MISSION REPORT

April, 25th to May 3rd 2024

PIM expedition to the Greek small islands

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Saronic Gulf *May 2024*

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GENERAL DATA

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RESUME: Du 25 avril au 2 mai 2024, une mission PIM a été organisée en Grèce sur une dizaine d'îlots du Golfe Saronique, permettant d'améliorer les connaissances de ces îles sur différents compartiments biologiques: herpétologie, botanique, avifaune et inverterbrés. Cette mission a notamment permis de signaler pour la première fois la présence de reptiles pour certains îlots inexplorés.

Mots-clés: Reptiles, Flore, Avifaune, Entomologie, Méditerranée, Îles Ioniennes, Grèce.

ABSTRACT: From the 25th of April to the 3rd of May, a PIM naturalist mission was organised in the Saronic gulf in Greece, enabling knowledge improvement of these islands in terms of various biological compartments: herpetology, botany, avifauna and invertebrates. In particular, this mission enabled the presence of reptiles to be reported for the first time on certain unexplored islets.

Key-words : Reptiles, Flora, Avifauna, Entomology, Mediterranean, Ionian Islands,

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CONTEXT

Initiative pour les Petites Iles de Méditerranée

Initiated in 2006 by the French Conservatoire du Littoral, PIM Initiative coordinates an international program to promote and assist in the management of Mediterranean and macaronesian small islands. PIM Initiative is an international NGO whose aim is to preserve Mediterranean islands of less than 1,000 hectares by implementing practical conservation measures on the ground. As refuges for many endangered species in ecosystems that are sensitive to global change, these small islands are at the heart of the challenge of safeguarding biodiversity. PIM's teams draw on a large network of experts and managers from all over the Mediterranean to support the creation and development of island protected areas, using an integrated approach that promotes:

- Improving knowledge of island ecosystems
- Setting up co-management systems for protected sites
- Capacity-building for managers
- Ecological restoration of degraded natural environments
- Communication and advocacy for better protection of these areas.

INDEX

LIST OF ABBREVATIONS

- PIM: Initiative pour les Petites Iles de Méditerranée

INTRODUCTION

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The small islands of the Saronic Bay constitute in many regards an ecological paradox: while they are situated in the immediate vicinity of Athens, one of the largest cities in the Mediterranean Basin, and despite bearing similarities to other nearby much-visited islands of international fame (e.g. the Cyclades), they remain to this day almost completely unstudied and unknown. At the same time, because they are relatively intact, and harbor populations of many sensitive and declining species, they offer exceptional opportunities for biodiversity conservation.
The purpose of this 2024 PIM expedition to the region was to gather critical baseline information 1. on the biodiversity of this region, and 2. On the ecological challenges and the conservation potential of the islands.

Background information

Geology

The focal islands of this visit (e.g. Lagophytonisia, Metopi, Plateia Porou, Mbisti, Galeanthi, Mbourtzi etc.) are products of complex geological processes resulting from the tectonic activity of the Aegean region. These islets are composed primarily of limestone and related sedimentary rocks (e.g. Metopi Isl. consists of sandstone) and have often a relatively even surface. Nonetheless a few (such as the islet of Limani as well as the nearby Methana Peninsula) consist of volcanic substrates derived from the nearby subduction zone between the European and African tectonic plate.

The Saronic Bay as a whole is a relatively shallow sea, meaning that much of it was subaerial during much of the duration the last ice ages. Consequently, the islands located in the bay are all quite young, having been connected to the adjacent mainland during the last ice age. Because of this young age and also their small distances to the nearby mainland which prevent the buildup of large waves, coastal wave erosion is comparatively modest. Many island coastlines are therefore relatively smooth, lacking the sea caves and towering sea cliffs of the more exposed central Aegean archipelago islands.

The karstic substrates of the Saronic islets have important effects for the vegetation and the ecology of the region. First this type of fissured bedrock tends to drain surface water away quickly, therefore exacerbating the effects arid conditions; second because limestone erodes very slowly into nutrient-poor *terra rossa* soils, soil profiles are quite shallow and can typically support only a limited, yet distinctive flora.

Climate

Climatic conditions on the islands resemble those of the nearby Attica and Peloponnesian mainlands (REF). Being situated in the rain shadow of the tall nearby mountain ranges (Parnitha, Kithaironas, Parnassos) and lacking themselves any high ground needed to intercept cloud moisture, the islands receive only modest amounts of annual precipitation. The climate of the region, which is characterized by arid summers, mild rainy winters, and the presence of year-round winds, exerts significant influence on the islands' biodiversity and ecological dynamics.

History of biological exploration of the islands

(to be filled in by the respective groups)

For Reptiles: cite mostly Clark who visited the islands 50+years ago, as well as early visits by Werner and Wettstein.

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Introduction

While the flora and fauna of the larger Greek Saronic Gulf islands is comparatively well known, there is almost complete absence of biological information regarding the numerous islets in the region. The objective of the Mission PIM - Greece 2024 was to improve knowledge of the flora and fauna of the small islands located in an area between western Attika and the coast of Northeastern Peloponnese (Map 1). Given the high biological value of these small islets, in conjunction with the general lack of knowledge regarding their species communities, resulted in us almost completely sidestepping the larger islands of the region (Aegina, Salamina, Angistri).

Map 1 - Study area Mission PIM - Greece 2024, Saronic islands.

Methods

We quantified the herpetofauna of the focal islands during targeted field surveys conducted by expedition members in the period of April 26-May 02 2024. We utilized the Visual Encounter Survey (VES) technique (Crump & Scott, 1994) which involves time-constrained visual surveys

focusing on species-appropriate reptile refugia. Whenever possible, presence of a species was documented through photographs. While the we focused on detection of live individuals, occasionally indirect evidence was used to also document species presence, including calls (geckos, anurans) or sloughted snake skins.

Occasional samples (e.g. snake sloughs) were collected under authorization from the Greek government (see general mission report) and deposited in the National & Kapodistrian University of Athens collections.

Results

The expedition started on April 26 from the marina of Nea Peramos (W. Attika) under good weather conditions (sunny, 3-4Bf winds). While sailing to the study area we passed by Salamina island and associated islets (e.g. Makronisos (Fig. 1), Revythousa (Fig. 2), Kanakia) without stopping. Our first surveys focused instead on the Lagophytonissia islet cluster between Aegina and Salamina. Our first stop was Lagousaki islet (Fig. 3–4), north of Aegina. During our stay (approx. 70 minutes) we were able to document *Chalcides ocellatus* (7 individuals) (Fig. 5), as well as *Mediodactylus kotschyi* (32) (Fig. 6).

Fig. 1. The unsurveyed islet of Makronisos, off the coasts of Attika and Salamina

Fig. 2. Revythousa Island is nearly completely occupied by natural gas storage facilities and was not surveyed

Fig. 3. Lagousaki Islet

Fig. 4. Lagousaki Islet-view of the central plateau with *Pistacea lentiscus* thickets

Fig. 5. Adult *Chalcides ocellatus* on Lagousaki Islet

Fig. 6. Adult *Mediodactylus kotschyi* on Lagousaki Islet

The next site visited was tiny islet of Gaidaros (Fig. 7–8) for about 25 minutes, which however produced no records.

Fig. 7. Gaidaros Islet-Overview

Fig. 8. Gaidaros. The central plateau of the islet

The third islet we visited was Lagousa (Fig. 9–10), for about 90 minutes, with *Chalcides ocellatus* (11 indiv.) (Fig. 11) and *Mediodactylus kotschyi* (4 indiv.) (Fig. 12) encountered there.

Fig. 9. Lagousa Islet

Fig. 10. Lagousa Islet

Fig. 11. Adult *Chalcides ocellatus* on Lagousa Islet

Fig. 12. Adult *Mediodactylus kotschyi* on Lagousa Islet *in situ*

The last islet for the first day where visited at late evening was Makronisi (Fig. 13–14) for about 60 minutes. Makronissi is a flat, low, longish island, without much elevational profile, and coverd by a mat of dense halophilous vegetation. There we were able to document *Chalcides ocellatus* (2 indiv.) as well as *Mediodactylus kotschyi* (7 indiv.) (Fig. 15–16). Following the completion of field surveys we returned to Aegina where we spend the night in the main port.

Fig. 13. Makronisi Islet

Fig. 14. Makronisi Islet

Fig. 15. Adult *Mediodactylus kotschyi* on Makronisi Islet

Fig. 16. Adult *Mediodactylus kotschyi* on Makronisi Islet *in situ*

On April 27 in the morning we visited the islet of Metopi (Fig. 17–22), located between Aegina and Angistri, for about 2,5 hours. Metopi is a largish, very flat, low island consisting of sedimentary rocks that has never been visited before by herpetologists. The islet is covered mainly by ruderal vegetation on abadoned grain fields, coastal heath and elements of maquis, as well as multiple old, mostly damaged structures (dry stone walls, chapel, cisterns and houses); on the west side there is a small lagoon with associated salt marsh areas. Reptile species observed on the island were *Chalcides ocellatus* (13 indiv.) (Fig. 23), *Hemidactylus turcicus* (4 indiv.) (Fig. 24); also, one a dead *Caretta caretta* (Fig. 25) was observed on the beach, as well as several snake sloughs. Based on scalation characters we concluded that two of the sloughs belonged to *Platyceps najadum* (Fig. 26) and four to *Hierophis gemonensis*. – however these records require additional confirmation for this island. All snake sloughs were collected for future studies.

Fig. 17. Metopi Islet

Fig. 18. Halophytic coastal heath on Metopi Islet

Fig. 19. Saltmarsh on Metopi Islet

Fig. 20. The south coast of Metopi Islet

Fig. 21. Abadoned old buildings on Metopi Islet

Fig. 22. Low dry-stone wall on Metopi Islet

Fig. 23. Adult *Chalcides ocellatus* on Metopi Islet *in situ*

Fig. 24. Adult *Hemidactylus turcicus* on Metopi Islet *in situ*

Fig. 25. A dead *Caretta caretta* on Metopi Islet

Fig. 26. A snake slough on Metopi Islet

While sailing to the next survey site (Plateia Porou) we passed by the Petrokaravo rocks (Fig. 27), unfortunately without being able to stop. Plateia was a smallish, flat rocky island with a dense seabird colony and covered by nitrophilous vegetation. Once on Plateia, we surveyed the islet (Fig. 28–29) for about 50 minutes. The island was notable for its dense population of *Mediodactylus kotschyi* (54 indiv.) (Fig. 30–31); *Ablepharus kitaibelii* (2 indiv.) was also present.

Fig. 27. Petrokaravo Rocks

Fig. 28. Plateia Islet, Poros

Fig. 29. Plateia Islet, Poros

Fig. 30. Adult *Mediodactylus kotschyi* on Plateia Islet, Poros

Fig. 31. Adult *Mediodactylus kotschyi* on Plateia Islet, Poros

In the afternoon we visited the islet of Mpisti (Fig. 32–33) just NE of larger Poros Island where we stayed for about 60 minutes. There we surprisingly observed two *Ophiomorus punctatissimus* (Fig. 34), a greek endemic skink species. In addition, 15 *Mediodactylus kotschyi* (Fig. 35) and possibly *Lacerta trilineata* (2–3 indiv.) were also encountered.
In the evening, we arrived at the port of Poros where we spent four nights, due to strong winds and inclement seas. As a result, over the next few days we were only able to visit Poros (3 surveys) as well as several small nearby islets situated in the protected narrows between Poros port and the Peloponnesian mainland.

Fig. 32. Mpisti Islet

Fig. 33. Mpisti Islet

Fig. 34. Adult *Ophiomorus punctatissimus* on Mpisti Islet

Fig. 35. Adult *Mediodactylus kotschyi* on Mpisti Islet

On the morning of the April 28 we had time to survey only two islets. The first islet was the Galenthi (Fig. 36–37), a tiny but so dense-vegetated island, on which we were stayed for 45 minutes. During this visit, only three individuals of *Hemidactylus turcicus* were found. The second surveyed islet of the same day was Lazareto (Fig. 38–39), a very small but so interesting island since on it we found four lizard species. During the 50 minutes we spent on the islet, we recorded nine individuals of *Mediodactylus kotschyi* (Fig. 40), two *Hemidactylus turcicus*, two *Chalcides ocellatus* (Fig. 41) and the big surprize is one *Ophiomorus punctatissimus*, the second record in this expedition. Then, the approach and attempt to jumped on Modi Islet failed (Fig. 42).

Fig. 36. Galenthi Islet

Fig. 37. Galenthi Islet

Fig. 38. Lazareto Islet

Fig. 39. Lazareto Islet

Fig. 40. Adult *Mediodactylus kotschyi* on Lazareto Islet *in situ*

Fig. 41. Adult *Chalcides ocellatus* on Lazareto Islet

Fig. 42. Modi Islet

The afternoon of the day we spent it in a three-hours survey in the central part of the island of Poros (port to Agios Efstathios chapel, Fousa and Ancient Kalavria) (Fig. 43–46). While walking towards the Ancient Kalavria, the following reptile species were observed: *Mediodactylus kotschyi* (15) (Fig. 47–48), *Hemidactylus turcicus* (2) (Fig. 49–50) and *Chalcides ocellatus* (4) (Fig. 51), as well as the only amphibian species of this expedition, one roadkill adult individual of *Bufotes viridis* (Fig. 52).

Fig. 43. The port of Poros Island

Fig. 44. Pine forest on Poros Island

Fig. 45. Terraced olive grove on Poros Island

Fig. 46. The ruins of the ancient city of Kalavria on Poros Island

Fig. 47. Adult *Mediodactylus kotschyi* on Poros Island *in situ*

Fig. 48. Adult *Mediodactylus kotschyi* on Poros Island *in situ*

Fig. 49. Adult *Hemidactylus turcicus* on Poros Island *in situ*

Fig. 50. Young *Hemidactylus turcicus* on Poros Island

Fig. 51. Adult *Chalcides ocellatus* on Poros Island

Fig. 52. Roadkill *Bufotes viridis* on Poros Island

The next morning, April 29, we achieved to jumped on only one islet as the wind started picking up early. We visited the Mpourtzi Islet (Fig. 53–55) and surveyed it for approximately 2 hours. On this small islet with a 19th century castle we found the following four lizard species: *Mediodactylus kotschyi* (22) (Fig. 56–57), *Hemidactylus turcicus* (2), *Chalcides ocellatus* (2) (Fig. 58) and possibly *Lacerta trilineata* (2). The most unexpected finding on this islet was the colour morph of *Lacerta trilineata*; two large dark grey lacertids were quickly hide in the castle walls without having time to confirm the species, we guess that these lizards belongs to this species because of the careful observation of their tails and big size.

Fig. 53. Mpourtzi Islet

Fig. 54. Mpourtzi Islet

Fig. 55. Mpourtzi Islet

Fig. 56. Adult *Mediodactylus kotschyi* on Mpourtzi Islet *in situ*

Fig. 57. Adult *Mediodactylus kotschyi* on Mpourtzi Islet *in situ*

Fig. 58. Adult *Chalcides ocellatus* on Mpourtzi Islet

The afternoon of the same day we spent it in a three-hours survey in the southern-central to eastern part of the island of Poros (port to Monastery of Zoodochos Pigi Monastery) (Fig. 59–60). While walking towards the Monastery seven individuals of *Mediodactylus kotschyi* and one individual of *Ablepharus kitaibelii* were observed.

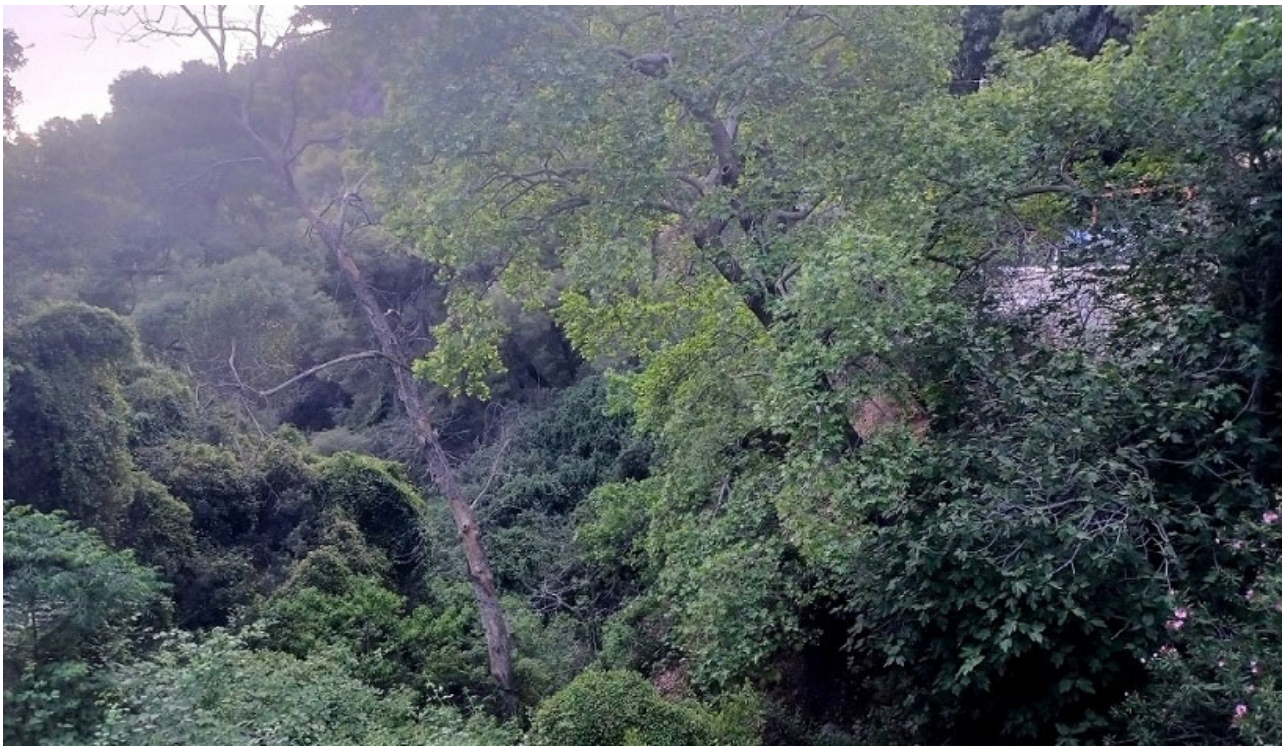

Fig. 59. Riverine and maquis vegetation on Poros Island

Fig. 60. The Zoodochos Pigi Monastery surrounded by dense vegetation on Poros Island

On the next day, April 30, high prevailing winds were prohibitive for sailing and approaching any offshore islets. Instead, we conducted a 5-hour long survey, on the western part of Poros Island (port, Russian Dockyard, Biological Treatment of Waste Water to Foussa Plateau) (Fig. 61–64). While walking through several habitats five individuals of *Mediodactylus kotschyi* (Fig. 65) and one *Hemidactylus turcicus* were observed. Furthermore one *Chalcides ocellatus* (Fig. 66) and one *Platyceps najadum* (Fig. 67) were encountered dead on the road, while one nest with hatched eggs of *Testudo marginata* was also discovered (Fig. 68).

Fig. 61. Olive grove and maquis on SW Poros Island

Fig. 62. The Foussa Plateau on Poros Island

Fig. 63. Maquis with *Juniperus turbinata* vegetation on Poros Island

Fig. 64. *Pinus halepensis* forest on Poros Island

Fig. 65. Adult *Mediodactylus kotschyi* on Poros Island *in situ*

Fig. 66. Roadkill *Chalcides ocellatus* on Poros Island

Fig. 67. Roadkill *Platyceps najadum* on Poros Island

Fig. 68. Hatched egg of *Testudo marginata* on Poros Island

The next day, May 01, the wind diminished, and with calmer seas we were able to leave Poros and continue our mission towards nearby islets. First, a 15-minute-long morning visit was paid to the

tiny islet of Daskalio (Fig. 69–71), located just 130 meters off the southwestern shore of Poros. The visit to this islet, dominated by the chapel of The Assumption of the Virgin Mary and a few planted pine trees, produced only two individuals of *Hemidactylus turcicus* (Fig. 72).

Fig. 69. Daskalio Islet

Fig. 70. Daskalio Islet

Fig. 71. Daskalio Islet

Fig. 72. Adult *Hemidactylus turcicus* on Daskalio Islet *in situ*

The next visit (over 60 minutes) was to the islet of Dorousa (Fig. 73–78), located ca. 500m W of Agkistri Island (itself situated W of Aegina). The island has a relatively steep profile, consisting of rough limestone with only shallow soil layers and is covered by an open *P. lentiscus* and *J. turbinata* maquis. There are also a few pine trees as well as abandoned acricultural terraces and drystone walls. Despite the comparatively substantial size of the islet and the presence of several habitat types, the only reptile species we encountered were five individuals of *Chalcides ocellatus* (Fig. 79–80).

Fig. 73. Dorousa Islet

Fig. 74. Dorousa Islet

Fig. 75. Dorousa Islet

Fig. 76. Dorousa Islet

Fig. 77. Dorousa Islet

Fig. 78. Dorousa Islet

Fig. 79. Adult *Chalcides ocellatus* on Dorousa Islet *in situ*

Fig. 80. Young *Chalcides ocellatus* on Dorousa Islet

Next we visited Kyra Islet (Fig. 81–84) located ca. 4km W of Angistri, where we stayed on for 75 minutes. This larger island was ecologically similar to Doroussa consisting of a substrate of rough, fissured limestone. Vegetation cover was also open *Pistacea* and *Juniperus* maquis interspersed with patches of xerophytic phrygana, copses of *P. halepensis,* and abandoned terraced fields with collapsing drystone walls. Against expectations and despite the comparably large size of the islet, seemingly favorable atmospheric conditions, and careful search, no reptiles were observed.

Fig. 81. Kyra Islet

Fig. 82. Kyra Islet

Fig. 83. Kyra Islet

Fig. 84. Kyra Islet

Next the small islet of Spalathronisi (Fig. 85–87) was visited for about 60 minutes. This steep, limestone island, lacked substantial soil layers and was covered by open xerophytic vegetation cover of low bushes. During our visit, we were able to document only three individuls of *Mediodactylus kotschyi*.

Fig. 85. Spalathronisi Islet

Fig. 86. Spalathronisi Islet

Fig. 87. Spalathronisi Islet

In the afternoon we sailed north to the Diaporia island complex located between Salamina, Aegina and the peloponnesian mainland in the west. The first islet we surveyed was Ledou, the southernmost islet of the western Diaporia cluster (dominated by the larger Agios Ioannis and Agios Thomas islands) (Fig. 88–89). Ledu is a small, low, flat limestone island consisting of the eastern main section and a long, narrow ridge in the west connected by a low neck and forming a deep protected SE-facing bay. Ledou is covered by only an open, low *P. lentiscus* bushland, and since the island is ungrazed, these bushes are complemented by a dense interspersed cover of seasonal grasses. We encountered 24 individuals of *Mediodactylus kotschyi* (Fig. 90) within approx. 50 minutes indicative of a high population density for this species.

Fig. 88. Ledou Islet - SE-facing bay. In the foreground fossil beach as the result of eustatic sea level change

Fig. 89. Ledou Islet. P*. lentiscus* bushes with interspersed ungrazed grassland

Fig. 90. Adult *Mediodactylus kotschyi* on Ledou Islet

The team spent the night off Tragonisi islet, located just south of the larger isle of Agios Thomas, so we took advantage of this proximity and the last hours of daylight to survey Agios Thomas (Fig. 91–94) for approx. 75 minutes. Agios Thomas is one of the largest islets in the Saronic Gulf, consisting of hard limestone substrate and vegetated predominately by tall *P. lentiscus* and *J. turbinata* maquis. However the vegetation has also many openings including abadoned agricultural land and associated decaying human structures. These include various collapsing drystone terraces, as well as abandoned buildings, cisterns and an old chapel, all in various stages of disrepair. The island is used as a nesting site by hundred of pairs of *Larus michahellis* but is also grazed by many feral goats. During our survey, we encountered only *Mediodactylus kotschyi,* documented by four individuals (Fig. 95–96). However, we expect that further surveys will document additional reptile taxa, including snakes, living on this island.

Fig. 91. Agios Thomas - View from the east, with the Peloponnesian mainland in the background

Fig. 92. Agios Thomas. Limestone coastline, showing the inhibitory effects of salt spray on the vegetation

Fig. 93. Agios Thomas – view of the central plateau used by hundreds of *Larus michahellis* gulls

Fig. 94. Agios Thomas – tall *Juniperus turbinata* maquis

Fig. 95. Adult *Mediodactylus kotschyi* on Agios Thomas Islet *in situ*

Fig. 96. Adult *Mediodactylus kotschyi* on Agios Thomas

On May 02, the last day of the expedition, we started in the early morning with a 35 minute-long survey on the islet of Tragonisi (Fig. 97–99) near which we had spent the night before. The island consists of a raised central block of hard, rough, white limestone, flanked on the N side by two eroding skirts of alluvial material that had been modified through terracing for agricultural use in the past. Much of the taller vegetation is restricted to the cooler, N-facing slope and consists of sparse but tall, tree-like *J. turbinata*. We were able to document about 21 adult individuals of *Mediodactylus kotschyi* (Fig. 100–101), as well as 2 adult individuals of *Hierophis gemonensis* (Fig. 102–103), almost all of them encountered basking.

Fig. 97. Tragonisi Islet. The lower brown areas along the coast denote the alluvial material

Fig. 98. Tragonisi Islet -view of the central limestone core of the island

Fig. 99. Tragonisi Islet. - *J. turbinata* bushes with dead lower branches indicative of damage by past lifestock overgrazing

Fig. 100. A well-camouflaged adult *Mediodactylus kotschyi* on Tragonisi Islet *in situ*

Fig. 101. Adult *Mediodactylus kotschyi* on Tragonisi Islet *in situ*

Fig. 102. Adult *Hierophis gemonensis* on Tragonisi Islet *in situ*

Fig. 103. Adult *Hierophis gemonensis* on Tragonisi Islet *in situ*

Then, after sailing around the islets of Agios Ioannis (Fig. 104–105) and Prasou (Fig. 106) without stopping, we landed on the small islet of Moladi (Fig. 107–108). This flat, sedimentary rock islet

rises gently from north to south where it terminates in a steep drop-off. The vegetation is low and consists predominantely of a dense halophytic heath. During a 30 minute survey we encountered two individuals of *Mediodactylus kotschyi,* as well as three *Chalcides ocellatus* (Fig. 109).

Fig. 104. Agios Ioannis Islet

Fig. 105. Agios Ioannis Islet

Fig. 106. Prasou Islet. The islet is being used by an aquaculture operation

Fig. 107. Moladi Islet

Fig. 108. Moladi Islet. Landing party surveying the islet

Fig. 109. Young *Chalcides ocellatus* on Moladi Islet

Following Molaid, we continued sailing towards the east and approached an another small islet cluster of four islets of which we visited three (Little Kourmoulou, Anagnostis, Ypsili); Large Kourmoulou (Fig. 110) was the islet we skipped due to lack of time. All of these islands were

ecologically very similar, consisting of hard, fissured limestone substrate and general lack of substantial soil cover. Vegetation across the islets was also similar, with sparse, low, xerophytic, summer deciduous cover interspersed with low, evergreen, *P. lentiscus* mats. On Little Kourmoulou, the first islet we visited (Fig. 111–112), we searched for reptiles for 30 minutes. The search produced thirteen individuals of *Mediodactylus kotschyi* (Fig. 113), as well as five *Chalcides ocellatus*.

Fig. 110. Large Kourmoulou Islet

Fig. 111. Little Kourmoulou Islet

Fig. 112. Little Kourmoulou Islet

Fig. 113. Adult *Mediodactylus kotschyi* on Little Kourmoulou Islet *in situ*

We then continued to the adjcent islet of Anagnostis (Fig. 114–116) which we visited for 25 minutes and where only two individuals of *Mediodactylus kotschyi* (Fig. 117) were observed. Lastly, we visited Ypsili, the biggest islet of this insular cluster (Fig. 118–119). The survey on Ypsili lasted about 40 minutes, producing three individuals of *Mediodactylus kotschyi* and one *Chalcides ocellatus*.

Fig. 114. Anagnostis Islet

Fig. 115. Anagnostis Islet

Fig. 116. Anagnostis Islet

Fig. 117. Adult *Mediodactylus kotschyi* on Anagnostis Islet *in situ*

Fig. 118. Ypsili Islet

Fig. 119. Ypsili Islet

Following the survey of the Ypsili cluster, we travelled to Plateia (Diaporia), the last island to be surveyed before the end of the expedition. On the way there, we passed Stachtoroi Islet, which was not surveyed due to lack of time (Fig. 120–121) (Fig. 122–123). Upon landing on Plateia (Diaporia) we surveyed the island's habitats, which were unusually sparse for approx. 40 minutes. We encountered predominately *Chalcides ocellatus* (13 individuals) (Fig. 124–125) primarily found under varius refugia, while *Mediodactylus kotschyi*, much less abundant (2 indiv.), were found only under stones. Last but not least, we also discovered on the beach a dead adult individual of *Caretta caretta* (Fig. 126).

Fig. 120. Stachtoroi Islet. View from the NE

Fig. 121. Stachtoroi Islet. View from the NW

Fig. 122. Plateia (Diaporia complex) Islet

Fig. 123. Plateia (Diaporia complex) Islet

Fig. 124. Young *Chalcides ocellatus* on Plateia (Diaporia complex) Islet. Close-up of the head

Fig. 125. Young *Chalcides ocellatus* on Plateia (Diaporia complex) Islet. Dorsal view

Fig. 126. A dead *Caretta caretta* on Plateia (Diaporia complex) Islet

After the visit to Plateia Islet (Diaporia), we passed by Kordeliaris Islet (in the Lagouses cluster) (Fig. 127) without stopping, and we sailed to return to the starting point, at the marina of Nea Peramos where this mission came to an end.

Fig. 127. Kordeliaris Islet

Discussion

In total we visited and surveyed for their herpetofauna 23 Saronic Gulf islands, including one larger island (Poros) and 22 islets (Lagousaki, Gaidaros, Lagousa, Makronisi, Metopi, Plateia Porou, Mpisti,

Galenthi, Lazareto, Mpourtzi, Daskalio, Dorousa, Kyra, Spalathronisi, Ledou, Agios Thomas, Tragonisi, Moladi, Little Kourmoulou, Anagnostis, Ypsili, Plateia Diaporia). With the exception of Poros, which had been visited before, the PIM Mission represented the first time these islands were surveyed formally. The visit resulted in the documentation of new species occurrences for all islands except Gaidaros and Kyra, which were found to be devoid of herpetofauna (Table 1). As such, the PIM mission represented a critical step towards elucidating the composition and establishing baseline knowledge of the herpetofauna of the Saronic Gulf islands. In total we recorded 11 herpetofauna species (1 anuran amphibian, 1 turtle, 1 tortoise, 2 geckoes, 1 lacertid, 3 skinks and 2 colubrids).

On the large island of Poros, three surveys documented a total of seven herpetofauna species (one anuran amphibian and six reptiles). Six of these species had already been known for the island through the work of previous researches (Werner, 1938; Wettstein, 1953; Clark, 1967; Clark, 1968; Clark, 1970; Clark, 1972; Clark, 1989) and we confirmed their presence, while *Hemidactylus turcicus* was a new record for the island. The total number of confirmed reptiles present on Poros Island thus increases from eight to nine taxa. Previously known herpetofauna species of the island of Poros which we did not encounter during the PIM survey are the following: *Pelophylax kurtmuelleri*, *Lacerta trilineata*, *Zamenis situla* and *Malpolon insignitus* (Clark, 1967; Clark, 1968; Clark, 1970; Clark, 1989), as well as *Elaphe quatuorlineata* whose presence is conjectured but which has never been confirmed.

Excluding the herpetofauna of Poros that has been previously studied, as well as the marine taxon of *Caretta caretta*, a total of eight species were observed for the first time on the 20 islets harboring herps. Arguably the most surprising and important records were the skink species *Ophiomorus punctatissimus* which was found on two islets (Mpisti, Lazareto). This skink is a greek steno-endemic species, that is thinly distributed across parts of the Peloponnese and the offshore islands of Elafonisos, Dokos and Kythera (Valakos et al., 2008; Pafilis and Maragou, 2020). Our observations constitute the first records of the species in Saronikos Gulf islands. The other seven species encountered are common and distributed over most of the country. The colubrid snake *Hierophis gemonensis* is newly confirmed on Tragonisi Islet, while remaining unconfirmed in Metopi Islet. The distribution of the species was previously known only from the largest Saronic islands (Valakos et al., 2008; Pafilis and Maragou, 2020). Similarly, the second colubrid species, *Platyceps najadum,* also remains unconfirmed on Metopi Islet, while its distribution in the region has previously been established only for the very largest Saronic islands (Valakos et al., 2008; Pafilis and Maragou, 2020). The lacertid lizard *Lacerta trilineata* was possibly observed on two islets (Mpisti, Mpourtzi) without however having sufficient time to confirm the species with certainty due to its rapid escape into ground cover. The distribution of the species is also known from the largest Saronic islands (Valakos et al., 2008; Pafilis and Maragou, 2020). The skink species *Ablepharus kitaibelii* was recorded only in one islet (Plateia Porou). The species is generally very common, is distributed throughout the Greece, and was previously known from the largest Saronic islands (Valakos et al., 2008; Pafilis and Maragou, 2020). The gecko H*emidactylus turcicus* was the third most common species recorded on islets. It was found on five islets (Metopi, Galenthi, Lazareto, Mpourtzi, Daskalio) with 2 to 4 individuals encountered on each of them. The species is generally common and widespread, being distributed throughout the Greece and is previously known from the largest Saronic islands (Valakos et al., 2008; Pafilis and Maragou, 2020).

The two most common species of the islets were *Mediodactylus kotschyi* and *Chalcides ocellatus*, with presence rates of 80% and 55% respectively on the total of the islets. Both species are widespread in many mainland and insular areas of Greece with the first species more distributed and the second limited to the southern Greece and several islands, as well as both are known from the largest Saronic islands (Valakos et al., 2008; Pafilis and Maragou, 2020).

We found the gecko *Mediodactylus kotschyi* in 16 islets (Lagousaki, Lagousa, Makronisi, Plateia Porou, Mpisti, Lazareto, Mpourtzi, Spalathronisi, Ledou, Agios Thomas, Tragonisi, Moladi, Little Kourmoulou, Anagnostis, Ypsili, Plateia Diaporia) in populations ranging from 2 to 54 individuals

(x̄=14). The largest populations were found on the islets of Plateia Porou, Lagousaki, Ledou, Mpourtzi, and Tragonisi, with 54, 32, 27, 24, 22, and 21 individuals respectively, while in Metopi and Dorousa islets the species was no found. With 244 individuals counted in all islands, *Mediodactylus kotschyi* it was the most common reptile species of the expedition.
The second most common species, *Chalcides ocellatus*, was found in 11 islets (Lagousaki, Lagousa, Makronisi, Metopi, Lazareto, Mpourtzi, Dorousa, Moladi, Little Kourmoulou, Ypsili, Plateia Diaporia) in populations ranging from 1 to 13 individuals (x̄=5,75). The largest populations were found on the islets of Metopi, Plateia Diaporia, and Lagousa, with 13, 13, and 11 individuals respectively, while in Plateia Porou, Mpisti, Spalathronisi, Ledou, Agios Thomas, Tragonisi and Anagnostis islets the species was no found. With 69 individuals counted in all islands, *Chalcides ocellatus* it was the second most common reptile species of the expedition.
Taking a first look at the populations and the presence of the two more common species of the islands (Chart 1), it becomes clear that there is a correlation between them which is probably due to their interspecific interactions.

The two species were found in sympatry on ten islets (Lagousaki, Lagousa, Makronisi, Lazareto, Poros, Mpourtzi, Moladi, Little Kourmoulou, Ypsili, Plateia Diaporia). With a focused look it becomes obvious how large populations of *Mediodactylus kotschyi* exist on islets where *Chalcides ocellatus* is absent or has low populations, while on the contrary, islets where *Chalcides ocellatus* are numerous, *Mediodactylus kotschyi* has low populations or is absent. This fact leads us to the conclusion that *Chalcides ocellatus* maybe is a predator of *Mediodactylus kotschyi*. If the observed pattern of presence–absence and population density between the two species on the islets is due to the predator–prey relationship, then further research is needed to confirm it, as well as more focused research on the relationships of other sympatry species.

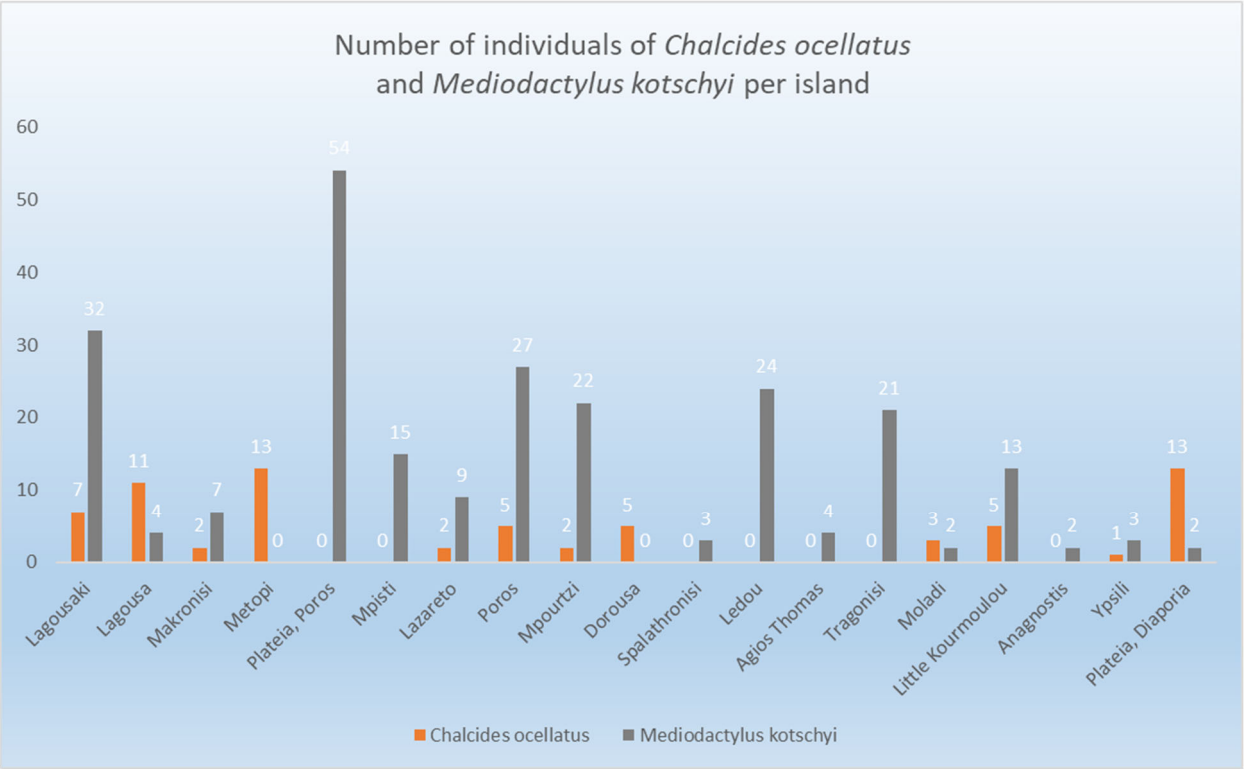

Chart 1. Number of individuals of the two most distributed and numerous species per islet

The islands with the most terrestrial herpetofauna species were Poros (seven species), Metopi (four species), Mpourtzi (four species), Lazareto (four species), and Mpisti (three species), while two

species were found on nine islets and one species were found on seven islets; lastly, two islets failed to support any herps.
Presently, confirmation of preliminary observation made here is needed for all snake species on Metopi Islet, for the presence of *Lacerta trilineata* on Mpisti Islet, and for the colouration pattern of *Lacerta trilineata* on Mpourtzi Islet.
Additional surveys are required for the islets of Dorousa and Agios Thomas as they were comparatively large and diverse, and where further field effort it needed to investigate all habitats adequately. Similarly, for Kyra Islet, where surprisingly, no reptiles were observed, additional surveys are needed. Priority for careful survey should also be given to those islets which we were unable to visit including Modi, Petrokaravo, Agios Petros (Petronisi), Trachili, Kordeliaris, Agios Ioannis, Large Kourmoulou, Stachtoroi and Prasou as well as the western islands of Ovrios and Plateia Korinthou.
In addition, for Poros specifically, targeted surveys for expected, but not yet reported, species need to focus on *Ophiomorus punctatissimus* and *Hierophis gemonensis*.

TABLES

Table 1. List of Islands for which new data are available after the Mission PIM – Greece 2024.

Island	Species	PIM Mission
Lagousaki	*Chalcides ocellatus* *Mediodactylus kotschyi*	First time records
Gaidaros	-	No species of herpetofauna found
Lagousa	*Chalcides ocellatus* *Mediodactylus kotschyi*	First time records
Makronisi	*Chalcides ocellatus* *Mediodactylus kotschyi*	First time records
Metopi	*Chalcides ocellatus* *Hemidactylus turcicus* *Platyceps najadum* ? *Hierophis gemonensis* ? *Caretta caretta*	First time records
Plateia Porou	*Mediodactylus kotschyi* *Ablepharus kitaibelii*	First time records
Mpisti	*Mediodactylus kotschyi* *Ophiomorus punctatissimus* *Lacerta trilineata* ?	First time records
Galenthi	*Hemidactylus turcicus*	First time records
Lazareto	*Chalcides ocellatus* *Ophiomorus punctatissimus* *Mediodactylus kotschyi* *Hemidactylus turcicus*	First time records

Poros	*Bufotes viridis* *Chalcides ocellatus* *Ablepharus kitaibelii* *Mediodactylus kotschyi* *Hemidactylus turcicus* *Platyceps najadum* *Testudo marginata*	*Hemidactylus turcicus* was recorded here for the first time for Poros
Mpourtzi	*Chalcides ocellatus* *Mediodactylus kotschyi* *Hemidactylus turcicus* *Lacerta trilineata* ?	First time records
Daskalio	*Hemidactylus turcicus*	First time record
Dorousa	*Chalcides ocellatus*	First time record
Kyra	-	No reptile/amphibian species encountered
Spalathronisi	*Mediodactylus kotschyi*	First time record
Ledou	*Mediodactylus kotschyi*	First time record
Agios Thomas	*Mediodactylus kotschyi*	First time record
Tragonisi	*Mediodactylus kotschyi* *Hierophis gemonensis*	First time record
Moladi	*Chalcides ocellatus* *Mediodactylus kotschyi*	First time record
Little Kourmoulou	*Chalcides ocellatus* *Mediodactylus kotschyi*	First time record
Anagnostis	*Mediodactylus kotschyi*	First time record
Ypsili	*Chalcides ocellatus* *Mediodactylus kotschyi*	First time record
Plateia, Diaporia	*Chalcides ocellatus* *Mediodactylus kotschyi* *Caretta caretta*	First time record

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Photos: Apostolos Christopoulos

INVERTEBRATES

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Introduction

During the 2024 PIM expedition to the Saronic Gulf invertebrate specimens were collected by Nikolaos Manolas and Christos Georgiadis. The researched area lies between three major zoogeographic areas: Sterea Ellada, Peloponissos and Aegean islands, and as a result shares many faunistic elements with them. Its climate could be described as similar to that of the rest Aegean islands, with sparse rainfall that results in the islands being relatively dry, and their main vegetation cover being phrygana and maquis. Although a lot of biodiversity expeditions have been carried out in that area of Greece (Attika and E. Sterea Ellada, NE Peloponissos and Cyclades islands) and on the large islands of the Saronic Gulf (Salamina, Egina etc.) as well, it's small islets remain mostly unresearched in terms of their invertebrate biodiversity.

Methods

Invertebrates where collected using three methods: collection by hand (using an aspirator or pincer) for ground dwelling species, net sweeping for flying insects (Hymenoptera, Orthoptera, Lepidoptera etc.) and substrate collection for micro invertebrates and bird exo-parasites. Ground dwelling species where collected and immediately preserved in 95° alcohol, flying insects where firstly killed in a freezer and then either preserved in alcohol (Diptera, Coleoptera, Wasps etc.) or pinned and left to dry (Lepidoptera, Orthoptera, Bees etc.). The collected substrate specimens were examined in the lab, after the expedition was over, by shieving them with a 1mm shieve and carefully examine them under strong light. The found specimens where either preserved in alcohol, or stored dry if they were already dead (for example micro mollusc shells). The collected specimens were then splited among the two researchers to be examined. Gastropoda, Isopoda, Myriapoda, Chelicerata (spiders and scrpions), Archaeognatha, Dermaptera, Dictyoptera, Embioptera, Lepidoptera, Neuroptera, Orthoptera, Raphidioptera, Thysanoptera and Zygentoma were given to N.M. while Coleoptera, Hymenoptera and Pseudoscorpiones to C.G. The rest of the taxonomic

groups [Acariformes and Parasitiformes (bird exoparasites), Diptera, Hemiptera and Psocoptera will be given to experts for proper examination.

Results

The specimens identified by the author (Nikolaos Manolas) compromise the following 129 species, belonging to 16 major taxonomic groups, as presented below.

Figure 1: Albinaria grisea grisea (c) N.Manolas

Gastropoda

Albinaria grisea grisea – Kalavria (Locality 1, 3, 5).

Bythinella sp. - Kalavria (Locality 4).
Possibly an undescribed species. The species of the genus are highly narrow-endemic. The genus is known from Attiki (*Bythinella charpentieri*).

Candidula syrensis – Kyra.
Species complex. First record in the Saronic.

Cantareus apertus – Kalavria (Locality 3), Sfairia.

Caracolina lenticula – Ledou, Metopi, Plateia (Diaporia), Lagousa, Daskalio, Galenthi, Limani.

Ceciloides sp. - Kalavria (Locality 5), Sfairia, Spalathronisi, Ledou, Moladi, Galenthi, Mpisti.

Cernuella virgata – Kalavria (Locality 3, 5), Daskalio, Galenthi, Lazaretto, Limani, Mpisti, Mpourtzi.

Chondrula bergeri – Kalavria (Locality 3, 5), Doroussa, Spalathronisi, Agios Thomas, Ledou, Plateia (Diaporia), Lagousa, Lagousaki, Galenthi, Lazaretto, Limani, Mpisti, Petra.
The populations of Poros (Kalavria) were initially described as a separate variation because of their elongated shell (Roth, J. R., unpublished). Collected specimens from the small islets around Poros have too the same elongated shell, in contrast to specimens from Diaporia, or the islets near Agkistri that show a more depressed figure.

Chondrus zebra – Ledou.

Cochlicella acuta – Kalavria (Locality 3, 5), Metopi, Plateia (Diaporia), Lagousaki, Daskalio, Petra.

Cornu aspersum – Metopi, Sfairia.

Eobania vermiculata – Mikros Kourmouladas, Kalavria (Locality 1, 3), Sfairia, Doroussa, Kyra, Metopi, Spalathronisi, Agios Thomas, Anagnostis, Ledou, Moladi, Plateia (Diaporia), Tragonisi, Ypsili, Lagousa, Lagousaki, Makronisos, Daskalio, Galenthi, Limani, Mpisti, Petra, Bourtzi, Plateia (Poros).

Ferussacia folliculum – Ledou.

Granopupa granum – Mikros Kourmouladas, Kalavria (Locality 5), Metopi, Plateia (Diaporia), Lagousaki, Mpisti, Ledou, Petra.

Helix figulina – Metopi, Spalathronisi, Moladi, Lagousaki.

Isabellaria isabellina – Doroussa, Kyra, Agios Thomas, Ledou, Plateia (Diaporia), Tragonisi, Ypsili, Petra.

Lauria cylindracea – Mikros Kourmouladas.

Lindholmiola lens – Mikros Kourmouladas, Kalavria (Locality 3, 5), Doroussa, Kyra, Spalathronisi, Anagnostis, Ledou, Lazaretto, Mpisti, Petra.

Microxeromagna loweii – Sfairia.

Monacha cf.frequens – Kyra.

Monacha messenica – Kalavria [Locality 3, 5(cf.)], Sfairia (cf.).
Endemic to Peloponissos, first record outside the peninsula.

Monacha cf.parumcincta – Lazaretto.

Oxychilus cyprius – Sfairia.

Pleurodiscus balmei – Sfairia.
Cryptic species.

Rumina decollata – Sfairia, Kyra, Metopi, Ledou, Tragonisi, Lagousaki, Makronisos, Daskalio, Mpourtzi.

Rumina saharica – Kalavria (Locality 3, 5), Sfairia, Doroussa, Spalathronisi, Agios Thomas, Ledou, Moladi, Tragonisi, Lazaretto, Mpisti, Plateia (Poros).

Rumina sp. – Plateia (Diaporia), Galenthi.

Trochoidea pyramidata – Kalavria (Locality 5), Galenthi, Mpisti, Petra.

Truncatella subcylindrica – Daskalio.

Truncatellina cylindrica – Mikros Kourmouladas, Kalavria (Locality 5), Sfairia, Doroussa, Agios Thomas, Ledou, Moladi, Plateia (Diaporia), Lagousa, Lagousaki, Daskalio, Galenthi, Petra.

Vitrea argolica – Sfairia.
Endemic to Peloponissos, first record outside the peninsula.

Vitrea contracta – Mikros Kourmouladas, Kalavria (Locality 5), Spalathronisi, Galenthi, Petra.

Xerocrassa cretica – Doroussa, Metopi, Agios Thomas, Moladi, Plateia (Diaporia), Tragonisi, Lagousa, Lagousaki, Makronisos, Petra, Plateia (Poros).

Xeropicta krynickii – Ledou, Lagousa.

Xerotricha conspurcata – Sfairia.

Isopoda

Armadillidium atticum – Makronisos.

Armadillidium vulgare – Spalathronisi, Moladi, Petra, Bisti,

Armadillo officinalis – Kalavria (Locality 3), Sfairia, Kyra, Galenthi, Lazaretto, Mpisti, Bourtzi.

Leptotrichus naupliensis – Lagousaki.

Porcellio dilatatus – Mpisti.

Porcellionides pruinosus – Moladi, Doroussa, Lazaretto, Mpourtzi, Plateia (Poros), Mikros Kourmouladas (*cfr*.).

Trachelipus aegaeus – Mpisti.

Indet. - Galenthi.

Myriapoda

Bothriogaster signata – Plateia (Poros).

Eupolybothrus transsylvanicus – Kalavria (Locality 3).

Lithobius sp. - Galenthi, Lazaretto.

Megaphyllum cf.anatolicum – Mikros Kourmouladas.

Megaphyllum cf.argolicum – Kalavria (Locality 5).

Polydesmus sp. - Sfairia.

Polyxenus cf.lagurus – Galenthi.

Scolopendra cingulata – Metopi, Tragonisi.

Figure 2:Megaphyllum cf.argolicum (c) N.Manolas

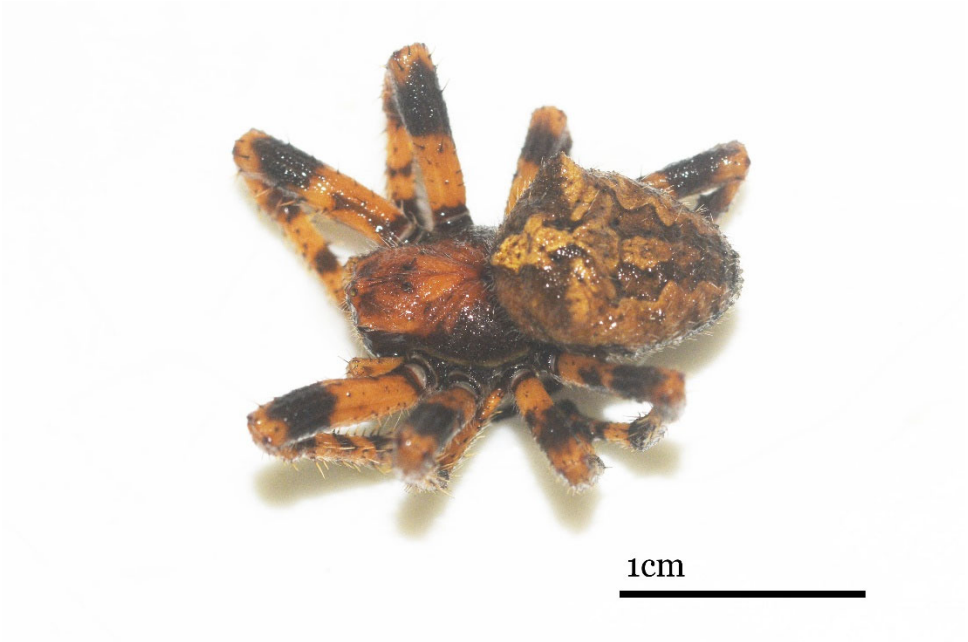

Figure 1: Araneus circe (c)N.Manolas

Chelicerata

Aculepeira ceropegia – Mpourtzi.

Agalenatea redii – Mikros Kourmouladas.

Agalenidae – Lazaretto.

Agroeca cuprea – Metopi.

Anagraphis pallens – Limani, Kyra (cfr.), Plateia (cfr., Diaporia), Mpisti.

Araneus circe – Mpisti, Petra.

Araneus trigutattus – Lazaretto.

Araneus sp. - Metopi, Agios Thomas, Ipsili, Lagousa.

Bassaniodes lalandei – Kalavria (Locality 3).

cfr.Hahnia molossidis – Daskalio, Mpourtzi.

cfr.Ostearius melanopygius – Petra.

Cicurina cicur – Plateia (Diaporia).

Clubiona cf.brevipes – Plateia (Diaporia).

Crustulina cf.scabripes – Plateia (Diaporia).

Cyclosa sierrae – Doroussa.

Dictyna sp. - Agios Thomas.

Dictynidae – Plateia (Poros).

Enoplognatha gemina – Kyra, Metopi.

Enoplognatha mandibularis – Mikros Kourmouladas, Kyra, Galenthi, Daskalio.

Enoplognatha thoracica – Metopi.

Euscorpius sp. - Kyra.
The only scorpion found during the expedition. A difficult genus in identification.

Evarcha arcuata – Metopi.

Heliophanus dampfi – Bourtzi, Mikros Kourmouladas (cf.), Anagnostis (cf.).

Hogna graeca – Petra.

Kochiura aulica – Metopi, Ledou, Lagousaki.

Lycosidae – Agios Thomas, Bourtzi.

Micrommata ligurina – Agios Thomas.

Minicia gomerae – Doroussa, Spalathronisi.

Mygalomorphae – Kalavria (Locality 3), Spalathronisi, Lazaretto, Galenthi, Petra.

Neoscona adianta – Metopi, Lazaretto, Mpisti, Petra.

Neoscona subfusca – Mikros Kourmouladas, Doroussa, Spalathronisi, Ypsili, Petra.

Oecobius maculatus – Sfairia.

Oonopidae – Doroussa.
Cryptic family.

Opiliones – Tragonisi.
Some specimens were found on the island but it was unfortunately not possible to be collected. Tragonisi was the only islet on the expedition where Opiliones were found.

Ozyptila atomaria – Plateia (Diaporia), Lagousaki.

Palpimanus uncatus – Lagousaki.

Philodromus cf.monitae – Ypsili (Diaporia).

Phlegra lineata – Metopi.

Pritha parva – Metopi, Agios Thomas, Ledou, Gaidaros, Daskalio, Lazaretto.

Pulchellodromus pulchellus – Moladi, Spalathronisi.

Salticidae – Kalavria (Locality 2).

Scytodes thoracica – Moladi, Petra.

Segestria senoculata – Sfairia.

Spermophora senoculata – Metopi.

Tegenaria sp. - Daskalio.

Thanatus sp. - Ypsili, Lagousa.

Thomisus onustus – Moladi.

Thyene imperialis – Moladi.

Zodarion sp. - Daskalio.

Zora sp. - Anagnostis, Moladi, Lagousa, Lagousaki.

Indet. - Spalathronisi, Ledou, Lagousaki.

Collembola

Figure 2:Willowsia sp. (c)N.Manolas

Willowsia sp. - Galenthi.
The only Collembola species found during the expedition. These animals need relatively high ground humidity so it's no surprise they are absent in nearly all the visited islets, where they are replaced by the more xerophilic Psocoptera as the main soil microarthropod.

Insecta

Archaeognatha

Machilinus rupestris – Doroussa, Spalathronisi, Agios Thomas.
The only species of the family Meinertellidae in Greece (Notario et al. 2014), common in rocky areas near the sea.

Dermaptera

Forficula aetolica – Spalathronisi, Lagousaki (*cfr*.).
Labia minor – Spalathronisi.
Indet – Mikros Kourmouladas.

Dictyoptera

Ameles sp. - Lagousaki.

Ameles spalanzania – Lagousa.

Loboptera decipiens – Kalavria (Locality 5), Sfairia, Daskalio.

Phyllodromica cf.subaptera – Metopi.

Polyphaga aegyptiaca – Plateia (Diaporia).

Reticulitermes balcanensis – Kalavria (Locality 3).

Embioptera

Haploembia solieri – Spalathronisi.
The only Embiopteran found during the expedition, a rather common species in Greece.

Lepidoptera

Acontia lucida – Lagousa.

Polyommatus icarus – Tragonisi.

Thymelicus acteon – Ledou.

Zygaena punctum – Metopi.

Indet. - Ledou, Moladi, Lagousa, Sfairia.

Figure 3:Zygaena punctum (c)N.Manolas

Neuroptera

Chrysoperla carnea – Agios Thomas, Plateia (Diaporia), Lagousa, Makronisos.

Creoleon plumbeus – Makronisos, Mikros Kourmouladas.

Pseudomallada genei – Lazaretto, Metopi (*cfr.*).

indet. – Lazaretto, Lagousa.

Orthoptera

Figure 4:Decticus albifrons (c)N.Manolas

Calliptamus barbarus – Ledou, Mpisti.

Calliptamus sp. Spalathronisi, Plateia (Diaporia).

cfr.Paneroptera nana – Metopi.

Decticus albifrons – Bourtzi.

Dociostaurus maroccanus – Lagousa, Lagousaki.

Dociostaurus sp. – Metopi, Ypsili, Plateia (Diaporia).

Drymadusa dorsalis – Kalavria (Locality 2).

Eupholidoptera megastyla – Kalavria (Locality 2).

Gryllus bimaculatus – Metopi.

Pezotettix giornae – Gaidaros, Plateia (Diaporia).

Pyrgomorpha conica – Metopi, Lagousa.

Rhacocleis sp. – Kalavria (Locality 2).
Possibly *R.germanica*, or *R.graeca*, as they are both known from the adjusted mainland (Willemse et al. 2018).

Tettigonia caudata – Kalavria (Locality 3).

indet. - Sfairia, Lagousaki.

Raphidioptera

Raphidia cf.mediterranea – Plateia (Poros).
Also found in Egina isl. (Aspöck H. & U., 2023).

Thysanoptera

Karnyothrips flavipes – Ypsili (Diaporia).
The only Thysanopteran found during the expedition, a carnivorous species that's found in a variety of different habitats (Factsheet 2024).

Zygentoma

Allacrotelsa kraepelini – Mikros Kourmouladas, Ledou, Kyra, Spalathronisi, Lagousaki, Kalavria (Locality 5), Anagnostis, Moladi, Lagousa, Petra.

Atelura montana – Lagousa.

Neoasterolepisma balcanicum – Lagousaki.

Thermobia aegyptiaca – Bourtzi.

Discussion

As expected by the general area's climate, the researched islands' invertebrate biodiversity is visibly smaller than that of islets with a more humid climate (for example in the inner Ionian sea), and compromises mostly of xerophilic species that can withstand long periods of drought. This can clearly be seen in the species number of soil arthropods like Collembola, Isopoda and Myriapoda, that need higher humidity, while groups like Chelicerata that can withstand higher levels of drought have remarkably larger species' numbers. It should also be noted that various species normally associated with human activities (like *Eobania vermiculata*) were quite common throughout the researched islets, possibly indicating transportation by humans in older times (although more data are needed to come in such conclusion). Furthermore, various species that were thought to be endemic to the Peloponissos (like *Vitrea argolica*) were found in some islands close to it (in the region of Poros), showing us that even though past biodiversity expeditions and

researchers focused their attention on the fauna of larger islands there is still much research to be carried out in the region, on both smaller and larger islands.

Figure 5:Xeropicta krynickii Attiki (c)N.Manolas

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Introduction

The Saronic Gulf, nestled in the Aegean Sea off the coast of Greece, is a region of ecological and cultural significance, renowned for its mild Mediterranean climate and varied coastal habitats. These habitats include wetlands, coastal marshes, and rocky islets that support a range of avian species, including seabirds such as Mediterranean Shag *(Gulosus aristotelis desmarestii*) and various gull species. Smaller islands and coastal zones in the gulf host essential nesting and foraging sites for these seabirds, while the wetlands attract wading birds (eg. Ardeidae). The surveyed area includes the Special Protected Area (SPA) "Nisides Saronikou Kolpou kai Thalassia Periochi" GR3000020 and the Site of Community Importance (SCI) "Thalassia Periochi Pafsania – Ypothalassia Ifaisteia Methanon" encompassing approximately 12,036.26 and 3,728.08 hectares respectively (**Fig. 1**). Notably, existing literature on the birds' communities of these scattered islands is scarce, prompting current study to conduct a survey of the bird species' presence in these lesser-documented regions to enlighten our relevant knowledge.

The SPA GR3000020 includes marine areas in both western and southern part of Saronikos Gulf, containing 19 islets and rocks, namely the Diaporioi islet group (Agios Ioannis, Agios Thomas, Tragonisi, Ledou and Molai islets), the satellite islets north-west of Aegina Island (Ipsili, Stahtorogi, Plateia, Panagitsa and Eleousa), as well as islets Petrokaravo (**Fig. 2**) and Platia located north of Poros island. The prementioned islets exhibit rocky low-lying shores, some coastal cliffs and are covered by maquis vegetation. The area is characterized as breeding site of a medium-sized population (34-53 pairs) and an important foraging area for the Mediterranean Shag with important species congregations on the islets north of Poros (Fric et al., 2012). It also includes foraging grounds for other common seabird species such as Scopoli's Shearwater (*Calonectris diomedea*) and Yelkouan Shearwater (*Puffinus yelkouan*) as well as significant breeding colonies of Yellow-legged Gull (*Larus michahellis*).

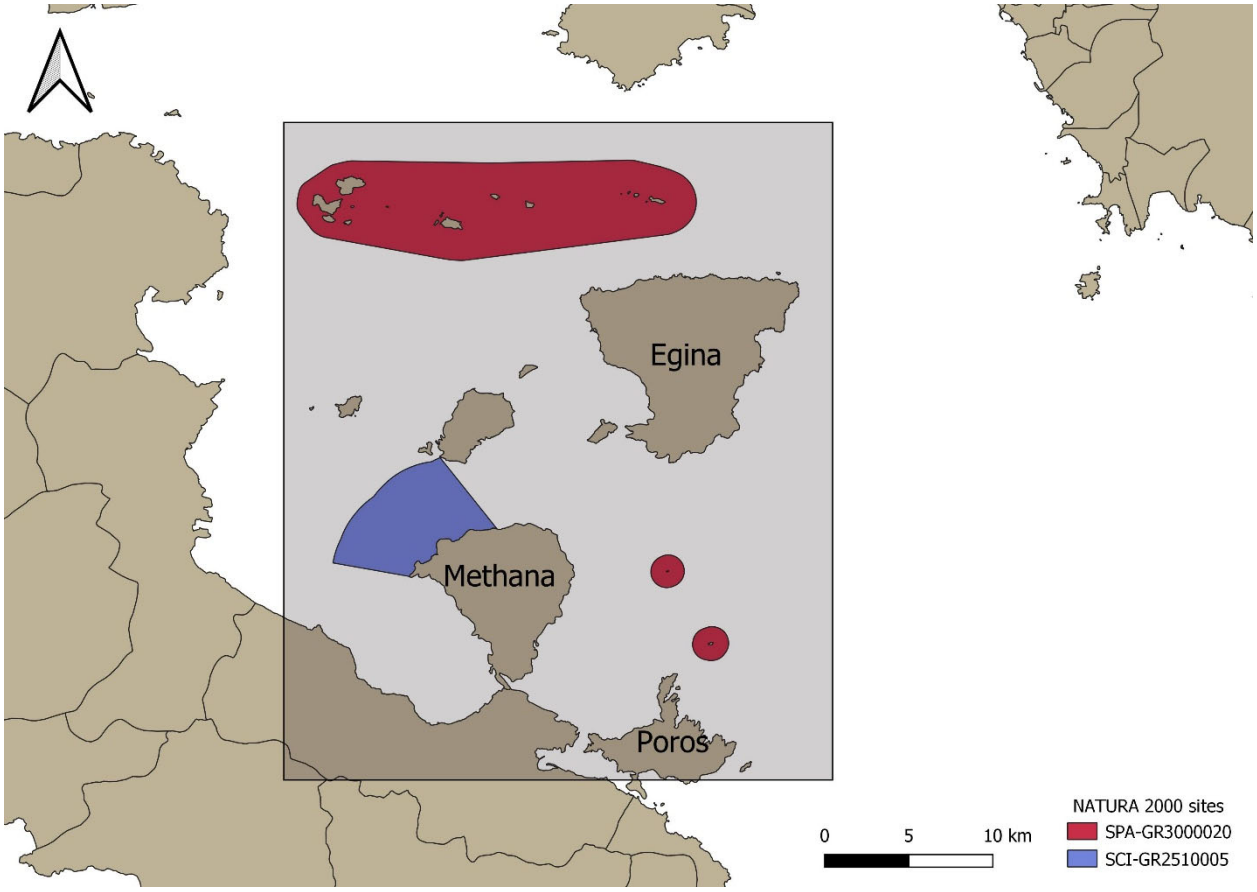

Figure 1. The study area of Saronikos Gulf mainly focused on islands and satellite islets between Attiki and Peloponnese peninsula. Local NATURA 2000 sites are also shown.

Figure 2. Petrokaravo islet in Saronikos Gulf.

Methodology

Data for seabird species were collected during a systematic on-board survey around islands and islets by using the general guidelines of the ESAS (European Seabirds at Sea) recording methodology (Fric et al., 2012). The surveys were carried out on-board of a catamaran operating from different ports in the

Saronic Gulf with generally low speeds. Data collection including human activities at sea as well as marine litter was gathered by a fieldwork team of two observers during three days (26-27 April and 1st of May 2024). Two specific protocols (Seabird On-board Observations, and General Data about the surveys) were filled. Individuals of each species were identified using binoculars (10×50 magnification) while the position of each observation was stored in a portable GPS device. All on-board surveys were performed during calm to fresh breeze conditions (<6 Beaufort) so as to be able to check about seabirds e.g. rafts, foraging and breeding behavior, roosting places and between dawn and late afternoon.

Landing on specific islands and islets was also followed in order to collect data for the biodiversity of avifauna (**Fig. 3**). Furthermore, reproductive performance of the Yellow-legged Gull was assessed through surveys conducted on specific islands (Lagousaki, Gaidaros, Metopi, Plateia, Lazareto, Bourtzi, Petra, Spalathronisi, Moladi, Anagnostis and Plateia-Diaporia). Colony size of the Yellow-legged Gull per island-islet has been determined by direct counts of occupied nests (**Fig. 4**). A Vernier caliper (readable to 0.05 mm) and a digital pocket scale (readable to 0.01 g) were used for the egg measurements, such as weight (WE), length (L), and width (W) (**Fig. 5**). Feather and egg samples were also collected for future contaminant studies including both organic and inorganic pollutants. Additionally, the presence of plastic items within nests was documented, noting both the quantity and coloration of the items observed.

Figure 3. Approaching an islet in Saronikos Gulf for counting apparently occupied nests by Yellow-legged Gull.

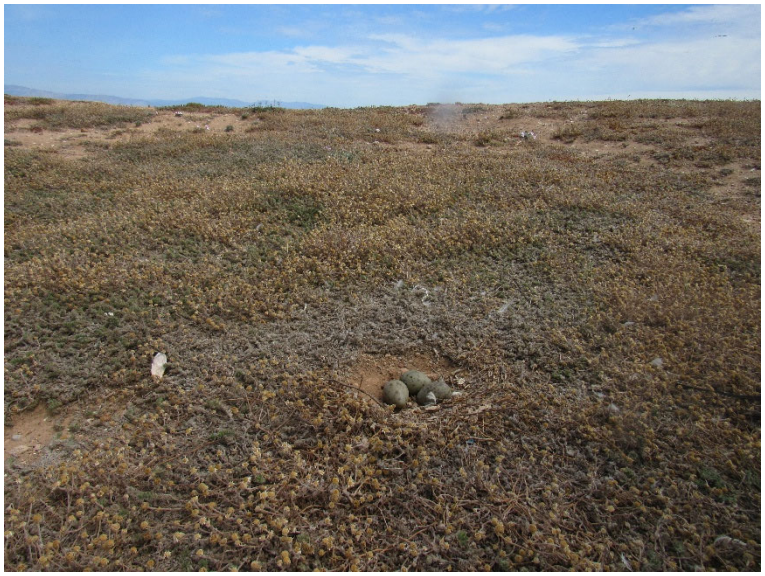

Figure 4. Typical type of a Yellow-legged Gull nest on an islet in Saronikos Gulf.

Figure 5. Fieldwork for the collection of Yellow-legged Gull egg measurements, such as weight, length, and width on an islet in Saronikos Gulf.

Results

A total number of **3,394** individuals were recorded during the expedition of **22** different avian species (**Table 1**). The majority of the birds observed were Yellow-legged Gulls, followed by the Mediterranean Shags. Yellow-legged Gulls were observed to take advantage of the fishery discards as it was also found in the Ionian Sea (Karris et al., 2018). Noteworthy observations included the presence of 150 individuals of the Mediterranean Shag on Metopi Island (**Fig. 6**) and a total population estimate of about 2,000–2,500 individuals of the Yellow-legged Gull at Agios Thomas–Diaporia Islet. Additionally, the observation of a pair of Bonelli's Eagles (*Aquila fasciata*) on Kera Islet provides strong evidence of an established breeding territory for this species. Scopoli's Shearwater (*Calonectris diomedea*) and Rock

Dove (*Columba livia*) were also found to use the study area as foraging ground and breeding site respectively (**Fig. 7-8**).

Table 1. Bird species encountered during the expedition 26-27 April and 1st of May 2024.

A/A	SCIENTIFIC NAME	COMMON NAME (ENGLISH)	COMMON NAME (GREEK)	CONSERVATION STATUS DIRECTIVE 2009/147	CONSERVATION STATUS IUCN	REDBOOKGR	NUMBER OF OBSERVATIONS
1	*Apus apus*	Common Swift	Μαυροστα χτάρα		LC	LC	21
2	*Tachymarptis melba*	Alpine Swift	Βουνοσταχ τάρα		LC	LC	10
3	*Aquila fasciata*	Bonelli's Eagle	Σπιζαετός	I	LC	EN	2
4	*Ardea cinerea*	Grey Heron	Σταχτοτσιχ νιάς		LC	LC	1
5	*Buteo buteo*	Eurasian Buzzard	Γερακίνα		LC	LC	1
6	*Calonectris diomedea*	Scopoli's Shearwater	Αρτέμης	I	LC	LC	4
7	*Columba livia*	Rock Dove, Feral Pigeon	Περιστέρι		LC	LC	1
8	*Corvus corone*	Carrion Crow	Μαυροκου ρούνα		LC	LC	3
9	*Egretta garzetta*	Little Egret	Λευκοτσιχν ιάς	I	LC	LC	2
10	*Falco eleonorae*	Eleonora's Falcon	Μαυροπετρ ίτης		LC	LC	1
11	*Falco peregrinus*	Peregrine Falcon	Πετρίτης	I	LC	VU	1
12	*Gulosus aristotelis*	European Shag	Θαλασσοκ όρακας	I	LC	LC	394
13	*Larus michaellis*	Yellow-legged Gull	Ασημόγλαρ ος Μεσογείου		LC	LC	3472
14	*Monticola salitarius*	Blue Rock Thrush	Γαλαζοκότ συφας		LC	LC	2
15	*Motacilla alba*	White Wagtail	Λευκοσουσ ουράδα		LC	LC	2
16	*Motacilla flava*	Western Yellow Wagtail	Κιτρινοσου σουράδα		LC	LC	5
17	*Nycticorax nycticorax*	Black-crowned Night Heron	Νυχτοκόρα κας	I	LC	LC	20
18	*Oenanthe*	Northern	Σταχτοπετρ όκλης		LC	LC	2

A/A	SCIENTIFIC NAME	COMMON NAME (ENGLISH)	COMMON NAME (GREEK)	CONSERVATION STATUS DIRECTIVE 2009/147	CONSERVATION STATUS IUCN	REDBOOKGR	NUMBER OF OBSERVATIONS
	oenanthe	Wheatear					
19	*Parus major*	Great Tit	Καλόγερος		LC	LC	PRESENCE
20	*Phylloscopus trochilus*	Willow Warbler	Θαμνοφυλλοσκόπος		LC	LC	PRESENCE
21	*Sterna hirundo*	Common Tern	Ποταμογλάρονο	I	LC	LC	1
22	*Sylvia melanocephala*	Sardinia Warbler	Μαυροτσιροβάκος		LC	LC	PRESENCE

Figure 6. Large aggregation of approximately150 Mediterranean Shags on Metopi Island in Saronikos Gulf.

Figure 7. Raft behaviour of Scopoli´s Shearwaters in Saronikos Gulf.

Figure 8. Nest site of Rock Dove inside a castle on an islet in Saronikos Gulf.

Furthermore, Yellow-legged Gull nesting sites, were found on Lagousaki, Gaidaros, Metopi, Plateia, Lazareto, Petra, Spalathronisi, Moladi, Anagnostis and Plateia-Diaporia islets (**Fig. 9**). The average dimensions of the eggs in the islets were as follows: length = 66.94 mm (range: 36.0–78.6 mm); width = 46.51 mm (range: 25.2–64.3 mm). The mean egg weight was 69.0 g (range: 11.3–90.2 g). Among the nests examined, the majority contained two eggs (n = 30), followed by nests with three eggs (n = 27) and one egg (n = 25). A total of 35 plastic items, including materials such as plastic bags, fragments of fishing nets, and rope, were recovered from 18 nests. Of these, two nests contained five plastic items each. Regarding the nest sites, the nests were located either beneath maqui bushes (n = 29) or in open settings exposed to direct sunlight (n = 35). The majority of nests were observed on Lagousaki Island (n = 20), followed by Metopi Island (n = 17). Notably, both islets contained the majority of the eggs recorded in the nests (**Table 2**). Noteworthy was one egg on Plateia Diaporia Islet which ruptured/ exploded after prolonged exposure to direct sunlight. Additionally, the nest containing five plastic items was the only one with one unhatched, unsuccessful egg.

Figure 9. Breeding pair of Yellow-legged Gull on Metopi Island in Saronikos Gulf.

Table 2. Number of nests and eggs of the Yellow-legged Gull on the Saronikos islets during the expedition 26-27 April and 1st of May 2024.

Islet	Number of nests	Number of eggs in nests
Anagnostis	3	5
Gaidaros	9	21
Lagousaki	20	44
Lazareto	1	2
Metopi	17	30
Moladi	9	19
Petra	1	2
Plateia	9	20
Plateia-diaporia	9	8
Spalathronisi	5	10
Total	**83**	**161**

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DISCUSSION

History of human use:

The islands bear pervasive signs of past human occupation and use. While most of these islands are too arid to permit permanent habitation, we found them to have been utilized by past societies for a variety of purposes. For example, several islets were used for defensive purposes: Lagoussa has the remnants of a Hellenistic defense tower, while much of Mbourtzi is occupied by the extensive fortifications of a 19th-century fortress (REF) (*other examples?*).
Some islands with relatively gentle topography (Metopi, Doroussa, Agios Thomas, Agios Ioannis?) were used for grain production as evidenced by the presence of drystone agricultural terraces. All of this farming ceased in the last century as the result of marginal production conditions, a shifting climate, and general abandonment of the agricultural landscape.

The majority of the study islands had also been used in the past for livestock grazing purposes. Small flocks of goats and sheep are typically released onto the islands for periods ranging from a few weeks to a few months during late winter and spring to fatten up the animals on the seasonal island vegetation. Because islet plant communities are typically not adapted to herbivory, this practice can lead to overgrazing, resulting in significant vegetation degradation, profound soil erosion and ultimate desertification. We found plant communities on islets grazed in the past to have shifted away from halophytic and palatable vegetation towards structurally- (e.g. thistles) and chemically-defended species (e.g. Euphorbiaceae, Lamiaceae).

The ecosystems of the study islands are also influenced by the impressive numbers of nesting seabirds, predominantly yellow-legged gulls (*Larus michahellis*) and Mediterranean shags (*Gulosus aristotelis desmarestii*). The observed seabird densities, far exceed similar islands in the Cyclades and the Sporades clusters and can be attributed to the presence of the nearby city of Athens. Recent research (Carlberg et al 2022) has demonstrated that size of nesting gull colonies on Aegean islands are determined by food subsidies from human settlements in the vicinity. These subsidies occur over two pathways: first the presence of urban landfills where seagulls now predominantly feed, and second through the eutrophication of waters surrounding sewage treatment plants. Untreated, or partially treated sewage, adds organic material to the marine environment, stimulating plankton blooms that form the base of the marine food web. This abundance supports fish populations, which in turn feed seabirds. The guano deposited by the resident seabird colonies has been shown to transform terrestrial ecosystems, enriching the soil and enabling the growth of more lush vegetation in nesting areas. Recent research has demonstrated that population density and even average body size of resident lizard populations is directly proportional on nesting seabird density (Stadler et al. 2022).

Conclusion

Today, the islands of the Saronic Gulf are valued for their ecological and aesthetic significance. Future conservation initiatives need to protect native wildlife, including seabird colonies, and preserving fragile habitats while eliminating damaging human activities. Removal of invasive species like rats, rabbits and goats will allow native species to recover, while the nutrient cycles driven by marine inputs will likely continue to sustain these ecosystems. Because the islands serve as important stopover points for migratory birds, adding to their ecological importance, restrictions on hunting of migratory songbirds will further aid their conservation value. Despite their proximity to the urban center of Athens, these islands remain vital reservoirs of biodiversity in the Saronic Bay and deserve full protection.