georgios, cistern / jímka; 2 – Megisti, cistern / jímka; 3 – Megisti, rocky cliff / skalní ostroh; 4 – Megisti; 5 – Mandraki, pine wood / borový háj.



Fig. 9. Megisti (Kastelorizo). a – view of Megisti in the foreground and the Anatolian coast in the background. b – steep cliffs above Megisti. c – cistern and surrounding plain on the cliff margin above Megisti. d – Agios Georgios tou Vounou, a plain in the centre of the island. Photos by M. UHRIN.

Obr. 9. Megisti (Kastelorizo). a – pohled na městečko Megisti v popředí a anatolské pobřeží v pozadí. b – strmý útes nad Megisti. c – jímka a okolní plošina při okraji útesu nad Megisti. d – Svatý Jiří Na hoře, plošina ve střední části ostrova. Foto M. UHRIN.

***Pipistrellus pipistrellus* (Schreber, 1774)**

Agios Georgios tou Vounou, at a cistern, 25 August 2012: det. & rec. calls of several foraging inds.

***Pipistrellus kuhlii* (Kuhl, 1817)**

Agios Georgios tou Vounou, at a cistern, 25 August 2012: det. & rec. calls of several foraging inds. [8]; – Mandraki, pine wood, 23 August 2012: det. & rec. calls of several foraging inds. [2], 24 August 2012: det. & rec. calls of several foraging inds. [4]; – Megisti, at a cistern above a rocky cliff, 22 August 2012: net. 1 ♂ sad, 1 ♀ sad, det. & rec. calls of several foraging inds. [9]; – Megisti, rocky cliff, 20 August 2012: det. & rec. calls of several foraging inds. [1]; – Megisti, town, 26 August 2012: det. calls of several foraging inds.; – Megisti, at a cistern in town, 21 August 2012: det. & rec. calls of several foraging inds. [2].

***Tadarida teniotis* (Rafinesque, 1814)**

Mandraki, pine wood, 23 August 2012: det. calls of several foraging inds., 24 August 2012: det. & rec. calls of several foraging inds. [2]; – Megisti, rocky cliff, 20 August 2012: det. & rec. calls of several foraging inds. [3]; – Megisti, at a cistern above a rocky cliff, 22 August 2012: det. calls of at least 1 foraging ind. [1].

COMMENTS

The newly documented bat fauna of the four Dodecanese islands, Astypalea, Kalymnos, Symi, and Megisti (Kastelorizo), comprises eleven species, all of which were already known from other islands of the Archipelago (Tables 2, 4). The diversity of the bat fauna of the particular islands is represented by five (on Astypalea) to nine (on Symi) species. Three bat species, *Rhinolophus blasii*, *Pipistrellus pipistrellus* and *P. kuhlii*, were found in all four islands, two species, *Hypsugo savii* and *Tadarida teniotis* in three islands (Astypalea, Kalymnos, Symi, and Astypalea, Kalymnos, Megisti, respectively), and *Eptesicus anatolicus* and *Plecotus kolombatovici* in two islands (Symi, Megisti, and Kalymnos, Symi, respectively). The remaining four species, *Rhinolophus ferrumequinum*, *Myotis blythii*, *M. emarginatus*, and *Miniopterus schreibersii*, are known from only one island each (Table 4). Finally, bats are now known from the five largest islands of the Archipelago, plus at least from two others (Tables 2, 4).

Eptesicus anatolicus was newly documented from Symi and Megisti (Kastelorizo). These islands are after Rhodes only the second and third sites of Greece (and thus, of Europe as a political unit) where this species was found. On the other hand, this is a bat occurring rather commonly along the southern Anatolian coast (SPITZENBERGER 1994, BENDA & HORÁČEK 1998) and its occurrences in two islands situated two and seven kilometres from the coast of Turkey, are thus natural parts of its distribution range.

The presence of *Pipistrellus pipistrellus* on seven islands of the Dodecanese Archipelago is rather surprising (Tables 2, 4). Although this bat is not traditionally regarded as the most typical pipistrelle species of the Mediterranean or even island environments, it is more frequent in the islands than the “typical” Mediterranean pipistrelle, *Pipistrellus kuhlii*, known only from five islands of the Dodecanese (Table 4). Anyway, both latter species were found in all four recently studied islands. With the exception of Kalymnos, where these two species were documented to forage at several sites equally distributed across the island, in the remaining three islands one species was found as dominating over the other (see Records).

Two bat species, *Hypsugo savii* and *Tadarida teniotis*, were newly documented only from three recently studied islands each. However, both species belong to the most common species in the eastern Mediterranean region including islands (see e.g. BENDA et al. 2009 concerning their known occurrence density in Crete) and represent similar faunal elements as the above two *Pipistrellus* species. We consider their missing in some island inventory lists rather as an accidental bad luck in the field works than their real absence in the island biotas. On the other hand, three generally widespread and rather large-sized bat species, *Rhinolophus ferrumequinum*, *Myotis blythii*, and *Miniopterus schreibersii*, were found only in one island each, *R. ferrumequinum* in Megisti, while *M. blythii* and *M. schreibersii* in Symi. These species are quite conspicuous both in their roosts and at their foraging grounds, their missing in a certain island inventory list can thus indicate their real absence in the respective island or at least a very low population density there. Concerning their common occurrence in the eastern Mediterranean, *Rhinolophus hipposideros* and *Myotis myotis* (known only from Rhodes and Kos in the Dodecanese) belong to the same category.

Rhinolophus blasii was documented from all Dodecanese islands with any bat records except from Kos and Leros (Table 4). This is a very common horseshoe bat of the eastern Mediterranean (although it is missing in the western and central parts of Mediterranean Europe), in islands of this region it is the most frequent and widespread member of the genus. Besides the four newly studied Dodecanese islands and Rhodes and Karpathos (Tables 2, 4), *R. blasii* was reported to occur also in Crete, Euboea, Lesbos, Thassos, Kythira, Ikaria, Skyros, Milos, Petalas, and Cyprus (HANÁK et al. 2001, LANE & ALIVIZATOS 2006, BENDA et al. 2007, 2009, GEORGIAKAKIS

Table 4. Composition of the bat faunas (+ = occurrence confirmed; – = occurrence unconfirmed) of the particular Dodecanese islands in comparison with the faunas of Crete, south-western Anatolia and Cyprus (BENDA & HORÁČEK 1998, BENDA et al. 2004, 2007, 2009, KARATAŞ & SÖZEN 2006, SPITZENBERGER et al. 2006, YİĞİT et al. 2008, FURMAN et al. 2010).

Tab. 4. Složení netopýřích faun (+ = výskyt potvrzen; – = výskyt nepotvrzen) jednotlivých Dodekaneských ostrovů ve srovnání s faunami Kréty, jihozápadní Anatolie a Kypru (BENDA & HORÁČEK 1998, BENDA et al. 2004, 2007, 2009, KARATAŞ & SÖZEN 2006, SPITZENBERGER et al. 2006, FURMAN et al. 2010).

Legend / legenda: CR = Crete / Kréta, AS = Astypalea, KR = Karpathos, RH = Rhodes / Rhodos, SY = Symi, KO = Kos, KL = Kalymnos, LE = Leros, MG = Megisti (Kastelorizo), AN = south-western part of Anatolia / jihozápadní část Anatolie; CY = Cyprus / Kypr; OI = number of occupied Dodecanese islands / počet osídlených Dodekaneských ostrovů; MNS = minimum number of species / minimální počet druhů

| species / druh | CR | AS | KR | RH | SY | KO | KL | LE | MG | AN | CY | OI |
|--|----|----|-----|-----|----|-----|----|-----|----|----|-----|-----|
| <i>Rousettus aegyptiacus</i> | – | – | – | – | – | – | – | – | – | + | + | – |
| <i>Rhinolophus ferrumequinum</i> | + | – | – | + | – | + | – | – | + | + | + | 3 |
| <i>Rhinolophus hipposideros</i> | + | – | – | + | – | [+] | – | – | – | + | + | 1–2 |
| <i>Rhinolophus euryale</i> | – | – | – | [+] | – | – | – | – | – | + | [+] | [1] |
| <i>Rhinolophus mehelyi</i> | – | – | – | – | – | – | – | – | – | + | + | – |
| <i>Rhinolophus blasii</i> | + | + | + | + | + | – | + | – | + | + | + | 6 |
| <i>Myotis myotis</i> | – | – | – | + | – | + | – | – | – | + | – | 2 |
| <i>Myotis blythii</i> | + | – | + | – | + | – | – | – | – | + | + | 2 |
| <i>Myotis bechsteinii</i> | – | – | – | – | – | – | – | – | – | + | – | – |
| <i>Myotis nattereri</i> | – | – | – | – | – | – | – | – | – | + | + | – |
| <i>Myotis emarginatus</i> | + | – | + | – | + | – | – | – | – | + | + | 2 |
| <i>Myotis mystacinus</i> s.l. | + | – | – | – | – | – | – | – | – | + | – | – |
| <i>Myotis capaccinii</i> | + | – | – | – | – | – | – | – | – | + | [+] | – |
| <i>Eptesicus serotinus</i> | + | – | – | – | – | – | – | – | – | + | + | – |
| <i>Eptesicus anatolicus</i> | – | – | – | + | + | – | – | – | + | + | + | 3 |
| <i>Hypsugo savii</i> | + | + | + | + | + | – | + | – | – | + | + | 5 |
| <i>Pipistrellus pipistrellus</i> group | + | + | + | + | + | + | + | – | + | + | + | 7 |
| <i>Pipistrellus kuhlii</i> | + | + | – | + | + | – | + | – | + | + | + | 5 |
| <i>Pipistrellus nathusii</i> | + | – | – | – | – | – | – | – | – | + | – | – |
| <i>Nyctalus noctula</i> | – | – | – | – | – | – | – | – | – | + | [+] | – |
| <i>Nyctalus leisleri</i> | + | – | – | [+] | – | – | – | – | – | + | + | [1] |
| <i>Nyctalus lasiopterus</i> | – | – | – | – | – | – | – | – | – | + | + | – |
| <i>Plecotus macrobullaris</i> | + | – | – | – | – | – | – | – | – | + | – | – |
| <i>Plecotus kolombatovici</i> | + | – | – | + | + | – | + | – | – | + | + | 3 |
| <i>Miniopterus schreibersii</i> | + | – | [+] | + | + | + | – | – | – | + | + | 3–4 |
| <i>Miniopterus pallidus</i> | – | – | – | – | – | – | – | – | – | + | – | – |
| <i>Tadarida teniotis</i> | + | + | + | + | – | + | + | [+] | + | + | + | 6–7 |
| MNS | 17 | 5 | 6 | 11 | 9 | 5 | 6 | [1] | 6 | 27 | 18 | 13 |

et al. 2012), i.e. altogether in 16 islands, which is a higher level than the insular occurrence of *Rhinolophus ferrumequinum* or *R. hipposideros* in the respective region (found in 13 and 11 islands, respectively), generally the most common and widespread horseshoe bats of the western Palaearctic. *Plecotus kolombatovici* seems to represent a similar faunal element in the eastern Mediterranean as *Rhinolophus blasii*; it is similarly missing in the central and western Mediterranean, while in the eastern part of the region, it is the most frequent *Plecotus* bat in

islands. Besides three Dodecanese islands, Rhodes, Symi and Kalymnos (Table 4), *P. kolombatovici* was recorded also in Crete, Corfu, Chios, Sazan and Cyprus (BENDA et al. 2004, 2007, SPITZENBERGER et al. 2006, THÉOU & LOCE 2017), most probably in Santorini and Samothrace (DOUGLASS 1892, HANÁK et al. 2001), and also at least in eight Dalmatian islands, from where it was originally described (ĐULIĆ 1980, TVRTKOVIĆ et al. 2005). *Plecotus macrobullaris* is another species of this genus with insular occurrence in the eastern Mediterranean; however, it remains known only from Crete (BENDA et al. 2009), while in other islands it was not found.

The recorded bat faunas of the four Dodecanese islands based on one-week research trips certainly cannot be considered as completely studied. There are several bat species, which occur both in Crete and the Asian mainland, but have not yet been recorded from the Dodecanese at all (Table 4), namely *Myotis mystacinus* s.l., *M. capaccinii*, and *Eptesicus serotinus*. These species could occur in some islands closely adjacent to Anatolia, such as Kalymnos, Kos, Symi, Rhodes and/or Megisti (Fig. 1). *Rousettus aegyptiacus* is another bat species which could be theoretically found in the Dodecanese. This bat has been recently documented to spread its range westward along the southern coast of Anatolia (BENDA et al. 2011) and its westernmost records are available from Finike, Demre and Fethiye, the areas facing two easternmost islands of the Dodecanese Archipelago, Rhodes and Megisti. Possible records of the fruit bat could enrich the European fauna by a new element, similarly as it was demonstrated in *Eptesicus anatolicus*, an Asian species that reaches the western margin of its range in these islands (see above).

To be concluded, the presented results of the first simple surveys have brought rather limited data on bats from the four Dodecanese islands. Additional trips, covering also other seasons, are necessary to complement the data from the islands. On the other hand, these surveys have shown the week period to be sufficient to gather basic data on the bat fauna from an island of the small to medium size, which could be applied also in other islands of the Dodecanese as well as other archipelagos of Greece or even the Mediterranean Basin.

SOUHRN

Dodekaneské souostroví sestává z více než 300 ostrovů a ostrůvků (obr. 1), z nichž jen 30 má rozlohu větší než 1 km². Fauna netopýrů tohoto souostroví není známá do velkých podrobností, netopýři byli dosud hlášeni jen ze tří či čtyř ostrovů. Nejvíce druhů (11–14) bylo nalezeno na největším ostrově Rhodos, méně pak na Karpathosu (6–7) a Kosu (5–6); jeden druh byl neurčitě hlášen z ostrova Leros. Zde je poprvé dokumentována fauna netopýrů ze čtyř dalších Dodekaneských ostrovů, Astypalee, Kalymnosu, Symi a Megisti (Kasteloriza). Celkem na nich bylo nalezeno 11 druhů, všechny už předtím ze souostroví známé (tab. 2, 4). Diversita fauny netopýrů jednotlivých ostrovů je představována pěti (na Astypalee) až devíti druhy (na Symi). Tři druhy netopýrů, vrápenec Blasiův (*Rhinolophus blasii*), netopýr hvízdavý (*Pipistrellus pipistrellus*) a netopýr vroubený (*Pipistrellus kuhlii*) byly dokumentovány na všech čtyřech ostrovech; dva druhy, netopýr Saviův (*Hypsugo savii*) a morous evropský (*Tadarida teniotis*) na třech ostrovech (Astypalea, Kalymnos a Symi, resp. Astypalea, Kalymnos a Megisti); netopýr anatolský (*Eptesicus anatolicus*) a ušán balkánský (*Plecotus kolombatovici*) na dvou ostrovech. Zbývající čtyři druhy, tedy vrápenec velký (*Rhinolophus ferrumequinum*), netopýr východní (*Myotis blythii*), netopýr brvitý (*Myotis emarginatus*) a létavec evropský (*Miniopterus schreibersii*), byli zaznamenáni každý jen na jediném ostrově (tab. 4).

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APPENDIX – GAZETTEER

Astypalea. Agios Konstantinos [Άγιος Κωνσταντίνος], gardens, 36° 31' 34" N, 26° 21' 11" E, 24 m a. s. l.; – Ftera Mt., Stavros [Φτέρρα, Σταυρός], spring, 36° 33' 05" N, 26° 18' 11" E, 238 m a. s. l.; – Hora [Χώρα], castle, 36° 32' 39" N, 26° 21' 19" E, 135 m a. s. l.; – Livadia [Λιβάδια], village, 36° 32' 36" N, 26° 20' 36" E, 2 m a. s. l.; – Livadia, Fragma [Λιβάδια, Φράγμα], northern bank, 36° 33' 11" N, 26° 19' 38" E, 50 m a. s. l.; – Vatses, Negrou caves [Βάτσες, Σπήλαιο του Νέγρου], lower cave, 36° 30' 58" N, 26° 18' 55" E, 135 m a. s. l.

Kalymnos. Arginonta [Αργινώντα], corniche, 37° 00' 55" N, 26° 58' 09" E, 10 m a. s. l.; – Kantouni [Καντούνι], village, 36° 58' N, 26° 56' E, 0–25 m a. s. l.; – Kefala cave [Σπήλαιο Κεφαλάς], 36° 56' 04" N, 26° 56' 45" E, 82 m a. s. l.; – Pothia [Πόθια], corniche, 36° 56' 55" N, 26° 58' 58" E, 1 m a. s. l.; – Pothia, Epta Parthenon cave [Πόθια, Σπήλαιο των Επτά Παρθένων], 36° 57' 43" N, 26° 58' 13" E, 77 m a. s. l.; – Pothia, Agia Varvara cave [Πόθια, Σπήλαιο Αγίας Βαρβάρας], 36° 57' 30" N, 26° 58' 24" E, 87 m a. s. l.; – Rina [Ρίνα], corniche, 36° 58' 29" N, 27° 01' 36" E, 1 m a. s. l.; – Rina, Daskalio cave [Ρίνα, Σπήλαιο Δασκαλειό], 36° 58' 31" N, 27° 02' 01" E, 15 m a. s. l.; – Skalia, Skalia cave [Σκάλια, Σπήλαιο Σκαλιών], 37° 01' 48" N, 26° 57' 30" E, 115 m a. s. l.

Symi. Ampeli, Kourkouniotis [Αμπέλι, Κουρκουνιώτης], cistern, 36° 34' 28" N, 27° 50' 38" E, 454 m a. s. l.; – Gialos, Harani [Γιαλός, Χαράνι], 36° 37' 12" N, 27° 50' 12" E, 5 m a. s. l.; – Gialos, Xynidas bay [Γιαλός, Όρμος Ξυνιδάς Γιαλί], 36° 37' 10" N, 27° 50' 42" E, 21 m a. s. l.; – Glyfonies [Γλυφονιές], cistern, 36° 35' 42" N, 27° 50' 01" E, 465 m a. s. l.; – Karo, Agioi Anargyroi monastery [Κάρο, Μονή Άγιοι Αναργυροί], cistern, 36° 36' 26" N, 27° 48' 22" E, 210 m a. s. l.; – Pedio [Πέδι], 36° 36' 56" N, 27° 51' 20" E, 1 m a. s. l.

Megisti (Kastelorizo). Agios Georgios tou Vounou [Άγιος Γεώργιος του Βουνού], cistern, 36° 08' 29" N, 29° 35' 23" E, 142 m a. s. l.; – Megisti [Μεγίστη], cistern above a rocky cliff, 36° 08' 44" N, 29° 35' 24" E, 145 m a. s. l.; – Megisti [Μεγίστη], rocky cliff, 36° 08' 46" N, 29° 35' 26" E, 119 m a. s. l.; – Megisti [Μεγίστη], town, 36° 08' 52" N, 29° 35' 23" E, 0–5 m a. s. l.; – Mandraki [Μανδράκι], pine wood, 36° 08' 49" N, 29° 35' 57" E, 5 m a. s. l.