Integrating Biodiversity into Forestry Practitioner's Guide













Integrating Biodiversity into Forestry - PRACTITIONER'S GUIDE Nature Conservation Centre (DKM), Ankara, Turkey ISBN: 978-605-06990-0-5



Nature Conservation Centre (DKM) ODTÜ Sitesi 1594 Sok. No:3 Çiğdem Mah., Ankara, Turkey Tel: 0312 287 81 44 www.dkm.org.tr Sertifika No: 35069

1. Edition: Ankara, January, 2020

#### **Chapter Authors**

**Chapter 1:** Introduction Deniz Özüt, Yıldıray Lise, İrem Tüfekcioğlu, Hüma Ülgen

**Chapter 2:** Priority Plant Species Nezaket Adıgüzel, Barış Bani, Mecit Vural

**Chapter 3:** Priority Large Mammal Species Hüseyin Ambarlı, Alper Ertürk, Mustafa Durmuş, Anıl Soyumert, Deniz Özüt

**Chapter 4:** Priority Small Mammal Species C. Can Bilgin, Tolga Kankılıç

**Chapter 5:** Priority Bird Species Kiraz Erciyas Yavuz, Nizamettin Yavuz, C. Can Bilgin, Hilary J. Welch, Geoff Welch, Özge Balkız

**Chapter 6:** Priority Amphibian & Reptile Species Kurtuluş Olgun, Mert Elverici

**Chapter 7:** Priority Butterfly Species Szabolcs Safian, Evrim Karaçetin, Didem Ambarlı, Hilary J. Welch

**Chapter 8:** Introduction of Other Biodiversity Elements and Recommendations on Forestry Practices Uğur Zeydanlı

**Chapter 9:** Priority Species and Their Distribution amongst Forest Enterprise Directorates Ömer Karademir, Sedat Akın, Mehmet Kılıç, Günal Şahin, Galip Çağatay Tufanoğlu

Editors: Deniz Özüt, Galip Çağtay Tufanoğlu, Uğur Zeydanlı

Production Coordinator: Yıldıray Lise, İrem Tüfekcioğlu

Maps: C. Can Bilgin, Semiha Demirbaş Çağlayan, Mustafa Durmuş, Ayşe S. Turak

Translation: Smart Tercüme

Graphic Design: Güngör Genç

Publication: Dumat Ofset Matbaacılık

All rights reserved. The material may not be reproduced or distributed, in whole or in part, or the information therein cannot be used without the prior written permission of Nature Conservation Centre. However, by providing the full name of the book and of the Nature Conservation Centre, citation is permitted for scientific researches, theses, articles, books and similar works.

In the preparation of this book, Uğur Zeydanlı, who is one of the editors of this book has used the works he conducted while he was a Visiting Researcher at Yale School of Forestry and Environmental Studies, Global Institute of Sustainable Forestry, which he attended within the context of the Fulbright Visiting Scholar Program.

#### Citation:

Recommended for the full text:

Özüt, D., Tufanoğlu, G.Ç., Zeydanlı U. (editors) 2020. Integrating Biodiversity into Forestry Practitioner's Guide. Ankara, Nature Conservation Center, 306 pages.

For a chapter, please cite according to the authors, by using the following example: Lise, Y., Özüt, D., Tüfekcioğlu, İ., Ülgen, H. 2020. Introduction. Page 1-7. Özüt, D., Tufanoğlu, G.Ç., Zeydanlı U. (editors) 2020. Integrating Biodiversity into Forestry Practitioner's Guide. Ankara, Nature Conservation Center, 306 pages.

The commercial license of all the photographs included in this book belongs to the photographers. The photographs cannot be copied without the written permission of the right owner and cannot be used for any other purposes.

"Integrating Biodiversity into Forestry: Practitioner's Guide" book was prepared in light of the experiences acquired through the projects supported by the BTC – Environmental Investment Program and Directorate General of Forestry and was published within the scope of the "Integrated Approach to Management of Forests in Turkey, with Demonstration in High Conservation Value Forests in the Mediterranean Region" which is being conducted with the financial support of the Global Environment Fund (GEF) by the Directorate General of Forestry in cooperation with the United Nations Development Programme (UNDP).

# Integrating Biodiversity into Forestry Practitioner's Guide













#### Acknowledgement

We thank all those who helped to complete this book and owe an apology to those whom we mistakenly forgot to thank.

Cafer Akdeniz, Caner Akgül, Ziyaeddin Akkoyunlu, Hüseyin Albayrak, Murat Altunal, Ankara Herbarium, H.Cihad Anlar, Alper Tolga Arslan, Fethi Arslan, Emine Ataş, Aziz Avcı, Mehmet Aydın, Mustafa Aydın, Sıddık Aydın, Burhan Aydoğan, Zeki Aytac, Emin Zeki Başkent, Mehmet Sıraç Batuk, Soner Bayhan, Gelincik Deniz Bilgin, Burcu Bursalı, Tevfik Büyükgebiz, Kemal Can, Mehmet Ceylan, Yılmaz Ceylan, Ahmet Cort, Ayhan Çağatay, Ece Gökçe Çakır, Celal Yavuz Çakır, Cem Çakıroğlu, Lale Çaktı, Oktay Demir, Turqay Demir, Cemil Demirci, Mehmet Demirci, Gökhan Deniz, Catherine Dijon, Ramazan Dikyar, Ali Dinç, Timur Doğan, Hayri Duman, Ahmet Duran, Murat Durmuş, Enver Elmas, Mustafa Elmas, Özgür Eminağaoğlu, Mehmet Erol, Ahmet Ersoy, Tamer Ertürk, Naci Eyyüpoğlu, Yücel Fırat, Michael Frenzen, Gazi Herbarium, Murat Genc, Selcuk Göktürk, Zeki Görgü, Hasan Güclü, Yılmaz Gün, Emin Güzenge, Bekir Ilgar, Nursel İkinci, Ergin Kahraman, Recep Karadağ, Osman Karaelmas, Gürsel Karagöz, Fazlı Karakas, Ahmet Karatas, Ömer Naci Kaya, Ersoy Kılıç, Kamil Kılıç, Rüstem Kırış, Gediz Metin Kocaeli, Tülay Kocaman, Mithat Koç, Fatih Köleli, C.A.J. Kreutz, İlker Kül, Hayrettin Küçük, Oğuz Kurdoğlu, Nursel İkinci, Necati Güvenç Mamıkoğlu, Talat Memiş, Necdet Mengen, Deniz Mengüllüoğlu, Akın Mızraklı, Levent Morkan, Ömer Necipoğlu, Olcay Odabaş, Gökhan Oğuz, Tolga Ok, Bahattin Örs, Hilmi Özdemir, Serdar Özkan, Sinan Özkaya, Murat Özmen, A. Kenan Öztan, Kenan Öztan, Rıfat Öztürk, Yavuz Öztürk, Szabolcs Safian, Sait Saălam, Nadir Sarıkaya, Fatih Satıl, Ali Onur Sayar, Mehmet Ali Sayın, Hermann Schachner, Yunus Seven, Nikolaus Stümpel, Ergün Süner, Abbas Sahin, Fuat Sanal, Ali Simsek, Cengiz Tapan, Erdoğan Tekin, Mehtap Teksen, Zafer Toksoy, Resat Tunc, Boris Tuniyev, Nedim Tuylu, Oğuz Türkozan, Ahmet Ulukanlıgil, Cemil Ün, Turgay Vatan, Eva Wallander, Armağan Yalçın, Semra Yalçın, Hakan Yıldırım, Kemal Yıldız, Mehmet Yıldız, Salih Yılmaz, Adnan Yılmaztürk, Mustafa Yurdaer, İbrahim Yüksel, Sırrı Yüzbaşıoğlu.



# Foreword

21<sup>st</sup> century marks a period when our world goes through a rapid process of growth and development while having to deal with environmental disasters. On top of the list of disasters comes the loss of natural habitats and biodiversity due to climate change. Yet, biodiversity and natural ecosystems as well as the benefits and services provided by these ecosystems are indispensable to the prosperity and development of societies. That is why, international organizations have defined 'sustainable development' as the global development vision. Sustainable management of forests has been the General Directorate of Forestry's key purpose, since inception: "Safeguard forests and forest resources, improve them with an understanding that aligns with that of nature, and sustainably manage them within the ecosystem, ensuring that they offer multiple benefits to the society."

Since the year 1839, General Directorate of Forestry has been aiming to achieve sustainable management of forests by striking a balance between conservation and utilization. Of course, definitions assigned to the concepts of conservation and utilization have gone through a series of changes since then. Although our approach to conservation in the past was rather associated with forest presence and forest lands, the 'quality' of forest presence has - over time - become an increasingly meaningful assessment criterion. Moreover, 'quality of forests' has gradually become something judged by the forest ecosystem's ecological characteristics and biodiversity.

Forests of Turkey are among the most distinctive forests of the northern hemisphere. Not only our forest lands in the northeast of the country, but also our forest ecosystem in the Aegean and Mediterranean Regions rank among the top 35 conservation priority hotspots, hosting thousands of species. Although they are mostly taken for granted, considering the ecological functions they fulfil, these species happen to be the insurance for the survival of our forests. That is why, sustainable management of forests must absolutely entail a key objective of also conserving these beings.

The ecosystem-based functional forest management planning, which we - as the General Directorate of Forestry - have been doing our best to disseminate from 2000 onwards is a powerful tool we can wield to reach our goal. Since 2008 when we began to intensively implement the functional planning approach, we have been trying to integrate practices that value biodiversity into the forest management plans.

Thanks to the more than a decade of partnership between the General Directorate of Forestry and Nature Conservation Centre, how to integrate biodiversity into forest planning and management in Turkey has now been clearly defined. The foregoing guide is one of the two major works produced addressing this subject.

This guide will provide our colleagues working in the field in charge of forest management with valuable guidance on how to recognize the elements of biodiversity in their own directorates and units, the kind of forest structure these species need and the specific actions they need to take as part of their practices.

Addressing a major gap, this guide will hopefully light the way for our entire staff in their efforts for the conservation of biodiversity - a key aspect of sustainable management of forests.

Bekir Karacabey General Directorate of Forestry

# Foreword

Conservation of biodiversity and ecosystem services are key to human life and sustainable development. As of today, we have already degraded several ecosystems and caused the decline of species and the pace of extinction is unfortunately increasing. Loss of biodiversity is causing a misfunctioning of ecosystem services that are crucial for human well-being, food, water and air provisions. The consequences are not only limited to humans, they affect all living beings that we are sharing our planet with. Convention on Biological Diversity sets the rational and solutions through Aichi Targets that emphasize five strategic goals as a pathway. These include addressing the causes of biodiversity loss by mainstreaming biodiversity, reduce the direct pressure, improve the status of species, enhance the benefits to all from biodiversity, and improve the implementation. In line with this priority setting, UNDP has put in place its new strategy document with three development settings and six signature solutions. The development settings take the resilience issue as a pillar subject and identify "promoting the nature-based solutions for a sustainable planet" as one of its signature solutions.

UNDP Turkey, having a strong history of cooperation with the Government of Republic of Turkey, has been implementing various programs and projects for biodiversity and natural resource conservation. Mainstreaming conservation and sustainable use of resources is a major approach UNDP adopts as part of its action. This book is an evidence of such work by creating concrete tools and approaches for biodiversity mainstreaming. Integrating biodiversity conservation into forestry sector is a specific milestone work that was defined and taken into action with great efforts. Of course, such a tool couldn't be realized without a sound partnership where we all managed to establish a working example of public, UN and civil society partnership. Besides, many experts form Government and academia have participated to this long engagement.

I believe, this unique example will be disseminated to other countries and regions as a best case and replicated. As UNDP Turkey, we will do our best to contribute to this target. Finally, I want to share my sincere thanks to General Directorate of Forestry, as the main body of conservation of forests in Turkey, and Nature Conservation Centre as well as all experts who have contributed to this particular work.

Claudio Tomasi UNDP Turkey Resident Representative



# Foreword

The conventional nature conservation concept followed a paradigm based on species and protected areas. However, it is now realized that not only is this approach inadequate on its own but the effectiveness and contribution of these approaches to nature conservation are also being debated.

One of the contemporary global paradigms is the integration of the conservation approaches into studies of natural resource use and the practices of sectors benefitting from nature. For example, we can integrate conservation measures into forest management and implement practices that take into account the needs of species within a forest ecosystem and thus ensure the continuity of the ecological processes when conducting forestry activities. This integration is what sustainable natural resource management aims to achieve in this book. Although appealing as a concept, putting sustainable natural resource management into practice and achieving successful results is not an easy job. Extremely well-planned approaches, precise strategies, strong institutions, good experts, and skilled teams are needed.

The General Directorate of Forestry has taken significant steps toward sustainable natural resource management by transitioning to ecosystem-based, multi-functional planning since 2000. Multi-functional planning provides an opportunity to plan the benefits and services provided by forests apart from wood. It also provides a framework for accounting during the planning process for other potential sectors that have interactions with forest ecosystems. For the past ten years, DKM has been cooperating with the General Directorate of Forestry to develop methods for addressing biodiversity within this planning process.

This Practitioners' Guide has been prepared for local forest officers who will be implementing the forest management plans in the field once biodiversity elements are integrated into the plans. The guide provides the necessary information on the target species within a district enterprise jurisdiction and explains the jurisdiction's needs as well as what to do and what not to do to ensure its conservation.

There are many research activities, large-scale works, and individual field projects addressing the conservation of biodiversity. There are also many successful examples throughout the world; however, this study is one of the first examples in which conservation of biodiversity is systemized, institutionalized, and made an integrated part of forest management.

This product is the result of fruitful cooperation and joint works between scientists and forest managers. It is hoped that it will contribute to the sustainable management of Turkey's forests and will be an example for other forests in the world.

#### Chadwick Dearing Oliver

Nature Conservation Centre, Member of Science Committee Yale School of Forestry and Environmental Studies, Global Institute of Sustainable Forestry



# Contents

| 1. INTRODUCTION  | 1  |
|--|----|
| 1.1. Priority Species  | 4  |
| 1.2. Other Elements of Biodiversity                          | 7  |
| 2. PRIORITY PLANT SPECIES                                    | 8  |
| 2.1. Woody Plants  | 16 |
| 2.1.1. Aceraceae   | 16 |
| 2.1.1.1. Balkan maple (Acer hyrcanum subsp. reginae-amaliae) | 16 |
| 2.1.1.2. Acer cappadocicum subsp. divergens                  | 17 |
| 2.1.2. Fabaceae  | 18 |
| 2.1.2.1. Cytisus gueneri                                     | 18 |
| 2.1.2.2. Genista sandrasica                                  | 19 |
| 2.1.2.3. Gonocytisus dirmilensis                             | 20 |
| 2.1.2.4. Colutea melanocalyx subsp. melanocalyx              | 21 |
| 2.1.3. Rhamnaceae  | 22 |
| 2.1.3.1. Sageretia spinosa                                   | 22 |
| 2.1.4. Pinaceae  | 23 |
| 2.1.4.1. Aleppo Pine (Pinus halepensis)                      | 23 |
| 2.1.4.2. Trojan fir (Abies nordmanniana subsp. equi-trojani) | 24 |
| 2.1.5. Phyllanthaceae  | 25 |
| 2.1.5.1. <i>Flueggea anatolica</i> Gemici                    | 25 |
| 2.1.6. Ericaceae   | 26 |
| 2.1.6.1. Rhododendron ungernii                               | 26 |
| 2.1.6.2. Epigaea gaultherioides                              | 27 |
| 2.1.7. Rosaceae  | 28 |
| 2.1.7.1. Amygdalus kotschyi                                  | 28 |
| 2.1.7.2. Cerasus erzincanica                                 | 29 |
| 2.1.7.3. Field rose (Rosa arvensis)                          | 30 |
| 2.1.7.4. Pyrus anatolica                                     | 31 |
| 2.1.7.5. Pyrus yaltirikii                                    | 32 |
| 2.1.7.6. Serik Cab (Pyrus serikensis)                        | 33 |
| 2.1.8. Altingiaceae  | 34 |
| 2.1.8.1. Sweetgum (Liquidambar orientalis) tree              | 34 |
| 2.1.9. Caprifoliaceae  | 35 |
| 2.1.9.1. Lonicera nummulariifolia subsp. Glandulifera        | 35 |
| 2.1.10. Betulaceae   | 36 |
| 2.1.10.1. Alnus glutinosa subsp. betuloides                  | 36 |
| 2.1.10.2. Alnus glutinosa subsp. Antitaurica                 | 37 |
| 2.1.10.3. Betula browicziana                                 | 38 |
| 2.1.11. Celastraceae   | 39 |
| 2.1.11.1. Euonymus latifolius subsp. cauconis                | 39 |
| 2.1.12. Ulmaceae   | 40 |
| 2.1.12.1. Zelkova (Zelkova carpinifolia)                     | 40 |

| 2.1.13. Fagaceae                                     | 41 |
|--|----|
| 2.1.13.1. Kasnak oak (Quercus vulcanica)             | 41 |
| 2.1.13.2. Pontine Oak (Quercus pontica)              | 42 |
| 2.1.14. Cupressaceae                                 | 43 |
| 2.1.14.1. Juniperus oxycedrus subsp. macrocarpa      | 43 |
| 2.1.15. Salicaceae                                   | 44 |
| 2.1.15.1. Salix caucasica                            | 44 |
| 2.1.16. Oleaceae                                     | 45 |
| 2.1.16.1. Fraxinus pallisae                          | 45 |
| 2.1.16.2. Fraxinus excelsior L. subsp. coriariifolia | 46 |
| 2.1.16.3. Osmanthus decorus                          | 47 |
| 2.2. Herbaceous plants                               | 48 |
| 2.2.1. Fabaceae                                      | 48 |
| 2.2.1.1. Glycyrrhiza flavescens subsp. antalyensis   | 48 |
| 2.2.1.2. Astragalus spitzenbergeri                   | 49 |
| 2.2.1.3. Astragalus bozakmanii                       | 50 |
| 2.2.1.4. Trigonella cassia                           | 51 |
| 2.2.1.5. Astragalus albertshoferi                    | 52 |
| 2.2.1.6. Astragalus altanii                          | 53 |
| 2.2.2. Lamiaceae                                     | 54 |
| 2.2.2.1. Satureja amani                              | 54 |
| 2.2.2.2. Thymus cariensis                            | 55 |
| 2.2.2.3. Salvia sericeotomentosa                     | 56 |
| 2.2.2.4. Salvia nydeggeri                            | 57 |
| 2.2.2.5. Nepeta conferta                             | 58 |
| 2.2.2.6. Thymus pulvinatus                           | 59 |
| 2.2.3. Primulaceae                                   | 60 |
| 2.2.3.1. Cyclamen mirabile                           | 60 |
| 2.2.4. Boraginaceae                                  | 61 |
| 2.2.4.1. Rindera dumanii                             | 61 |
| 2.2.4.2. Anchusa limbata                             | 62 |
| 2.2.4.3. Rough comfrey (Symphytum asperum)           | 63 |
| 2.2.4.4. Alkanna dumanii                             | 64 |
| 2.2.5. Caryophyllaceae                               | 65 |
| 2.2.5.1. Gypsophila pilulifera                       | 65 |
| 2.2.5.2. Silene koycegizensis                        | 66 |
| 2.2.6. Plumbaginaceae                                | 67 |
| 2.2.6.1. Acantholimon koeycegizicum                  | 67 |
| 2.2.6.2. Acantholimon birandii                       | 68 |
| 2.2.7. Rubiaceae                                     | 69 |
| 2.2.7.1. Rubia davisiana                             | 69 |
| 2.2.8. Asparagaceae                                  | 70 |
| 2.2.8.1. Muscari macbeathianum                       | 70 |
| 2.2.8.2. Scilla sardensis                            | 71 |
| 2.2.8.3. Asparagus lycicus                           | 72 |
| 2.2.8.4. Ornithogalum microcarpum                    | 73 |
|  |    |

| 2.2.9. Apiaceae   | 74  |
|---|-----|
| 2.2.9.1. Chaerophyllum aksekiense                       | 74  |
| 2.2.9.2. Ferulago isaurica                              | 75  |
| 2.2.9.3. Ferula coskunii                                | 76  |
| 2.2.9.4. Ferula amanicola                               | 77  |
| 2.2.9.5. Prangos turcica                                | 78  |
| 2.2.10. Amaryllidaceae                                  | 79  |
| 2.2.10.1. Allium elmaliense                             | 79  |
| 2.2.10.2. Galanthus koenenianu                          | 80  |
| 2.2.10.3. Galanthus cilicicus                           | 81  |
| 2.2.11. Asteraceae                                      | 82  |
| 2.2.11.1. Centaurea antalyensis                         | 82  |
| 2.2.11.2. Centaurea ptosimopappoides                    | 83  |
| 2.2.11.3. Anthemis macrotis                             | 84  |
| 2.2.11.4. Anthemis adonidifolia                         | 85  |
| 2.2.12. Orchidaceae                                     | 86  |
| 2.2.12.1. Ophrys isaura                                 | 86  |
| 2.2.12.2. Ophrys lyciensis Paulus                       | 87  |
| 2.2.12.3. Ophrys amanensis subsp. iceliensis            | 88  |
| 2.2.13. Scrophulariaceae                                | 89  |
| 2.2.13.1. Verbascum freynii                             | 89  |
| 2.2.13.2. Verbascum prusianum                           | 90  |
| 2.2.13.3. Verbascum adenocaulon                         | 91  |
| 2.2.14. Iridaceae                                       | 92  |
| 2.2.14.1. Crocus abantensis                             | 92  |
| 2.2.14.2. Crocus adanensis                              | 93  |
| 2.2.15. Liliaceae                                       | 94  |
| 2.2.15.1. Fritillaria forbesii                          | 94  |
| 2.2.15.2. Fritillaria kittaniae                         | 95  |
| 3. PRIORITY LARGE MAMMAL SPECIES                        | 96  |
| 3.1. Fallow deer ( <i>Dama dama</i> )                   | 97  |
| 3.2. Brown bear (Ursus arctos)                          | 104 |
| 3.3. Chamois ( <i>Rupicapra rupicapra</i> )             | 108 |
| 3.4. European roe deer ( <i>Capreolus capreolus</i> )   | 112 |
| 3.5. Caracal ( <i>Caracal caracal</i> )                 | 116 |
| 3.6. Red deer ( <i>Cervus elaphus</i> )                 | 120 |
| 3.7. Wolf ( <i>Canis lupus</i> )                        | 124 |
| 3.8. Eurasian lynx ( <i>Lynx lynx</i> )                 | 128 |
| 3.9. Wild goat ( <i>Capra aegagrus</i> )                | 132 |
|   |     |
| 4. PRIORITY SMALL MAMMAL SPECIES                        | 136 |
| 4.1. Asia Minor spiny mouse ( <i>Acomys cilicicus</i> ) | 139 |
| 4.2. Caucasian Mole ( <i>Talpa caucasica</i> )          | 142 |
| 4.3. Levantine Mole ( <i>Talpa levantis</i> )           | 145 |
| 4.4. Major's Pine Vole ( <i>Microtus majori</i> )       | 148 |
| 4.5. Robert's snow vole (Chionomys roberti)             | 151 |

|   | 5. PRIORITY BIRD SPECIES  | 154 |
|---|---|-----|
|   | 5.1. White-tailed eagle (Haliaeetus albicilla)  | 158 |
|   | 5.2. White-backed woodpecker (Dendrocopos leucotos)   | 161 |
|   | 5.3. Northern goshawk (Accipiter gentilis)  | 164 |
|   | 5.4. Black woodpecker ( <i>Dryocopus martius</i> )  | 167 |
|   | 5.5. Cinereous vulture ( <i>Aegypius monachus</i> )   | 170 |
|   | 5.6. Great spotted woodpecker (Dendrocopos major)   | 173 |
|   | 5.7. Eastern Imperial Eagle (Aquila heliaca)  | 176 |
|   | 6. PRIORITY AMPHIBIAN & REPTILE SPECIES   | 180 |
|   | 6.1. Lyciasalamandra genuses  | 184 |
|   | 6.1.1. Atıf's Lycian Salamander ( <i>Lyciasalamandra atifi</i> )  | 184 |
|   | 6.1.2. Bille's Lycian Salamander (Lyciasalamandra billae)   | 184 |
|   | 6.1.3. Antalya Salamander ( <i>Lyciasalamandra antalyana</i> )  | 184 |
|   | 6.1.4. Fazıla's Lycian salamander (Lyciasalamandra fazilae)   | 185 |
|   | 6.1.5. Luschan's Salamander ( <i>Lyciasalamandra luschani</i> )   | 185 |
|   | 6.1.6. Marmaris Salamander (Lyciasalamandra flavimembris)   | 185 |
|   | 6.2. White-banded Mountain Viper (Montivipera albizona)   | 188 |
|   | 6.3. Pontic Adder ( <i>Vipera pontica</i> )   | 191 |
|   | 6.4. Caucasian Viper ( <i>Vipera kaznokovi</i> )  | 194 |
|   | 6.5. Caucasian Salamander ( <i>Mertensiella caucasica</i> )   | 197 |
|   | 7. PRIORITY BUTTERFLY SPECIES   | 200 |
|   | 7.1. Ali Bali blue ( <i>Polyommatus alibali</i> )   | 206 |
|   | 7.2. Pearl-bordered Fritillary (Boloria euphrosyne)   | 209 |
|   | 7.3. Southern Festoon (Zerynthia polyxena)  | 212 |
|   | 7.4. Brown hairstreak ( <i>Thecla betulae</i> )   | 215 |
|   | 7.5. Caucasian Festoon (Zerynthia caucasica)  | 218 |
|   | 7.6. Grecian Copper (Lycaena ottomana)  | 221 |
|   | 7.7. Levantian marbled white ( <i>Melanargia wiskotti</i> )   | 224 |
| 8 | INTRODUCTION OF OTHER BIODIVERSITY ELEMENTS AND RECOMMENDATIONS ON FORESTRY PRACTICES                     | 226 |
|   | 8.1. Old-growth forests   | 227 |
|   | 8.2. Forest areas with high tree species richness   | 230 |
|   | 8.3. Forest areas with an unusual tree species composition  | 232 |
|   | 8.4. Large forest blocks and connecting corridors   | 234 |
|   | 8.5. Marginal populations   | 236 |
|   | 8.6. Forests with special microclimate  | 238 |
|   | 8.7. Relict ecosystem   | 239 |
|   | 8.8. Water resources and peatlands of the forest  | 240 |
|   | 9. PRIORITY SPECIES AND THEIR DISTRIBUTION AMONGST FOREST ENTERPRISE DIRECTORATES                         | 242 |
|   | 9.1. Table for Forest Species with Conservation Priority  | 244 |
|   | 9.2. Evaluation Table for the Impact of General Forestry Practices in Turkey on Fauna Species/Groups with |     |
|   | Conservation Priority   | 249 |
|   | 9.3. Table for Distribution of Species with Conservation Priority amongst Forest Enterprise Directorates  | 273 |
|   | and Regional Forest Directorates (by year 2019) <b>10. REFERENCES</b>                                     | 295 |
|   |   |     |

# 1. Introduction

Biodiversity is a term summarizing the diversity of processes that support the survival of living organisms, their habitats and life in general. Since it is broad concept that relates to almost everything we see on the surface of the planet, biodiversity needs to be explored by segregating it into a series of levels: genetic diversity, diversity of species, diversity of ecosystems and ecological processes. Biodiversity has been negatively affected by human activity that has been directly and indirectly damaging the nature particularly since the early years of the 20<sup>th</sup> century. As in the case of human activity in every domain including industry, energy, transportation, urbanization, agriculture, and mining, practices of industrial forestry have had adverse impacts on biodiversity.

As it became more and more evident through research conducted and losses endured that biodiversity was at the heart of all services provided by the nature, the need for ensuring that human activity becomes sustainable and avoids hurting the nature was finally understood, and the actions were restructured based on this principle.

A similar process of restructuring is now under way in forestry. Various examples of this new approach can be found across the globe today; it is especially very common in developed countries. Instead of planning and operating a forest by only viewing it as a raw material source of wood, an understanding where it is valued as an ecosystem by addressing and planning it with all of its elements, and practices reflecting such an understanding have been increasingly acknowledged also in Turkey recently.

Bringing together forestry practices to be implemented from a nature-friendly perspective with biodiversity, this book is designed to:

- · Introduce the elements of biodiversity,
- · Provide guidance on how these elements are linked to the forest ecosystem, and
- Explain the recommended course of action for carrying out forestry activities that take account of these elements.

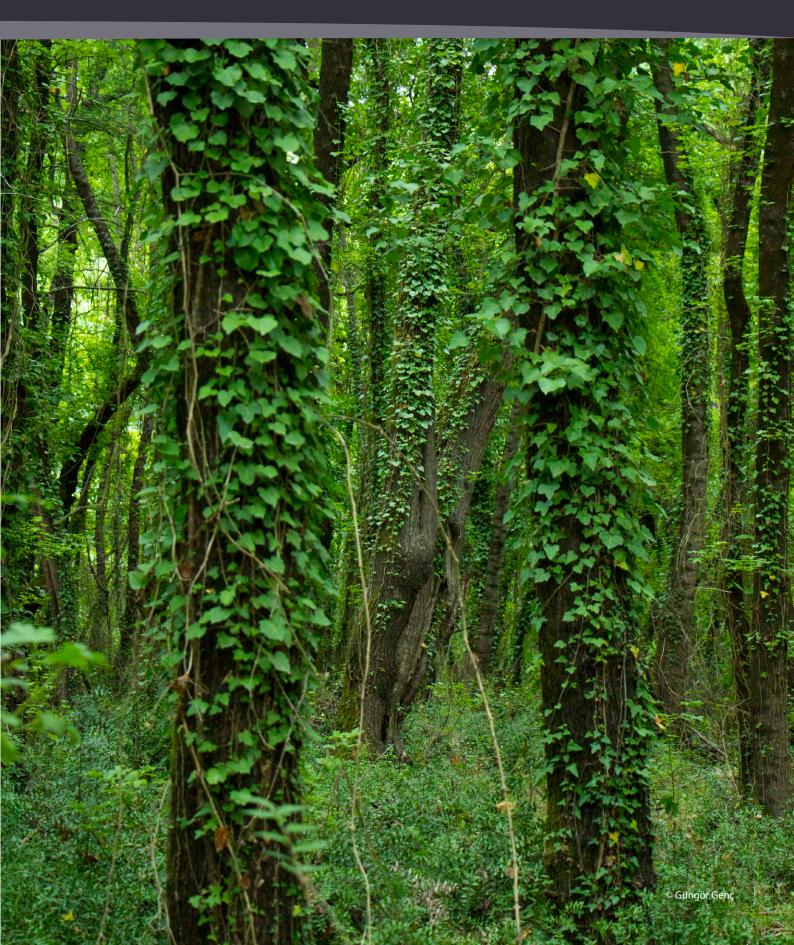
The first chapter of the book provides a brief description of the biodiversity elements in question, and how they are selected.

The second chapter features an overview of groups involving forest-dependent species with conservation priority (large mammals, small mammals, birds, reptiles, amphibians, butterflies and plants). After exploring how the presence and importance of these groups within the forest ecosystem, their general habitats and other needs are linked to forestry practices, a set of practical recommendations are provided. This chapter also incorporates a generic overview of each species group followed by a discussion of priority species in each group. Furthermore, it dwells on the descriptive characteristics of these species with conservation priority which will be included in the new management plans of Forest Enterprise Directorates as target species, their distribution across Turkey, population statuses and ecological features as well as inventory methods and a set of specific recommendations for forestry practices.

The third chapter of the book includes an introduction to the forest ecological processes and structures that are addresses as other elements of biodiversity (old-growth forests, Forest areas with high tree species richness, different stands by tree species composition, large habitat blocks and connecting corridors, marginal populations, forests with special microclimate, relict ecosystems, Water resources and peatlands of the forest) and recommendations for inventory efforts and forestry practices associated with these elements.

In the fourth and final chapter, priority species and the areas of jurisdiction by Regional Forest Directorates and Forest Enterprise Directorates where they are found are shown in the form of tables. In addition, an itemized list of common forestry practices in Turkey can be found in this chapter, accompanied by a table where the degree to which priority species/groups of species are affected by these practices is reviewed.

Finally, the part entitled References features a list of resources which the authors found helpful while developing this guide, as well as other resources that the readers might want to refer to for further reading.





©DKM archive

# **1.1. Priority Species**

An approach based on species would ensure high functionality and comprehensibility both during planning and implementation. Advantages of a species-based study includes easy data validation, representation of other elements of biodiversity, straightforward mapping, convenience for integration to management plans and ease of understanding by implementers about species.

Nevertheless, an essential component of a species-based approach would be the challenging nature of filtering a huge number of species at a board scale (at the scale of Forest Enterprise Directorates) to reduce them to a manageable number, by employing an objective modality. This is because, a great number of species would require paramount resources and workload during planning and implementation. In this context, establishing priority species through prioritization has been used in this study as an objective modality to substantially reduce the number of species to be explored. For the purposes of the forgoing study, species that are forest-dependent, in need of conservation, can be effectively conserved per unit effort and have the potential to represent biodiversity have qualified as priority species.

To this end, as an objective method that can be updated and improved, a scoring system has been developed. Species from the groups of large mammals, small mammals, birds, reptiles, amphibians, butterflies as well as herbaceous and woody plants about which there is up-to-date and sufficient information available in our country have been explored with top priority. An up-to-date list of species found in Turkey under these species groups was developed by experts, and then these species were selected at the end of an assessment based on a set of objective criteria which were also established by the experts. Species that scored higher than the calculated average value were identified as conservation-priority.

At the end of this study, the following were identified as species with conservation priority:

- **Species dependent on forest ecosystems:** Species that need forest ecosystems to fully or partially fulfill their basic needs such as reproduction (breeding), feeding and shelter.
- Species in need of high conservation: Endangered species that are rare and/or endemic.
- **Species with high conservation potential:** Species for which conservation-centric planning and forestry practices are highly likely to prove effective in terms of conservation.
- **Species representing forest biodiversity:** Species that would ensure the conservation of other species and habitats thanks to the conservation of priority species.

The scoring criteria employed in the selection of priority species are briefly described in Table 1.1.

Priority species are addressed in Chapters 2, 3, 4, 5, 6 and 7. These chapters feature an introduction to the species that are given priority in the conservation of forest biodiversity. These species are listed under the species groups to which they belong.

Before priority species are introduced, these chapters provide an overview of each species group and recommended forestry practices. Pages where these species are introduced provide guidance to decision-makers, planners and implementers for the activities they may carry out at any stage of forestry practices. The authors have done their best to ensure that these pages incorporate simple and accurate information.

It should be kept in mind that, new studies on species to be carried out in the coming years might require revisiting the information provided in these chapters, or shifts in the environmental paradigm and new research could make it imperative to assess how the species are distributed.

Table 1.1. Categories and criteria employed in the selection of priority species, and brief explanations

#### 1. Species dependent on forest ecosystems

Species that are most dependent on forest ecosystems happen to be species that would be most affected by forestry practices. The more dependent a species is on the forest, the greater priority it has in terms of being selected as a target species. Species that are highly dependent on forest ecosystems are given higher scores. Species that are not at all dependent on forest ecosystems are excluded from the assessment.

#### 2. Species in need of high conservation

It establishes to what extent the species is threatened; and therefore, the level of conservation it needs. Species that are more threatened are given higher priority in terms of conservation.

#### a. IUCN Red List Criteria at National Level

Red list criteria at national level (i.e. Turkey) for each species are applied. Species that are highly endangered are given higher scores.

#### b. Endemism

It involves checking whether a species is endemic/regionally endemic, and endemic species receive higher scores. **c. Habitat specialists** 

Such species usually are in greater need for conservation and therefore are given higher scores.

#### 3. Species with high conservation potential

It establishes whether the species have typical characteristics that would make its conservation easier. Species bearing such characteristics have higher conservation potential in comparison to others. Especially in cases that require most efficient use of limited resources, characteristics of a species that facilitate its conservation would stand out.

#### a. Economic return

It involves checking whether the species offers an economic return. It would be easier to mobilize resources for the conservation of species that bear financial profits. Such species receive higher scores.

#### b. Flagship species

It involves exploring whether the species have an interesting, iconic aspect, or a cultural or religious value that would promote ownership by the community or implementers during conservation efforts. Since they bear such characteristics, it would be much less difficult to draw people's attention to and leverage support for the conservation of flagship species. Flagship species receive higher scores.

#### c. Ease of Inventory

It involves checking whether it is easy to make an inventory of the species. In a context of limited timeframe and resources, more adequate data can be collected on species that are easier to take stock of compared to others, and it would be feasible to more realistically monitor the impacts of the actions on the situation of the species. Species that are comparatively easier to take stock of are given higher scores.

#### 4. Species with a higher potential to represent forest biodiversity

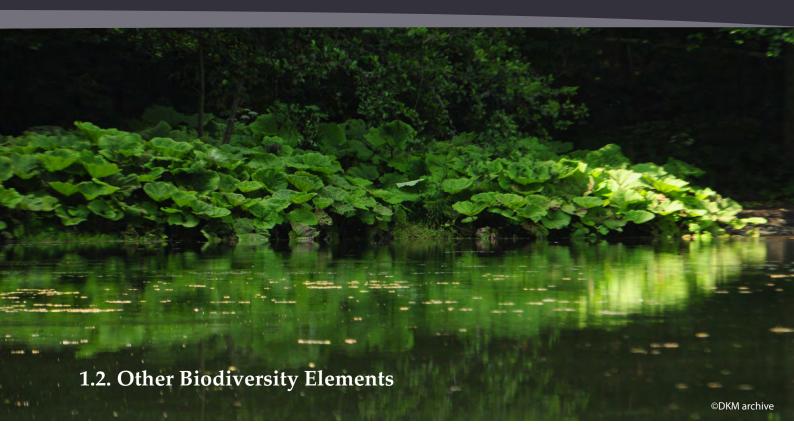
The potential of a species to represent biodiversity is as great as the extent to which the actions and conservation efforts undertaken for that species help conserve other species, ecological process or habitats.

#### a. Umbrella Species

This term refers to species that live/are found in many different biotic communities or extensive habitats, whose conservation would mean conservation of these vast habitats, therefore, those of many other species.

#### **b. Keystone Species**

It refers to species that have a disproportionately large effect on the ecosystem in which they live, relative to their abundance (i.e. number of individuals or size of biomass). These species play a critical role in the survival of the ecosystems in which they live.



Ensuring the survival of forest ecosystems is a key principle of forestry. However, as in the case of all ecosystem types, survival of forest ecosystems depends on ecological processes and relations. Presence of units and factors that provide for these processes would ensure a healthy and self-regenerating ecosystem. Moreover, some processes themselves happen to appear as virtues in terms of biodiversity

Forest structures that accommodate or are formed by these processes that are indeed spatial reflections of ecological processes have been addressed in this guide as 'other' biodiversity elements. In addition to species, other elements of biodiversity addressed hereof include those listed below. For detailed explanations about these elements, please see Chapter 8 "Other Biodiversity Elements".

- 1. Old-growth forests
- 2. Forest areas with high tree species richness
- 3. Different stands by tree species composition
- 4. Large forest blocks and connecting corridors
- 5. Marginal populations
- 6. Forests with special micro-climate
- 7. Relict ecosystems
- 8. Water resources and peatlands of the forest

# 2. Priority Plant Species

As a source of life for living creatures, plants account for the most essential component of biodiversity. Today, the pressure on herbaceous and woody plants as well as their home ranges has been driving the extinction of these species. Therefore, conservation efforts targeting plant species have gained momentum all around the globe. Turkey stands out in the world with the diversity of plants and high endemism rate it accommodates. Our country is home to 9,753 plant species, 3.305 of which are endemic species that are found only in Turkey. When we add, subspecies and varieties to that number, plant types in Turkey would go up to 12,596, and that of endemic species to 3,788 (Güner, 2012). Forests are home to a great variety of plant and animal populations together with trees and shrubs. Hence, when formulating the forest management objectives and priorities, it is necessary to consider the plant diversity, especially the endemic and rare plant resources they contain.

Regeneration and afforestation activities in forest areas may cause differentiation of herbaceous and woody species in forests from the natural vegetation cover. Artificial regeneration activities undertaken especially in regions with endemic and rare plant species of local distribution cause their mass extinction. Therefore, preference should be given to natural regeneration techniques in order to protect the natural vegetation cover and habitat in forest areas where the conditions for natural regeneration are not yet lost.



© İsmail Gökhan Deniz

Early or excessive overgrazing in forest or non-forest areas causes the decline of natural herbaceous plants without giving them a chance for regrowth. Herbicides used to destroy weeds also cause damage to natural herbaceous plants.

Afforestation and land reclamation activities misinformed in terms of a site or species selection also lead to the degradation of habitat and the loss of rare plants.

As plants require a diverse range of natural habitats and are oversensitive to habitat degradation, many forestry practices affect them to some extent directly or indirectly. Forestry activities undertaken specifically in forest areas where biodiversity is assessed at first and aimed at all plant species, particularly endemic and rare plant species with limited distribution, should be arranged based on the following considerations:

• Openings and gaps in forests are important for plants as well as for animals. These areas with rich biodiversity should not be targeted by the afforestation and artificial regeneration activities. The areas that have been damaged due to various reasons should instead be considered sites that need to be conserved and improved under the rehabilitation activities.



- Openings and gaps in forests that are considered to have no significant biodiversity but found in less than 100-200 meters or more from a forest borderline with a surface area of less than 1 ha should not be targeted by the afforestation activities except under certain circumstances (such as erosion, flood control, etc.).
- Clearance of vegetative cover in the full area under the afforestation and regeneration activities threatens the existence of plant species, especially the endemic species with limited distribution. The land with special plant species unavoidably targeted by afforestation activities must be prepared in strips or patches.
- Maquis described as unproductive forests in terms of wood yield are actually forest areas with rich biodiversity. Prior to silvicultural activities, it is important to study and assess the maquis in terms of plant endemism and non-wood product resources.
- If field activities chance upon intense distribution of endemic and rare plant species with limited distribution, especially the ones given in this book, it is necessary to ensure that the relevant management plans aimed at protecting these areas integrate them, and the local people and implementers are informed through warning signboards.
- Natural regeneration activities should preserve the richness of species and the mixture of a regeneration site with climax tree species. For this, it is necessary to regenerate first the wild cherry, rowan and fruit species such as yew, maple, elm and rare tree species contained more or less in the existing mixture, considering the growth physiology of their regeneration groups for the continuity of their generations. Moreover, in order to release adult individuals of such rare species in the field, the aging islets in regeneration sites should be selected from places where such rare trees are highly contained in a mixture.
- Most of the herbaceous and woody species distributed in high mountain and wetland ecosystems are very sensitive to changes in their habitats. Therefore, many well-known silvicultural practices applied in such fragile ecosystems should be selective as they may lead to undesirable consequences such as degradation of habitat and subsequent loss of species.

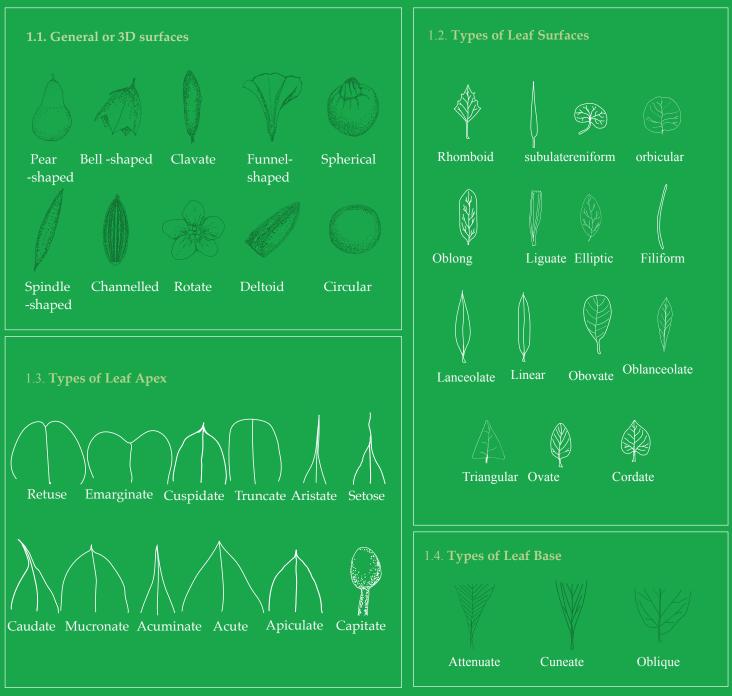


```
©Barış Bani
```

- Particularly since the in-forest tracks built on the slopes of high mountains could change the flow route of ground and underground waters, they might have a negative effect on the water economy of humid and semi-humid habitats located below the slopes; therefore, on their biodiversity. That is why, opening of new tracks at such locations should be avoided.
- Silvicultural practices in forest lands where biodiversity has been prioritized should be carried out during periods other than flowering and seeding of plants to ensure the continuity of generations of species under conservation.
- Existing maintenance pathways and skid trails should be used for skidding and transporting of forest products attained form silvicultural practices. Especially to ensure that sensitive ecosystems that are at high risk of erosion while accommodating rare and endemic species remain intact, haulage methods involving animal skidding or aerial and channel systems should be preferred.
- The role insects and bees play in pollination, and therefore, in the reproduction of plants is of paramount importance for the survival of ecosystems. Beekeeping activities should be encouraged and supported particularly in sensitive forest ecosystems that accommodate endemic and rare plant species.

# **Definitions of Plant Morphology Terms**

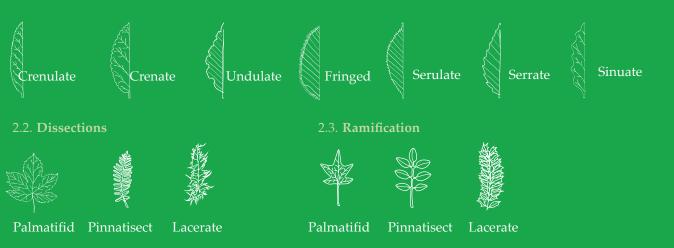
## **1. FIGURES**



Integrating Biodiversity into Forestry - Practition**er's Guide** 

### 2. DIVISIONS

2.1. Edges



#### **3. SURFACES**

| 3.1. Patterns      | 3.2. <b>Hair</b>    |                   |         |                      |
|--------------------|---------------------|-------------------|---------|----------------------|
| Reticulate Spotted | Sericeous Tomentose | Velvety Floccose  | Hispid  | Canescent Hirtellous |
| Rugose Punctate    | Setulose Ciliate    | Tubercled Hirsute | Villous | Stellate Wolly       |

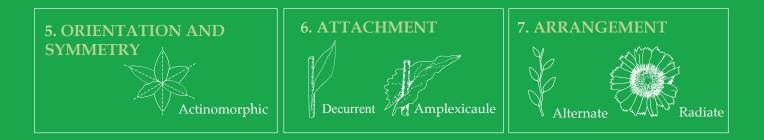
- 3.3. Surface features
- Pruinose: A surface that looks as if it is covered in frozen water Glandular: A surface covered in any type of gland.
   drops. Eglandular: A surface without glands.
- **Glaucous:** A surface with a waxy blue-grey appearance.

# 4. STRUCTURES, TEXTURE AND MATERIAL

- Horny: A structure with a rigid and firm texture, which can be easily cut yet hard to break.

- Coriaceous: A leather-like structure similar to the leaf of a Cherry Laurel.

- Hyaline: Colorless and transparent.



### 8. STEM

#### 9. LEAF



## **10. FLOWERING AND FRUITING FEATURES**

- Cyathiform: Saucer-shaped inflorescence.
- Cyme: Inflorescence where the meristem stops growing and flowering continues on secondary stems.







Monochasium

Raceme

Peduncle



Umbellule





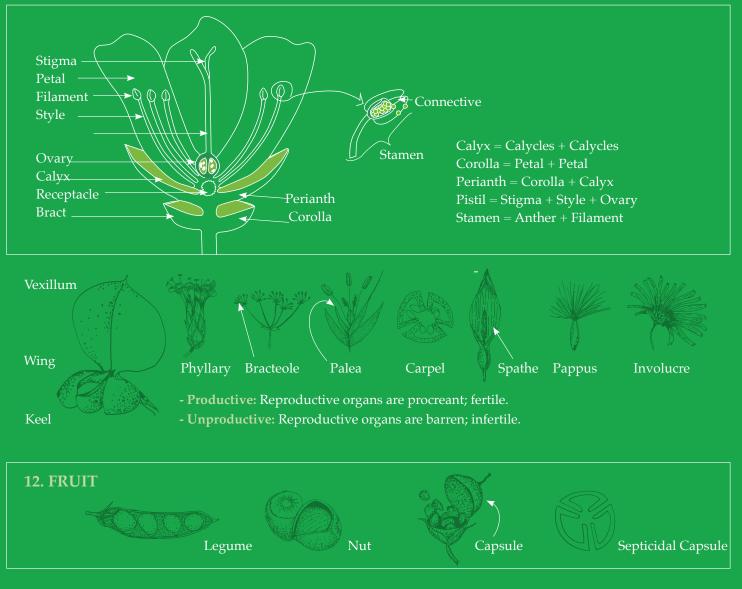
Dichasium

Head



Corymb

#### **11. FLOWER**



### **13. OTHERS**

- Anthophore: An elongated stalk that supports the flowering parts.
- Epidermis: A single layer of cells that covers the exterior of plants (external skin).
- Asexual reproduction: A type of parthenocarpic reproduction where the seed is developed without the involvement of male and female gametes.
- Fibrillose: Covered with thin fibers whose stem is made of petiole scrapes.
- Medifixed: All hairs are fixed at the middle.
- Pannose: Covered with feltlike, closely interwoven hairs.
- Stomata: Cells, pores on the leaves that provide for water and air exchange.
- Suborbicular: Almost circular.
- Tubular: Tube-like.



2.1.1.1. Balkan maple *Acer hyrcanum* Fish & C.A. Mey subsp. *reginae-amaliae* Orph. ex Boiss



© Necati Güvenç Mamıkoğlu

**Distribution:** They can be observed in Fethiye/Muğla (on Akbel Plateau at Babadağ) and south of Burdur (Altınyayla, Akpınar Plateau, Kurudere location)

**General Description:** A ramified, small species of maple tree that can grow as tall as 8 to 10 meters. Leaves are firm, skin-like, hairless and elliptical; the bottom surface is glaucous.

**Morphological Characteristics:** Newly formed branches are short-haired; one-year-old branches are hairless and have a grey-brown crust, awhile older branches have a grey crust. Having a size of 12-18-30 x 16-24-40 mm, the elliptical leaves are firm and skin-like with a heart-shape at the bottom; has typically 3, and sometimes 5 lobes with main lobes curled, accommodating sparse teeth; top surface is shiny and hairless while the bottom surface is glaucous.

It has 3 to 5 veins, and hairy at the bottom. Calycle is yellowish. Petals are white. The fruit is wing-nut, the wings are as wide as 18-28 mm; the bottom is narrow the tip is obtuse. The angle between the wings is around 70 to  $90^{\circ}$ .

Flowering/Fruiting: It blooms in March-May while the fruiting takes place in July-August.

Habitat: They can be observed on mountain slopes, at a height of 1350 to 1870 meters.



# 2.1.1.2. Acer divergens Pax



© Necati Güvenç Mamıkoğlu

**Distribution:** They can be observed in Artvin (Ardanuç, Yusufeli, Çoruh Valley) and Erzurum (Northeast of Tortum, Oltu).

**General Description:** Growing as tall as 8 meters, it is a small tree species that might also come in the form of a shrub. It secretes a milk-like substance when the petioles are broken. The leaves are hairless, and the tips are angular.

#### Morphological Characteristics:

Has milky petioles as long as 2 to 3.5 cm. With 3 to 5 lobes, the leaves have a size of  $2-4 \times 3-5$  cm; the tips are angular, the top surface is dark green, bottom surface is pale green, both surfaces are hairless.

The fruit is wing nut as big as 2 to 2.5 cm. The angle between the wings is around 120 to 140°.

Flowering/Fruiting: It blooms in April.

**Habitat:** They can be observed individually or in small groups on alkaline soils located behind the coastal mountains of Eastern Black Sea known for its continental climate where the dryness of summer is strongly felt, in forests dominated by Juniper (*Juniperus oxycedrus*) -Oak (*Quercus pubescens*)-Larch (*Pinus nigra*) trees at the rocky and dry slopes of Çoruh River and its tributaries. They can be observed at a height of 400 to 1500 meters.



© Hayri Duman & Zeki Aytaç

**Distribution:** They can be observed in Köyceğiz/Muğla (On Sandras Mountain, between Ağla and Eskere, and upper parts of Ağla)

**General Description:** A shrub-formed species that can grow as tall as 40 to 60 cm, with closely matted silvery hairs. The flowers have two colors: yellow and brownish-red.

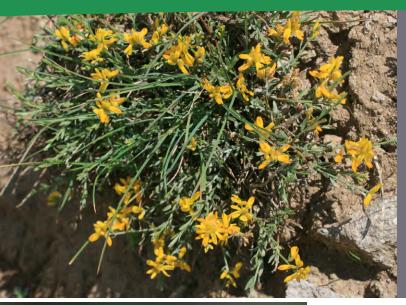
**Morphological Characteristics:** With a length of 4 to 15 mm, the pedicles have matted hairs. Petiole can measure up to 1 to 1.5 mm. Leaves are of elliptic shape and cuneate at the base, mucronate at the tip (4-10 mm x 3-7 mm) from obovate leaf towards oblanceolate leaf. They are glabrous, or closely matted with closely matted hair at the upper parts, and densely haired with closely matted sericeous hair at the bottom. There are 2-8 flowers. Pedicles are measured 1-3 mm, closely matted with sericeous hair. Calyx is measured 10 mm. The flowers have two colors: yellow and brownish-red. Vexillum is circular, notched with a glabrous back or short hair at the middle and measured 17-20 mm. Wings are 14-15 mm long with ciliates at the bottom part. Keel is 12-13 cm, filament 3-4 mm and ovary 5-8 mm with sericeous hair, style 5-6 mm. Fruit is measured 20-25 x 4 mm, dense grayish with matted sericeous hair.

Flowering/Fruiting: It blooms in June and July.

H.Duman, Başer & H.Malyer

**Habitat:** They can be observed in *Pinus nigra* forest glades and serpentine barrens, between 1450 and 1700 meters.

18



2.1.2.2. Genista sandrasica Hartvig & Strid

4



© Zeki Aytaç

(Note: These are the photos of *Genista burdurensis*, which is a species akin to Sandras genista)

**Distribution:** They can be observed in Muğla-Köyceğiz (the Sandras Mountain).

**General Description:** It is a bush-like species with a recumbent trunk, dispersed ramification, and length from 7 to 20 cm. It has bright yellow flowers. There are pairs of leaflets at the bottom of petiole.

**Morphological Characteristics:** Its trunk and branches are 0.8-1.5 mm in diameter and have 4-6-8 strings, the strings draw apart with channels; branches are green. Leaves are semi-opposite, permanent, oblanceolate, 3.5-5.5 x 1.5-2.2 mm in size, have straight edges, blunt points, and scarce hairs when young. Stipules are 1-1.5 mm long and subulate. Its inflorescence is on lower branches and has 3-8 flowers. Lower bracts are similar to leaves, upper bracts are either too regressed or lost. Pedicles are very short. Bracteoles are linear and 1.5 mm long. Calyx is 3.3-4.2 mm in size and hirsute. Flowers are bright yellow, 8-10 mm in size and hairless. Vexillum is broadly ovate, is cuneate at the base, has the same length with the blunt-point keel; keels are 0.5 mm shorter than vexillums and keels and have blunt points. Ovate has 3(-6) ovule and hirsute. Legume is linear oblong, up to 18 x 4 mm in size, has acute points, scarce hairs, 1-3 seeds.

**Flowering/Fruiting:** It blooms in June-July.

**Habitat:** They can be observed in *pinus nigra* forest glades on serpentine bedrock, and between 1700 and 1750 meters.

# 2.1.2.3. Gonocytisus dirmilensis Hub.-Mor.

5

**Distribution:** They can be observed in Burdur-Gölhisar, Altınyayla and Tefenni.

**General Description:** It is a tall-growing bush with an upright stem and 1.5 m length. It has yellow flowers in racemes.

**Morphological Characteristics:** Crosscut of young branches is triangle, old branches are cylindrical, twigs are flat with short hairs.

Leaves have 3 leaflets, usually stemless, but can grow up to 1 mm in large leaves; leaflets are narrowish elliptical or narrowish oblanceolate, both sides are flat and sparsely hirsute. Flowers form racemes at the short end.

There are no bracts, bracteoles are shorter than 1 mm and deciduous; pedicles are 1-2 mm long. Calyx is 2 mm, corolla is 10-11 mm in size. Its fruit is rhomboid-oblong, has sparse flat hairs.

Flowering/Fruiting: It blooms in the June-August period.

**Habitat:** They can be observed in *Pinus nigra* forests and glades, and between 950 and 1200 meters.





© Zeki Aytaç



2.1.2.4. *Colutea melanocalyx* Boiss. & Heldr. subsp. *melanocalyx* 

© Mecit Vural

(Note: This is the photo of *Colutea cilicica*, which is a species akin to wild cassia.)

**Distribution:** They can be observed in Isparta (Sütçüler, Eğirdir and Şarkikarağaç) Antalya-Kemer and Muğla-Köyceğiz (Sandras Mountain).

**General Description:** It can grow up to two meters, it is a bush-like plant from the fabaceae family. Its flowers are yellow. Its fruit is hirsute, bulging and not self-opening.

**Morphological Characteristics:** Old branches are grey-brown. Leaflets are 3(-4) pairs, elliptical, up to 20 mm long. Flowers are yellow, up to 19 mm long. Fruit is hirsute, bulging and not self-opening, papyroceous, walled and in the bag form. Calyx is hirsute, hairs are dark brown.

Flowering/Fruiting: It blooms in the March-May period.

**Habitat:** They can be observed in woody, stony and rocky slopes, in coniferous and mixed forests, up to 1250 meters above sea level.

## 2.1.3.1. Sageretia spinosa Wettst.

7

**Distribution:** They can be observed in Antalya (Kemer, Termessos, Düzlerçamı, Beydağları).

**General Description:** It is a thornbush-like plant. It has greenish cream flowers. Its fruit looks like olives.

**Morphological Characteristics:** Leaves are broadly elliptical, 8-12 x 4-6 mm in size, has straight or serrulate edges, mucronate ends and is hirsute. Flowers are spicates with panicles, and have a greenish cream color. Fruit is black and edible.

Flowering/Fruiting: It blooms in June-July.

**Habitat:** They can be observed in maquis groves in shady calcite rocks, between 900 and 2000 meters.



© ANK Herbarium (Ankara University Faculty of Science Department of Biology)

8



© Necati Güvenç Mamıkoğlu

2.1.4.1. Aleppo Pine *Pinus halepensis* Mill.

**Distribution:** They can be observed in Adana-Karataş (Yumurtalık lagoon) and from the city center to Kozan, in Osmaniye, Muğla, Aydın and İzmir.

**General Description:** It is a coniferous pine species that can grow up to 15 meters and has a bent trunk. Its cones hang down, and their stems are very distinctive. They can be seen upon the tree all year long. It sometimes creates pure stands and sometimes mixed stands with *Pinus brutia*. Its cones are either red or yellow and are hanging down.

**Morphological Characteristics:** Corolla is acute when young, and dispersed when old. Twigs are hairless and greyish. Buds are small and nonresinous, flakes are retroverted and fringed. Leaves are mostly pairs and sometimes triplets, are light green and 6-15 cm in size.

Cones are 8-18 cm in size, has a light brick red or yellow color, are conical, hanging down; cone stems are 1-2 cm long. Flakes are high and pyramidal ribbed.

**Flowering/Fruiting:** Cones can be seen upon the tree all year long.

**Habitat:** They can be observed in coastal sand dunes, hilly terrains, up to 150 meters above sea level.



2.1.4.2. Trojan fir A*bies nordmanniana* Spach subsp. *equi-trojani* (Asch. & Sint. ex Boiss.) Coode & Cullen

© Necati Güvenç Mamıkoğlu

Distribution: They can be observed in Çanakkale and Balıkesir (Kazdağları).

**General Description:** It can grow up to 35 meters. It is a coniferous forest tree and is a sub-species of fir. Its resinous, standing-cylindrical cones on twigs can be 15-20 cm long and can be seen upon the tree all year long. Number of buds at lateral twig apexes is higher than other species and sub-species.

**Morphological Characteristics:** Young twigs are grewyish shelled, they gradually turn greyish-black, and are hairless. Leaves are linear or linear-oblong, apex of leaves that get sunlight are acute, and the others are blunt or retuse. Buds are very resinous, there are 5(-7) buds at the end of lateral twigs. Cones are 15-20 cm, cylindrical and resinous. Bracts are longer than cone flakes, ends are upward.

#### Flowering/Fruiting: -

9

**Habitat:** They create pure forests or mixed forests with *Pinus nigra* subsp. *pallasiana* (larch) and *Fagus orientalis* (beech), they usually prefer north aspects, favor humidity and shadow, can be observed between 1300 and 1800 meters.



# 2.1.5.1. Flueggea anatolica Gemici

10



© Tolga Ok

**Distribution:** They can be observed in Mersin-Tarsus (Kadıncık I Dam area), Kahramanmaraş-Andırın and Adana-Kozan (Gedikli Village).

**General Description:** It is a bush that can reach up to 5 meters. They can be observed as twigs stemming from a trunk that lies parallel to the soil surface. It is usually a multi-trunked bush, and individuals growing in rock fractures are singly-trunked.

**Morphological Characteristics:** Twigs have sharp corners and are green. Petioles are rarely winged, and (2-)4-7(-8) mm in size. Leaf blade is 2.5-6.5 x 1.5-3.5 cm in size, ovate or elliptical, ends are semi-blunt, and is cuneate at the base. Male flowers are 13 pieces in each glomerule, and female flowers form groups of (1-)2-3 pieces.

In male flowers, pedicles are 5.5 mm; calycles are greenish yellow, 1-1.5 mm in size, outer calycles are shorter than inner ones; stamens are 1-2 mm, longer than calyx, anthers are matte yellow; unfruitful pistil is 1 mm. In female flowers, pedicles are 5-30 mm; calycles are similar to those of male flowers; ovary is ovate-semi-spherical, and 1 mm in diameter. Style is 3 pieces, retroverted, two-pronged, 1 mm in size. Fruit is 3.5 x 5.5 mm in size. Seeds are 2.5 x 1.5 mm in size, bright, matte brownish-yellow.

Flowering/Fruiting: It blooms in May-June.

**Habitat:** They can be observed in semi-humid *Pinus brutia* forests and in the maquis groves in areas where these forests can be observed (where there are species such as oak, bay, canna, sandalwood and judas trees), between 350 and 1250 meters.

11



2.1.6.1. *Rhododendron ungernii* Trautv.

© Özgür Eminağaoğlu

**Distribution:** They can be observed in Artvin city center, Murgul (Tiryal Mountain and Şavval Hill) and Borçka (Karagöl, Otingo Stream) and Rize-Çamlıhemşin (Kaçkar Mountains).

**General Description:** It is an evergreen bush species that is aromatic and can grow up to 7 meters. Color of its flowers can vary from white to light rose. Flowers have dark vessels and are bell/funnel-shaped. Lower surface of leaves is hirsute.

**Morphological Characteristics:** Young trunks are canescent; terminal bud is 3 cm. Petiole is 1-1.5 cm; leaf blade is  $\pm$  obovate, 7.5-19 x 3-4.8 cm in size, its lower surface is tomentose and coriaceous. It has 12-24-flowers; bracts and bracteoles are 3-4 cm; pedicles are densely glandular-hirsute. Calyx lobes are 4-9 mm. Corrolla varies from white to light rose color, has dark vessels, is 3 cm in diameter, outer surface is rarely glandular-short haired, inner surface is short haired near the base, tube length is 2 cm; lobes are 1.5-2 cm, apex is circular or retuse, has green spots. There are 10 stamens. Ovary is densely glandular and has thick eglandular hairs; style is 2 cm and hairless. Fruit is 1.2 cm; seeds are 1.7 mm.

Flowering/Fruiting: It blooms in the June-August period.

**Habitat:** It is usually observed in *Picea* (spruce), and sometimes in *Fagus* (beech) forests, it prefers north aspects and humid areas, can be seen between 1000 and 2000 meters.



2.1.6.2. *Epigaea gaultherioides* (Boiss.) Takht.

© Özgür Eminağaoğlu

**Distribution:** They can be observed in Rize, Artvin (Çoruh, Tiryal Mountain), Artvin (Tiryal Mountain) and Erzurum (upper Ilıca).

**General Description:** It is an evergreen bush species that has an oblique trunk and can reach up to 10-20 cm in length. Flowers have pink-white color.

**Morphological Characteristics:** All vegetative parts are brown, setose glandular or eglandular hirsute (2.5 mm). Petioles are 1-1.5 cm; leaf blade is lanceolate-elliptical, 5-11.5 x 2.5-4.5 cm in size and coriaceous. It has 1-5 flowers; pedicles are 1.5-6 mm in size and hairless. Flowers are white, light pink, funnel-shaped, 2-6 cm in diameter.

Stamen is 10 pieces, filament is 1.5-2.5 cm, anther is 3.5 mm, ovary is hairless; style is 1.5-2.3 cm. Fruit is thin walled and spherical; seeds are 0.3-0.4 mm.

Flowering/Fruiting: It blooms in the May-July period.

**Habitat:** It prefers shady and humid areas in *Fagus orientalis* (beech) and *Picea orientalis* (spruce) forests, it can be observed between 900 and 2300 meters.

12

2.1.7.1. *Amygdalus kotschyi* Hohen. ex Spach

13

**Distribution:** They can be observed in Siirt (Halakur Mountain) and Hakkari.

**General Description:** It is a thornbush species with multiple branches. It has pink flowers. Fruit is yellowish-brown and greyish.

**Morphological Characteristics:** Young twigs have whitish hairs, and they get hairless gradually. Leaves are in different forms from lanceolate to oblonglanceolate, grow up to  $5 \times 1$  cm, are rarely serrate, almost stemless, has dense yellowish-grey hairs. Flowers are pink. Stamens are 20 pieces or more. Young fruit is golden yellow-brown, has curly hairs, ripe fruit is elliptical,  $15-20 \times 10-13$  mm in size, is densely floccose with yellowish-grey hairs.

Flowering/Fruiting: It blooms in April-May.

**Habitat:** They can be observed in *Quercus* (oak) stands, between 1400 and 1850 meters.



© Barış Bani



# 2.1.7.2. Cerasus erzincanica Ş.Yıldırımlı

© Mecit Vural

(Note: This is the photo of *Cerasus incana* species, which is akin to Erzincan black currant)

Distribution: They can be observed in Erzincan-Kemah (Tuztaş Stream, Munzur Mountains).

**General Description:** It is a thornless bush or small tree. It is a very distinctive species with its lacerated and chappy trunk barks.

**Morphological Characteristics:** Young twigs are hairless. Leaves are 3-6 x 0,5-1 cm in size, vary from elliptical to linear-elliptical, have a very thin structure and serrate edges. Upper surface of young leaves is hairless, lower surface is woolly and gets hairless as they grow ripe. Petiole is 3 cm. There are 1-2 flowers in leaf axils. Pedicles are 6-8 mm.

Flowering/Fruiting: It blooms in May.

Habitat: They can be observed in oak forests, between 1200 and 1500 meters.

14

2.1.7.3. Field rose *Rosa arvensis* Huds.



© Hermann Schachner

with usually 9-15 teeth on each edge, is hairless or rarely hirsute, matte green.

Flowers are 1-2-6 pieces. Calycles are long and slightly widened, lobes are lanceolate, usually glandular-serrulate or eglandular. Flowers are white, turn pink toward the bottom. Fruit is 1-1.2 cm, ovate, red.

Flowering/Fruiting: It blooms in August.

Distribution: They can be observed in Osmaniye-

**General Description:** It is a bush-like species with a 3-5-meter length from the rosaceae family. Its flowers are white and turn pink toward the bottom. It has a climbing stem with thorns on it. Leaf edges are serrate, leaves are hairless or rarely

**Morphological Characteristics:** Stems are weak and climbing, thorns are thin, long and rare. Leaflets are rarely 3, usually 5-7 pieces, vary from broadly elliptical to ovate, are 1.5-3.5 x 1-2 cm in

size, has sharp ends, round base, serrate edges

Hasanbeyli.

hirsute.

Habitat: They can be observed in bushy slopes, between 900 and 1200 meters.



2.1.7.4. Pyrus anatolica Browicz

© ANK Herbarium (Ankara University Faculty of Science Department of Biology)

(Note: A photo of *Pyrus amygdaliformis* is used to represent this species because there are no available photos of this species taken in the nature.)

**Distribution:** They can be observed in Uşak.

General Description: It is a wild pear species in the form of a tree. Its fruit is pear-like.

**Morphological Characteristics:** Leaves vary from elliptical-orbicular to broadly elliptical, are 3-4 x 2.5-3 cm in size, have round edges, very slightly crenate toward to apex, upper surfaces are villous when young and gradually become hairless, lower surfaces are permanently white villous; petioles are 1-2 cm. Fruit is pear-like, 2-3 cm; calycles are permanent.

Flowering/Fruiting: It blooms in the April-June period.

Habitat: They can be observed in *Quercus pubescens* (pubescent oak) stands, 1000 meters above sea level.

16



2.1.7.5. Pyrus yaltirikii Browicz

© Mecit Vural

(Note: A photo of *Pyrus* (pear) is used to represent this species because there are no available photos of this species taken in the nature.)

**Distribution:** They can be observed in Bingöl-Solhan.

**General Description:** It is a species of small wild pear. Its young branches are floccose, and petioles have flat hairs. Leaf edges are irregularly serrated.

**Morphological Characteristics:** Young branches and buds are whitish-tomentose. Petiole is 15-18 mm and has flat hairs. Leaf blade is narrowly elliptical or ovate-lanceolate, 4.56 x 1.2-1.8 cm in size, leaf length is 3-4 times longer than its width, leaves are irregularly serrate, upper surface of leaves is partially hirsute or almost hairless, especially along the veins; lower surface has permanent hairs.

Flowering/Fruiting: It blooms in the April-June period.

Habitat: They can be observed in oak forests, at 1200 meters above sea level.



2.1.7.6. Serik cab Pyrus serikensis Güner & H.Duman

© Mecit Vural

**Distribution:** They can be observed in Antalya-Serik, Manavgat and Aksu.

**General Description:** It is a thorny small tree that can grow up to 5 meters. Mature branches and leaves are hairless. Petiole is usually longer than leaf blade. Fruit is hairless.

**Morphological Characteristics:** Mature branches and leaves are hairless. Leaves vary from ovate to ovateorbicular, are green, 2-4 cm in diameter, crenulate, and the base is semi-heart shaped. Petioles are usually longer than leaf blade. Fruit is spherical, 0.7-1.5 cm in diameter, and hairless. Calyx comes down after Flowering. Fruit stem is 4 cm long.

Flowering/Fruiting: It blooms in March.

**Habitat:** It coexists with *Quercus* (oak) and *Pistacia* (gumwood) trees, it can also be seen in graveyards and the spaces between croplands. There can be individual trees that are left in croplands in order to provide shade in summer. They can be observed up to 150 meters above sea level.

18

2.1.8.1. Sweetgum Liquidambar orientalis Mill.

19



**Distribution: lt occurs in** Aydın-Center (Emirdoğan Village) and Çine, Muğla-Milas, Fethiye, Köyceğiz, Datça and Marmaris, Denizli, Isparta, Burdur, Antalya-Kaş, Serik and Kalkan.

**General Description:** It is a tree that can grow as long as 20 meters. It can create pure stands. Leaves are palmate and hairless, and edges of the leaves are serrated.

**Morphological Characteristics:** Leaves are slightly palmate, 5-10(-12) x 6-13 cm, have 5 lobes, edges are sinuate-toothed or saw toothed, hairless, rarely the bottom of the midribs on the back surface can be slightly hairy. Anthers formed by fruit balls are 2.5-3 cm in diameter, and hanging. When the fruit is ripe, webbed capsules open and seeds are released.

**Flowering/Fruiting:** It blooms in March-April, and its fruit which looks like a plane tree ball grows ripe in November-December.

**Habitat:** It occurs in wetlands and wetland coasts, by the shores of rivers and streams in valleys, and by the sea. It can grow up to 880 meters together with woody plants such as *Pinus brutia*, *Quercus cerris*, *Quercus coccifera*, *Alnus orientalis*, *Fraxinus angustifolia* subsp. *angustifolia*, *Salix alba*, *Ulmus minor* subsp. *canescens*, *Platanus orientalis*, *Myrtus communis*, *Nerium oleander*, *Vitex agnus castus*.

20



2.1.9.1. *Lonicera nummulariifolia* Jaub.& Spach subsp. *glandulifera* (Hub.-Mor.)Chamberlain

© Mecit Vural

(Note: The photograph is of Lonicera nummulariifolia subsp. nummulariifolia)

**Distribution:** They can be observed in Burdur-Tefenni, Denizli (Bozdağ) and Antalya (the north of Kaş, Kemer, Akdağ, Tahtalı Dağı).

**General Description:** It is a shrub species with upright step that can grow as long as 9 m. The color of its flowers can vary from light cream to dark yellow. It has berry-like fleshy fruits which grow in pairs with a yellowish color (black when dried).

**Morphological Characteristics:** Younger branches are hollow and glandular-villous. Leaves are of 1.5-5 x 0.8-3.5 cm varying from ovate-lanceolate to circular with blunt tips and non-glandular. 2 flowers bloom together from the arm; the joint pedicle which carries the flowers is of 1-3 cm and shorter than the pedicle of each flower. Pedicles are non-glandular. Bracts are of 1 mm, linear-lanceolate while bracteoles are of 1 mm and unattached. The color of flowers varies from light cream to dark yellow, and are of (10-)15-20 mm. Fruits are densely non-glandular.

Flowering/Fruiting: It flowers in May-June.

Habitat: They can be observed in *Cedrus* (cedar) and *Quercus* (oak) forests at 1000-1850-meter heights.



**Distribution:** They can be observed in Erzurum, (near the stream of Şihbir which is located close to the village of Acar in Hinis), Bingöl, and Bitlis (Hizan).

**General Description:** It is an *Alnus glutinosa* subspecies that can grow as long as 20-30 m. Its trunk, branches and offshoot shells are white or gray. Its male flowers are of 10-12 cm height, raceme-shaped and yellowish colored. Branches, petioles and the lower surface of leaves are pilose. Fruits are racemose, and dark or redbrown colored.

**Morphological Characteristics:** Younger offshoots are sticky and tomentose. Branches and petioles are pilose. Leaves range from obovate to circular or broadly oblong-elliptic of 35-13 x 3-11 cm, with retuse, rounded or acute tips, a broad cuneate base, and a pilose lower surface. Racemose fruits are of 1-1.8 x 0.6-1.1 cm with thick stems. Fruits are dark or red-brown colored, of 2-3 mm, and narrow winged.

Flowering/Fruiting: They flower in April-May.

Habitat: They can be observed near streams, rivers and wetlands at 1200-1600-meter heights.



2.1.10.2. *Alnus glutinosa* (L.) Gaertner subsp. *antitaurica* Yaltırık

© Necati Güvenç Mamıkoğlu

22

**Distribution:** They can be observed in Adana-Karataş, the area between Adana-Kozan and Feke, Osmaniye-Yarpuz, Kahramanmaraş-Göksun, and Tunceli-Ovacık.

**General Description:** It is a tree species that can grow as long as 6-7 m. Its cones are longer than those of the other subspecies of *Alnus glutinosa subsp. antitaurica*. Its male flowers are of 10-12 cm, racemose and yellowish colored. Its fruits are racemose with a dark or red-brown color.

**Morphological Characteristics:** Its trunk bark is dark brown and split. Branches and petiole are pilose. Leaves vary from obovate to circular or broadly oblong-elliptic with  $3.5-6.5 \times 3-5$  cm length, retuse, rounded or acute tips, a broad cuneate base, and a pilose lower surface and petiole. Racemose fruits are of  $1-1.5 \times 0.8-1$  cm with thick stems. Fruits are dark or red-brown colored, of 2 mm, and narrow winged.

Flowering/Fruiting: They flower in April.

**Habitat:** They can be observed individually or in small groups, near to streams in broad-leaved forests and at inner areas of humid valleys, at 300-1600 m heights.



2.1.10.3. Betula browicziana

© Mecit Vural

(Note: A photograph of *Betula* is given above to represent *Betula browicziana* as there is no photograph taken of it in the nature.)

**Distribution:** They can be observed in Trabzon (the area between Maçka and Meryemana), Rize-Çamlıhemşin (the area between the village of Hisarcık and the upland of Ortasırt), and Artvin (the mountain of Çoruh Tiryal).

**General Description:** It is a tree species that can grow as long as 12 m. Branches and petioles are resinous. Fruits are racemose.

**Morphological Characteristics:** Branches are glandular-resinous. Petioles are short-haired and glandular-resinous. Leaves range from broad ovate to ovate-triangular with 2-6 x 1.5-4.5 cm length, a broad cuneate or truncate base, and acute or acuminate at tips, with serrate edges. Leaf strings are short-haired when they are younger, then they become hairless when they mature. Pedicles are short-haired and of 1.3 cm. Fruits are racemose and of 2.3-3.7 x 1-1.2 cm. Fruit is oblong or elliptic and of 2.5 x 1.2 mm; while wings are of 2 mm and do not have a membrane.

Flowering/Fruiting: They fruit in August.

Habitat: They can be observed in the *Rhododendron* shrubs in volcanic slopes, at 1300-1950-meter heights.

23

24



2.1.11.1. *Euonymus latifolius* (L.) Mill. subsp. *cauconis* Coode & Cullen

© Özgür Eminağaoğlu

**Distribution:** They can be observed in Zonguldak-Kozlu, Sinop (the area between Ayancık and Zindan), Artvin-Şavşat, Karabük (Keltepe road), and Bolu (Yedigöller).

**General Description:** It is a plant in the form of shrubs or small trees that grow as long as 6 meters. The following information can help to distinguish them from other *Euonymus* species and subspecies in its distribution areas:

1. If fruits winged, terminal buds of 5-18 mm, spindle-shaped, and bud scales of various lengths, then *E. latifolius* 

2. If terminal buds of 9-18 mm, leaves of 8-17 cm, and acuminate, then subsp. latifolius

2. If terminal buds of 5-8 mm, leaves of 5-7 cm, and acuminate, then subsp. cauconis

1. If fruits non-winged, terminal buds of 2-4 mm, ovate, and 2 scales of a bud covering others, then *E.europaeus* 

**Morphological Characteristics:** Younger leaves are half-cylindrical and often flat. Terminal buds are of 5-8 mm. Leaves are of 5-7 cm, often with various shapes varying from elliptic to obovate. They are slightly serrate, and acute at tips. Flowers have 4-5 parts and are greenish. Fruits are broad winged and pendulous.

Flowering/Fruiting: It flowers in April-June.

**Habitat:** They can be observed in forest lands and open areas in the inner areas of forests, at heights up to 1450 m above sea level.

25

## 2.1.12.1. Zelkova carpinifolia Dippel

**Distribution:** They can be observed in Kars (next to the river of Kura), Muş, Siirt, Hakkari (the area between Şemdinli and Yüksekova) and Trabzon (Yomra).

**General Description:** It is a big-tree species that can grow as long as 30-35 m. Its trunk has a diameter of 2-3 m, with grayish-brown bark. Branches are hirsute and leaf edges are serrated. The upper surface of leaves is ragged.

**Morphological Characteristics:** Branches are hirsute and leaves come in shapes varying from ovate to oblong of (1.5-)2-8(-9) x (1-)1.5- 4(-4.5) cm with a round or semi-cordate and oblique base. They have blunt-teethed/serrate edges and a rough and ragged upper surface, with hirsute or hairless lower strings (particularly midribs). Petioles are of 1-2 mm. Fleshy fruits are of 5 mm width at the base and greenish with thick strings.

In addition, some newly-discovered Zelkova carpinifolia

populations in Trabzon exhibit different characteristics. They are of (2-)3-5 length and shrub-like with smaller leaves of  $2-5(-6) \times (1.5-)2-2.5$  cm. Leaf edges have fewer teeth and its wood contains heterocellular type of rays.

Flowering/Fruiting: They flower in April.

**Habitat:** They can be observed in slopes covered with *Quercus* (oak), and *Quercus* (oak)-*Carpinus* (hornbeam shrubs), at 40-1550 m heights.





2.1.13.1. *Quercus vulcanica* Boiss. ex Kotschy



© Necati Güvenç Mamıkoğlu

26

**Distribution:** They can be observed in Karaman (Karadağ), Kütahya (Türkmen Mountain), Konya (Sultan Mountain), Afyon-Çay (Dereyaka Plateau) and Sandıklı, Isparta-Şarkikaraağaç (Gedikli Village), Eğirdir (Yukarı Gökdere Village, Yaka Village), Kovada and Dedegöl Dağı (Kapız Stream), Kayseri (Mount Erciyes), Osmaniye, and Kastamonu (Ilgaz and Küre Mountains).

**General Description:** It is a deciduous oak species with a broad and expansive top, which can grow as long as 25-30 m with a size up to 1,6 m in diameter. The upper surface of leaves is either hairless or thinhaired.

**Morphological Characteristics:** Younger offshoots vary from yellowish to reddish-brown. Buds are large (5 mm or above) and hirsute with ciliate edges. Stipules are permanent and grow up to 12 mm. Leaves are evenly distributed on offshoots, and obovate with lobes of 19-17 x 5-10 cm, 4-7(-8). Lobes are succulent and parallel with acute or blunt tips. Lower surfaces are stellate-tomentose while upper surfaces are yellowish-green or gray, and hairless or thin stellate. Petioles are of 0.8-3.5 cm and almost hairless. Acorns are stemless. Calyx has a diameter of 15 m, varying from semi-globose to cyathiform, with a grayish-brown color and its scales are ovate-lanceolate, flat, matted, and tomentose.

Fruiting: Their fruits (acorns) ripen in August-September.

**Habitat:** They can be observed in certain locations conserved from the northern winds, in mixed groups with *Cedrus libani* (Taurus cedar), *Acer hyrcanum* (hairy maple), *Quercus cerris* (Turkey oak) and *Pinus nigra* (black pine), at 1300-1800-meter heights.

## 2.1.13.2. Quercus pontica K.Koch

**Distribution:** They can be observed in Rize, Trabzon, Artvin (the area between Merkez-Hopa and Borçka), Kars-Posof (Sarıçiçek Village, Doğrular Village).

**General Description:** It is a deciduous oak species that can grow as long as 3-5 m. Leaves look similar to broad chestnut leaves. Leaf edges are ragged with acute tips. The upper surface is hairless and dark green while the lower surface is hirsute on strings and have a lighter color. Fruits grow on short and thick stems.

### **Morphological Characteristics:**

27





Younger offshoots are hairless and reddish-brown

while buds are ovate of 1 cm and hirsute with dark-edged scales. Leaves are mostly observed at the tip of branches, elliptic, and of 10-26(-30) x 5-13(-15) cm long, with even serrate edges and acute tips, and a cuneate base. The upper surface is hairless and dark green while the lower surface is only hirsute on strings and have a lighter color. Petioles are of 1-2 cm long. A few fruits grow on short and thick stems. Acorns are semi-globose, of 15-20 mm diameter, and brownish while scales are triangular-ovate, acuminate, and setulose.

Flowering/Fruiting: Fruits ripen in August-September.

**Habitat:** They can be observed among *Fagus orientalis* (beech), *Picea orientalis* (Oriental spruce), and *Rhododendron* communities, at 800-2100-meter heights.



2.1.14.1. *Juniperus oxycedrus* subsp. *macrocarpa* (Sibth. & Sm.)



© Necati Güvenç Mamıkoğlu

28

**Distribution:** They can be observed in İzmir-Çeşme (Çiftlikköy), the are between Karaburun and Mordoğan, Aydın, and Muğla.

**General Description:** It is a evergreen coniferous tree species that can grow as long as 5-14 m with a diameter up to 50-60 cm.

**Morphological Characteristics:** Leaves are circularly ordered in groups of 3, green, of 6-25 x 1.5-2.5 mm long, lanceolate, and acuminate-mucronate, with 2 distinct stoma bands on the upper surface. Matured cones are round and of 15-23 mm diameter, with 3-6 scales. They grow mature in two years and are dark red, purple or light brown.

Flowering/Fruiting: They flower in March.

**Habitat:** They can be observed in maquis shrublands, at heights up to 400 m above sea level.

29



© Özgür Eminağaoğlu

Distribution: They can be observed in Kastamonu, Artvin-Merkez, Murgul (Tiryal Mountain and Şavval Hill) and Şavşat, as well as Rize-Çamlıhemşin (the area between Hisarcık-Sıraköy), and Kars-Posof (the area between Gönülaçan Village and Alabalık-Arsiyan Mountain).

**General Description:** It is a plant species which is usually found in the form of shrubs with a length of 2-3 m. Salix caucasica can be distinguished from goat willow (Salix caprea) with the hairless lower surface of its leaves and its dense-toothed edges.

Morphological Characteristics: Offshoots are spring-shaped and curled backwards or upright with a dark brown or gray color. Woody parts where the bark is stripped off, have even or distributed indistinct stripes. Buds are triangular or ovate, brown, and blunt at tips. Leaves vary from obovate-elliptic to ellipticoblong. Their length is 2.5 times shorter than the width. They are of 4-15 x 2.5-6 cm long and hairless, with green upper surface while the lower surface is glaucous, sometimes only hirsute on the midrib with unevenly toothed edges. Petioles are of 4-9 mm long. Stipules are reniform or semi-reniform and permanent. Racemose (kedicik) flowers form before leaves form. Male flowers are upright, narrowly cylindrical, of 2-3 cm long, with densely populated flowers on a thin and long (3-12 mm) stem. They have 2 male organs, hairless filaments, anthers of 0.4-0.7 mm whereas female flowers are either distributed or pendulous and cylindrical with a long stem and capsule of 0.7-1.8 cm.

Flowering/Fruiting: They flower in May.

2.1.15.1. Salix caucasica Andersson

Habitat: They can be observed among *Picea* (spruce) and *Rhododendron* communities, at 1500-3000-meter heights.



© Eva Wallander

2.1.16.1. *Fraxinus pallisae* Wilmott ex Pallis

30

**Distribution:** They can be observed in İstanbul (Terkos Village), Samsun and Zonguldak.

**General Description:** It is a tree species that can grow as long as 30 m. Trunk bark is covered with leaflets and the midrib of leaves is covered with long soft hair.

**Morphological Characteristics:** Trunk barks, the midrib of leaves, and leaflets (both surfaces, at least when they are young) are densely covered with short villous hair. Leaflets grow in 1-7 pairs and are stemless, oblong, lanceolate or linear-lanceolate, of (5-)7-13(-15) cm long, and acuminate, with a cuneate bottom and serrate edges. Flowers grow from the arm before leaves are formed. Flowers do not have a calyx or corolla. Fruits vary from obovate-oblong to cuneate. They are of 2-4.5(-5) x 0.6-1 cm and hirsute, with blunt or acute tips.

Flowering/Fruiting: They flower in April-May.

**Habitat:** They can be observed in forests near streams, humid coastal plains and floodplain forests, at the sea level.

# 2.1.16.2. *Fraxinus excelsior* L. subsp. *coriariifolia* (Scheele) A.E.Murray

31

(Note: This photograph is of a tall ash species (*Fraxinus excelsior*) and similar to subspecies *coriariifolia*)

**Distribution:** They can be observed in Kars-Kağızman (the east of Kağızman, and the upper parts of Akçay).

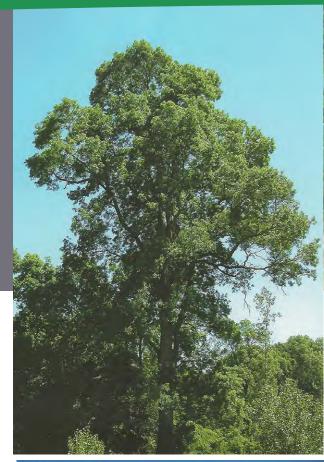
**General Description:** It is a tree species that can grow as long as 30 m. The upper surface of leaves is dark green while the lower one is light green and hirsute along the midrib. Its thin branches and petioles are densely hirsute.

## Morphological Characteristics:

Older trunk barks are cracked; thin branches and petioles are densely hirsute while winter buds are black colored. Leaflets grow in 4-6 or rarely in 7 pairs, and are stemless, of (3-)5-9(-11) x (1-)2-3(-4) cm, varying from oblong-cuneate to long-acuminate. They narrow down toward the base and have serrate edges. The upper surface of leaflets is dark green but goes lighter at the bottom while the lower surface is hirsute along the midrib. Flowers grow from the arm before leaves are formed. Flowers do not have a calyx or corolla. Anther is dark purple colored. Fruits come in various shapes from cuneate to narrowly oblong and are of (2-)2.5-4(-5) x (0.5-)0.7-0.9(-1) cm long, emarginate or acute.

## Flowering/Fruiting: -

**Habitat:** They can be observed in forestlands composed of broad-leaved trees, at 1300-1750-meter heights.





© Necati Güvenç Mamıkoğlu



2.1.16.3. *Osmanthus decorus* (Boiss. & Balansa) Kasapl.

© Özgür Eminağaoğlu

32

**Distribution:** They can be observed in Rize-Pazar, Hemşin and Çamlıhemşin (Fırtına Stream), Artvin-Merkez (Hatila) and Murgul (Şavval Hill), Trabzon-Maçka and Giresun.

**General Description:** It is an evergreen shrub species that can grow as long as 4 m. It has whitish-cream colored and scented flowers and olive-like, dark blue-purple fruits. Younger branches are hairless and leaves are coriaceous and bright. The upper surface is dark green while the lower surface is light green.

**Morphological Characteristics:** Younger branches are brownish and hairless. Leaves are coriaceous and bright, varying from ovate-lanceolate to oblong-lanceolate. The upper surface is dark green while the lower one is light green. Leaf blades are of 4.5-17 x 1.2-6.5 cm, with flat and involute edges or if remained under shadowy environment, distinct thin serrate edges. They are cuneate at the base and both surfaces are hairless, with petioles of 8-20(-28) mm long. Flowers are whitish-cream colored and scented while corolla is of 5 mm long with 4 succulent lobes. Flowers are elliptic, of 10-14 x 11-12 mm long, and dark blue-purple colored.

### Flowering/Fruiting: They flower in May.

**Habitat:** They can be observed in mixed, deciduous forests, in mixed *Fagus* (beech)-*Picea* (spruce) forests, and in mixed shrubs, at 100-1600 m heights.

2.2.1.1. Glycyrrhiza L., G. flavescens Boiss. subsp. antalyensis Sümbül

33

**Distribution:** They can be observed in Antalya, Kemer, and Tekirova.

**General Description:** It is a perennial herbaceous plant which has a well-developed root structure and can grow as long as 30-100 cm.

## **Morphological Characteristics:**

It has a channeled stem. Leaves are of 8-20 cm length, and oblong and hairless. Leaflets grow in groups of 6-8, and are of 12-45 x 8-16 mm length,



©Ahmet Duran

elliptic, glandular, with a spotted upper surface and hairless lower surface. They are mucronate at tips and have straight edges. Stipules can grow as long as 12 mm and are triangular and deciduous. It is floriferous and the spicate is of 3-9 cm when in the form of flower and of 15-18 cm when in the form of fruit. Bracts are of 4-7 mm length, linear or linear-cuneate. Pedicles are hairless and channeled. Calyx is of 5-7 x 2-2,5 mm length, bell-shaped, bilabiate, and hairless. Corolla is of 9-13 mm length, golden colored, and hairless. Bean is of 30-45 x 13-15 mm, oblate, hairless, and dark brown, with mucronate tips and 1-2 seeds. Seeds are of 5,56 x 4,5-5 mm, roundish, hairless, dark brown, and rugose.

Flowering: They flower in March-May.

Habitat: They can be observed in maquis shrubland and red pine forests at 10-100-meter heights.



2.2.1.2. *Astragalus spitzenberger* Podlech

©ANK Herbarium (Ankara University Faculty of Science Department of Biology)

**Distribution:** They can be observed in Antalya.

**General Description:** It is a perennial herbaceous plant of 20-30 length. It has yellow flowers.

(Note: Since there is no photograph of this species taken in the nature, a photo of *Astragalus fraxinella* is given in

**Morphological Characteristics:** Stipules are white-membranous, of 9-12 mm length, and narrowly triangular, with ciliate edges. Leaves are of 12-30 cm length and petioles are of 4-10 cm. Leaflets grow in 18-22 pairs, and are elliptic and of 6-15 x 3-6 mm, with blunt or rarely acute tips. The upper surface is hairless while edges and the lower surface is sparsely covered with matted hairs. Pedicle stems are of 0.5-1.5 cm and hairless. Racemes have 5-9 flowers. Bracts are whitish, of 5-7 mm, and closely matted. Pedicles are of 6-10 mm. Calyx is tuberous, of 12-13 mm, and short-matted. Corolla has subulate teeth which are of 5-7 mm. Calycles are yellow. Vexillum is of 20 mm. Wings are of 18 mm while keel is of 15 mm. Ovary is elliptic, densely haired while style is hirsute in stripes below stigma. Beans are elliptic and of 10-15 mm.

representation.)

Flowering: They flower in June.

Habitat: They can be observed in forestlands.

34



2.2.1.3. Astragalus bozakmanii Podlech

©Mecit Vural

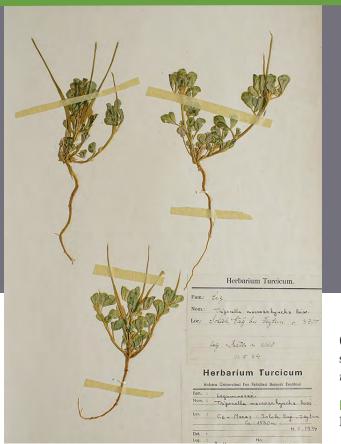
Distribution: They can be observed in Ankara, Kızılcahamam-Çeltikçi Road.

**General Description:** It is a perennial plant of 15 cm length. Plant base is woody but it is considered an herbaceous plant as it does not have the form of a shrub.

**Morphological Characteristics:** Stem is of 3 cm length and closely matted. Stipules are whitishmembranous, of 10-12 mm, narrowly triangular, and closely matted. Leaves are of 15-20 cm while petiole are of 4-6 cm. Leaflets grow in 15 pairs (10 pairs on first leaves), and are elliptic and of 10-13(-18) x 5-6(-8) mm. Both surfaces are sparsely or relatively densely covered by hair which can grow up to 2 mm. Pedicles are of 2-4 cm. Racemes are of 3-5 mm, with scattered hair. Bracts are whitish, of 5-9 mm, and closely matted, varying from narrowly ovate to triangular. Pedicles are of 3-5 mm and have scattered hair. Calyx is of 12-13 mm, tubular, and slightly bulging at the bottom. The teeth of calyx are of 5-6 mm, not equally sized, and their inner surface is densely haired. Flower petals are hairless and yellow. Vexillum is of 1820 mm while lamina is of 9 mm width, obovate, and slightly emarginate at the top and narrows down towards the bottom. Wings are of 17-19 mm while lamina is narrowly oblong, round at the top, and of 9-10x3 mm. Keel is of 15 mm while lamina is triangular, acute at tips, of 6x4 mm, with an appendage of 9 mm. Ovary has a stem of 2 mm length, and is densely haired while style is hirsute up to the middle part.

Flowering/Fruiting: They flower in July.

Habitat: They can be observed in forestlands.



©ANK Herbarium (Ankara University Faculty of Science Department of Biology)

# 2.2.1.4. *Trigonella cassia* Boiss.

(Note: Since there is no photograph of this species taken in the nature, a photo of *Trigonella macrorrhyncha* is given in representation.)

**Distribution:** They can be observed in Hatay (Akra Mountain) and Mersin.

**General Description:** It is a perennial, herbaceous creeping or ascendant plant of 7-15 cm height. It has purple-colored flowers.

**Morphological Characteristics:** Stipules are triangular-lanceolate, with straight edges. Petioles are of 2-15 mm. Leaves are of 8-30 mm while leaflets are oblong, obovate-obcordate-cuneate, and of 4-23 x 1-7 mm, with small teeth at tips and interruptedly emarginate at the top. 1-2 flowers grow from the arm. They are light lilac, yellowish-white colored and stemless. Calyx is tubular and of 5-20 mm while corolla is of 8-10 mm. Bean is nearly hairless, cylindrical, linear, straight or sometimes curved, and longitudinally nervate while the part which contains seeds is of 2-5 cm and gradually narrows down towards the beak.

### Flowering: They flower in April-May.

**Habitat:** They can be observed in cultivation areas, rocky slopes, shrublands, woodlands, oak forests, and maquis shrublands, at 100-1200-meter heights.

# 2.2.1.5. *Astragalus albertshoferi* Göktürk, O.D.Düşen & Sümbül

37

(Note: Since there is no photograph of this species taken in the nature, a photo of *Astragalus pinetorum* is given in representation.)

**Distribution:** They can be observed in Antalya, Korkuteli.

**General Description**: It is a perennial herbaceous astragalus.

**Morphological Characteristics:** Leaves are imparipinnat, of 10-25 cm (including the stem of 4-5



©ANK Herbarium (Ankara University Faculty of Science Department of Biology)

cm length), and oblong, with a petiole and midrib of 3-4 mm length. They have scattered white basic-villous hair while leaflets grow in (7-)10-16 pairs, and are oblong or ovate-oblong, of 10-25x4-8 cm with a round bottom. They are straight at the edges and blunt to slightly acute at the top. Both surfaces have long, white basic-villous hair. Stipules are membranous, straw-colored, of 10-20 mm, and acuminate, varying from triangular-lanceolate to oblong. They have long edges and are sparsely simple-villous. Pedicles are of 10-20 mm during the flowering period and of 15-30 mm during the fruiting period.

Flowers have pedicles, and a raceme has 1-3 flowers. Bracts are linear-lanceolate, acuminate, and have sparsely distributed white simple-villous hair. Pedicles are of 5-10 mm during the flowering period and of 9-15 mm during the fruiting period, with scattered white simple-villous hair. Calyx is tubular, and of 16 mm in the flowering period and of 19-22 mm in the fruiting period, with scattered white simple-villous hair. Teeth of calyx are triangular-lanceolate and of 2-4 mm. Corolla is greenish-yellow; vexillum is of 22-28 mm while lamina is ovate, of 16-20x11-14 mm, and blunt. Wings are of 15-20 mm while lamina is oblong, of 13x2.5-3.5 mm, and blunt. Keel is of 19-23 mm while lamina is oblong, of 9-12 mm, and blunt. Ovary is binocular, oblong-elliptic, matted villous, with about 14-16 ovules. Style is about 10 mm and hairless. Bean sticks out of calyx and is oblong-elliptic, bulging, of 30-80x15-30 mm, reddish-green, with densely scattered white simple-villous hair of 4-5 mm.

Flowering/Fruiting: They flower in April-May.

Habitat: They can be observed in pine forests, at 1300-meter heights.



©Hayri Duman

## 2.2.1.6. Astragalus altanii Hub.-Mor

**Distribution:** They can be observed in Malatya, Pötürge.

**General Description:** It is an upright, perennial, spineless astragalus species of 20-30 cm height.

### **Morphological Characteristics:**

Stem is of 5 mm diameter, whitish, and channeled. Leaves are imparipinnat and of 30-45 cm. Leaflets grow in 15-20 pairs, and are of 2-4 x 0.5-1.5 cm, lanceolate or elliptic, and acute at tips. Stipules are lanceolate-acuminate, and membranous. Racemes have 10-15 flowers. Bracts are of 8-15 mm, linearsubulate, and do not have a membrane. Calyx is tubular, of 12-17 mm, whitish-membranous while teeth of calyx are linear-subulate and of 3-7 mm. Corolla is white or yellowish, vexillum is of 20-25 mm, wings and keel is of 17-22 mm. Fruits are hairless, elliptic, and of 25-30 x 10-12 mm. The beak is of 5-7 mm.

### Flowering/Fruiting: Flowers in June.

**Habitat:** They can be observed in oak forests, at 1450-meter height.

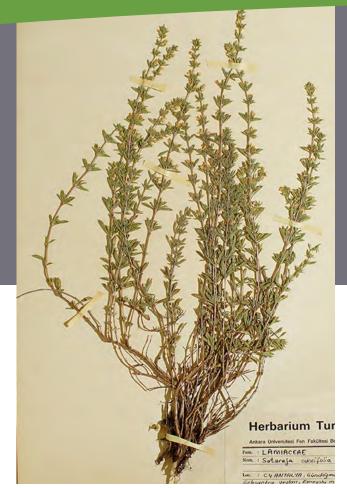
39

## 2.2.2.1. Satureja amani P.H.Davis

(Note: Since there is no photograph of this species taken in the nature, a photo of *Satureja cuneifolia* is given in representation.)

**Distribution:** They can be observed in Adana (Kislici Mountain) and Hatay (Amanos Mountains).

**General Description:** It is a shrubby, creeping, oblique plant of 5-10 cm. It has white-colored flowers. Although it is woody at the bottom, it is considered herbaceous plant as it does not have the form a shrub.



©ANK Herbarium (Ankara University Faculty of Science Department of Biology)

**Morphological Characteristics:** Stems are branched, thin and long, with short hair on leafy parts. Leaves are cuneate-oblanceolate, of 10-15 x 2-3.5 mm, acute at tips, mucronate, sparsely ragged-tomentose, and grayish. Flowers are partially dense, ovate-oblong, and of 2-3 cm. Flower clusters have 2 flowers with short pedicles. Calyx is of 3-3.5 mm, actinomorphy, short-haired, while teeth of calyx are lanceolate-subulate. Corolla is of 7-8 mm and grayish-white.

Flowering: Flowers in August-September.

Habitat: They can be observed in forestlands, at 1220-1980-meter heights.



2.2.2.2. *Thymus cariensis* Hub.-Mor. & Jalas

©Hayri Duman & Zeki Aytaç

Distribution: They can be observed in Muğla Köyceğiz and Fethiye.

**General Description:** It is a perennial, shrubby plant of 12-20 cm height. Its flowers are rose-pink colored. Although it is woody at the bottom, it is considered herbaceous plant as it does not have the form a shrub.

**Morphological Characteristics:** Stems with flowers are thin and long, quadrangular or semi-cylindrical. All surface or only the opposing two sides are short and have backwardly curved hair. Stem leaves are of 14-18 x 2-4(-6) mm, narrowly lanceolate to linear-oblanceolate, hairless, and ciliate toward the bottom, with slightly teethed edges. Bracts are of up to 17 x 8 mm, ovate, acuminate, generally purplish, hairless or short haired, with ciliate edges towards the tip. Calyx is of 6-8 mm while teeth of calyx are of 1.3-1.7 mm, lanceolate, and ciliate.

Flowering: Flowers in June-July.

Habitat: They can be observed in maquis shrublands, open areas of *Pinus brutia* forests, at 70 m height.

## 2.2.2.3. Salvia sericeotomentosa Rech.f.

41

(Note: Since there is no photograph of this species taken in the nature, a photo of *Salvia euphratica* is given in representation.)

**Distribution:** They can be observed in Hatay (Amanos Mountains, the area between Karakişi-Aşağı Zorkun).

**General Description:** It is a perennial, shrubby plant of 20-50 cm height with ascendant-upright stem. It has light pink or purplish-blue colored flowers. Although it is woody at the bottom, it is considered herbaceous plant as it does not have the form a shrub.



©ANK Herbarium (Ankara University Faculty of Science Department of Biology)

**Morphological Characteristics:** Leaves are densely covered with basic, sericeous hair. They are narrowly oblong, and of 2.5-8 x 1.5-4 cm, and narrow down at the base. Upper bracts are broadly ovate, of 15-30 x 15-25 mm, green to purplish colored while lower ones are similar to the leaves. Pedicles are of 3-10 mm. Calyx is greenish to purplish, hairless, short haired or villous, broadly bell-shaped, and of 20-30 mm in diameter. Corolla is light pink to purplish-blue colored, of 35 mm in diameter while corolla tube is of 20-25 mm, slightly curved, and broadens towards the neck. Fruits are deltoid, and at a dimeter of 5x4 mm.

Flowering: Flowers in June.

Habitat: They can be observed on slopes covered with Aleppo pine, at 800-1000-meter height.



©ANK Herbarium (Ankara University Faculty of Science Department of Biology)

2.2.2.4. Salvia nydeggeri Hub.-Mor.

42

(Note: Since there is no photograph of this species taken in the nature, a photo of *Salvia potentillifolia* is given in representation.)

**Distribution:** They can be observed in Muğla (Altınyayla at the south of Dirmil).

**General Description:** It is a perennial, semishrubby, leaning plant of 25-30 cm height. It has white or yellow flowers.

**Morphological Characteristics:** Stem is highly glandular at upper parts with long eglandular hair. Leaves are imparipinnat, terminal segment is oblong

and of 0-30 x 10-15 mm. Pedicles are of 8-12 cm. There are 4-6 flower clusters, each containing 2-4 flowers. Pedicles are of 2-5 mm. Calyx is tubular-funnel shaped, of 10-17 mm, with 12 strings. Corolla is either white or yellowish, and of 25-30 mm.

Flowering: Flowers in June.

Habitat: They can be observed in coniferous forests, at 1000-meter height.

# 2.2.2.5. *Nepeta conferta* Hedge & Lamond



**Distribution:** They can be observed in Antalya-Elmalı (Çığlıkara).

**General Description:** It is a perennial, herbaceous plant which can grow as long as 60 cm. It has withered white or cream-colored flowers.

**Morphological Characteristics:** Leaves are ovateoblong, of  $(1-)2-3.3 \times (0.5-)0.8-1.7$  cm, with different colors at lower and upper surfaces. Lower surface



©ANK Herbarium (Ankara University Faculty of Science Department of Biology)

has gray hair, and is crenate with truncate tips. Petioles are of 0-1 cm. Pedicles are spicate, of 5 x 2 cm in diameter, and straw colored. Calyx is tubular, broader at the top, of 10-12 mm with acuminate-mucronate teeth of 4-5 mm. Corolla is white or cream colored, of 14 mm in diameter while tube is thin-long and curved.

Flowering: Flowers in June.

Habitat: They can be observed in forestlands, at 1500-meter height.



# 2.2.2.6. *Thymus pulvinatus* Čelak.

© Fatih Satıl

Distribution: They can be observed in Balıkesir (Kapı Mountain).

**General Description:** It is a perennial, shrubby thyme species of 2-4 cm height. It has purple colored flowers. Although it is woody at the bottom, it is considered herbaceous plant as it does not have the form a shrub.

**Morphological Characteristics:** Leaves are of  $12-18 \times 0.6-1(-1.2)$  mm, falcate, curved inwards at edges, densely covered with velvety short hair, and ciliate at the tip. Bracts are longer than flowers with a width of 1.2-1.7 mm, and ± similar to leaves. Calyx is of 5.7-7.2 mm, hirsute, and glandular in the form of a stemless spot. It is at a diameter of 10 mm.

Flowering: Flowers in July.

Habitat: They can be observed in forestlands, at 1600-1800-meter height.

44



2.2.3.1. Cyclamen mirabile Hildebr.

© Hayri Duman

**Distribution:** They can be observed in Muğla, (the area between Çine-Yatağan and Kişle-Koslağan), Aydın (the area between Gökbel-Çine), and Isparta (around Isparta and Barla).

**General Description:** It is a perennial, bulbous, herbaceous plant of 5 cm height. Flowers are light pink colored and have dark stains at the base.

**Morphological Characteristics:** It is a perennial, bulbous, herbaceous plant of 5 cm height. Bulbs are of 3-6 cm diameter. Leaf blades are usually teethed and the upper part is often pink or reddish stained. Flowers are light pink with dark stains at the base.

Flowering/Fruiting: Flowers in September-November.

**Habitat:** They can be observed in *Pinus brutia* (red pine) and *Quercus* (oak) forests at calcite, metamorphic and granitic rocky areas, at 500-1000-meter height.



© Gazi University Faculty of Science and Letters Herbarium (GAZI)

2.2.4.1. Rindera dumanii Aytaç & R.R.Mill

46

**Distribution:** They can be observed in Konya (northern slopes of Kızıldağ around Çamlık Town seated between Akseki-Beyşehir).

**General Description:** It is a perennial, upright, herbaceous plant of 25-40 cm height. It has reddish-purple flowers.

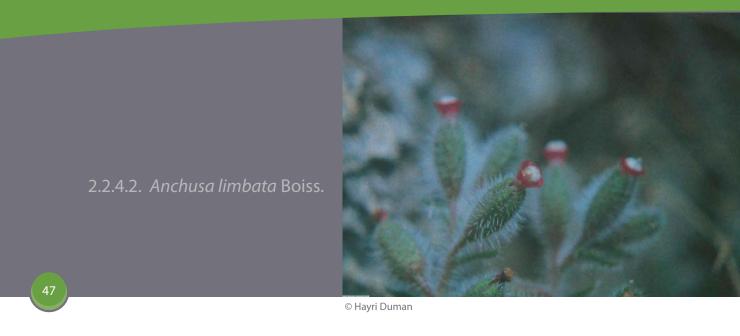
#### Morphological Characteristics:

Stems are densely matted-woolly with grayishwhite hair. It has a large number of base leaves

while petioles are of 40-70 mm, curved backwards, with grayish-white woolly hair. Leaf blades are narrowly elliptic, of 80-150 x 8-15 mm, and acuminate. Stem leaves are highly reduced without petioles, lanceolate to linear-lanceolate, of 10-40 x 2-5 mm, with dense woolly hair. Cymes have maximum 12 flowers. Pedicles are of 5-10 mm in the flowering period and up to 15 cm in the fruiting period. Calyx lobes are ovate-lanceolate, 5-7 mm with blunt tips and dense white tomentose hair. Corolla is reddish-purple, of 6-7 mm while tube is of 2.5 mm. Lip is of about 5 mm. Male organs are longer than the corolla tube but shorter than the corolla as a whole. Style distinctly sticks out of the corolla. Fruits are of 14-16 x 15 mm, double-winged- roundish while outer wings are of 2-4 mm width with flat or slightly corrugated edges. Inner wings are of 4-5 mm width with lacerate edges.

Flowering: Flowers in May-June.

**Habitat:** They can be observed in the open areas of *Pinus nigra* (black pine) forests, at 1600-1700-meter height.



Distribution: They can be observed in Antalya (the area between Antalya and Kayadibi-Elmalı).

General Description: It is an upright herbaceous plant of 5-19 cm length. It has whitish flowers.

**Morphological Characteristics:** It is a hispid, biennial plant. Lower leaves are linear, flat or slightly corrugated. Cymes are dense. Bracts are leaflike, with ± dense whitish hair. Calyx is of 7.5 mm in diameter, and do not distinctly grow in the fruiting period. It has thick- short hair. Corolla is actinomorphy while corolla tube grows up to 8 mm and is whitish. Male organs (anther + filament) are seated at the upper part of the corolla tube with distinct corolla scales of 1.75-2.5 mm, which have dense long tubercles.

Flowering/Fruiting: Flowers in March.

**Habitat:** They can be observed in calcareous hills below *Pinus brutia* (red pine) and *Cedrus libani* (cedar), at 1100-130-meter height.



©ANK Herbarium (Ankara University Faculty of Science Department of Biology)

### 2.2.4.3. Symphytum asperum Lepech.

**Distribution:** They can be observed in Erzurum, Trabzon and Kars.

**General Description:** It is a perennial, herbaceous plant of 30-120 cm height. It has blue flowers and a nut-like fruit.

**Morphological Characteristics:** Lower leaves are oblong-ovate, acuminate, attenuate, decurrent while upper leaves do not have petioles and amplexicaul. It has 20 flowers in diameter. Calyx is of 5 mm, linear, blunt tipped, and divided into lobes. Corolla is blue, of 13-15 mm while corolla scales are of 6 mm, linear, with blunt tips.

Flowering: Flowers in May-August.

**Habitat:** They can be observed in shrubby areas, at 1600-meter height.



Distribution: They can be observed in Konya-Ermenek (the area of Kuniseki on the Ermenek-Mut road).

**General Description:** It is a perennial, upright, herbaceous plant of 15-30 cm height. Flower tubes are yellow with blue lips.

**Morphological Characteristics:** Base leaves are linear-lanceolate. Stem leaves are linear-lanceolate to ovate, of 2.5-3.5 x 0.5-1.2 cm, with slightly corrugated edges. Cymes are of 5-12 cm. Bracts are ovate to lanceolate, of 1-2.5 x 0.5-1.2 cm. Pedicles are of 1-2 mm in the flowering period. Calyx is of 5 mm in the flowering period and of 6-7 mm in the fruiting period, with lanceolate calyx lobes. The outer part of corolla is shorthaired while tube is yellow. Lips are blue and of 5-7 mm diameter. Fruits are of 2.5 mm diameter, reticulate and the beak of the fruit is slightly curved backwards or flat.

Flowering/Fruiting: Flowers in April.

Habitat: They can be observed in the open areas of *Quercus coccifera (kermes oak)*, at 1200-1300-meter height.



2.2.5.1. *Gypsophila pilulifera* Boiss. & Heldr.



© Gökhan Deniz

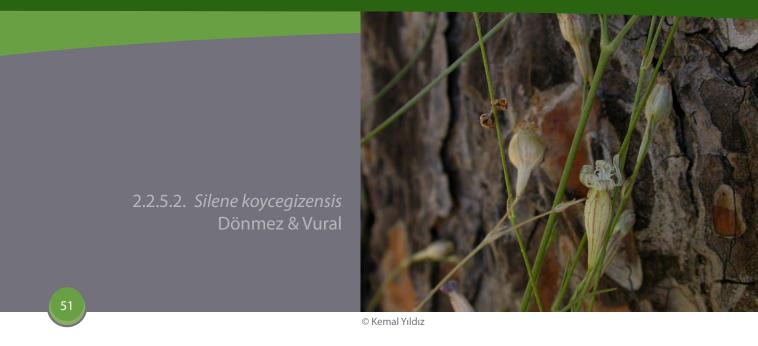
**Distribution:** They can be observed in Antalya.

**General Description:** It is a perennial, upright, herbaceous plant of 10-70 cm length. Flowers are white-pink colored.

**Morphological Characteristics:** Leaves are linear, thriedral or flat, of 10-60 x 0.5-3 mm, and narrowly acuminate. Pedicles grow in circular clusters, and are of 4-18 mm diameter. It has a large number of flowers without pedicles, in different colors varying from white to pink. Inner bracts are oblong and apiculate. Calyx is of 2.5-3 mm with blunt and apiculate teeth. Petal is of 4.5-7 mm, linear, with blunt tips. Fruit is a 4-lidded capsule.

Flowering: Flowers in July-August.

**Habitat:** They can be observed in *Pinus* (pine) forests close to sea level.



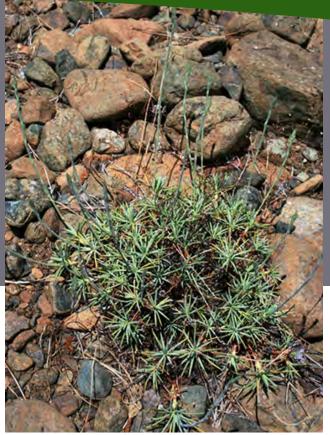
**Distribution:** They can be observed in Muğla-Köyceğiz (Çandır Köyü and Hamitköy) and Marmaris National Park.

**General Description:** It is an annual, upright herbaceous plant of 50-70 cm height, with pink-colored flowers.

**Morphological Characteristics:** Stem is thin and long, either simple or branched at the base while the lower and middle parts of the stem is covered with backwardly-curved hair. Upper parts are hairless while internode is stickily glandular. Base leaves are spatulate while upper leaves do not have petioles and are linear with leaves gradually becoming smaller towards the top. Bracts have 1 string, and are linear and subulate. Pedicles are dichasium. Pedicles are thin and long, upright, and of 5-10 mm. Calyx is oblanceolate, slightly greenish in the flowering period, ampullate, membranous, of 10-12 mm with triangular calyx teeth of 1 mm with ciliate edges. Calycles are of 10-12 mm while calyx blades are two-lobed, pinkish, with oblong lobes. Male organs are of 6-8 mm while anther is of 1 mm. Anthophore is of 4-5(-6) mm, with backwardly curved long hair. Capsule is of 4-6 x 4-6 mm and remains in corolla. Seeds are of 1-1.2 mm, brownish and slightly tubercled.

#### Flowering: Flowers in May-June.

Habitat: They can be observed in maquis areas, between 20-130-meter height.



© Hayri Duman & Zeki Aytaç

2.2.6.1. *Acantholimon koeycegizicum* Doğan & Akaydın

**Distribution:** They can be observed in Muğla-Köyceğiz (the area between Sultaniye Village and Köyceğiz – Kaplıcalar).

**General Description:** It is a perennial, loosely spiked, clustering shrubs in the form of a cushion. They are of 17-27 cm length and have pink-colored flowers. Although it is woody at the bottom, it is considered herbaceous plant as it does not have the form a shrub.

**Morphological Characteristics:** Leaves are of 20-32 x 1-1.5 mm, hairless, glaucous, with rugged edges. Flowery stems are longer than leaves, of 17-27 cm and have 7-8 scales. Scales are of 8-9.5 mm, acuminate, hairless, brownish. Pedicles are 2-5 branched and spicate. Bracts are short haired while outer bracts are of 6.5-7 mm, lanceolate, acuminate. Inner bracts are of 8-9 mm, lanceolate, acute or mucronate. Calyx is of 11-12 mm while calyx tube is densely haired. Calycles are pink.

Flowering: Flowers in July-August.

**Habitat:** They can be observed in serpentine mountain slopes and in *Pinus brutia* (red pine) forests along the coastline, at about 20-meter height.

2.2.6.2. *Acantholimon birandii* Doğan & Akaydın



**Distribution:** They can be observed in Karaman (around Bucakkışla and Gökçe pine grove).

**General Description:** It is a perennial, densely aculeous shrubs in the form of a clustering cushion. Although it is woody at the bottom, it is considered herbaceous plant as it does not have the form a shrub.

**Morphological Characteristics:** Branches are very short and densely leaved. Leaves are of 25-35 x

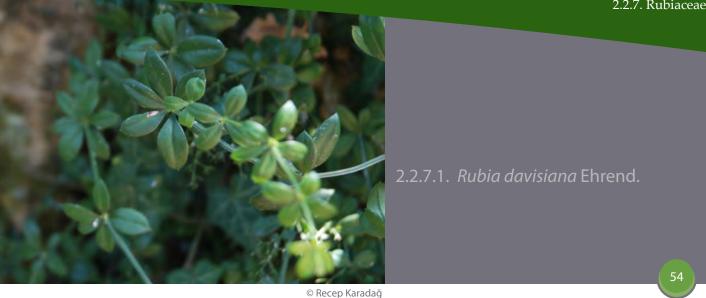


©ANK Herbarium (Ankara University Faculty of Science Department of Biology)

1 mm, and linear-subulate, green with rugged edges. Calyx is of 7-8 mm; while lip is of 2-3 mm, 10-lobed, white, of 5-6 mm width. Petals are pink.

Flowering/Fruiting: Flowers in August-September.

**Habitat:** They can be observed in calcareous mountain slopes, open oak lands, open fir forests, Astragalus steppes, at 1600-1700-meter height.



Distribution: They can be observed in Antalya-Elmalı (around Sivridağ-Söğüt Plateau, Avlan Lake and Hafizbey Gate).

General Description: It is a perennial, semi-shrubby, climbing plant of 1-1,5 m height. It has racemose and vellow-green flowers.

Morphological Characteristics: Stems are semi-upright or ascendant, distinctly woody towards the base, with 4 edges. Stem shell is flat, pruinose, green when young and has white-brown slots when matured. Leaf arrangement is circular and leaves grow in groups of 4, corlaceous, of 20-35(-50) x 5-11(-15) mm, ovatelanceolate, acuminate, round at the base, stemless, with a light-colored lower surface. Edges are sometimes curved inwards. Pedicles are long-cylindrical. Pedicles are of 1-3 mm diameter. Corolla is yellowish-green, rotate, of 2-3 mm diameter, while lobes are ovate and aristate (of 0.5 mm diameter). Anthers are semiglobous, and of 0.3-0.4 mm diameter. Fruits are globous, of 3-4 mm diameter, and blackish.

**Flowering:** Flowers in July.

**Habitat:** They can be observed in fractured rocks and shrubs, at 1050-1200-meter heights.



2.2.8.1. *Muscari macbeathianum* Kit Tan

© Barış Bani

Distribution: They can be observed in Tufanbeyli, Adana (Nearby Tufanbeyli-Saimbeyli Güzelim Village)

**General Description:** It is a bulbous perennial plant measured 5-12 cm. The color of its flowers varies between white and blue.

**Morphological Characteristics:** Bulbs have a diameter of 2 cm and the cover of the bulb has a color ranging from greyish to ivory. There are 8-9 channeled, narrowish and linear leaves at a width of 1-2 mm. There are up to a couple of flowered nodes measured 5-12 cm, and they share the same length with the leaves or are slightly longer. This plant has typically (10-) 15-20 flowers whose sizes are  $1.5-2.5 \times 1.5-2$  cm. Stems are 1.5 - 2 mm long, 3 mm at most, and bent backwards. Bracts are small and membranous. The color of all flowers ranges from amethyst to bluish mauve. Perianth (Petal+Calyx) is wide and tube-like resembling to a bell measured 5-6.5 x 6 mm in diameter. Tube has a size of 3.5-4.5 mm, from white to blue, and the lobes of Perianth (Petal+Calyx) are white and ovate measured at a diameter of 1.5-2 mm. Filaments are 0.5-0.6 mm long and anthers 0.8-1 mm. with dark blackish purple. Ovary is spheral has a diameter of 1.5 mm and style 1 mm.

Flowering/Fruiting: It blooms in March, April and May.

**Habitat:** *Pinus nigra* (Black pine) forests with sandy soils. They are observed between 1400 and 1450 meters. They spread in an area of 7 km<sup>2</sup> in the regions they live in. They do not prefer an aspect over another. The average annual temperature figures are between -2.9 °C and 22.7°C, and the annual precipitation is approximately 561,5 mm. Damaging forest areas are seen as the greatest danger to the species.

Other taxons that it can be observed with; Pinus nigra subsp. nigra var. caramanica, Abies cilicica subsp. cilicica, Cedrus libani, Juniperus excelsa, J. Foetidissima, Aegilops umbellulata subsp. umbellulata, Anthemis tinctoria var. tinctoria, Alyssum minutum, A. strigosum subsp. cedrorum, Arabis laxa, Astragalus densifolius subsp. densifolius, A. chamaephaca, A. vaginans, A. campylosema subsp. campylosema, Centaurea lycopifolia, C. carduiformis, C. cheirolopha, C. urvillei, Cephalanthera rubra, C. damasonium, C. kotschyana, Cerastium gracile, Coronilla varia subsp. varia, Dactylorhiza romana subsp. romana, Dactylis glomerata, Dianthus zonatus, D. calocephalus, Doronicum orientale, Dorycnium graecum, Eryngium campestre, Epipactis helleborine, E. condensata, Evax anatolica, Galium verum subsp. verum, Geranium lucidum, Grammosciadium confertum, Hedysarum laxum, Helichrysum plicatum, Kotschyella cilicica, Knautia integrifolia var. integrifolia, Lathyrus cicera, Lomelosia divaricata, Michauxia campanuloides, Noccaea densiflora, Onosma armena, Ononis adenotricha var. adenotricha, Onopordum turcicum, Origanum laevigatum, Pilosella hoppeana subsp. isaurica, Potentilla recta, Ranunculus illyricus subsp. illyricus, Rosa heckeliana subsp. orientalis, Rumex tuberosus subsp. horizontalis, Salvia aethiopis, S. hypargeia, Sanguisorba minor, Silene italica, Silene compacta, Teesdalia coronopifolia, Trifolium resupinatum var. resupinatum, T. lucanicum, T. arvense var. arvense, Trigonella

brachycarpa, T. mesopotamica, Vicia sericocarpa var. sericocarpa, Zosima absinthifolia.



©ANK Herbarium (Ankara University Faculty of Science Department of Biology)

### 2.2.8.2. Scilla sardensis Barr & Sugden

56

(Note: Since there is no photograph of this species taken in the nature, a photo of *Scilla bithynica* is given in representation.)

**Distribution:** They can be observed in İzmir (around Mahmut Mountain, Parsa Village, and around Kemalpaşa-Yukarıkızılca).

**General Description:** It is a perennial, bulbous and herbaceous plant of 7-20 cm height. It has blue colored flowers.

**Morphological Characteristics:** Leaves usually grow in groups of 2 and are dark green or slightly bronze colored. Pedicles usually grow one by one and are of 7-20 (-40) cm. Flowers are of 4-12 pieces and slightly drooping, and blue.

Flowering/Fruiting: Flowers in March-April.

Habitat: They can be observed in pine forests and mountain slopes facing to the north, at 550-meter height.

### 2.2.8.3. Asparagus lycicus P.H.Davis

(Note: Since there is no photograph of this species taken in the nature, a photo of *Asparagus coodei* is given in representation.)

**Distribution:** They can be observed in Antalya (around Elmalı).

**General Description:** It is a perennial, upright, herbaceous plant of 70 cm height. It has red-colored grape-like fruits.

©Selçuk University Faculty of Science Department of Botanic Herbarium.

**Morphological Characteristics:** Leaves grow in groups of 6-10, and are hairless, with quite short internodes. It has red grape-like fruits of 7-8 mm length.

Flowering/Fruiting: Flowers in May-August.

Habitat: They can be observed in forestlands, 1000-1100-meter height.





2.2.8.4. *Ornithogalum microcarpum* Speta

©Mecit Vural

(Note: Since there is no photograph of this species taken in the nature, a photo of *Ornithogalum* is given in representation.)

Distribution: They can be observed in Kastamonu, Ilgaz Mountains.

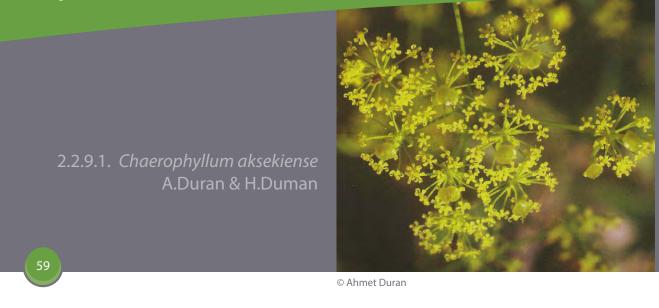
**General Description:** It is a small, herbaceous, and tuber plant.

#### **Morphological Characteristics:**

Tubers are of 0,8-1,5 cm diameter, globous, slightly oblong. Their outer part is covered by a thin and light brown membrane. It has simple thin roots. Leaves are of 10-18 cm height and 6 mm width, broadly channeled, dark green colored. Fruits do not fall off until they ripen. Scapose is of 0,5- 2,5 cm while rachis is of 3 cm. Racemes have 1-12 flowers.

Flowering: Flowers in June.

Habitat: They can be observed in forestlands, at 1650-meter height.



Distribution: They can be observed in Antalya-Akseki (Pınarbaşı Village).

General Description: It is a perennial, upright, herbaceous plant of 80-130 cm height, with yellow flowers.

**Morphological Characteristics:** Stem is cylindrical. Lower part is covered with backwardly curved hair while upper part is sparsely covered with either forked or scattered hair or hairless. Lower leaves have long stems and petiole is broadly winged at the base. Leaf blade is oblong to broadly ovate-triangular, of 12-20 x 5-15 cm, 4-5- imparipinnat. Upper leaves are smaller and hairless. Pedicles are of 2-6 cm length. Fruits are of 10-23 x 1,5-2 mm, linear-oblong to clavate, and hairless.

It is the only yellow-flowered *Chaerophyllum* species found in Turkey.

Flowering/Fruiting: Flowers in June-July.

Habitat: They can be observed in cedar forestlands, at 1450-meter heights.



© Gazi University Faculty of Science and Letters Herbarium (GAZI)

### 2.2.9.2. Ferulago isaurica Peşmen

**Distribution:** They can be observed in Antalya-Alanya (Kargı Stream).

**General Description:** It is a perennial, upright, herbaceous plant of 140-180 cm height. It has yellow flowers.

#### **Morphological Characteristics:**

Stems with flowers are angular, slightly channeled and leafless. Leaf bases are 5 imparipinnat, triangular-ovate, of 30 x 30 cm in diameter; while stem leaves are reduced and semi-membranous, while leaf sheaths are oblong-linear. Pedicles are panicle-corymb while umbellule has long stems, with 5-8 umbellule rays of 3-5 cm. Bracts and bracteoles are ciliate. Flowers are yellow colored. Petals and ovary are hairless. Fruits are elliptic and of 12-16 mm.

Flowering: Flowers in June-July.

**Habitat:** They can be observed in black pine forests and forestlands, at 1000-meter height.

# 2.2.9.3. *Ferula coskunii* H.Duman & Sağıroğlu



61

**Distribution:** They can be observed in Hatay (Ziyaret Mountain between Hatay-Yayladağı, Hassa Dedemli Village).

**General Description:** It is a perennial, upright, long herbaceous plant of 80-225 cm length. It has yellow flowers. Fruits are elliptic-oblong, of 5-9 x 3-5 mm, and dark green-brown.

**Morphological Characteristics:** Roots are thick, cylindrical, and of 1-4 cm diameter. Stem is cylindrical, corrugated, ± glaucous, hairless, and



of 0.5-1.5 cm diameter at the base. Base leaves are triangular-ovate, of 50-90 x 20-40 cm; while petioles are of 30-50 cm, cylindrical, corrugated, and hairless. Leaf blades 6-7- imparipinnat, and leaf segments at the tip are linear-lanceolate, of 0.5-2(-3) x 0.2-0.4 mm, acute-acuminate, with sparse curved-short hair. All leaf sheaths are linear-lanceolate, slightly bulging, membranous, corrugated, glaucous and hairless. Lower and middle leaf sheaths are amplexicaul, of 5-15 x 1-3 cm while upper ones are semi-amplexicaul, and of 2-10 x 1-2 cm. Bracts look similar to leaf sheath (1-3 x 0.5-2 cm); central umbellule have short stems (0.5-1 cm). Umbellule rays are of (4-) 8-14(-18), 1-2(-3) cm. There are generally 2 umbles at sides, with thin and long stalks, mostly unproductive. Small umbles have 20-35 flowers and flower stalks are 3-5(-7) mm long. Bracteoles are of 0(-2)(-4) pieces, linear-lanceolate, of 0.5-1 mm, and deciduous. Calycles are not distinct. Petals are yellow, hairless, of 1.5-2 mm, and curved backwards. Fruits are elliptic-oblong, of 5-9 x 3-5 mm, dark greenish-brown when matured, and strings on the back are thinly filiform while side wings are of 0.3-0.5 mm width. Style is usually permanent and stigma is capitate.

Flowering: Flowers in July-August.

Habitat: They can be observed in calcareous rocky areas at the open areas of forests, at 1000-1300-meter height.

Other taxons that it can be observed with: *Ostrya carpinifolia* Scop., *Quercus infectoria* Olivier subsp. *boissieri* (Reut.) O.Schwarz, *Q. coccifera* L., *Calicotome villosa* (Poir.) Link, *Jasminum fruticans* L., *Laurus nobilis* L., *Styrax officinalis*, L., *Fraxinus ornus* L., *Pistacia terebinthus* L. subsp. *palaestina* (Boiss.) Engl., *Ferulago antiochia* Saya & Miski, *Phlomis longifolia* Boiss. & Balansa var. *longifolia, Sideritis huber-morathii* Greuter & Burdet, *Stachys pumila* Banks & Sole



© Gazi University Faculty of Science and Letters Herbarium (GAZI)

2.2.9.4. *Ferula amanicola* Hub.-Mor. & Peşmen

(Note: Since there is no photograph of this species taken in the nature, a photo of *Ferula longipedunculata* is given in representation.)

**Distribution:** They can be observed in Osmaniye (Yağlıpınar and Yarpuz.)

#### **General Description:**

It is a perennial, upright, herbaceous plant which is longer than one meter. Leaves are dense, silvery colored, thick and hirsute, with yellow flowers.

**Morphological Characteristics:** Stem is cylindrical, slightly channeled, and hairless. Leaves are densely setulose-canescent. Base leaves have 5-6 imparipinnats, and are triangular-rhomboid, of 30 x 25 cm in diameter; with linear-filiform segments at tips of (10-)15- 20 x 0.3 mm in diameter, and mucronate. Leaf sheaths are distinctly swollen, amplexicaul, corlaceous, ovate, of 11 cm in diameter, hairless-slightly glaucous. Inflorescence corymb with panicle and central umbels have short pedicels (0.2-0.3(-1) cm), or without pedicel. There are 8-15 flower stalks measured 2-2.8 cm. The small umbels have 7-12 flowers with flower stalks of 3-6 mm. Bracteoles have thin tips. Fruits (when not ripen) obovate-oblong.

Flowering/Fruiting: Flowers in June-July.

Habitat: They can be observed in mixed beech and cedar forests, at 1600-1650-meter heights.



Sağıroğlu & H.Duman

© Ahmet Duran

Distribution: They can be observed in Osmaniye (they are between Yarpuz-Yağlıpınar).

General Description: It is a perennial, upright, herbaceous plant of 80-150 cm height. It has yellow flowers.

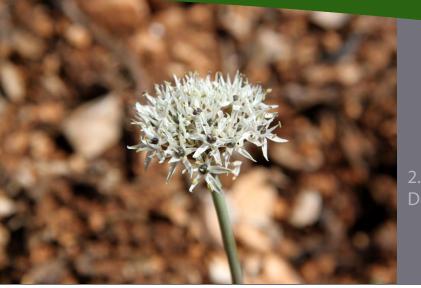
**Morphological Characteristics:** Stem is cylindrical. Lower parts are densely covered with short basic hair while upper parts are hairless. Stem bottom is of 4-8 mm with long-thin fibers while thin fibers are of 5-10 cm. Base leaves are oblong to elliptic, of 40-70 x 10-17 cm, and distinctly ensheathed. All sheaths are linear to linear-lanceolate, of 60-170 x 6-10 mm, with 3-4 imparipinnat leaf blades. Lower stem leaves are oblong to slightly ovate. Middle and upper stem leaves are highly reduced, semi-amplexicaul and leaf blades have several segments. Branches are alternate in the middle part and face to each other in the upper parts. Central umbellule has 6-12 rays while rays grow up to 2-5 cm. Lateral umbellules have 2-5 rays and infertile. Bracts and bracteoles are permanent. Flowers are yellow. Fruits are of 20-30 x 10-13 mm, matted at the back, narrowly oblong to elliptic.

Flowering: Flowers in July-September.

Habitat: They can be observed in shadowy slopes in mixed forests, at 1500-1650-meter heights.

Other plants that can be observed in the same habitat: *Dryopteris filix-mas, Pinus nigra, Abies cilicica, Cedrus libani, Juniperus oxycedrus, Rosa canina, Crataegus monogyna, Ferula elaeochytris, Cirsium amani, Carlina oligocephala, Quercus cerris, Fagus orientalis, Ostrya carpinifolia* ve Populus tremula.

64



2.2.10.1. *Allium elmaliense* Deniz & Sümbül

©Gökhan Deniz

Distribution: They can be observed in Antalya-Elmalı.

General Description: It is bulbous, herbaceous plant of 15-30 cm length. It has white flowers.

**Morphological Characteristics:** Bulb is of 1.3-2.8 cm diameter with a papyraceous brownish-black outer perianth and white inner perianth. Leaves are of 2-5 pieces, narrowly linear, 6-10(-13) x 0.2-0.6 cm, flat, hairless, and distinctly corrugated. Stem is of 1-25(-30) x 0.15-0.25 cm, cylindrical, and longer than leaves. Spathe is permanent with 2-3 lobes, while lobes are of up to 2 cm, acuminate, light yellow colored, with purple strings. Flowers are semi-globous and have 15-35 flowers with a scent. Perianth segments are from linear to oblong, of  $3.5-4.5 \times 0.8-1.1 \text{ mm}$ , while ovary is black, of  $1.3 \times 1.6 \text{ mm}$ . Style is filiform and stigma is capitate. Capsule is triangular, of  $4-5 \times 3.5-4.2 \text{ mm}$ , and hairless. Seeds are black and rugose.

Flowering: Flowers in April-May.

Habitat: They can be observed in *Quercus -Juniperus* forests, at 1050-1175-meter height.

Other plants which can be observed in the same habitat include the following species: Juniperus excelsa, Quercus coccifera, Helianthemum salicifolium, Coronilla emerus subsp. emeroides, Geranium divaricatum, Arabis verna, Cruciata taurica, Valeriana dioscoridis, Asyneuma virgatum subsp. ciccoriiforme, Bupleurum sulphureum, Vincetoxicum canescens subsp. canescens, Lamium ehrenbergii ve Descurainia sophia

### 2.2.10.2. *Galanthus koenenianus* Lobin, C.D.Brickell & A.P.Davis

**Distribution:** They can be observed in Gümüşhane (around Soğanlı Mountain).

**General Description:** It's a perennial, bulbous, herbaceous plant of 7,5 cm length. It has white flowers and smells like urine.

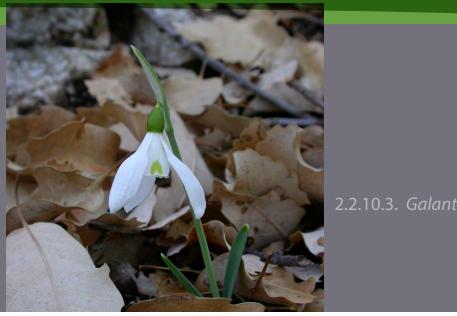


© Sırrı Yüzbaşıoğlu

**Morphological Characteristics:** Bulbs vary from globose to ovate, and are of  $2 \times 1.1$  cm in diameter. Leaves are linear to narrowly oblanceolate and grow up to  $2.5 \times 0.5$  cm in diameter during flowering and 12-22.8  $\times 0.5$ -1.2 cm after flowering. Both surfaces have the same color. The inner surface is flat while the outer one is distinctly channeled. The midrib is distinct while edges are flat with a blunt or acute tip. Stem with a flower is of 5.5 cm, and glaucous. Outer perianth segments are narrowly obovate, of 1.5- $1.7 \times 0.6$ -0.8 cm, and slightly appendage. Inner perianth segments are obovate to cuneate, of 0.7- $0.8 \times 0.4$ -0.5 cm, emarginate. Outer surface of each segment has a stain of reverse V shaped and the bottom of the segments are pale yellow. Capsule are globous to elliptic and grow up to 1 cm diameter.

Flowering: They flower in February-April.

**Habitat:** They can be observed in mixed forests, mainly along with species *Picea orientalis, Fagus orientalis, Acer campestre* subsp. *lepicarpa, Corylus avellane, Sambucus ebulus, S. nigra* and *Sorbus torminalis,* in volcanic soils. At 1550-meter height.



2.2.10.3. Galanthus cilicicus Baker

© Sırrı Yüzbaşıoğlu

Distribution: They can be observed in Mersin province (around Kağırakı and Arslanköy).

**General Description:** A bulbous perennial, herbaceous herb growing as tall as 11-18 cm. Flowers are white, inner face of each segment with a faint green mark covering the entire segment.

**Morphological Characteristics:** Bulb is spherical to ovoid, 1.5-2.2(-2.7) x 1-2(-2.4) cm. Leaves are flat and linear within gemma, 16-18 cm x 6-9 mm at flowering, recurving at maturity growing up to 50 x 1 cm; apex is acute, flat and glaucous. Scape is 11-18 cm long. Outer perianth segments are obovate to broadly obovate, or  $\pm$  elliptic, 18–28 x (6–)8-10 mm, slightly unguiculate. Inner perianth segments narrowly obovate, 7–11 x 5 mm, each segment with a sinus and an apical, green mark. Filament is 1-2 mm, and anther is 5 mm. Capsule is spherical, 14 x 12-14 mm.

Flowering: Flowers between November and April.

**Habitat:** It is found amongst rocks on slopes, in short grass, and with maquis-type vegetation at heights up to 600 m.

2.2.11.1. *Centaurea antalyensis* H.Duman & A.Duran

67

**Distribution:** They can be observed near Antalya-Akseki Güzelsu.

**General Description:** A perennial herbaceous plant growing as tall as 5-40 cm. Flowers are pink-purple.

**Morphological Characteristics:** Leaves are heavily glandular- punctate; lower leaves are lanceolate, 4-7 x 0.7-1 cm, apex is acute; middle and upper leaves are acaulescent, lanceolate to oblong or linear-lanceolate.



© Hayri Duman

Involucre is 15-20 x 10-15 mm, ovoid to oblong. Base of phyllaries are entirely covered by the appendages; orbicular, margins are broadly hyaline; brown and more rigid in the center, 4-6 x 4-6 mm, flat or small-toothed, apex ends with a 1-1.5 mm-long needle. Flowers are pinkish-purple. Paleas are 2-3 mm long; pappus is absent.

Flowering/Fruiting: Flowers between May and June.

Habitat: Grows amongst *Cedrus* (cedar), calabrian pine and maquis at heights between1030-1600 m.



2.2.11.2. *Centaurea ptosimopappoides* Wagenitz

© Ahmet Duran

Distribution: They can be observed in Adana province (around Karsanti and Pos).

**General Description:** A perennial subshrub growing as tall as 35 cm, erect or ascending stem. Flowers are yellow. Although this plant is woody at the base, it is categorized as herbaceous as it does not have shrub-form.

**Morphological Characteristics:** Leaves are firm, glabrous and lanceolate; base and lower leaves are caulescent, 10-13 x 1-2 cm, upper leaves are acaulescent and smaller. Involucre is 18-22 x 9-11 mm, narrowly ovate. Appendages are 0.5-1,5 mm long, short mucronate. Flowers are yellow. Paleas are 5.5 mm; pappus is 1.5 mm long.

Flowering: It flowers between June and July.

Habitat: They can be observed among *Pinus* (pine) forests at an elevation of 1000 m.

## 2.2.11.3. Anthemis macrotis Rech.f.



(Note: Since there is no image of this species captured in its natural habitat, a photo of an *Anthemis* (daisy) has been used for representation purposes.)

**Distribution:** They can be observed in Muğla-Bodrum (from Muşgebi to Karatoprak).

69

**General Description:** An annual, herbaceous plant growing as tall as 15-120 cm. Ray flowers are liguate and white while disc flowers are yellow.

**Morphological Characteristics:** Stem is 20-25 cm, flattened and short-haired. It bears 2-pinnatisect leaves, obovate;



© Mecit Vural

1-3 cm, primary segments 3-5-paired, segments at the tips are linear-oblanceolate and acute. Solitary heads grow from the 10-15 cm-long leafless stem. Involucre is 1 cm wide; phyllaries are obovate, 2.5-4 x 1.5-2 mm, obtuse; light brown on the edges. 12-15 ray flowers grow on the edges; these are liguate and 5-12 mm long. Disc flowers are - 3 mm, and slightly ventricose at the base. Paleas on the edges are sterile while those on the center are 1.5 - 2 mm, cylindrical, curved and slightly vertucose.

Flowering: It flowers between April and May.

**Habitat:** It is found on limestone rocks among maquis, and slopes covered in volcanic soil at heights from 50 to 1000 m.



2.2.11.4. Anthemis adonidifolia Boiss.

© Barış Bani

(Note: Since there is no photo of an *Anthemis adonidifolia*, photo of a similar species (*Anthemis cretica*) has been used).

Distribution: They can be observed in Adana-Pozantı.

**General Description:** It is an annual, herbaceous plant with an accumbent or ascending stem, growing as tall as 25-30 cm. Ray flowers are liguate and white while disc flowers are yellow.

**Morphological Characteristics:** Ramified at the base, the stem is 25-30 cm long. Leaves are 23 cm, 2-pinnatisect, ovoid-oblong, leaf segments 3-5, linear, divided into acute lobes, 4-5 x 0.75-1 cm. The head is radiate. Involucre is 0.75-1 cm; outer phyllaries

are ovate and acute, inner ones are obovate and obtuse. Receptacle is conical, and palea is subulate. It has 12 ray flowers that are fertile, liguate and 5-7 mm long. Disc flowers are 2.5 mm, and non-ventricose at the base. Paleas are permanent, 1.5-1.75 mm, ± cylindrical and truncate.

Flowering/Fruiting: It flowers in July.

Habitat: It is found within shrubs at an elevation of 850 m.



Distribution: They can be observed in Mersin (Gülnar-Bozağaç).

**General Description:** A perennial tuberous, herbaceous plant growing as tall as 40 cm. Flowers are greenish white with occasional reddish marks. It produced maximum 12 flowers. Calycles are substantially retroverted.

**Morphological Characteristics:** Inflorescence is as long as 25 cm, carrying a maximum of 12 flowers. Broadly lanceolate, the leaves grow from the base. Calycle are 12 x 5 mm in size, and prominently retroverted; green with occasional greenish-purple marks. Petal is 4 x 2.5 mm in size and liguate; greenish white with pink marks, short-haired. Labellum is 10 mm long with 3 lobes where the middle lobe is characterized by a narrow base and brownish color; the lobes on the sides have small outward horns; the outer surface is heavily villous, while the inner surface is whitish and glabrous. Connective is short and acute.

Flowering: It flowers between May and June.

**Habitat:** They can be observed on limestone soils in maquis-covered areas and *Quercus* (oak) forests at an elevation of 850 m.



2.2.12.2. *Ophrys lyciensis* Paulus, Gügel, D.Rückbr. & U.Rückbr.



© Catherine Dijon

**Distribution:** They can be observed in Antalya (Ulupınar and Çıralı)

**General Description:** It is a perennial tuberous, herbaceous plant that can grow as tall as 70 cm.

**Morphological Characteristics:** No information available.

Flowering: It flowers between May and June.

**Habitat:** It can be found in forest edged and Pinus forest at an elevation up to 100 m above sea level.

72

2.2.12.3. İçel salebi *Ophrys amanensis* subsp. *iceliensis* Kreutz

73

**Distribution:** They can be observed in Mersin (around Soğucak locality, 15 km north of Mersin).

**General Description:** It is a perennial tuberous/ bulbous, herbaceous plant that can grow as tall as 70 cm.

**Morphological Characteristics:** It has 6 to 12 flowers that are

25-45 cm long. Calycle are 7-13 x 3-4 mm in size, and ovoid; obtuse, greenish with slightly purple on the front. Petals are 3-5x1-3 mm in size and triangular; they have a yellowish-green pink or light pink color with reddish or purple dots in general; edges are undulate. Lip is 9-12x6-9 mm in size, round or ovate, spotted h-form, greyish-blue, and the edges are generally white. Appendages are small, forward-curved, yellow to yellowish brown. Connectives are acuminate.

Flowering: It flowers between May and June.

**Habitat:** They can be observed in open areas within sparse pine forests that also include broad-leaved trees, at an elevation of 850 m.



© C.A.J. Kreutz

74



©Gazi University Faculty of Science and Letters Herbarium (GAZI)

# 2.2.13.1. Verbascum freynii (Sint.) Murb.

**Distribution:** They can be observed in Kastamonu-Tosya (around Gavur Mountain, Yukarı Dikman and

**General Description:** A biennial herbaceous plant with an erect stem, growing as tall as 50-120 cm. Flowers are yellow.

**Morphological Characteristics:** It has long glandular and eglandular hairs. The stem is cylindrical or slightly angular, simple or with few short branches. Basal leaves oblong to obovate,

6-12 x 2.5-5 cm, prominently crenate, petiole is 1-3 cm long; stem leaves are high in number and smaller in shape; upper leaves are ovoid-heart-like, acuminate. Inflorescence is mostly simple, with few slender branches, clusters of 2-7 flowers. Bracts are linear-lanceolate to linear, very acuminate; lower bracts are longer than flower clusters. Pedicle is as long as 10 mm, with 2 bracteoles. Calyx is 5-10 mm; lobes are oblong-linear, acute or mucronate. The corolla is yellow, 22-25 mm in diameter. Stamen is 4; anther is reniform, filaments with brown wool, 2 anterior filaments are glabrous near apex. Capsule is broadly ovate-pyramidal, 5-8 x 45 mm, stellate-tomentose.

Kılkuyu Villages)

Flowering: It flowers between June and July.

**Habitat:** They can be observed in Subalpine *Pinus nigra* (black pine) forest at heights between, 1400 to 1600 m.



2.2.13.2. Verbascum prusianum Boiss.

© Erdoğan Tekin

Distribution: It can be found in Bursa (Uludağ).

**General Description:** A biennial herbaceous plant with an erect stem, growing as tall as 60-130 cm. Flowers are yellow.

**Morphological Characteristics:** Stem is thin and long, cylindrical, strapped; densely glandular-sticky; and sparsely ramified, with eglandular hairs. Basal leaves are greenish, ovoid to elliptical, 10-35 x 4-18 cm, crenate; stem leaves are smaller; upper leaves are linear-lanceolate, acuminate, flat on the edges. Inflorescence is mostly simple, with clusters of 2-4 flowers. Bracts are lanceolate, acuminate or caudate; bracteoles 2. Pedicles are as long as 5 mm.

Calyx is 5-7 mm, lobes are linear-lanceolate. The corolla is yellow, 25-40 mm in diameter. Stamens 5, 3 posterior filaments are whitish-yellow wool near anthers and anterior filaments are glabrous near apex. Capsule is broadly ovate, 6-10 x -7 mm, stellate-tomentose.

Flowering: Flowers between May and August.

**Habitat:** They can be observed in *Catanea* (chestnut) and *Pinus* (pine) forests, within *Quercus* (meşe) clusters at heights between 780 to 1300 m.



2.2.13.3. *Verbascum adenocaulon* Boiss. & Balansa

©Ahmet Duran

Distribution: They can be observed in Niğde-Çamardı (Kavaklı Stream).

**General Description:** A biennial herbaceous plant with an erect stem, growing as tall as 60 cm. Flowers are yellow.

**Morphological Characteristics:** Stems grow up to 60 cm, with white-floccose trichomes at the base and glandular pubescent near the top. Basal leaves are broadly ovoid-elliptical, 3-5-6 x 2.5-4 cm, crenulate; petioles 1.5-2.5 cm; stem leaves are smaller, upper leaves are acaulescent, ovoid-lanceolate to lanceolate, acute. Inflorescence is oblong-pyramidal, panicle. Bracts are oblong to linear-lanceolate. Pedicle is 2-3.5 mm long. Calyx is 3-4 mm. Flowers are yellow. Fruit is broadly ovate, 4-5.5 x -4 mm, glabrous.

Flowering: It flowers in June.

Habitat: They can be observed on woodland hills, at an elevation of 1500 to 1870 m.

2.2.14.1. Crocus abantensis Baytop & B.Mathew



77

Distribution: Bolu, around Abant Lake.

**General Description:** A perennial herbaceous plant with a corm. Flower colors range from dark blue to lilac, with a yellow throat.

**Morphological Characteristics:** Corm tunic is prominently reticulate, finely fibrous. Produces 5-8 leaves which develop simultaneously with the flowers with a width up to 0.5-0.8 mm. Perianth segments are dark blue to lilac, with a yellow throat, 2-2.7 x 0.7-1.3 in size. Anthers are 0.8-1.4 cm in size, yellow. Style branches 3, orange.

Flowering/Fruiting: It flowers in April.

**Habitat:** They can be observed on short-grass amongst sparse *Juniperus communis* subsp. *nana* (dwarf juniper) stands at heights between 1100 to 1350 m.



© Nursel İkinci



2.2.14.2. *Crocus adanensis* Baytop & B.Mathew



©Mecit Vural

(Note: Since there is no image of this species

captured in its natural habitat, a photo of a Crocus biflorus has been used for representation purposes.)

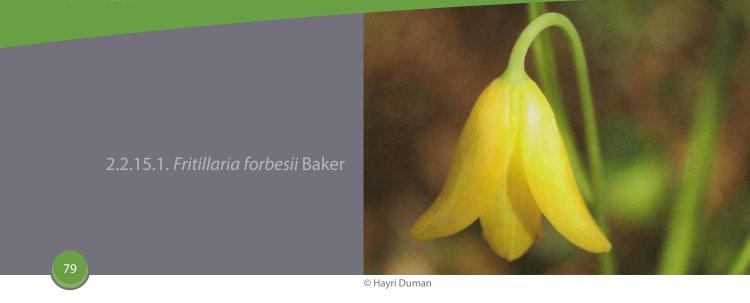
**Distribution:** They can be observed in Osmaniye-Haruniye (Kurt Castle).

**General Description:** A perennial herbaceous plant with a corm. Flower is light lilac with a white throat.

**Morphological Characteristics:** Corm tunic is membranous, finely fibrous at the base. Produces 2-3 leaves which develop simultaneously with the flowers with a width up to 1.5-2 mm. Lower halves of the leaves have white stripes. Perianth segments are light lilac, with a white throat, 2-2.5 x 0.4-0.7 cm in size. Anthers are 7-9 mm in size, yellow. Style branches 3, orange.

Flowering/Fruiting: It flowers in March.

**Habitat:** Grows on the edges of *Juniperus* (juniper) and *Quercus* (oak) maquis shrublands at an elevation between 750 to 1300 m.



Distribution: They can be observed in Muğla, Fethiye and Marmaris.

**General Description:** A bulbous perennial, herbaceous herb growing as tall as 8-20 cm. Flowers are pendulous, greenish yellow.

**Morphological Characteristics:** Bulb is up to 1.5 cm in diameter. Stem grows as long as 8-20 cm, occasionally tubercled. It produces 5-10 leaves that are linear-lanceolate to linear, all of which are alternate or lower ones are opposite; lowermost leaves are 5-12 x 0.5 cm, and upper ones are 4-7 cm in size. It produces 1-2 flowers; perianth is narrowly bell-shaped, greenish yellow; perianth segments are oblanceolate, 15-25 mm, outer ones 4-6 mm wide while inner ones are 3-5 mm wide. Filaments are 5-8 mm, tubercled. Style is 6-8 mm, clavate.

Flowering: It flowers between February and March.

**Habitat:** It is found in *Pinus brutia* (red pine) forests and maquis shrubs (serpentine areas), at an elevation up to 1000 m above the sea level.



2.2.15.2. *Fritillaria kittaniae* Sorger

© Mehtap Tekşen

**Distribution:** They can be observed in Antalya (south of Sinekçibeli strait)

**General Description:** A bulbous perennial, herbaceous herb growing as tall as 6-11 cm. Flowers are pendulous, light purple and yellowish-green.

**Morphological Characteristics:** Bulblets 2, bulbs are 1 cm in diameter. Produces 4(-5) leaves, alternate, elliptic-ovoid to narrowly elliptic-lanceolate; lowermost leaves are 2-4 x 0.3-0.5(-1) cm in size, semi-obtuse, glabrous, glaucous. Flowers grow individually, pendulous. Perianth is bell-shaped; outer segments are slightly curved, elliptic-ovate to narrowly obovate; 15(-18) x 4-6 mm, exterior matt purple; interior yellowish-green, with broad stripes; inner segments are elliptic-obovate, same size as outer segments, 5 mm wide, non-curved, light yellow, yellowish-green striped.

Flowering: It flowers in April.

**Habitat:** *Cedrus* (cedar) forests Bulblets 2, bulbs are 1 cm in diameter. Produces 4(-5) leaves, alternate, elliptic-ovoid to narrowly elliptic-lanceolate; lowermost leaves are 2-4 x 0.3-0.5(-1) cm in size, semi-obtuse, glabrous, glaucous. Flowers grow individually, pendulous. Perianth is bell-shaped; outer segments are slightly curved, elliptic-ovate to narrowly obovate; 15(-18) x 4-6 mm, exterior matt purple; interior yellowish-green, with broad stripes; inner segments are elliptic-obovate, same size as outer segments, 5 mm wide, non-curved, light yellow, yellowish-green striped.

# 3. Priority Large Mammal Species

L SETTING

Some forestry practices may strongly affect large manufal species and their habitats. All practices should be designed to cause minimum damage to the nature and cast minimum impact on the ecosystems and habitats that are home to countless species. In particular, large mammals are adversely affected by the surge in human activity, abnormally high sound levels, and disruption of their feeding and hiding habitats. Due to such activities, animals in a specific area may chose the leave that area and not come back for a very long time. An array of studies have shown that large mammals have opted out of certain woodlands, especially the ones that accommodate intense silvicultural and production activities.

Since they are at the top of the food chain in the forest ecosystem, and need extensive and diverse types of natural habitats, large mammals are directly or indirectly, yet profoundly affected by numerous forestry practices. Especially in woodlands where biodiversity is the top priority, forestry practices need to be carried out in view of the following considerations about large mammals as well as other living creatures that share the same habitat as large mammals and provide food to them:

 Rehabilitation, afforestation and natural regeneration practices should focus on planting diverse woody species with different periods of



© Ali Onur Sayar & Deniz Özüt

fructification, and conservation of existing fruit-bearing species.

- Particularly in areas where afforestation and regeneration practices are scheduled, existing fruit-bearing shrubs should not be entirely cleared-off during preparatory works, and mechanical cleaning of the understory should be avoided to the greatest extent possible.
- Although disinfesting the seeds have been shown to elevate success rates of regeneration and forestation practices, we have to keep in mind that it might be harmful to both small and large mammal species in case of overconsumption. In areas dedicated to conserving and improving biodiversity, use of pharmaceutical products such as repellents should be avoided.
- Especially in woodlands where biodiversity is the main concern, silvicultural practices aimed at preserving and improving the existing complex stand structure must be preferred while avoiding practices that would lead to a same-age, single-layer and single-species stand structure.
- As part of production works, tractor-skidding could be employed if there are existing skid trails. However, new skid trails should not be opened as they would lead to soil degradation for mechanization. Instead of these practices, methods involving aerial wires should be employed.
- Particularly in conservation priority areas, opening of new trails should be avoided; use of existing trails should be encouraged. In cases where it is inevitable to create a new trail on the other hand, valleys that are closed to trail networks should be preserved and kept away from human activity.



© Hüseyin Ambarlı

- Any silvicultural activities that might negatively affect the mixture of tree species within the stand should also be avoided. For instance, during forest thinning, not all other species that might put a pressure on the monumental trees should be cleared-off; fruit and or fresh sucker-bearing species should be preserved by conserving the intermediate and lower layers. This natural flora happens to be the food source for many large mammals including the roe deer, red deer and brown bear.
- Designed to cover the smallest land possible, proper silvicultural interventions should be finalized as soon as possible. The interval between periodic silvicultural interventions should be elongated so that new populations would have a chance to arrive and settle in the area after an intervention.
- Planning for the timing and place of silvicultural interventions should consider the biology and feeding habits of the species. For example, from mid-October to late-November is the heavy eating period for large mammals such as the brown bear before the winter arrives. Therefore, stand maintenance activities such as thinning should be carried out either long before or right after this period in order to promote food (seed) quality and quantity.

- It is recommended that prunning activities be scheduled for periods other than breeding season of large mammals. This is because, dried vegetation also provides large mammals with places of refuge and hiding throughout this season.
- Especially in woodlands where biodiversity is given top priority, employing methods that involve using smaller areas such as group regeneration technique is advised instead of regeneration methods that cover large areas (such as shelterwood).
- Constant intervention aimed at understory cleaning as well as mechanical methods should be avoided. In order to preserve fruit-bearing species such as cherry laurel, Jamaican cherry, myrtus, bearberry, blackberry, etc. which are major food resources for large mammals, it is recommended to use strip-cleaning techniques,



and avoid understory cleaning throughout the entire area.

- In addition to species such as chestnut, juniper, wild cherry and mountain ash in the natural vegetation, medicinal and aromatic plant species should be preserved individually or in groups, encouraging their population.
- Oak and beech stand in the stem exclusion stage rank among the top feeding zones for many large mammal species. In such areas where density is profoundly high, thinning practices should be undertaken at a moderate intensity; simultaneous thinning across vast areas that are interconnected in terms of the ecosystem should not be avoided. It is recommended that new maintenance tracks in addition to existing ones not be opened. In these areas, practice cycle periods should be as long as possible (e.g. 10 years).
- It is particularly essential during rehabilitation and forestation activities that areas smaller than one hectare not be afforested and kept in its natural state in view of feeding and reproductive needs of large mammals.
- Density and initial thinning maintenance activities carried out in autumn in an effort to prevent trunk and crown fractures that might occur in winter due to reasons such as snow pressure may cause shelter and feeding problems for large mammals. Such silvicultural practices should be undertaken in spring at the earliest.
- Especially in woodlands dedicated to conservation of biodiversity, human pressure should be mitigated; and to this end, protective measures should be intensified. For instance, entry of dogs to such areas during the breeding season of large mammals should be prevented; informative and warning signs should be placed on the roadside to raise awareness about the special status of the area.

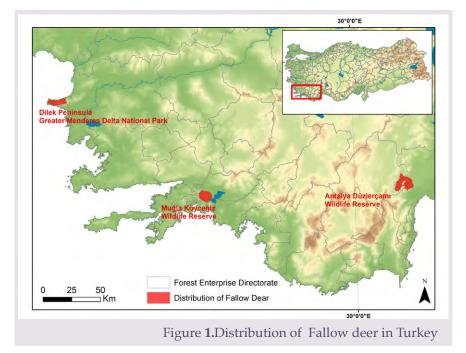


Fallow deer Dama dama

© Ahmet Karatas

**Descriptive Characteristics:** With a body length of around 130 to 165 cm and shoulder height of 85-115 cm, the species weighs between 45 and 120 kg. It has a reddish and brownish summer coat which turns brown and grey in winter. Although the spots are prominent in summer, they fade away in winter. Males have antlers all year round, apart from the period of March-April when they start to shed their antlers. Females do not have antlers. Black and white, the tail is prominent.

**Distribution:** Naturally found in Turkey only around Antalya – Düzlerçamı, fallow deer were captured in 2011 in Antalya and released to Dilek Peninsula – Greater Menderes Delta National Park which was previously their home range.



Integrating Biodiversity into Forestry - Practitioner's Guide

81

**Population:** It is estimated that there are 100-120 fallow deer within a fenced-area in Düzlerçamı-Eşenada Breeding Facility located in Antalya, and the total number might be as high as 200-250 including the ones outside the fence.

It is reported that 12 fallow deer have been living and breeding in Dilek Peninsula National Park (Aydın) since 2012.

**Habitat:** They live at elevations up to 800 m above the sea level. Their habitat in Düzlerçamı consists of red pine forests maquis and areas covered in dense shrubs. In addition, they are known to have previously inhibited oak woodlands and olive groves back in their former home ranges. They do not tend to inhabit rocky and stony terrains; they rather live on soil grounds, sparsely stony areas and meadowlands in forests and forest openings.

It is essential for them to have access to a water resource in their home ranges, especially during summer. They do not naturally inhabit regions where the winters are harsh; they prefer a warm and rainy winter weather.

**Home Range:** Across convenient habitats, and under favorable conditions, the average population size would be 15 individuals per an area of 100 hectares. Although it would vary depending on the season of sex of the animals, the size of their home range may grow up to 300 hectares.

**Food:** Their diet includes various herbs, leaves of numerous maquis shrubs and fresh suckers. They also visit the citrus groves near their home ranges for feeding purposes.

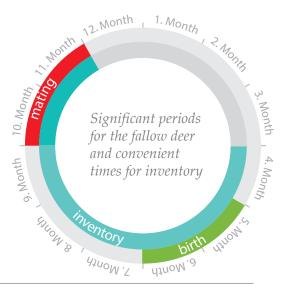
**Daily Activity:** Mainly nocturnal creatures, fallow deer are most active especially right before dawn and at sunset. They spread throughout forest opening early in the morning and in the afternoon. They tend to rest in the shade inside the forest during the rest of the day.

## **Seasonal Activity:**

**Breeding:** Their mating season would cover October and November. Following a gestation period of 8-9 months, they give birth around May and June, rarely to twins. As the birth nears, pregnant females leave the group and come back around 10 days after delivery. During this period, females are very sensitive to external factors.

### **Inventory:**

Recommended methods for taking inventory of fallow deer are listed below. Before on-site documenting, it would be advisable to get in contact with key informants from the area to receive reliable information. Next, in light of these information and preliminary studies about the site as well as experiences (if available), it is recommended to perform trail and dropping tracking to document the prevalence of the species within a designated area; direct observation should be preferred if possible. If the area to be scanned is relatively small, and there is enough time, camera traps can also be used.



**1. Direct Observation:** Watching the area using binoculars or telescopes at sunrise, from high-ground that allows for a clear view of openings within the forest inside the designated area would give an idea of the number of fallow deer. Being familiar with the area to be scanned and the specific locations known to be preferred by the fallow deer would decrease the workload and the amount of time to be spent on the field. That is why, it could be a good idea to work with a local hunter or shepherd who has profound insight about the area. This technique would yield the best results between September and November, i.e. the mating season for fallow deer. It is recommended that watch-spots are chosen from among locations with a clear view of the area, where fallow deer would not be able to see the observers. In addition, taking environmental factors into consideration such as making sure that the observation does not take place on a foggy or windy day would help with the success rates of inventory efforts. The most convenient time for observation during the day would be early in the morning and sunset in the evening.

**2. Tracking of Traces and Feces:** Looking for traces and droppings of fallow deer within the designated area could provide insight on the prevalence and volume of the species. For droppings, it would be advisable to scan the openings in the forest and nearby citrus groves (if any) as these are the places the fallow deer would be visiting in search of food. For traces, it would be ideal to explore the trails and pathways after a rainy day, when the ground is soft. Trace and dropping tracking should be performed during the day between sunrise and sunset when fallow deer are known to be inactive in order to not disturb the daily routine of these animals.

**3. Camera Trap:** A camera trap can be used for documenting the prevalence of fallow deer without having to actually be present on-site. Since it is a non-invasive method, it could be employed as an auxiliary technique to support the main methods of direct observation and trace and feces tracking. Camera traps should be placed at a height of 60 cm along the paths by which the fallow deer are likely to pass. Placing the camera traps facing the path horizontally rather than vertically would minimize the risk of missing the capture of animals using the path. Each camera should be checked and tested following setup.

**Recommendations on Forestry Practices:** Since the areas inhabited by the fallow deer in Turkey are very limited, the practices to be carried out in this region should focus on meeting the habitat needs of this species and improving their well-being. In this context, advice and expertise from the teams of local Natural Conservation and National Parks must be used.

Woodlands that are known to be the home range of fallow deer should be preserved in their natural form. In other words, small group thinning aimed at creating near-natural openings in the forest could be preferred over large and small-span regeneration efforts. Grassy areas within the forest and the openings on the edges, the layer consisting of herbaceous plants, shrubs and bushes within the understory and their density are essential for the fallow deer's feeding and protection. In addition, the bushes within the understory and on the edges of the forest provide the fallow deer with favorable placed to hide their offspring during the postpartum period. These bushes should not be cleared off.

Especially trees such as olive, phllyrea and oak are major food sources for the fallow deer. During forestation activities, it would be advisable to prefer these tree species to feed the fallow deer. They would provide extra nutrients for the deer. It should be ensured that people stay away from areas known to be inhabited by the fallow deer in May and June, i.e. the breeding season, and forestry practices should not be carried during this period.

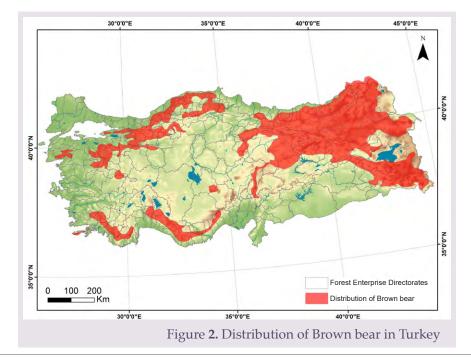
For further information, please see Chapter 9.2 for a table presenting the results from an assessment on the impact of general forestry practices in Turkey over conservation priority fauna species/groups.



**Descriptive Characteristics:** Brown bear is the largest mammal living in Turkey. As is known, the average weight of females ranges between 80-150 kg and of males between 100-230 kg, and their sizes may vary between 110-230 cm. The fur coloration ranges from gray to brown, golden yellow, black or light beige. In rocky areas at high altitudes, the coloration may be brown and silver, or the shades of silver.

**Distribution:** It occurs in Central Anatolia, in some provinces of the Mediterranean and Aegean regions, and in many provinces except some areas close to the Thrace Region and the Syrian border.

Population: The population of brown bears in Turkey is estimated to be over 4000 individuals.



**Habitat:** Any slightly hilly environment with sufficient cover to hide provides habitat for brown bear. It can live in many different habitats with the locations ranging from sea level to high mountains. It cannot live on flat plains and in areas with no cover. In general, it favours forest openings, alpine stony and rocky areas with food, and highly enclosed coniferous and deciduous forests where it can hide in the daytime far away from the human intervention. It does not have constant or seasonal nest but uses dense forests in dip slopes to rest in the daytime.

For hibernation, it favors southern slopes, elevations of 2000 meters and above, dense forest covers or natural old forests, or rocky and steep slopes that are hard to reach.

**Home range:** Brown bears can travel across the area of 1000-4000 ha but in certain seasons can live in a limited space until the depletion of resources. Brown bears live alone. However, the habitats of different individuals may overlap. Its home range may overlap with the range of animals like chamois, wild goat, wild boar, European roe deer, marten, fox, wolf, etc. There is a competition for space between brown bear, wolf, and wild boar.

**Food:** The brown bear eats a wide variety of food but usually choose herbivorous diet. It may eat large mammals (such as wild boar cubs), small mammals (such as mice, rabbits), bird eggs, insects and larvae, plant roots and fruits. It may feed on honey and larvae in beehives during harsh climatic conditions in spring, alfalfa, fruits in orchards and crops in fields in summer, and sometimes may feed on domestic animals. To eat the shoots of fruits and vegetables, it waits until they are mature and full of vitamins and protein.

**Daily Activity:** Brown bears generally start getting active in the twilight and continue searching for food until the predawn hours. During the daytime, they mostly rest. They can also become active and seen during the daytime in areas with little human intervention and the temperature below 20°C.

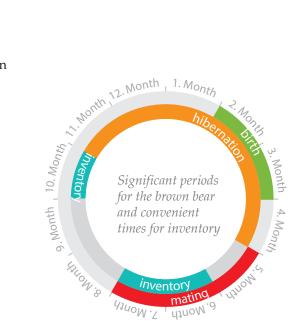
### **Seasonal Activity**

**1. Hibernation:** Brown bears go into a winter sleep based on the climatic conditions in November and December, and wake up between March and April. However, this is not exactly a winter sleep but rather a state of sleep spread over 3 to 5 months. During this time, individuals can be easily aroused. Female bears can give birth while hibernating, and the cubs can suckle without waking their mother up. Brown bears lose a lot of weight while hibernating, thus becoming more susceptible to disturbing external factors right after hibernation. In the weeks before and after hibernation, the nutritional needs of bears increase a lot making them intensify their search for food during the daytime.

**2. Mating and Breeding:** Brown bears live long, mature late and have a prolonged reproductive cycle. They are promiscuous; thus, a female can mate with two different males in one day. Mating starts in mid-May and may last until July. The female's oestrous period during this time lasts 10-30 days. The fertilized egg does not implant on the uterus until autumn. The bear cubs are born in February or March underdeveloped, weighing around 500 grams with eyes closed, and helpless. Adult female bears give birth once every 3 years as they take care of their cubs until they become self-sufficient, and do not mate with another bear during this time.

**Inventory:** The best period for the inventory of brown bear is the time between the first weeks of June, mating time, and the first weeks of October. Here are the methods that can be applied in the field:

**1. Collecting Local Information:** Information is collected within the boundaries of the Forest Enterprise Directorate to be surveyed by visiting locations with features proper for the life of brown bears and consulting local people and hunters, if any, about the distribution of brown bears in the region, spots observed, zones known to be used (by bears), and making a decision on the reliability of such information. Recording information on the occurrence of brown bears in the areas with high probability requires direct observation, tracing and scat identification.



**2. Direct Observation:** It is effective in areas with low visibility and vegetation in open terrains and mountainous areas.

**3. Tracking Marks and Other Signs:** The scat of the brown bear, its hair and claw or biting marks left on a tree through rubbing or scent marking can provide proof that a bear recently used this spot. The scat of the brown bear is significantly larger than the scat of living beings in the entire forest. It contains grass in spring, fruit seeds in summer and the seeds of pears and apples, pits of plums in autumn. Trees marked by a brown bear in the east are mostly pine trees with a diameter of 20-40 cm. However, it rubs the spruce and fir trees on two legs leaving hair on them. In addition, bears mark the telecommunication and electric poles impregnated with creosote (substance that looks like black pitch on brown poles) (green poles dipped in insecticidal water). This is the most suitable method for collecting geodata in areas like the Eastern Black Sea coasts and slopes.

**4. Camera trap:** Another method to apply is to place camera traps in a number of areas to sample all types of habitat that is likely to be used by bear. When choosing camera station points, it is important to identify the bear marks observed and the pathway it used. Camera traps should be set at least 50 cm above the ground and not directed at the pathway but at the arrival or departure routes minimizing the probability of camera traps overlooking the animal. Each camera trap has to be tested after installation. However, this method can be applied in smaller areas as there is not enough time to use camera traps in the whole area during rapid evaluation surveys undertaken towards integration.

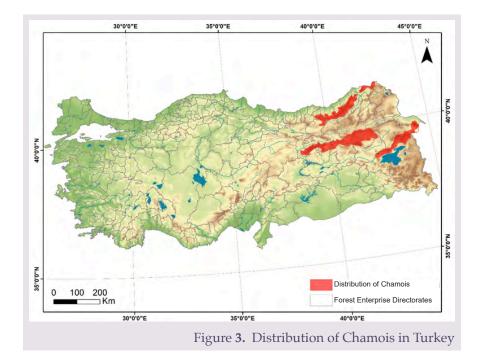
**Recommendations on Forestry Practices:** Brown bears use large areas and require various habitats for seasonal feeding, sheltering, reproduction, and hibernation. It is therefore important that all habitats such as closed canopy forests, wild fruit trees and shrubs, oak areas, open forest areas and its edges, steep cliffs with some forest texture exist together in their natural state in the regions inhabited by bears. Thus, it is important that forest management activities do not transform a region with diverse forest closure, stand types and underforest vegetation into a homogeneous / uniform structure.

As brown bears are negatively affected by human activities in their natural habitats, it is important to avoid new road construction, road extension, intensive production and other similar forestry activities in the regions inhabited by bears. When necessary, such management activities should be limited to the period from November to February so that the brown bears are less affected by such developments.

For further information, please see Chapter 9.2 for a table presenting the results from an assessment on the impact of general forestry practices in Turkey over conservation priority fauna species/groups.



**Descriptive Characteristics:** Its body is 100-120 cm tall, and shoulder heights varies between 70-80 cm. Adult chamoix weighs 35-50 kg and are slightly more slender animals than wild goats. Their fur is light brown in summer and dark brown and black in winter. Their faces are light yellow and white with black thick lateral stripes that start from the eyes and go down to the mouth. The light yellow-white neck is followed by a wide black stripe on the chest. Its tail is 6-10 cm long, thick, and black in color. Males and females have horns, which rise straight from the forehead to 18-20 cm upright and then bend back and down forming a hook with a total length of 25-30 cm.



**Distribution:** It is distributed in the westernmost part of the Eastern Black Sea Region up to Ordu. It spreads along the mountain ranges extending towards the Eastern Black Sea: the mountains around Erzurum extend eastward from Munzur Mountains between Erzincan and Tunceli. It still occurs in the north of Ağrı. However, the information on its occurrence further in the south and north of Lake Van and Bitlis is uncertain.

**Population:** There is no clear information on the size of its population in Turkey. The recent years inventories in the wildlife development areas known for their occurrence does not show more than 1000 individuals.

**Habitat:** They favour open areas such as steep rocky slopes, alpine meadows, mountain steppes, but also use high bush and forest areas. They are spread in mountainous broadleaf, coniferous and mixed forests. In summer and winter, they favour different areas. When the high lands fall under the snow in winter, they come down to lower safeguarded elevations with less or no snow. In spring, they return to high elevations with grass.

**Home range:** The size of a home range used throughout a year varies between 100-700 ha. Females, compared to males, usually forage in larger areas to find better food for their calves in spring and summer. Males can travel as far as 15-20 km during autumn-winter for mating.

**Food:** In spring and summer, most of the nutrients are taken from herbaceous plants, and partially from the leaves and shoots of bushes and shrubs. In winter, it is still herbaceous plants, leaves, pine needles, and algae.

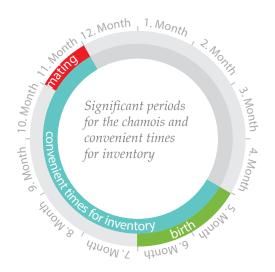
**Daily Activity:** It is a diurnal animal, though rarely active in evenings. It begins wandering and grazing at daybreak. Especially in summer, it rests more at noontime and keeps actively grazing towards the afternoon.

**Seasonal Activity:** In summer, they use meadow and grassland on the high steep slopes of a mountainous area. In winter, they come down to lower and warmer elevations with little/light snow cover. Females calve in May. During the reproductive period, November-December, the females and males form mixed groups. In the rest of the year, females, offspring and young individuals form joint groups, while males live separately or in separate groups. Females change more places between seasons than males.

**Breeding:** During the reproductive period in November, some males defend the less-snowy areas favored and grazed by females, and mate with them. The rest of the males travel around these areas and try to seize the opportunity to mate. This is why the population in the reproductive period is mobile and formed by males defending 4-10 hectares and females using this area, and males wandering in the area. The mating period continues from the end of October to the beginning of December. Calving occurs in May-June.

**Inventory:** The most suitable inventory period for chamois is November-December. It requires consultations with local people and local authorities for information about the use of area by the species and reliable point records. It is also recommended to directly observe and install camera traps in the areas where the species is rare and has low density.

**1. Collecting Local Information:** If chamois population occurs in the Wildlife Development Areas located within the boundaries of the Forest Enterprise Directorate subject to survey, the relevant information (stocktaking, observations results, etc.) has to be obtained first from the relevant office of the National Parks (Directorate).



Apart from the Wildlife Development Areas, it is necessary to visit especially the settlements located in or close to the areas that can provide connection between the Development Areas, and collect information from local people and hunters, if any, about the occurrence of chamois, its distribution, spots observed, and zones inhabited.

**2. Direct Observation:** Based on the information collected locally, the species distribution areas are visited early in the morning or in the evening, and the slopes are observed with the help of binoculars and telescopes for individuals and herds. If there is a need for data on population size and its composition in the area, enumeration should be done through identified observation spots in November - the reproduction period - before snowfall. The best time for inventory activities is daybreak and sunset.

3. **Camera trap:** This method can support inventory activities and can be applied in smaller areas. Chamoix often use forests and areas near forests more intensively in winter. To determine their occurrence in forest areas, it is therefore recommended to place camera traps at possible transit points within a forest, and operate traps at least for a month. Camera traps can be attached to a tree about 50-60 cm above the ground on the chamois pathways. Camera traps directed not at a pathway but rather at arrival or departure routes of the animal provide better results.

**Recommendations on Forestry Practices:** Chamoix usually live in mountainous areas higher than the forest borders in late spring, summer and early autumn. In winter, they come down and starts using high mountain forests and the surrounding area. Therefore, it is important not to have maintenance, production, road paving, etc. activities in the areas inhabited by chamoix, i.e. forest upper and lower (up to 200-300 meters altitude) areas, during the period starting from the end of October to spring.

Poaching is another most important threat posed to the species. The organization of Nature Conservation and National Parks, which provides protection in areas inhabited by the species, should be supported in the fight against poaching.

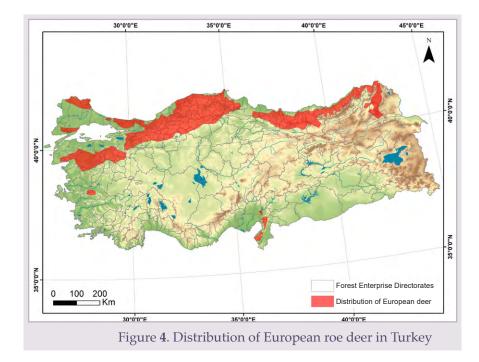
The alpine and subalpine mountainous areas known as habitats of chamoix should not be permitted the activities adversely affecting the wildlife such as intensive tourism, helicopter skiing trips in winter (heli-skiing), construction of new roads on pasturelands, and construction of roads that improve connectivity across mountain ranges and dams.

For further information, please see Chapter 9.2 for a table presenting the results from an assessment on the impact of general forestry practices in Turkey over conservation priority fauna species/groups.



**Descriptive Characteristics:** These animals have a body length of 95-130 cm and a shoulder height of 65-75 cm. They weigh between 15 and 30 kg and have brown and gray fur. They are short-tailed and have a white spot behind their bodies. Only males have antlers.

**Distribution:** Being one of the most common herbivorous species in Turkey, European roe deer inhabit Black Sea Region and parts of the Marmara and Aegean Regions as well as the forests in Amanos Mountains (Nur Mountains) located in the Eastern Mediterranean Region of Turkey.



**Population:** Although a precise information on the number of European roe deer living in Turkey is yet to be achieved, it is estimated that there are around 6000-7000 of them.

**Habitat:** European roe deer is widely known to be a species inhabiting forests. They live particularly in damp forests composed of deciduous trees as well as coniferous ones, which are highly productive. Having a particular behavior of watchfulness, European roe deer usually prefer forests with high levels of closedness. However, they are also often observed in glades early in the morning and at sunset. Fertile meadows in such areas are extremely important for their nutrition. European roe deer, however, can also survive in Europe and Aegean Region, where the structure of forests degenerates. In such areas, they live near small coppices, orchards and meadows and agricultural land neighboring woods.

**Home Range:** Depending on the productivity and distribution of resources (e.g. water) in the habitat European roe deer live in, the home range of the individuals varies between 10 and 200 hectares. Forming small groups in winter when finding food is difficult, European roe deer separate from each other with the coming of Spring, when males can be observed wandering lonely whereas females can be found in groups of few members. During postpartum, followed by rut and copulation, they spread across a wider area for food. European roe deer inhabiting Black Sea, where their largest population is reported, share the regions they live in with other large mammal species such as brown bear, wild boar, red deer, wolf, coyote, fox and Eurasian lynx.

**Food:** Food preferences of European roe deer may vary depending on the productivity of the area. The typical diet of this species mostly includes seeds like chestnut and acorn with high nutritional facts as well as young shoots of forest trees and young herbaceous plant sprouts in the regions where understory vegetation is dominant. Besides, they can also live on moss, mushroom and lichen.

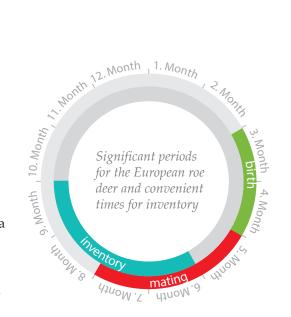
**Daily Activity:** European roe deer is a species that is mostly active both days and nights. However, they are known to be more active especially in the morning and at sunset. During this time of day, they are seen in glades and forest edges.

### **Seasonal Activity**

**Breeding:** Seasonal activity of roe deer peaks in May and June, the mating season. Besides, activity at a high level is observed in forests which are productive in terms of food sources from the Summer months until the coming of Fall. The seasonal activity of the species which gets even lower with the coming of Winter, reaches its minimum level in March and April as the females tend to go to the areas with dense group of trees or bushes which are relatively safe during the breeding season.

**Inventory:** The most convenient time period for the inventory of European roe deer starts with summer months following their copulation and ends with the early Fall. A considerable rise in the activity of this species is also observed due to the rich content of the forest ground at this time of the year and dramatic increase in the number of water sprouts and plant shoots.

**1. Collection of Data on Local Scale:** Within the area of responsibility of the Forest Enterprise Directorate, the residential areas which are also suitable for the inhabitance of European roe deer will be visited and information regarding the distribution, the spots they are seen and the areas known to be used by them



will be collected through the accounts of the residents and hunters, if there is any. The information will be then assessed for its reliability, followed by direct observation and tracking of traces and feces in order to document records from these areas where the possibility of finding the roe deer is high.

**2. Tracking of Traces and Feces:** Using the inventory method which relies solely on tracking traces and feces is difficult as the forest ground is covered with vegetation and deposit, which makes the tracking traces and feces of the European roe deer harder. Even so, when the traces and feces of the European roe deer is identified, tracking of traces and feces can ensure important records, documenting the existence of the species in the area.

**3. Direct Observation:** European roe deer choose specifically forests to live in, which makes the method of close observation unsuccessful. However, it might be possible to observe the individuals in glades early in the morning and at meadows on which sun shines during sunset.

**4. Camera trap:** Alternatively, a camera trap can be used as a non-invasive method to be able to support inventory works even in small areas. Camera traps are located at a high of 60 cm or more along the paths by which the roe deer are likely to pass. Placing the camera traps facing the path horizontally rather than vertically minimizes the risk of missing the capture of animals using the path. Each camera trap should be checked in test mode following their setup.

**Recommendations on Forestry Practices:** Bushes, shrubs and tall herbaceous plant covers composing understory in the forest stands where European roe deer are known to be living in should be left untouched as they need them to hide and live. Understory and the vegetation that blanket over the glades (herbaceous plant, bush and shrubs etc.) also supply food for roe deer. It is recommended that glades located in the central area of the forest and those located near the forest edges be preserved in their natural forms. The trees with leaves are also advised to be conserved. Besides, it is also of importance that the nearby water resources be not polluted and the continuity of the course of them be not intervened.

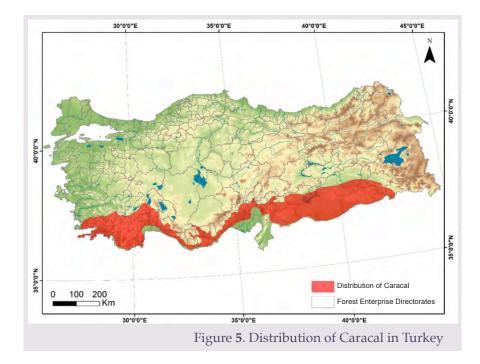
European roe deer are among the species which are under the threat of poaching, as a result of which they are reported in fewer numbers than they should actually be in the areas they populate. Another pressure that European roe deer feel is the wild dogs, with a recently increased density in some areas. In the areas known to be increasingly populated by roe deer, a cooperation with the local forest organization, nature conservation and national park crews in order to fight against poaching and wild dogs might be a sound idea.

For further information, please see Chapter 9.2 for a table presenting the results from an assessment on the impact of general forestry practices in Turkey over conservation priority fauna species/groups.



<sup>©</sup> Ali Onur Sayar & Deniz Özüt

**Descriptive Characteristics:** Named after the black tufted ear, caracal (*Caracal caracal*) is a medium-sized member of Wild Cat Family (Felidae). Its coat's uniformly reddish or sandy color is lighter in the ventral parts. While they can weigh up to 20 kg when fully mature, the body of females are smaller compared to that of males. Their hind legs are larger than the front ones and look stronger. This feature of caracals allows them to jump up high with ease. Apart from these, they are taller than Eurasian lynxes and they are particularly identified by their tail which is unexpectedly short in comparison to the size of their body.



**Distribution:** They are known to live in Middle and Southwestern Asia, Africa, Nile basin and Arabian Peninsula. Although recent updates suggest that their population in North Africa is on the edge of extinction, it is known that there are healthy populations of this species in other regions in the continent. The populations in Asia are scarcer than those in Africa, though. The latest updates by IUCN also report that the population in Turkey is found nowhere but Western Mediterranean and the Southern Aegean regions. According to this, distribution of the species over Anatolian peninsula is restricted to forest areas located to the South of Aydın, Denizli and İzmir and an area stretching between Datça peninsula and Amanos Mountains (Nur Mountains). They are rarely seen in Eastern Mediterranean. There have been no reliable data collected regarding the distribution of the species in Southeastern Anatolia and North Aegean region.

**Population:** The population size of Caracals has yet to be estimated through scientific research. However, the existing population in Anatolia seems restricted to Western Mediterranean region only, which can show a broken contact with the other groups distributed over the world. Despite being few in number, studies on Caracals suggest that their population has a downward trend in recent years. Therefore, not only the size of the existing population but also the distribution, which is another significant parameter, should be particularly taken into account in conservation and planning works.

**Home Range:** The size of Caracals' home ranges is known to vary depending on the geographical conditions of the region they live in. It is also noted that males inhabit a larger area in comparison to that used by females. Despite showing discrepancies in different regions, the size of the areas in which males live doubles that of females. While males can share their area with other males, females are more defensive, which stands out as the main reason of the gap between the size of areas. It is also known that Caracals inhabiting African continent uses a smaller area when compared to those used in Asian continent. In short, the home range of the species varies depending on gender, the area inhabited and abundance of prey and is estimated to cover an area of 10 - 300 km<sup>2</sup>, which is quite large.

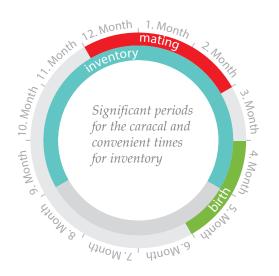
**Habitat:** Although caracals are thought to be desert animals due to the fact that their distribution is quite large in Africa and Middle East, it is observed that they better adapt to areas with bush and scrub and are rarely found in extremely arid regions. The species lives mostly in the borders of two different habitats where edge effect manifests itself. The species living in groups are observed often in forest areas in the Asian continent, whereas those in Africa are not. In particular, the vegetation in Mediterranean region that is composed of Calabrian pines and shrub is the habitat of the species. On the other hand, habitat preferences of Caracals may change depending on the variety and abundance of the prey they rely on, as in all other carnivorous mammals.

**Food:** It is known that Caracals rely on a variety of preys changing from one location to another. This variety of preys is a good explanation for the high adaptive skills and wide distribution of this species. It is also noted that Caracals live on rodents or small mammals such as rabbits while their populations in Africa eat various monkeys in addition to herbivorous animals, namely impala and gazelle. Bird species such as pigeon, dove and partridge also have a significant share in the diet of Caracals. The ability of them to jump up high allows them to hunt these with ease. In Turkey, though, it is recorded that mostly rabbit and small mammals make up their diet as well as wild goat kids in some places.

**Activity:** More active at nights, Caracals go hunting at different times of a day depending on the prey they are chasing, which causes an activity in the mornings, too. Nevertheless, hunting in an active manner generally takes place at nights. It is observed that especially males are more active in breeding season. The Caracals living alone usually meet during this period and females can even copulate with more than one male, at times. Breeding season that comes only once, is usually the end of Winter, depending on the geographical conditions of the area in which they live.

After copulation, gestation period takes around 2.5 months after which birth takes place in Spring. Caring of the babies lasts about 10 months. During this period, mother Caracal feeds and takes care of them. Especially in the first 2.5 months of the growth period, tree hollows, trunks of dead trees, abandoned hollows or caves used as nesting sites also function as a safe place for vulnerable offspring to live in. This is the most critical period for the offspring which are going to leave their mother when they are of breeding age after 12 months.

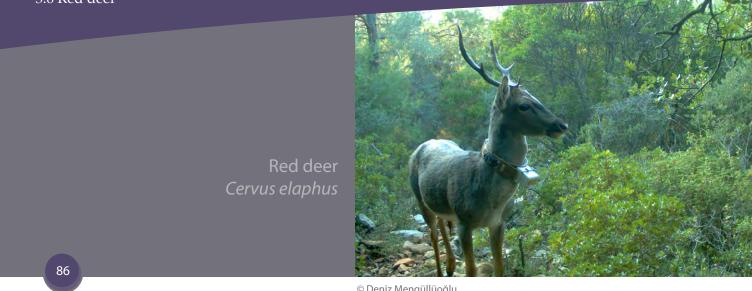
**Inventory:** Caracals are quite timid and usually active at night, which makes the conduction of inventory works based on methods requiring Direct Observation of individuals challenging. That is why indirect methods should be employed to conduct censuses with the aim of identifying the population size. In this sense, collecting feces and hair through fieldwork and analyzing the DNA composing them, which is reproduced in vitro, through the use of genetic markers can produce results. The individuals, from which the samples are taken, can be distinguished from each other thanks to this method, even if they are not observed directly. Thus, statistical analysis that can shed light on the population size can be made with high precision. Even though the reliability of the data produced by using this method is indisputable, the possibility of



working on a damaged DNA which is obtained from samples exposed to field conditions stands as a major obstacle. For this reason, it is of importance that the samples be not exposed to temperature and sunlight for long. Accordingly, the efficiency of the aforementioned works decreases in Summer. In addition to this, photographs taken through the use of camera traps can be compared in terms of the abundance of the individuals captured, through which the tendencies can be observed, even if the population size may not be estimated. Unlike Eurasian lynxes, the coats of Caracals do not have a particular design varying from one individual to another, as a result of which photos taken by these cameras cannot be used to estimate the population size.

**Recommendations on Forestry Practices:** When the current distribution of Caracals within the borders of Western Mediterranean region where the Calabrian pines have a dominance is considered, the types of forestry practices and applications in these areas stand out as extremely important. The usual fire regime in the Calabrian pine forests lead to some special applications with the aim of preventing fires. In this sense, precautions like cleaning of litter at regular intervals and removing dead or felled trees ensure a reduction in the amount of the potential fuel which would accelerate fire, otherwise. However, this cleaning also means destroying the potential nesting sites of Caracals. The natural forest floor is also extremely important for the species that are potential prey for Caracals. Regarding this fact, the precautions to address fires have to be optimized and limited at early planning stages, especially in the areas Caracals populate. Similarly, works for obtaining forestry products in district forests should be thought through well, taking the early Spring, which is of vital importance for the Caracals, into account. Last but not least, while planning hunt permissions for the species that Caracals live on, the fact that a change in the number of the individuals of them would have a direct impact on Caracals should be considered and the practices in the areas without any conservation status for Caracals should be shaped accordingly.

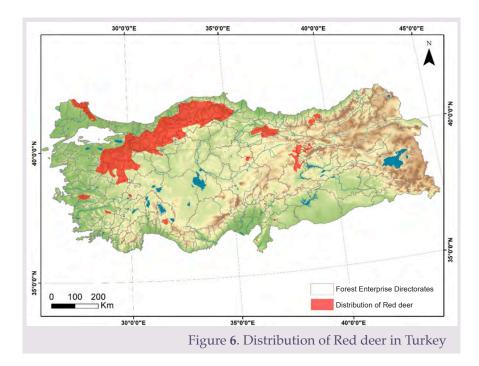
For further information, please see Chapter 9.2 for a table presenting the results from an assessment on the impact of general forestry practices in Turkey over conservation priority fauna species/groups.



© Deniz Mengüllüoğlu

Descriptive Characteristics: They are large animals with a body length of 160-250 cm and a shoulder height of 105-150 cm, weighing between 150 and 250 kg when fully mature. They have a reddish coat coloration in the summer, while in winter brown and grey coloration is prevalent. Only males have antlers and they fall off the heads in March and April after which that year's antlers grow until August.

**Distribution:** The largest area they live in is between the western Black Sea and inner Aegean regions, whereas few of them can be found in Black Sea, Central Anatolia and Marmara regions.



**Population:** Although a precise information on the number of red deer living in Turkey is yet to be achieved, it is estimated that there are around 6000-7000 of them.

**Habitat:** Their habitats are plains at sea level and mountainous areas up to 3000 meters and the forests with oak, fir, juniper, beech and pine as well as glade and meadow. They also live in sparsely vegetated areas. They prefer the forests with a rich understory.

Home Range: The home range varies between 200 and 2000 hectares depending on season and sex.

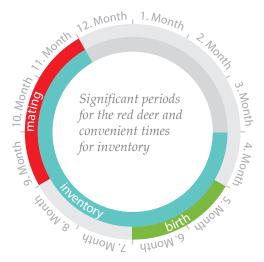
**Food:** The food sources are various: They live on bushes, young water sprouts and leaves in the forests while relying on grass and bush outside them. It is also noted that that they can feed on cultivated crops if there are agricultural activities nearby the area they live in.

**Daily Activity:** They are active early in the morning, at sunset and night. They spend their daytime laying down, ruminating and resting in the inner parts of the forest.

### **Seasonal Activity**

**Breeding:** Copulating between September and November, red deer give birth after a gestation period of approximately 250 days. When it is time to couple, female red deer gather in an area, and males compete each other to be able to copulate. The fights at this time may result in injuries, too. From May to June, the pregnant females leave their groups to live alone for a couple of weeks. Fawns are able to be out at grass in around 4 weeks. Forestry practices that may disturb red deer during copulation and especially giving birth should be avoided.

**Inventory:** The methods recommended to be used are listed as follows. It is necessary to meet local people to collect reliable data before collecting data in the field. Next, in the light of the information learned from locals, preliminary work on the area and experience, if there is, traces and feces should be tracked and direct observation method should be employed, if possible. Whenever the aim is to scan small areas and there is no time limitation, camera trap method can be used, too.



**1. Collection of Data on Local Scale:** Within the area of responsibility of the Forest Enterprise Directorate, the residential areas which are also suitable for the inhabitance of Red deer will be visited and information regarding the distribution, the spots they are seen and the areas known to be used by them will be collected through the accounts of the residents and hunters, if there is any. The information will be then assessed for its reliability, followed by direct observation and tracking of traces and feces in order to document records from these areas where the possibility of finding the red deer is high.

**2. Tracking of Traces and Feces:** The glades and their surrounding area in the forest can be scanned as red deer feces can be found in higher density in these places, where red deer use to find food. Traces can be found on paths composed of gumbo. Forest roads and paths located in the areas where Red deer are known to distribute based on reliable information should be scanned both by vehicle and on foot to get the records of traces and feces.

**3. Direct Observation:** When the sun rises, observations by using binoculars and telescopes in glades and alpine meadows near tree line located in the area being studied is one of the ways to see red deer in the area. Identifying the study area and the knowledge of the locations inhabited by red deer save time and energy. To this end, involving local people who know the area well such as hunters or hunters in the process can be effective. The optimum time for the use of this technique on red deer is when they are in breeding season between September and November, and to be more precise, late September and early November. It is recommended that observation sites should not be seen by red deer and have an open view. Also, the consideration of environmental factors such as fog and wind are likely to enhance the inventory's success. The best time for inventory is the early morning and sunset in the evening.

**4. Camera trap:** A camera trap can be used as a method to be able to support inventory works in small areas. Camera traps are located at a high of 60 cm or more along the paths by which the roe deer are likely to pass. Placing the camera traps facing the path horizontally rather than vertically minimizes the risk of missing the capture of animals using the path. Each camera trap should be checked in test mode following their setup.

**Recommendations on Forestry Practices:** The leaves of herbaceous plants and bushes and shrubs in the understory are the main source of food of red deer.

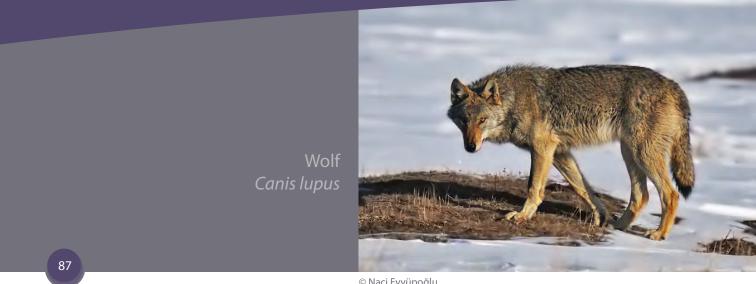
In the areas where their inhabitance is known, the vegetation and understory should remain as untouched as possible.

In the areas known to be used by red deer for breeding and shelter, the works which are noisy and involve high human intervention should be avoided, especially during breeding, birth and postpartum. There should not be construction for widening roads or paving new ones in these areas except for a case of dire necessity. In the areas known to be home range of red deer, the closedness should not be decreased by cutting practices such as coppicing and maintenance, and these processes should not be carried out for a long time or repeatedly in the same area and its surrounding area. Otherwise, red deer can leave these areas temporarily (for short or long term) or permanently, which will affect their chance of survival adversely, leading to miscarriage, poor care of fawns, stress etc.

Clearings to create small spaces will affect the home range of red deer positively, especially in the forest areas with high levels of closedness but poor in glades.

There is pressure of poaching on red deer. To address it, it is important that district forestry crews work in collaboration with those working under the nature conservation and natural park.

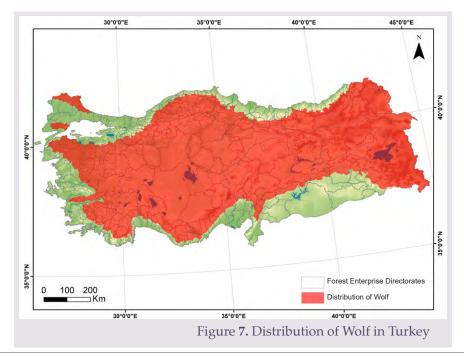
For further information, please see Chapter 9.2 for a table presenting the results from an assessment on the impact of general forestry practices in Turkey over conservation priority fauna species/groups.



© Naci Eyyüpoğlu

Descriptive Characteristics: Wolves that form the largest group of the dog family (Canidae) in Turkey weigh 32-50 kg and they measure approximately 90 cm in shoulder height. Looking large and strong, wolves carry their bushy hirsute tails downward unlike domestic dogs. Their footprints and feces are hard to distinguish from those of large domestic dogs.

**Distribution:** Wolf which is one of three members of the dog family found in our country can be observed in almost every region of Anatolia. However, it cannot be found in the coastline where the altitude is close to the sea level and the tectonic plains of the Western Anatolia. Nevertheless, it can rarely be observed in these areas due to wide territory usage and large habitat. The species is mostly found in Central and Eastern Anatolia.



Population: It is estimated that 4000-7000 wolves live in Turkey.

**Habitat:** The appropriate habitat for wolves is determined by the availability of food / prey rather than the vegetation. Therefore, wolves can be observed in many different habitats. Wolves' ties with the forests are due to the fact that some large herbivorous mammal species (such as European roe deer, red deer) which are among their preys are found in forests and that forest canopies are safer for pups especially during the breeding season. Another factor for females during the breeding and raising season is the den's being close to water resources. Fluid intake during nursing is critical for females that cannot go far from the den. Therefore, while choosing dens before the breeding, females prefer areas close to water resources.

Another factor that affects wolves' habitat preference is the topographic structure of the territory. The species is known to prefer areas above sea level. Generally, wolves cannot be observed in areas where the altitude is less than 400 m above sea level. However, the main reason for this preference is not only the altitude but also the fact that the possibility of encountering humans is low because there is relatively less human settlement in areas where the altitude is high.

Therefore, wolves use many different habitats from forests to open fields, from rocky sides to lakesides and riversides. They change places within their home range according to the movement of their preys (e.g. seasonal). Accordingly, it is important to maintain the natural habitat integrity and correlativity (landscape) that can continue their mobility in territories where we know they live.

**Home range:** It is known that potential food sources in a territory play an essential role in determining the limits of wolves' home range. It is observed that some wolf packs go into areas where other packs live to look for food due to decrease in food sources in their own areas because of human activities and that in some cases, they approach to areas where human activities abound. This poses a serious threat to the life cycle of wolf packs.

It is known that, in territories where there are sufficient food sources, a pack of wolves use a territory of between 100 km<sup>2</sup> and 250 km<sup>2</sup>. However, especially in the Nordic countries where there are uneroded large natural habitats, this area may extend up to 3000 km<sup>2</sup> for a wolf pack. Moreover, there is a direct connection between the size of the pack and the home range. It is observed that as the number of the wolves in a pack increases, the home range expands.

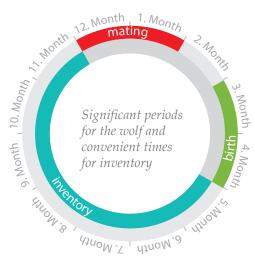
**Food:** Wolf is able to hunt species larger than its own body weight as it hunts along with the pack and it has advanced hunting strategies. However, the feeding behavior of the species varies by the characteristics of the territory where the pack lives and especially by the hunting potential. Wolf feeds generally on herbivores such as red deer in the Northern Europe and the North America. In regions where these species are rare, wolf feeds on a wider range of food sources. Populations that

can especially be observed in Europe and Mediterranean region usually feed on small and medium sized wild mammals, and domestic sheep and goats because large herbivorous mammals are rare. This can also be observed in our country where habitat fragmentation is common.

**Daily activity:** A wolf pack spends most of their time looking for preys that constitute their potential food sources. Accordingly, a pack is known to cover a distance of approximately 50 km a day. Like many carnivorous species, wolves are nocturnal, but they are also known to be active during the day.

**Seasonal activity:** Seasonal activity of wolves follows the seasonal movements of large herbivorous species that constitute their food web. Therefore, it is not possible to define a specified seasonal activity for wolves. However, the species is known to approach anthropogenic territories in the countryside especially during winter in our country.

**Inventory:** Wolves are known to use very large territories. Packs spend most of their time looking for food and they are known to cover a distance of 50 km a day for this purpose. Inventory methods based on direct individual observation fail because wolves are more active during the night and consistently in motion. Indirect methods based on tracing and tracking also may not bring to successful conclusions. It is nearly impossible to distinguish the footprint of an adult wolf from that of a large shepherd dog. Moreover, it is also known that a wolf is able to live for days without food and this is a natural cycle of wolves' daily life. Therefore, it would be difficult to get results from tracking of feces.



The period between the beginning of summer and the end of fall when herbivorous species which are wolves' food sources are more active is a convenient inventory period for wolves. Considering wide territories used by wolves, the inventory approach to be applied should be revealing how important the territory is for the species and how much the pack uses it rather than questioning how many individuals there are in the territory. Accordingly, especially in inventory studies that should be completed in a short span of time, reliable observation and case reports should be gathered from local people in order to detect the parts more commonly used by wolves in the territory. This information is especially important in identifying territories that are known to be previously used as dens by wolves.

Camera traps should be used in order to get detailed information about wolves' territory usage. This study may enable us to estimate the size of the pack using the territory. However, in cases where large territories should be scanned in a short span of time, camera traps would only help providing supporting additional data.

Finally, it should be noted that wolves may be aggressive especially during the rut and mating season in other words, in December and January and that the individuals should not be annoyed in March and April when they give birth.

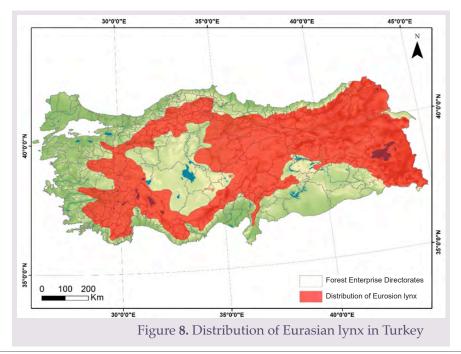
**Recommendations on Forestry Practices:** It is important not to carry out activities such as lumbering and road opening in territories where they are known to be present during the period between the beginning of April when wolves start to look for the place for their dens and June when the nursing period after birth is over. Large scale regeneration is not recommended in territories where wolves are observed. Canopies may be inspected during critical periods (to ensure that they do not leave their waste in environment such as grease and dishwater).

For further information, please see Chapter 9.2 for a table presenting the results from an assessment on the impact of general forestry practices in Turkey over conservation priority fauna species/groups.



**Descriptive Characteristics:** The species whose body size and fur pattern vary by region is divided into subpopulations having different characteristics in the world due to its large geographical distribution area. Having reddish, brownish, yellowish, greyish colors in its fur, Eurasian Lynx is one of the cat species which have the most color variations. Dark and prominent spots in its fur may be indistinct in some parts; however, this spotted pattern is one of the descriptive characteristics of the species.

Another characteristic used to define Eurasian Lynx is its tail length. Being one of the main distinctive morphological characteristics of Eurasian Lynx, tail length is 110-245 mm on average, and it is shorter than the body. According to the average values in the world, head and body length range between 800-1300 mm and weight varies between 8-38 kg.



In addition to the spots on its fur which can be observed almost invariably, the black tip on its tail and the black tufts at the tips of its ears are among significant morphological characteristics of the species.

**Distribution:** Eurasian Lynx, which is one of the cat species most commonly found in the world, can be observed in an area including Russia, Europe and Central Asia. Although it has a healthy population structure around the world, it was destroyed by humans as a result of habitat destruction, decrease in the number of potential prey species and direct killing in some regions particularly Western and Central European countries in the previous centuries. Today, with the emergence of negative conclusions of these local extinctions, many European countries (e.g. Switzerland, Italy, Austria, France, Germany) carry out studies through relocation programs to bring the species back to the ecosystem.

**Population:** Although there has been an increase in the studies carried out in Anatolia on Eurasian Lynx in recent year, no scientific evaluation has been made about the population size across the country.

**Habitat:** As it is understood from its large geographical distribution, the species is able to adapt to different types of habitats and different climatic conditions. Although it is generally associated with the forest ecosystem in Europe and Siberia, it is also able to form healthy populations in steppes and rocky habitats in regions like Central Asia. Similarly, they are known to exist in different habitats in Anatolia. In addition to the forest ecosystems in Black Sea and Mediterranean regions, it can also be observed in steppes, rocky regions and regions with sparse vegetation in Central and Eastern Anatolia.

**Home range:** As with many predator species, factors such as habitat structure, population density and availability of prey species in the territory affect the home range size of Eurasian Lynx. Correspondingly, in the studies carried out in different regions of the world on the home range size of the species, detected values range from 25 km<sup>2</sup> to 2800 km<sup>2</sup>. The average home range size of the species varies between 100-200 km<sup>2</sup> for females and 240-300 km<sup>2</sup> for males. Although there are differences between females and males regarding the area size, it has been detected that the home range is determined by the availability of prey species and that any decrease in the population density of prey species cause Eurasian Lynx to use a larger home range.

**Food:** Being a solitary animal, Eurasian Lynx is a successful predator although it does not make use of the advantage of a clowder. It is able to hunt animals 3-4 times larger than its body size. The diet of this carnivorous species includes various animals such as ungulates, hares, birds and small mammals. Different hunting preferences are observed in different regions of the world. In some regions, Eurasian Lynx hunts even-toed ungulate species such as European roe deer and chamois the most while in other regions hares are the most preferred prey species. Studies carried out in Turkey show that the species feeds particularly on hares.

Eurasian Lynx does not prefer approaching human settlements since they are avoidant. If necessary, measures are taken, the species do not harm domestic animals and humans.

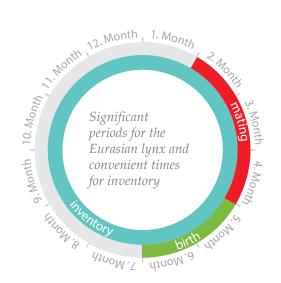
**Daily activity:** Eurasian Lynx is known to be more active in the early morning and dusk. However, in the studies carried out in the Northern Anatolia, it was detected that the species generally displays nocturnal behaviors in the region mostly preferring evening hours while its activity is at its lowest ebb in the daytime.

**Seasonal activity:** Although we cannot mention a specific seasonal activity pattern for the species, there may be variations based on the breeding cycle and fluctuations in the populations of prey species.

**Breeding:** Breeding characteristics vary based on the geographical area; however, mating is mostly observed in the period between February and April. Although mature individuals are able to breed once a year, females who have kittens don't mate before the care of kitten is completed and the kitten leaves. The average duration of pregnancy is 69 days. Although the number of kittens in a litter was recorded to be at least 1 or 5 at the most, the average number of kittens is 2-3. Males do not contribute to the care of kittens and this period which lasts approximately a year is undertaken by the female. During this period, firstly kittens are fed by their mother hiding in a safe den. After they become mature enough, they start to wander with the female and learn skills such as hunting.

**Inventory:** Eurasian lynx is among the predator species who are at the top of the food chain and it has a big influence on the populations of other species with which it shares the same environment. Therefore, in order to maintain the balance in the ecosystem at a healthy level, predator species such as Eurasian Lynx should have healthy populations. Conservation programs and management plans to be carried out in this direction should take actual and sufficient scientific data into consideration above all. Accordingly, as in other species in the wildlife, it is necessary to know the essential scientific characteristics of Eurasia Lynx such as their population size, population dynamics and demographic structure.

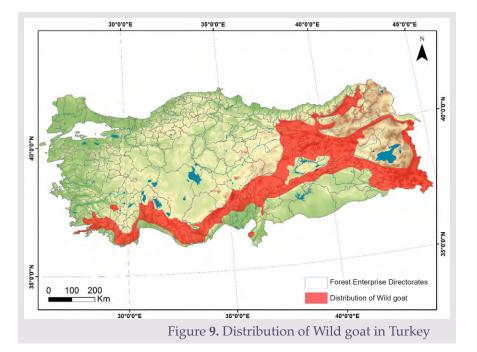
First and foremost, this nocturnal species with a strong hiding behavior is difficult to directly observe and it is not possible to obtain reliable and sufficient data from a study based on this method. Therefore, indirect methods should be chosen for studies carried out to monitor the populations of Eurasian Lynx in their natural habitat. Today, camera traps are regarded as a safe and efficient method for this species. Long-term application of systematical camera trap method provides information on the distribution of the species and activity characteristics. Eurasian Lynx has a patterned fur which are unique to each individual and this enables us to detect Eurasian Lynxes individually through camera traps and to determine the local population size. Thanks to this characteristic, the population size of the species can be determined through systematical camera traps and therefore reliable scientific data can be obtained for conservation programs.



**Recommendations on Forestry Practices:** The survival of a Eurasian Lynx population depends on its breeding cycle and the availability of prey species in the territory. Negative effects of human activities such as lumbering in the territory during the periods of mating, breeding and nursing endanger the future of the population. The pressure caused by illegal poaching on Eurasian Lynx or the species hunted by the species such as hares and European roe deer is one of the highest priority threats. Forestry activities should not be carried out and illegal poaching should be restrained by keeping under strict and regular control in areas where the species uses especially for breeding. Moreover, forest glades should be prioritized in order to maintain the hare population which is the main prey of the species at a sufficient level.



**Descriptive Characteristics:** Its body is 120-150 cm tall, and its shoulder height varies between 70 and 100 cm. A fully-grown chamois weighs 35-80 kg. They are generally largest than domestic goat. Its fur has a dark red-brown color in summer, and a grey-brown color in winter. Particularly elder male goats have a whitish grey-black-brown color. They have black stripes on their fur, from their back to legs. The fur gets a whitish yellow color toward the abdomen. Their tails are 15-20 cm long. Males and females have horns. Horns of females are thinner and can grow as long as 30 cm. Horns of males are thick at the root and get thinner toward the tip, hooked backwards, and can grow as long as 150 cm. Males are larger than females. The distinct and thick parts on the horns account for one year of age.



**Distribution:** The wild goat can be observed in Turkey in an area starting from the Datça Peninsula in the westernmost part and continues along the Mediterranean region and the Taurus Mountains, also including Eastern Anatolia and Eastern Black Sea regions. It can also be observed down along the periphery of Lake Van, to the southeastern parts of the Southeastern Anatolia region.

**Population:** According to the inventory studies conducted in Wildlife Improvement Areas by Directorate General of Nature Conservation and National Parks, around 12000 thousand wild goats were observed. However, there is no information on their total number.

**Habitat:** Wild goats spread in a wide variety of habitat types ranging from very high peaks to lower rocky mountainous areas and mountain steppes, alpine meadows, maquis shrublands and forests. They especially prefer interior areas and edges of sheer, rocky, scree slopes of steep valleys. They also use coniferous, broad leaved and mixed forests as their habitats.

**Home Range:** Female wild goats and the herds they form are loyal to specific areas and live in these areas seasonally. They have upward and downward mobility between summer and winter. Adult males, on the other hand, can travel long distances to get a chance to mate, especially during breeding.

**Food:** Wild goats obtain their food generally from herbaceous plants. They also feed on the leaves, new shoots and fruits of trees, shrubs and bushes, especially during the winter months.

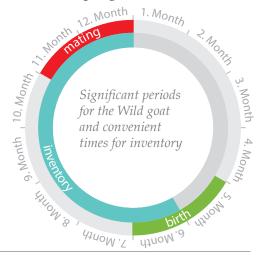
**Daily Activity:** Wild goats are diurnal animals. They get up before the sun rises and start grazing and wandering around. During the winter periods when the weather is cold, they can actively graze and wander around throughout daytime; while during the hot summer months they usually spend their time in cool areas like tree shades, caves and rock bottoms during the day and become active in the morning and late afternoon.

**Seasonal Activity:** Males and females form mixed herds from November, which is before the mating period, to the end of winter. Starting from the nesting period which starts around May-June to November, females, their offspring and young goats form separate herds from adult males. In this period, adult males live either on their own or in small groups.

**Breeding:** Mating begins at the end of November and continues through December. Prior to mating period, physical interactions such as horn fights can occur between two adult male goats as a part of their struggle for dominance. After the mating period, the kids are born at the end of spring and are not weaned for 4-5

months. The most critical periods in the kids' life are the first month they are born and their first winter.

**Inventory:** The most suitable time for carrying out inventory studies for wild goats is November-December period. During the inventory, the local people and the local authorities working in the area should be consulted about the territory used by the species and reliable point records should be obtained. In addition to these records, it is also recommended that direct observations and camera traps be used in areas where the species is rare and has a low population density.



**1. Collection of Data on Local Scale:** If wild goat populations are living in the Wildlife Improvement Areas (WIA) located within the boundaries of the Forest Enterprise Directorates which will be the subject to the inventory study; first of all, information about them (past counts, observations, etc.) should be obtained from the relevant National Parks Sub-District Directorate. Information about the presence and distribution of wild goats in the region, spots where they are seen, and the areas known to be used by them are collected from the communities living in the region and from hunters, if any, by visiting the settlements located outside of WIA, and especially in or near the areas that may provide connection between them.

**2. Direct Observation:** In accordance with the information obtained from local sources, the areas where the species spread are visited early in the morning or early in the late afternoon, and individual goats and their flocks are looked for by observing the slopes used by them with binoculars and telescopes. If data on population size and composition in the area is to be obtained, counting works should be carried out at predetermined observation points before the snowfall begins in December, which is the breeding period of the wild goats. The best times for inventory works are early in the morning during daytime and sunset times during evening hours.

**3. Camera Trap:** Camera traps can be used as a method suitable for smaller areas and to support inventory studies. To identify their presence, particularly in forest areas, it is recommended that the camera traps be placed and left for a period of at least one month at points where they can pass within the forest. On the trails which can be used by the goats, camera traps can be attached to trees at a point where they will be about 50-60 cm above the ground. It will be better to place the camera traps in way that they will the see the path not in a downright direction, but in position allowing to see the direction towards or from the path.

**Recommendations on Forestry Practices:** Wild goats use largely rocky, stony and highly sloped steep terrains. Coniferous, broad leaved or mixed forests, which are described as 'degraded' according to altitude and region, can also be found in these types of areas. It is important that intensive maintenance, rehabilitation or reforestation activities are not carried out in these 'degraded' forest areas which are identified as areas where wild goats live. The most important negative effects of such activities and any following subsequent activities to be carried out later (such as human activity, road opening or widening) will be: causing wild goats living in the area to move away, as well as the area to becoming more open to human threat (for example, illegal poaching posing a larger threat after opening/maintaining roads). Maintenance and production activities should not be carried out at Wildlife Improvement Areas which are known to host wild goats. Forestry activities should also be limited in sites around and among these areas, which serve like a "corridor" habitat ensuring connection between various wild goat populations.

Species of natural trees and shrubs found in forest areas used by wild goats mostly in the winter season, but also during the rest of the year should be conserved. These species provide feeding opportunities to wild goats in various seasons. Again, the breeding and nesting times of the species should be taken into account in the forestry activities to be carried out in these areas and intensive forestry practices should not be implemented in these periods.

New roads should not be built in areas which are known to be inhabited and used by the species. For this purpose, the relevant authorities of the Regional Directorate of Forestry and the Forest Enterprise Directorate, which are responsible for the preparation and implementation of road plans, should be informed about the issue.

# 4. Priority Small Mammal Species

Small mammals are of great importance in the forest ecosystem. Small mammals, especially with their activities like feeding and nest-making in the soil under the forest, contributes to the processing of the vegetation and enables the introduction of food necessary for many creatures into the ecosystem cycle. For example, small mammals play an important role in the dispersal of fungal spores and plant seeds. They are also involved in aerating and loosening the soil.

ODKM archive

Small mammals are the prey for many predators, such as birds of prey, large mammals, and reptiles found in the forest ecosystem. For example, in a study, Obuch (2001) showed small the mammal species on which owl species that live in Turkey feed.



© Tolga Kankılıç

It has been identified that small mammals also have important roles in increasing soil fertility. Their feces contribute to the increase of the amount of nitrogen and other minerals in the soil. Because many small mammals nest under the soil, they enable the minerals located in the lower parts of soil to move to the upper parts.

For example, moles (*Talpa spp*.) and the Mediterranean blind mole-rat (*Nannospalax spp*.) which form large subsoil galleries, throw out all the soil that accumulates when opening galleries (can also be seen from photographs on the right side.).



© Tolga Kankılıç

Although the roles of small mammal species in the ecosystem show similar characteristics, their habitats differ from each other. For example, squirrels (*Sciurus spp.*) and the fat dormouse (*Glis glis*) are tree-dependent species that need hollow for nesting, and a dense forest for movement, where they can hop from one tree to another. In contrast to this species, the Major's pine vole (*Microtus majori*) prefers open areas in forests or short thicket areas like rhododendrons. The decrease in the density of trees negatively affects squirrels, while the increase in open trees areas and bushes positively affects Major's pine vole (Microtus majori). Closed deciduous forests which contain trees with wide a basal base are the places which the wood mice (Apodemus spp.) prefer for nesting. Some species nest in rocky areas that remain within or on the edge of the forest. The broad-toothed field mouse (Apodemus mystacinus) and the Asia Minor spiny mouse (*Acomys cilicicus*) particularly prefer these rocky areas. Many small mammal species live in soft and moist soiled habitats with dense shrubbery found on water edges. These species

sometimes follow a creek as a line. For example the insectivorous Radde's shrew (*Sorex raddei*) and the East European vole (*Microtus levis*), which inhabit sides of streams in the forests in our country prefer to live in thicket areas located close to water bodies. In addition to these, there are also small mammal species that are fully dependent on water and can swim in water. The European water vole (*Arvicola amphibius*) and the Transcaucasian water shrew (*Neomys teres*) are small mammal species that can be given as examples of this. As can be seen in the examples given, small mammals are creatures with special living environments that vary according to species.

Although the Palearctic Region, which is the zoogeographic area we live in, is highly diverse in terms of mammal species, ecological information and studies on the habitat of these species, the status of their populations, areas they are observed and the danger of extinction they face are insufficient. Especially in our country, data about the current status and future of populations of endemic mammal species is almost non-existent. Recent studies have focused on large mammal species, and small mammals have been ignored, although they have a very important place in the ecosystem.

Forestry practices in areas where rare and/or endangered species are found and practices in areas where common species live must be different and specific to species. Afforestation studies should be carried out considering the habitat of species that prefer in-forest open areas and meadow areas, and enough open areas should be left to allow a habitat for these species to live on. In areas with natural steppe characteristics, it is recommended that the afforestation practices should be limited and the species of trees that exist naturally in the area should be sparsely conserved together with areas that retain natural characteristics. In reforestation, the use of tree species that are native to the area is especially important for mammalian fauna. In newly reforested areas, spaces should be left to meet the needs of small mammal species within the existing ecosystem.

Some small mammal species that live fully dependent on trees should be taken into account in forestry practices such as pruning and precommercial thinning. In this context, older trees that are naturally present in the area should not be subject to any silvicultural application, especially those that have nests on them (such as holes, hollows, under tree burrows). Small mammal species like squirrels (*Sciurus spp.*) and the fat dormouse (*Glis glis*) nest on walnut, hazelnut and oak trees and feed on their seeds. They move mainly on the tree and descend to the forest floor less frequently. The species' presence in the site can be adversely affected if older trees in which such mammals nest and feed are removed during precommercial thinning or rejuvenation practices. So, it will be useful to identify these types of trees and leave them in the site during practices like rejuvenation, etc. In rejuvenation and precommercial thinning, gradual and controlled cuts should be preferred, instead of making dramatic changes by cutting a large number of trees at once.

©DKM archive

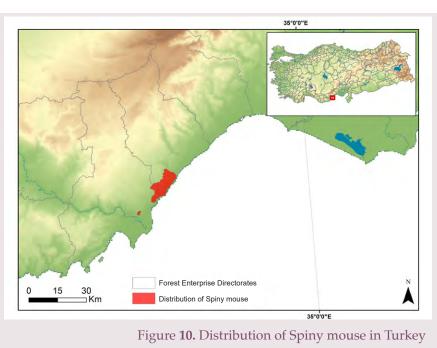
Many small mammal species live in larger numbers in open areas on the edge of and in forests, roadsides, or in thicket areas close to watersides. They use the interior of forests much less. Shrubby areas hosting these species should be left untouched during practices like living cover cleaning and stone and rock removal. If the species living in that area are endangered, rare or narrow-spread species, priority should definitely be given to them when intervening in the area and appropriate measures should be taken for this purpose.





Descriptive Characteristics: Head and body length is around 9 to13 cm, tail length is 8 to 12 cm and the weight is 20 to 100 grams. The dorsal fur is in greyish brown tones. The difference in colour between the dirty white colored belly part and the greyish brown dorsal forms a distinct line. The spines, which start at the waist and continue to the beginning of the tail, are not stiff and stinging.

**Distribution:** The Asia Minor spiny mouse is a species endemic to the Mersin - Silifke region. It is observed in a narrow area in Turkey including Silifke, Narlıkuyu, Kızkalesi and Kumkuyu.



Population: Although their exact number is not known for sure, they have a very narrow distribution area. It has a dwindling population due to the opening of new settlements and habitat degradation.

**Habitat:** The Asia Minor spiny mouse lives in Mediterranean maquis shrublands, especially in areas dominated with kermes oak (*Quercus coccifera*) and blackberry (*Rubus spp.*) shrubs, located in rocky terrains near the seaside. These areas are about 0-100 meters high from the sea level. It inhabits small fragmentary rocks in blackberries and oak vegetation spreading in narrow areas. In its habitat, it lives in the same area with the broad-toothed field mouse (*Apodemus mystacinus*) and other mice from the mus genus.

**Home Range:** An individual spiny mouse lives in an area smaller than 100 m<sup>2</sup>. The area covered by the colony to which the individual belongs varies according to the size of the in-forest open area or the appropriate forest edge they inhabit.

Food: Seeds and green plants constitute their foods.

Daily Activity: Usually active at night. They hide in their underground galleries during the day.

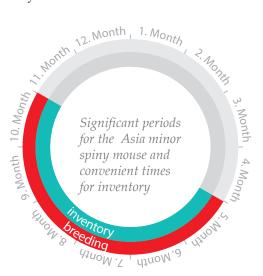
**Seasonal Activity:** Their breeding period starts in May and last until October, but there are also records that state nursing females are observed until the end of October. The number of pups per litter is around 2 to 3 on average. A typical female mouse can birth between 1 or 2 liters per year (Kryštufek and Vohralik 2005).

**Inventory:** The spiny mouse is difficult to see as it is active at night, and it is not possible to form its inventory by direct observation. This species is especially found in areas 10-15 meters above the sea level, in small rocky sites inhabited by blackberries and oaks.

If it can be observed, it can be searched in nest holes which may be located under rocks or tree bottoms. It is

easier to find the animal in areas where nest holes are visible.

Since they are nocturnal animals, the most ideal method is to use a live capture trap. The most suitable trap is the Sherman live capture trap (H.B. Sherman folding traps 8x9x23 cm). These traps protect animals from environmental conditions such as rain, as they are closed traps. The existence of the species can be investigated by placing these traps in suitable habitats in the forest site to be studied. In the afternoon, two hours before dark, traps set up with freshly prepared peanut butter are placed in the area of study. 50 to 100 traps are placed in a 50 to 100-meter-wide rocky and forest area near a stream at 5-10-meter-wide intervals, ensuring that the traps are placed in hidden corners or



rock bottoms. When placing the traps, it should be ensured that the door of the trap does face the open side (i.e. the door of the trap should face the slope or the side where there is a cover such as grassland, rocky or shrub). It is easier to catch these animals, if the traps are placed near the holes indicating their nests or the traces of the route in which they move. According to the condition of the habitat, one or two rows of traps are lined up in parallel with the stream. Traps which stay in place throughout the night must be checked and collected early in the morning, before the sun rays reach the cages.

If any Asia Minor spiny mouse is caught, an inventory form should be issued and the animal should be recorded. Captured individuals should be released at where they were found, after they are recorded.

**Recommendations on Forestry Practices:** it is known that the majority of the area in which the species has a limited distribution has been partially destroyed due to settlement and quarry operation, but populations of the species still live in narrow areas in the form of some small rocky sited that remain untouched (Kıvanç, 2004). These block-shaped limestone rock-based areas are dominated by carob trees and oaks from place to place, as well as different types of shrubs and maquis groups. It is important that these areas where the species inhabit stays untouched in their natural state and is conserved from human activities like utilization and construction.

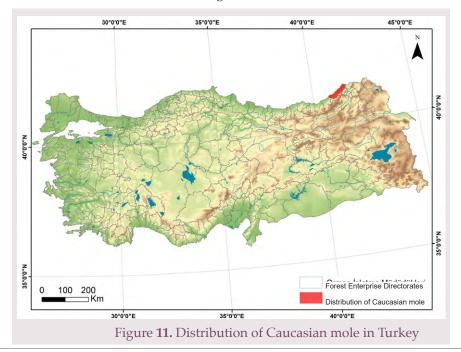


**Descriptive Characteristics:** Head and body length varies from 134 to 142 mm. Tail length is around 20-25 mm. Its weight is 60 to 90 grams. Its fur is in black and gray tones. Its eyes are covered with skin.

**Distribution:** The Caucasian mole is a species endemic to Caucasus, found in the Eastern Black Sea region of Turkey around Hopa, Arhavi and Kemalpaşa, and in a narrow area in Georgia and the Western Caucasus.

**Population:** Their exact number is not known for sure, but it has a narrow distribution.

**Habitat:** The Caucasian mole lives in moist meadows near deciduous, mixed and coniferous woodlands; in agricultural areas and orchards located near forests; and in very moist and shady areas like swamps. It can nest in soft, wet and moist soils near water and along streams.



It particularly prefers areas where insects like worms are abundant. It has been observed that the Caucasian mole lives in the same area (sympatric) with the Levant mole (*T. levantis*) in certain locations (Kemalpaşa, Doğramacı 1989). The Caucasian mole has been recorded to be observed as high as for 2500 meters above sea level in Georgia. In Turkey, however, it lives at lower elevations like in Arhavi, Hopa and Kemalpaşa. It lives in open areas in forests and in areas and gardens with moist soil.

**Home Range:** The gallery system where an individual Caucasian mole lives cannot be greater than 100 m<sup>2</sup>, because it is a species living under the ground. The area covered by the colony to which the individual belongs varies according to the size of the in-forest open area or the appropriate forest edge they inhabit.

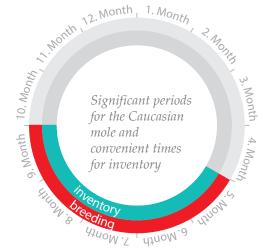
Food: Insects, insect larvae and worms constitute their food sources.

**Daily Activity:** It is active both during the day and at night, as it moves under the soil. It moves within the galleries it forms under the soil and can come out on the ground to feed in the morning and at night.

**Seasonal Activity:** Breeding periods begin in May and last until September. (Kryštufek and Vohralik, 2005). The number of pups per litter is around 2 to 3 on average.

**Inventory:** The Caucasian mole lives in galleries under the soil and discards the soil it excavated from certain parts of the gallery. This discarded soil forms deposits and, on the deposits, there is a single hole that opens to the outside. It can close these holes out when its activity outside over. Outside activities are more frequent in the morning and in the evening

Since the regions where the species is found are under snow during the winter months and the activity of the species during this period is low, it is better to do inventory studies between May and September.



**Recommendations on Forestry Practices:** Since the Caucasian mole nests and lives under the soil, activities like ploughing and hoeing in the areas which are known to be inhabited by it, will negatively affect the species. During maintenance, reforestation and rejuvenation works, practices like tillage and weed, bush and stone clearing should not be carried out in areas which are known to be inhabited by the Caucasian mole. If such practices are inevitable, they should be carried out at a certain distance from the soil bumps, which indicate the habitat of the species.

In degraded woods, degraded coppice forests, in-forest open areas and forest edges which are known to be inhabited by the Caucasian mole, no works should be carried out to convert these sites into a closed forest. The grass and shrub cover on the forest floor should be conserved, dead parts of vegetation (such as branches, leaves, bark) on the floor should be left untouched.

92



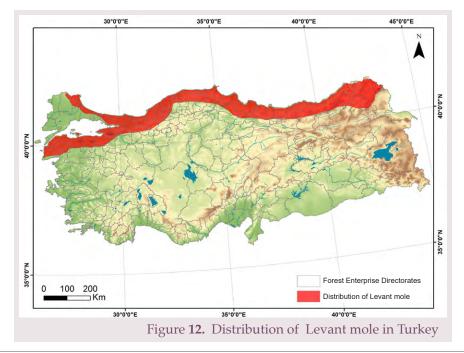
Levant mole Talpa levantis

© Ahmet Karataş

**Distribution:** The Levant mole is a common species observed in the North-facing slopes of Western Thrace and Black Sea regions. They live up to an altitude as high as the start of the timberline. This is the most widely distributed mole species in Turkey. They can be observed in the Caucasus, Azerbaijan, Armenia and Georgia.

**Population:** It is a widely distributed and widespread species, although the exact number of its population is not known for sure.

**Habitat:** The Levant mole lives in deciduous, mixed and coniferous woodlands. It is not a tree-dependent species, although it lives in the forest. They can be observed in open, sparsely vegetated, moist meadows within forests; in agricultural areas and fields located at the edge of the forest; and in pastures and open areas located at the timberlines. It can burrow near tree roots but does not enter into dense forest areas.



It can burrow in soft and moist areas close to the water and along the stream, but has no adaptation to entering the water and swimming. This species has no specific elevation preference and records about Levant moles living up to 2400 meters are present. It can also live in the Alpine belt. It is commonly found in moist soils near lakes. They can live in open areas in forests and in areas with moist soil and in the Alpine belt on the timberline.

**Home Range:** The gallery system where an individual Levant mole lives cannot be greater than 100 m<sup>2</sup>, because it is a species living under the ground. The area covered by the colony to which the individual belongs varies according to the size of the in-forest open area or the appropriate forest edge they inhabit.

Food: Insects, insect larvae and worms constitute their food sources.

**Daily Activity:** It is active both during the day and at night, as it moves under the soil. It moves within the galleries it forms under the soil and can come out on the ground to feed in the morning and at night.

**Seasonal Activity:** Breeding periods begin in May and last until September. (Kryštufek and Vohralik 2005). The number of pups per litter is around 2 to 3 on average.

**Inventory:** The Levant mole lives in galleries under the soil and discards the soil it excavated from certain parts of the gallery. This discarded soil forms deposits and, on the deposits, there is a single hole that opens to the outside. It can close these holes out when its activity outside over. Outside activities are more frequent in the morning and in the evening.

Since the regions where the species is found are under snow during the winter months and the activity of the species during this period is low, it is better to do inventory studies between May and September.

It is possible to carry out the inventory study about this species by direct observation. However, especially because its above-ground deposits can be easily distinguished, these "bumps" can be used as records of the species' existence and their inventory can also be made through the discovery of these bumps.

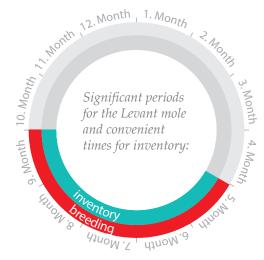
Nevertheless, since the area the species inhabit largely overlaps with the Caucasian mole's (*Talpa caucasica*) habitat, and since it is known that the Levant mole also form similar bumps, live capture should be carried out in areas where these two species inhabit together to identify their species.

The Levant mole is a smaller species than the Caucasian mole.

The live capture traps are not suitable for capturing it. So, the openings to their galleries can be cleared and the mole can be waited to come.

As the most suitable capturing method, the gallery can be closed in a further point using a hoe without hurting the animal when it arrives.

However, the preferred time for this procedure should be in the morning, when the animal is most active. As soon as the species is identified, the captured animal should be brought and left to the point where it was captured and the hole should be covered with soil.



**Recommendations on Forestry Practices:** Since the Levant mole nests and lives under the soil, activities like ploughing and hoeing in the areas which are known to be inhabited by it, will negatively affect the species. During maintenance, reforestation and rejuvenation works, practices like tillage and weed, bush and stone clearing should not be carried out in areas which are known to be inhabited by the Caucasian mole.

If such practices are inevitable, they should be carried out at a certain distance from the soil bumps, which indicate the habitat of the species.

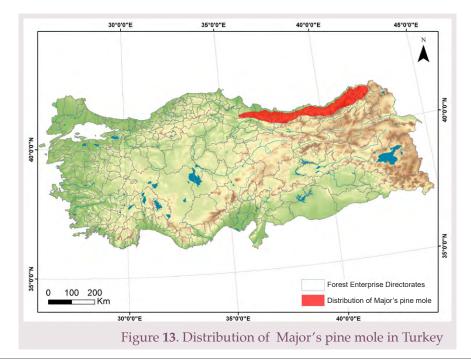
In degraded woods, degraded coppice forests, in-forest open areas and forest edges which are known to be inhabited by the Caucasian mole, no works should be carried out to convert these sites into a closed forest. The grass and shrub cover on the forest floor should be conserved, dead parts of vegetation (such as branches, leaves, bark) on the floor should be left untouched.



**Descriptive Characteristics:** Head and body length varies from 90 to 110 mm. Tail length is around 30-50 mm. Its weight is 20 to 30 grams. The fur color is in dark brown and grey tones.

**Distribution:** It is a species endemic to the Caucasus and Eastern Black Sea region. The border of its distribution in Turkey is Seyfe-Amasya in the west and Ardanuç-Artvin in the east. It is found on the sea-facing slopes of the northeastern Anatolian mountains. It is not observed on the south-facing slopes. Although some records state that it was also observed in Sarıkamış and Tatvan, these records are doubtful.

**Population:** There is no clear information about the size of its population.



**Habitat:** It is observed in moist woodlands whose floor is densely covered with ferns and herbaceous plants, on the northern foothills of the North Anatolian Mountains in the eastern Black Sea region . The most important feature of their habitat is that the rocks are mossy, and the terrain is dominated by a dense cover of ferns and bushes (such as rhododendron bushes). Major's pine vole lives in mixed, rocky forests covered with moss, which extend along streams and contain tree species like beech, walnut, chestnut, alder and oriental hornbeam. It prefers in-forest open areas, forest edges and degraded forest meadows and shrubbery areas. It can also live in alpine meadows and swampy areas.

Sometimes it can also be observed above the timberline. Records in Turkey usually come from altitudes ranging from 800 to 1400 meters. However, the record with the lowest elevation is from 500 meters (Ülkü - Rize). It moves on the floor, not on trees. It can burrow in tree roots or the base part.

**Home Range:** An individual pine vole lives in an area of less than 100 m<sup>2</sup>. The area covered by the colony to which the individual belongs varies according to the size of the in-forest open area or the appropriate forest edge they inhabit.

**Food:** It feeds on green plants in summer and seeds in winter. It is said to have damaged roots of young oak trees in Armenia.

Daily Activity: Usually active at night.

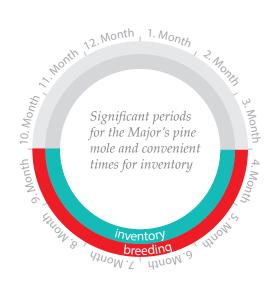
#### **Seasonal Activity**

**Breeding:** Breeding period start in April in spring and continue until autumn. However, it has been stated that their reproduction continues all year round in the Caucasus (Kryštufek and Vohralik 2005). The number of pups per litter is around 2 to 4 on average. A typical female can birth between 2 or more litters per year.

**Inventory:** Major's pine vole is difficult to see as it is active at night, and it is not possible to form its inventory by direct observation.

This species should be searched at an elevation of 800 to 1400 meters, in in-forest open areas, forest edges and in forest areas extending along streams such as creeks and rivers and in open areas close to the alpine belt.

If it can be observed, its holes can be searched under rocks or tree bottoms or meadow clearings. It is easier to find the animal in areas where nest holes are visible. Since the regions where the species is found are under snow during the winter months and the activity of the species during this period is low, it is better to do inventory studies between April and September.



Since they are nocturnal animals, the most ideal method is to use a live capture trap. The most suitable trap is the Sherman live capture trap (H.B. Sherman folding traps 8x9x23 cm). These traps protect animals from environmental conditions such as rain, as they are closed traps. The existence of the species can be investigated by placing these traps in suitable habitats in the forest site to be studied. In the afternoon, two hours before dark, traps set up with freshly prepared peanut butter are placed in the area of study. 50 to 100 traps are placed in a 50 to 100-meter-wide rocky and forest area near a stream at 5-10-meter-wide intervals, ensuring that the traps are placed in hidden corners or rock bottoms. When placing the traps, it should be ensured that the door of the trap does face the open side (i.e. the door of the trap should face the slope or the side where there is a cover such as grassland, rocky or shrub). It is easier to catch these animals, if the traps are placed near the holes indicating their nests or the traces of the route in which they move. According to the condition of the habitat, one or two rows of traps are lined up in parallel with the stream. Traps which stay in place throughout the night must be checked and collected early in the morning, before the sun rays reach the cages. If any Major's pine vole is caught, an inventory form should be issued and the animal should be recorded. Captured animals should be released where they were captured after they are recorded.

**Recommendations on Forestry Practices:** Since the Major's pine vole nests under the soil, activities like ploughing and hoeing in the areas which are known to be inhabited by it, will negatively affect the species. As dead branches and leaves on the ground constitute a sheltered above-ground cover for the vole, this cover should also be conserved. Again, as the herbaceous and shrubby vegetation on the soil provide the species nutrients, aids its protection from predators, and helps maintaining the moisture and heat during its out-of-nest activities like food search, this vegetation is also important. So, these structures should be conserved during practices like maintenance, reforestation, etc.

The transformation of the in-forest clearings and forest edges located in forests where the Major's pine vole lives into a closed forest by reforestation threatens the species' existence. Again, the use of insecticides on seeds that are planned to be used for afforestation by seed cultivation practices is not recommended in the areas known to be inhabited by the species, as will adversely affect the population of the species in that area. For more information, see the table about the effects of forestry practices on the species and the section written specially the species group.

94



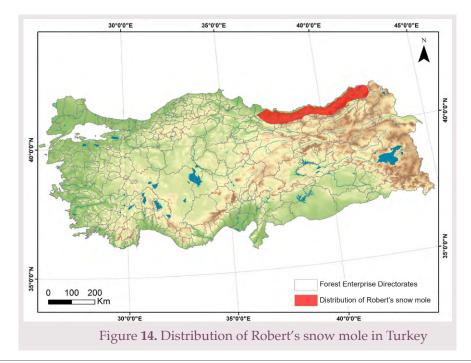
Robert's snow mole *Chionomys roberti* 

© Ahmet Karataş

**Descriptive Characteristics:** Head and body length varies from 125 to 155 mm. Tail length is around 80-110 mm. Its weight is 40 to 78 grams. The fur is dark brown on the dorsal and in grey tones below the belly. Its black colored whiskers can grow up to 45 mm.

**Distribution:** Robert's snow vole is a species endemic to the Caucasus and Eastern Black Sea. The border of its distribution in Turkey is Ordu - Akkuş in the west and Yalnızçam - Artvin in the east. It is observed on the sea-facing slopes of the northeastern Anatolian mountains. It is not observed on the south-facing slopes.

Population: Their numbers in Turkey are not known clearly.



**Habitat:** Robert's snow vole lives in deciduous, mixed and coniferous forests that contain tree species like oriental beech (*Fagus orientalis*), walnut (*Juglans regia*), chestnut (*Castanea sativa*), black alder (*Alnus glutinosa*), Caucasian spruce (*Picea orientalis*) and Caucasian fir (*Abies nordmanniana*). It is observed in moist woodlands extending along streams flowing from mountains, whose floor is densely covered with ferns and herbaceous plants, on the northern foothills of the North Anatolian Mountains in the eastern Black Sea region, and also in clearings between these forests and water bodies.

The most important feature of their habitat is that there are mossy rocks, a dense cover of ferns and bushes. It can also be found in open and moist in-forest meadows and clearings covered with dense vegetation. It is semi-dependent on trees, although it lives in the forest. It moves on the floor, not on trees. It can burrow in tree roots or the base part or under mossy rocks.

It can burrow close to water and along the stream, but has no adaptation to entering the water and swimming. There are records of the species observed in localities that are located 500 and 2600 meters high. However, the optimal elevation for it is 1000 to 1500 meters. It usually avoids living in the alpine or sub-alpine belt.

**Home Range:** An individual Robert's snow vole lives in an area smaller than 100 m<sup>2</sup>. The area covered by the colony to which the individual belongs varies according to the size of the in-forest open area or the appropriate forest edge they inhabit.

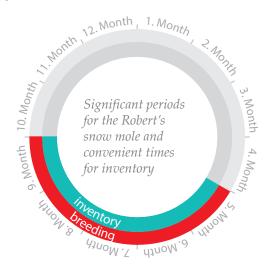
**Food:** Their food sources include ferns, black elderberry (Sambucus nigra) leaves and rhododendron (*Rhododendron spp.*) forms leaves.

Daily Activity: Usually active at night. Spends the day underground.

**Seasonal Activity:** Their breeding period starts in May and last until September, but there are also records that state nursing females are observed until the end of October (Kryštufek and Vohralik, 2005). The number of pups per litter is around 3 to 4 on average. It can give birth 1 or 2 times a year.

**Inventory:** Robert's snow vole is difficult to see as it is active at night, and it is not possible to form its inventory by direct observation This species should be sought especially in the elevation range of 1000-1500 meters and especially along streams such as creeks and rivers. Areas to be observed should be stony sites, densely vegetated areas or in-forest clearings extending along streams.

If it can be observed, it can be searched in nest holes which may be located under rocks or tree bottoms. It is easier to find the individuals in areas where burrow



holes are visible. Since the regions where the species is found are under snow during the winter months and the activity of the species during this period is low, it is better to do inventory studies between May and September.

Since they are nocturnal animals, the most ideal method is to use a live capture trap. The most suitable trap is the Sherman live capture trap (H.B. Sherman folding traps 8x9x23 cm).

These traps protect animals from environmental conditions such as rain, as they are closed traps. The existence of the species can be investigated by placing these traps in suitable habitats in the forest site to be studied. In the afternoon, two hours before dark, traps set up with freshly prepared peanut butter are placed in the area of study. 50 to 100 traps are placed in a 50 to 100-meter-wide rocky and forest area near a stream at 5-10-meter-wide intervals, ensuring that the traps are placed in hidden corners or rock bottoms. When placing the traps, it should be ensured that the door of the trap does face the open side (i.e. the door of the trap should face the slope or the side where there is a cover such as grassland, rocky or shrub). It is easier to catch these animals, if the traps are placed near the holes indicating their nests or the traces of the route in which they move.

According to the condition of the habitat, one or two rows of traps are lined up in parallel with the stream. Traps which stay in place throughout the night must be checked and collected early in the morning, before the sun rays reach the cages. If any Robert's snow vole is caught, an inventory form should be issued and the animal should be recorded. Captured animals should be released where they were captured after they are recorded.

**Recommendations on Forestry Practices:** Since Robert's snow vole nests under the soil, activities like ploughing and hoeing in the areas which are known to be inhabited by it, will negatively affect the species. As dead branches and leaves on the ground constitute a sheltered above-ground cover for the vole, this cover should also be conserved. Again, as the herbaceous and shrubby vegetation on the soil provide the species nutrients, aids its protection from predators, and helps maintaining the moisture and heat during its out-of-nest activities like food search, this vegetation is also important. So, these structures should be conserved during practices like maintenance, reforestation, etc.

The transformation of the in-forest clearings and forest edges located in forests where the Major's pine vole lives into a closed forest by reforestation threatens the species' existence. Again, the use of insecticides on seeds that are planned to be used for afforestation by seed cultivation practices is not recommended in the areas known to be inhabited by the species, as will adversely affect the population of the species in that area. For more information, see the table about the effects of forestry practices on the species and the section written specially the species group.

## 5. Priority Bird Species

Like many forest ecosystem-dependent species, the ability of forestdependent birds to survive depends on the presence of healthy forest habitats, with their natural structure not degraded. The shape of the economic benefit provided by the forest and its change over time also fundamentally affect the habitats that birds need. In addition, increased mechanization and production in forestry works are also effective in exposing habitats to rapid changes.

©Ahmet Karataş

If we are to make a generalization, a forest habitat of suitable structure for forest-dependent birds should basically have the following characteristics:

- A forest structure with multiple layers and natural openings,
- A ground cover, including herbaceous species, ferns and mosses,
- A shrub cover with a height that can reach up to five meters,
- A sub forest tree layer consisting of young trees and arborescent shrubs,
- An upper layer or crown cover formed by adult trees,
- Large and small, natural in-forest openings,
- A layered shrub vegetation in and along the forest edge,
- A dead and rotting woody layer,
- Dead and rotting woody material that can be found in each layer,
- Old trees with dead branches, crevices, hollows and other formations due to aging.

A multi-layered forest structure and both a dead and alive cover (grassy ground cover and shrub cover) is important for birds as it holds many living environments together. This layered structure also ensures that the biomass of invertebrate animal stays high, creating an important source of food for birds feeding their offspring, especially in the spring.

| Developmental Ages | Deadwood Volume |
|--------------------|-----------------|
| 81 - 100 years     | 8.7 m³/ha       |
| 101 - 140 years    | 11.7 m³/ha      |
| 140 years <        | 22.9 m³/ha      |

Bush vegetation is a habitat layer that birds need because of the many benefits it provides. Reasons for the decline of shrub vegetation include increased crown closure due to the conversion of oak and beech coppices into forest, mechanical clearing of the shrub cover, and grazing.

Dead and rotting trees (planted or felled) provide shelter for birds nesting in hollows and crevices. Besides, the presence of invertebrate biomass, which constitute a source of food for birds throughout the year, is also closely related to the presence of such woody materials. But out of concern that it could lead to an epidemic of pests, this dead woody mass is being removed from forests for use as firewood, or simply to create a "clean forest". Although this is seen as a positive practice in the first stage in terms of forest health, in the later periods it negatively affects forest ecosystem and health due to its negative effects on the bird population in particular. Therefore, all such materials should not be removed from the forest at once. Instead, they should be left in place in the forest to help the formation of a certain amount of biodiversity. In this regard, the Swedish example is an important reference in terms of the number of dead trees to be left in the forest:

A combination of different environments existing together in which forest birds can shelter and feed, ensures a high bird species diversity in that area. Especially in forests which are planned and operated with trees of the same age, the closedness of the forest increases and trees in the same age group dominate the area.

Homogeneous thinning across the area generally ensures that sufficient light reaches to the forest base, and also prevents the formation of dead wood. Besides, removing trees before they are old enough restricts the formation of old trees and felled trees, which contain many of the characteristics that birds need. In forests operated in this manner, only certain bird species that can live in a simple forest structure can find a habitat.



## **Coppice Forests**

©ilker Kül

thicket layer is generally conserved. In addition to this, the protection of older/higher trees which have not been pruned and left to their natural development, and making interventions to increase tree species diversity in these areas will provide a habitat in the coppice forests for the birds that need these types of trees. In addition, interventions to increase the diversity of tree species in coppice forests will have a positive impact on the diversity of bird species in the area. In order to increase the potential of the coppice forests to provide habitat for bird species, with an arrangement in the operating rotation, it should be aimed to create different groups of coppices managed at different dates. In other words, the operation of part of a coppice area with short-term (1-3 years) rotations, and another coppice area with medium term (4-10 years) rotations, and another part with longer term (10-15 years) rotations will create a habitat for all birds that use coppices of different development stages. In the coppice forest, standing dead trees and wood should be left untouched to a certain extent. To a certain extent, older trees should be left untouched their natural course of growth, as happens in the case of conversion into forest. It would be useful to leave some of the wood cuttings in the field. In addition to these, supporting the mix of species in coppices and protecting different species of arborescent shrubs / trees bring will result a diverse population of fruits and insects, which are sources of food for birds.

## Old and Dead Trees

Older trees offer important habitats to birds, as they do to many other creatures, for nesting and feeding. Elements in older trees which are not found in young trees such as holes, cracks, vines, dead thick twigs are important in this respect. There is not much that can be done in areas where old trees are not present, but it will be useful to leave old trees as is in areas where they are present. For example, old black pine trees with flattened tops are very important old trees where cinereous vultures, which are a rare bird species in our country, make their nests. This type of trees, just like wounded or rotten trees are often not high in timber value; so, leaving them in the forest will not cause a substantial material loss.

Dead and felled trees are important elements of a forest ecosystem. Although they are often seen as a source of disease and an obstacle to effective forest management, they provide nutrients to the soil and provide habitat for many living things. Many different types of dead wood material are found in natural or near-

natural forests: in this type of forests, one-third to half of the total volume of timber is formed by dead wood.

But in heavily managed forests, this ratio is quite low. Especially under the leadership of mushroom species, dead wood material forms the raw material of a large and complex food chain. Fungi that grow in dead and rotting wood are the food for hundreds of invertebrate species that form the food sources of forest birds. For example, invertebrates that live in felled trees and rotting dry branches are important nutrients of bird species that feed on the ground like the thrush and nightingale species. Insect larvae and invertebrates that live in dead branches of old trees also provide food to woodpecker species. Flycatcher birds, for example, feed on wasps and flies, which are associated with dead wood. Woodpeckers use standing dry trees, trees with heart rot, and dead branches as nests. The marsh tit, some flycatcher species and the true redstart species also nest in natural holes found in standing dry trees.

Secondary forest areas, which are formed with the re-transformation of abandoned farmland back into forests, will also provide a habitat for many species of birds dependent on forests. When this process of transformation is left untouched in its natural course, it is sometimes possible to experience situations where shrubs or other species such as rhododendron predominate the flora. This greatly reduces the importance of the areas with the potential to transform into a secondary forest, in terms of its value for birds.

Silvicultural applications may need to be implemented to prevent such unwanted transformations. Looking at these types of sites only in terms of birds can also sometimes be misleading. For example, certain species of butterflies have adapted to living in meadows formed in areas where regular grazing is carried out or certain weed forms grow.

So, the transformation of these areas into forests will have devastating consequences for these important butterfly species. Therefore, silvicultural interventions should be planned for such areas according to the priority species found in the region, taking the opinion of the relevant experts.

The sub-forest shrub layer is a very important structure for birds in many ways, but these areas are sometimes damaged by overgrazing, dense shading, or improper management. Many bird species use the under-forest shrub cover for feeding, protection, or nest-making purposes. In order to improve the sub-forest shrub layer in areas where it is damaged for any reason:

- To reduce shading, forming clearing areas here and there will support new shrub development and promote the development of shrubbery weakened because of lack of sunlight.
- Reducing grazing pressure is important; however, it is also important to protect the shrubs and saplings and to plant new ones in areas where grazing pressure cannot be reduced.
- In places where the reduction or removal of the under-forest shrub cover is planned, the plan should be reviewed once more and it should be carefully evaluated whether this practice is really necessary or not.
- In the thinning and maintenance practices, it is important to be careful to prevent damage to existing shrubs as well as young trees and forest seedlings

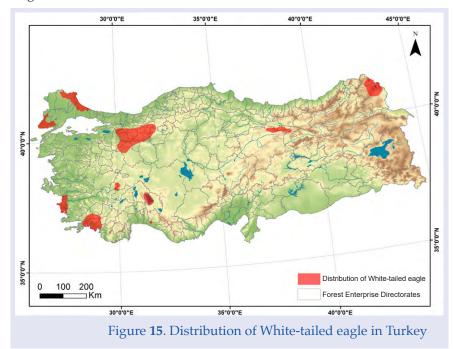
In-forest openings, large open spaces and road-shaped openings form conserved 'border' habitats (forest - open area border). These types of areas provide very important habitats for birds with appropriate silvicultural applications.

## 5.1. White-tailed eagle



**Descriptive Characteristics:** It is a large and bulky bird with quite large wings. Its length is 70 – 90 cm and its wingspan is 200 - 240 cm. The body and wings are in shades of brown. The light-colored head of adults turn to white in older ages. Its tail is short, wedge-shaped and light colored. On the tip of its wings are prominent (finger-like) feathers. Its call is similar to a repeated barking, and is heard especially at the beginning of the incubation period. The male call often has 4 to 5 syllables, as "krick, krick, rick, rick, rick, rick, while the female's is a deeper like "ra, rack, rack".

**Distribution:** There are settled populations of the white-tailed eagle spreading across the northern and western regions of Turkey. Adult individuals live settled in these areas, while young individuals may migrate south during the winter season.



**Population:** There has been a drastic decrease in their numbers recently due to human pressure. It is estimated that 5000 - 6000 breeding pairs (close to 15000 – 20000 individuals) live in Europe, where more than half of its distribution on Earth is found. In the world, it is estimated that there is a total of 20000 - 40000 individuals. The population of Turkey is estimated to be 20 to 25 pairs. It lives as a settled, invasive or migrant inhabitant, depending on the latitude it is found and its age.

**Habitat:** It lives in habitats where aquatic and forest ecosystems coexist to meet its need for feeding and nesting. It feeds near seas, lakes, wide rivers, islands and other wetlands hosting plenty of fish and other aquatic food sources. It prefers groves containing high, thick and old trees (like pines, beeches and oaks) and high rocky hills with steep cliffs.

It makes its nests on branch forks of old trees, which are 3 - 10 meters high above ground. White tailed gales rarely use aquatic habitats as their breeding grounds. It can use the same nest and space for many years. Since they prefer being neighbors with herons nesting in trees or seabirds nesting in cliffs, they prefer to make their nests near the nests of these birds. Their habitat can reach as high as 2000 m in altitude. On trees, it uses live branches as roosts, not dead branches. The area where they stay at night is sheltered and hidden, and may be located in forests and cliffs overlooking the sea or river valleys.

**Home Range:** Although the size of the home range they defend varies according to the quality of the habitat, they are usually between 3000 – 7000 ha; but may also be larger. The home range size of single individuals can be lower: 300 - 600 ha.

**Food:** As a versatile hunter, the white-tailed eagle can feed on preys such as water birds and mammals, as it can also feed on carrion. It can hunt freshwater and marine fish weighing 0.5 to 3 kg. It can hunt birds of different sizes ranging from fledglings to swan-size birds. It can hunt mammals of different sizes ranging from mouse size to lamb size but it rarely feeds on mammals. Occasionally, it can also hunt reptiles and amphibians. When hunting fish, it flies close to the surface of water and hunts fish swimming near the surface. It uses hiding skills rather than its agility, for hunting other species except from the fish. It attacks birds at certain intervals for a long period of time, focusing on an individual bird in the herd and choosing it as its target. They also attack breeding colonies to hunt eggs, hatchlings, and sometimes adolescents. It rarely attacks flying birds, instead it attacks birds that are either resting or waiting in the nest. The white-tailed eagle attacks the duck, grebe and Eurasian coot species which he identifies to be single and forces them to dive into water. Thus, it causes them to be exhausted and then catches them. This method is highly effective when partners attack the prey alternately.

The choice of prey varies depending on habitat and availability. In spring and summer, the fish are quite prominent. It feeds on different bird species throughout the year, but with the start of nestling time, the rate of preying on fledglings becomes higher. While feeding on carrion is important all year round, it becomes especially important in winter. It tries to reach its food as easily as possible, and in the meantime, it looks clumsy and heavy, but on the other hand it can reach a flight speed of 60 km per hour. Their daily nutrient requirement is about 500 - 600 grams.

**Daily Activity:** In March and April, birds wake up before sunrise, but their evening schedules are highly variable; sometimes they may be active even at dusk. It can be active from 1 hour after sunrise to sunset. It can spend most of the daylight hours on a roost or on the ground.

## **Seasonal Activity**

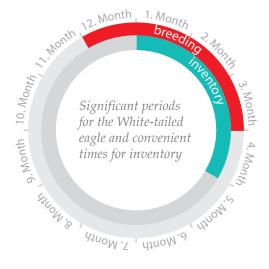
**Breeding:** It is monogamous and the loyalty of the partners continues throughout life. Reaches sexual maturity at the age of 5. The pre-breeding period begins in mid-December and continues until mid-March. It uses large branches, shoots, grass, moss and lichens to build its nest.

A nest used for successive years grows larger, expanding each year. It has been determined that a fouryear old nest consists of 2900 branches and weighs about 240 kg. The width of the nest can reach 200 - 240 cm and the depth can reach 80 - 100 cm. The nest is built by both partners. Usually the male contributes to nest construction by carrying nest material to the female. The white-tailed eagle starts to construct a nest or repair its existing nest at the beginning of the year.

Early in the breeding season, the pairs are fairly close together and often stay together in the nest. The female incubates in the evening, while the male perches on a branch close to the nest. Females undertake the most of the incubation and feeding tasks. When the female is not available, the male individual takes over the task. Once a year, at intervals of 2-5 days, a total of 2 or rarely 4 eggs are laid. In case of egg loss, it can lay eggs one more to compensate.

The incubation period starts from late January to early February and its duration ranges from 34 to 46 days. The hatchlings' feathering period before they become ready to fly lasts 70 to 75 days. When the eaglet is 55 days old, it can leave the nest and walk to side branches to go exploring near the nest. However, it stays near the nest for another 35 to 40 days and is fed by its parents until it becomes fully independent.

**Inventory:** The easiest way to determine whether the species is found in an area or not is to identify nest sites. In January - March period, when the trees are leafless and breeding takes place, nests can be identified by visiting nest areas. A telescope is needed to be able to see the nest easily from a distance. After several nests have been found, the nest or the area around it should be explored to see whether any white-tailed eagle is found, to be sure that the nest belongs to a white-tailed eagle.



**Recommendations on Forestry Practices:** It is important to protect potential nesting trees of old or giant character located in woodlands especially in fresh water areas such as lakes, deltas, wetlands and seasides. During the species' breeding period, which covers nest-making, incubation and brood-feeding periods (when the species is most vulnerable), it is recommended to take a break from forestry practices especially in areas which are known to be nested or used by the white-tailed eagle. All kinds of contamination, overhunting and disruptive/destructive practices must be prevented in the in-forest water sources close to the areas where the species is known to live.

96

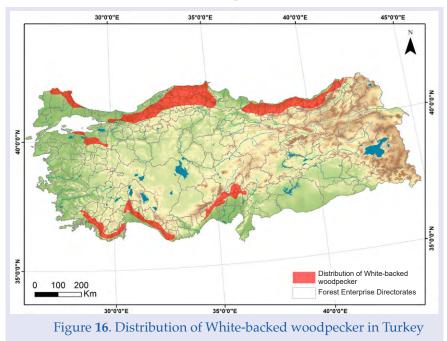


© Ömer Necipoğlu

White-backed woodpecker Dendrocopos leucotos

**Descriptive Characteristics:** It is the largest of the spotted woodpecker (dendrocopos) genus. Its length is 24 to 26 cm. Its body and wings are black-and-white and spotted like other spotted woodpeckers.

The wings are cross striped in white and they turn to red in color towards the underside of the abdomen. The top of the male's head is red. It has a flight pattern resembling a wave shape, which is unique to woodpeckers. The drumming "tock tock" sound which is heard when they rapidly peck at a tree trunk is easily distinguishable. Its call is in the form of a soft "kiuk" and several long "kweeks" between pecks.



**Distribution:** As a native species in our country, the white-backed woodpecker spreads in our coastal regions, especially in the Black Sea and Mediterranean regions.

**Population:** The size of the breeding population in Europe is estimated at 180,000 - 550,000 pairs. Europe hosts 25-49% of the world population. Although the species' habitat is expanding in Slovenia and Switzerland, the number of species is in decline. Dramatic declines have been observed in the number of white-backed woodpeckers, particularly in Scandinavian countries. Young individuals are known to show scattering (dispersion) behaviors in autumn and winter in breeding areas in Russia and Siberia. It is a native species but there is no clear information on the size of its population in Turkey.

**Habitat:** It is observed in Turkey in an elevation ranging from 600 to 1700 meters. It prefers forests of old, broad-leaved trees. It prefers broad-leaved forest areas containing beech, birch, maple, ash, elm, alder, poplar and oak trees and hornbeam forests or mixed hornbeam & fir forests. But sometimes it can be seen only in forests where coniferous trees are present. It can also use forest fragments found on steep and rocky terrains as habitat. It does not prefer forest areas which were heavily managed or still under heavy management. They need vast old forests and plenty of dead tree trunks to live in.

It makes its nests especially on rotten tree trunks. The width of the nest hole is 5 - 6 cm and the depth is around 25 - 30 cm. Nest holes are located at an average height of 4 - 5 m above the ground, but nests at an elevation of 28 m have also been recorded. Both sexes participate in the nest construction, but often females undertake this task.

**Home Range:** Individuals defend their home range (territorial). The area defended by an individual varies depending on the quality of the habitat, but covers the nest and an average of 10 ha area around it. One study found that 4 couples lived in a forest area with a size of 100 ha. In addition, the total area size used by an individual can range from 100 hectares in summer to 700 hectares in winter.

**Food:** Feeds mainly on insects, especially insects that drill holes in trees (e.g. *Coleoptera spp.*). In some areas, shelled fruits and fleshy fruits like blackberries may also be added to their diet, outside the breeding season. It picks up insects by pecking through hollows that are opened in dead or rotting deciduous tree trunks. They have a particular interest in felled trees and cut/broken, rotting tree trunk/roots. It uses the lower parts of the tree trunk more to feed. Adult individuals of white-backed woodpeckers pick their food from the bottom, not from the surface of the tree trunk, by opening deep holes in the trunk. The holes formed by its strong pecking on the rotten tree looks like as hollows, and these hollows may be 20 cm or deeper. They are known to peck the same spot for an hour and visit a tree that has been infested by insects many times until it becomes thoroughly clean. Young individuals tend to go for the easily accessible food sources found on the leaves of the forest crown. The insect species they use as food often belong to the following families: *Carabidae, Lymexylidae, Elateridae, Buprestidae, Scarabaeidae, Cerambycidae, Chrysomelidae, Curculionidae, Scolytidae.* It also feeds on the pupae and larvae of moths. These include species belonging to the following families: *Lymantriidae, Geometridae, Cossidae, Plutellidae.* 

Rarely, it can also feed on adult sawflies (*Tenthredinidae spp.*), wood wasps (*Siricidae spp.*) and flies (*Diptera spp.*) and their larvae.

**Daily Activity:** Active throughout the day. It moves from the early hours of the morning to an hour before sunset, especially for feeding purposes. Females leave the nest near noon during nestling care.

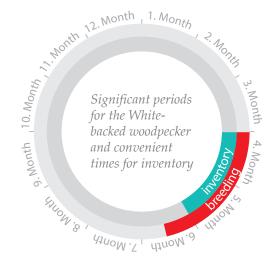
## **Seasonal Activity**

**Breeding:** It makes its nests in late March - early April and lays eggs during late April - early May. They lay eggs once during each breeding season and lay one egg each day during the egg laying period, laying a total of 3 to 4 eggs. Both sexes participate in the incubation period lasting about 35 days. The hatchlings complete the feathering phase 24 - 28 days after hatching and become ready to fly. During this period, the female usually rests in the nest with the hatchlings and leaves the nest late in the morning. Until 1 hour before sunset, the female and male, respectively, return to the nest. It can fly up to 1 km away from the nest when a situation threatening the nest occurs.

During the breeding period, both partners takes part in the care of the hatclings. During the incubation period, the female and the male incubate in turns, during 3 - 4 hour-long shift. At night, both pairs incubate. When the female is abrood, the male individual feeds the hatchling, and while the male incubates the female feeds it.

**Inventory:** While the most appropriate period for inventory is April-May, which is the reproductive period, inventory studies can be done all year round. The presence of the species in a sample area can be determined through playing a pre-recorded wood-pecking sound of the white-backed woodpecker, and then listening the possible response from the species. It would be useful to leave a 600-meter space between sampling areas where the recording was played. The sound is played for a duration of 3 minutes, followed by 5 minutes of rest for listening whether an answer comes or not. This method applies to all sampling areas. The study can also be carried out by walking along transects or driving along forest roads.

The response to the sound, its location, direction and distance are recorded and individuals or their nest areas are identified.



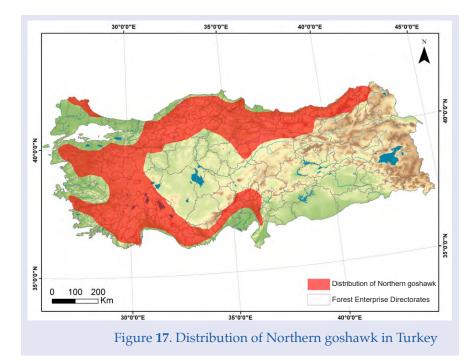
**Recommendations on Forestry Practices:** The main reason for the decline in the number of this species is the partial or complete loss of their suitable habitats due to some forestry activities. The most important factors that threaten the species are the removal of dead trees (felled or standing dry) and other dead materials from the forest for use as fuel, and the rejuvenation of deciduous old forests. Practices of rejuvenation and clearing of the forest floor are also reducing or destroying habitat characteristics that are critical to the species. In areas where the species is known to live, it is important to leave all kinds of dead woody matter (dry leaves, green and dry branches, felled trees, standing dry trees, wood fragments, etc.) untouched in the forest.



**Descriptive Characteristics:** The northern goshawk is the size of a large accipiter. Its length is 48 – 52 cm and its wingspan is 135 - 165 cm. The head is darker in color than the body, and the lower body is cross-striped. Its tail is long and wide and also cross-striped.

**Distribution:** Spreads in the Black Sea, Inner Aegean, Mediterranean and Northern Thrace regions.

**Population:** It is estimated that its settled population in Turkey is below about 500 individuals.



**Habitat:** It lives only in woodlands and forest areas. Northern goshawks are specialized in flying in dense woodlands. While it prefers forests and woodlands which usually house coniferous trees, it can also be found in areas where there are broad-leaved trees such as oak and beech. It spreads over a wide elevation range starting from sea level and reaching to 2500 meters. It prefers areas away from settlements, but can also hunt in areas close to villages where it can find easy prey. For hunting, it can travel as far as 6 km from its nest. It can use open areas during hunting only if they are close to woodlands or there are small shrubs allowing it to hide.

It can also hunt in places with small wetlands or agricultural areas amidst woodlands. It usually flies low, very close to tree crown or shrubs, but can fly gliding hundreds of meters in the breeding season. Nests are made 10 - 20 meters above the ground, on the branch of a large tree. Small branches and tree barks are used for nest construction, while green leaves including needle leaves are sometimes placed inside the nest. A new nest is about 75-90 cm in diameter and 25 cm in height. But older nests can reach 75 x 120 cm in size and 55 cm in height.

**Home Range:** Home ranges of same-sex individuals from the species do not overlap, because it is an area defending (territorial) species. But the home ranges of females and males may overlap. During the breeding season the nests of the pairs can be located 1 - 2 km apart from each other. In suitable habitat conditions, the total home range size, which includes the area it uses for wintering, ranges from 4000 - 8000 ha.

**Food:** It feeds mostly on birds and mammals. It can hunt chicken-sized birds and rabbit-sized mammals. It usually hunts alone, but the species has also been observed hunting in pairs. Hunting takes place in short flights that can reach up to 500 meters, with fast, aggressive, adept and agile movements. Using its vegetation for hiding, it monitors its prey from a hidden roost and makes sudden attacks. They normally give up if their first hunting attempt fails but they have also been observed attacking for a second time, albeit rarely. Just like the peregrine falcon (*Falco peregrinus*), it quickly descends from high above and catches its prey in the air. It uses this method, often for hunting the rock dove (Columba livia). It catches its prey with its claws and kills it. In a spot where it can hide, it eats its prey by depluming its feathers, or (especially in the breeding area) by carrying it onto an old nest or a branch.

Food preference varies depending on the availability of prey and is very varied. The grouse, pheasant, pigeons, crows, thrushes from the bird species; and rabbits and red squirrels as mammal species are animals that can be hunted by the northern goshawk. It rarely feeds on carrion, but it has been observed to return later to the prey killed by itself. It hunts in forest areas in habitats that are natural or close to natural, but in environments that change due to human influence, the hunting area also begins to cover agricultural areas. In some regions, its hunting areas differ in summer and winter.

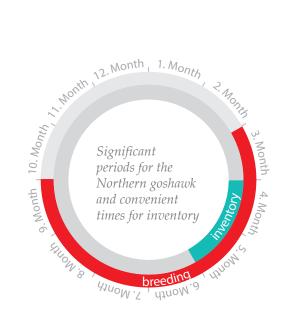
### **Seasonal Activity**

**Breeding:** The northern goshawk reaches reproductive maturity at 3-4 years of age. Nest construction begins at least 2 months before egg laying takes place, which is the period from February to April. It carries fresh green branches to the nest in the early morning hours during nest construction. They make their nests 10-20 meters above the ground, on the branch of a large tree.

Small branches and tree barks are used for nest construction, while green leaves including needle leaves are sometimes placed inside the nest. In April and early May, the female lays an average of 3 - 4 eggs in nests located on the tops of trees. The female incubates for a period of 35 to 38 days, while the male does not incubate, but helps the female to feed. Hatched during the May-June period, the hatchlings become ready to fly after a 35-42-day feathering period.

**Inventory:** The pre-recorded calling sound of the species is played by walking along transects or driving along suitable forest roads and stopping at certain intervals in the sampling areas in April-May, which is the breeding season. If any response is received, the direction and distance of the call is recorded and notes can be taken about the presence / lack of the species in that spot and an estimated location of its distribution.

Since the sound of the northern goshawk can be imitated by the Eurasian jay (*Garrulus glandarius*), the person who will do the inventory study must be well acquainted with the sounds of these two species and be experienced in this regard. The success rate of the searches performed by playing the northern goshawk's pre-recorded sound with a tape/CD/ MP3 player is much higher than when there no sound used. Therefore, making inventory studies using sound will ensure more successful results.

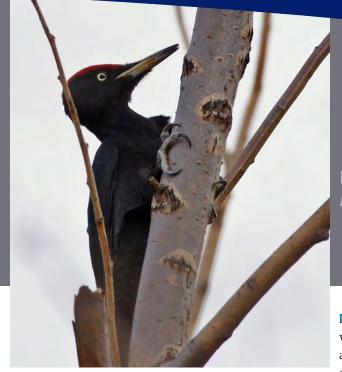


In addition to this method, frequent courtship flights made by the northern goshawk near its nest during the breeding period can be used to locate the nest, as these flights can allow the species to be seen over the forest from afar. For this purpose, the spots where the northern goshawk is seen flying in the breeding period should also be recorded, and if the identification of the nest location seems possible, the abovementioned method should be used by approaching this area.

**Recommendations on Forestry Practices:** If there are any detected nests, an area including the 200 to 400-meter diameter around the nest should be determined as a buffer zone, and forestry activities in this region should be stopped/interrupted especially during breeding time.

If there are certain areas which are known to be inhabited by the species but nest locations have not been detected, it is recommended that no forestry work be carried out in these areas, especially during the breeding period.

98



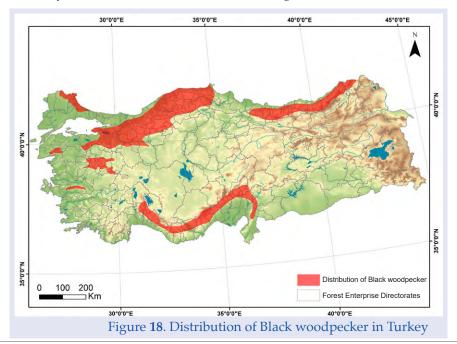
Black woodpecker *Dryocopus martius* 

© Ahmet Karataş

**Descriptive Characteristics:** It is the largest of all woodpeckers. Its length is 45 – 47 cm. Its body and wings are completely black in color. The top of the male's head, and the nape of the female are colored red. It has a flatter and less wavy flight than other woodpeckers.

Its call is clear and high-pitched in the form of a "k'luu". Its flight call repeats in the form of a shrill "crux crux". Like other woodpeckers, the 'tock tock' sound they make when pecking a tree trunk quickly is more articulate and louder.

**Distribution:** They spread in old forests in Northern Anatolia, Northern Thrace, Western and Eastern Black Sea regions. In the south, they are found in small areas in several regions of the Taurus Mountains.



**Population:** Its European population is estimated to be 1,500,000 – 2,900,000 individuals, but there is no information on the size of its population in Turkey. It is a native species.

**Habitat:** It prefers forests containing especially beech, fir, scots pine and mixed forests of needle leaved and broadleaved trees, as well as spruce forests, and other broadleaved or needle leaved forests. Sometimes, it is also found in small pieces of forest near the main forest (~4 km). Because they use the holes in the trunks of large trees to breed, they prefer old, needle leaved and mixed forests especially at breeding time. It chooses habitats away from humans and is easily disturbed. Its nest which is located 4-25 m above ground, with an entrance width of 8 - 12 cm, 37 - 60 cm depth and an inner diameter of 19 - 25 cm, is made by each sex on beech, pine, spruce, willow, poplar, birch or alder trees.

**Home Range:** Black woodpeckers defend their home range (territorial). During the breeding season, females and males form a pair and defend a common area, while living in separate areas outside the breeding season. The size of the area defended/used by the pairs during the breeding season varies between 150 - 3000 ha. In areas where trees are abundant enough to be used for food and nesting, a habitat size of 300-400 hectares may be sufficient; while in areas in which they need to fly long distances to search for food, the habitat size can range from 800 - 3000 hectares. Outside the breeding season, the female and male use different territories. Areas of some individuals may overlap in suitable nesting areas where there are large numbers of tree hollows. Older birds show quite a commitment to the areas they defend and some tree hollows. After the separation of the family, young woodpeckers move far away individually or in small groups.

**Food:** It usually feeds on adult ants and other insects or their larvae and pupae. Throughout the year, it opens holes in rotting root residues, standing dry trees, and tree trunks. It also feeds on dead trees and root remnants, in swamps and in fire-struck areas. It can use specific suitable areas very intensively. To feed, it primarily reaches insects on the tree surface and then the insects within the trunk, by drilling holes up to 30 cm deep. In winter, it can open holes 60 cm deep in the ground to reach ant nests, and in summer it can easily feed by collecting ants from their paths. In May-June, it can sometimes open holes in sap-rich trees and make use of them. Their diet consists of some species of ant (*Formicidae*), membrane-winged insect (*Hymenoptera*), sheath-winged insect (*Coleoptera*), two-winged fly (*Diptera*), and moth & butterfly (*Lepidoptera*) families. They have also been observed to hunt small snakes from time to time. It rarely feeds on cherries, apples, sorb tree fruits, hawthorn berries, blueberry and mistletoe fruits and scot pine seeds. It can clean a 20-30 cm thick snow deposit.

The adults regurgitate the food they eat to feed their hatchlings with. It can bring to the nest 26 grams of food at a time at the most. 2- or 3-weeks old hatchlings need about 70 grams of food daily. During the 28-day feathering period, the number of insects eaten by 3 hatchlings is 150,000 to 180.000.

**Daily Activity:** The feeding hours of adults start at 6:00 a.m. and continue until 20:00 in the evening. Feeding accounts for about half of its daily activity. The other half is made up of nest construction and nestling maintenance, depending on the season.

#### **Seasonal Activity**

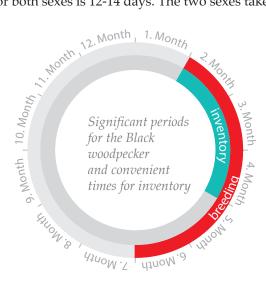
**Breeding:** Nest spot selection, nest hole opening and copulation takes place from mid-February to early May, with variations depending on each location. Each partner is involved in nest-hole opening, although the male works more than the female. Trees they prefer for opening nest holes include beech, pine, spruce,

poplar, birch, and alder. The nest height is 4 to 25 meters above the ground and the entrance of the nest is 8-12 cm in diameter. Both sexes are involved in nest building. Copulation takes place about 3 to 4 weeks before laying eggs, either after nest construction or after the selection of an existing nest. Both sexes incubate, while at night only the male incubates. The chest-high diameter of the trees chosen by the black woodpecker to nest is at least 30 cm. Females lay eggs once a year, laying one egg every other day and reaching a total of 4 – 6 eggs a year. The incubation period for both sexes is 12-14 days. The two sexes take

care of the hatchling, but the male is more interested, staying in the nest with the nestling at night. The feathering period of the hatchlings is 24 to 28 days.

**Inventory:** The best time of year for carrying out inventory studies for the black woodpecker is mid – February to April. Black woodpeckers are found active near their nests around this period and thus they are easier to detect. Because of their low level of activity during the summer period, inventory studies are more difficult then. It is possible to detect their nests by observation, taking into account the properties of their nest holes and the tree species they prefer for building their nests.

Inventory studies can be carried out by playing a prerecorded wood-pecking or calling sound of the black woodpecker, and then listening the possible response



from the species. A method suitable for this study is playing the record for a duration of 2 - 3 minutes, followed by 3 - 5 minutes of listening for the sounds in the environment. If there is an individual nearby and it answers, the location and direction of the voice can be recorded and the location of the answering species can be approached. This work can be done around the clock. When black woodpeckers hear the pecking sound, they can also respond by approaching the area where the sound comes from. If a record-aided inventory study is carried out and the black woodpecker gives a response to the recoded sound, it is suggested that the nest location should definitely be determined.

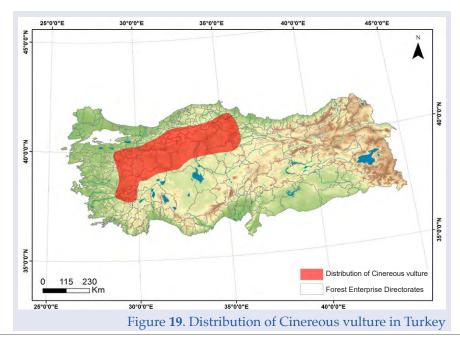
**Recommendations on Forestry Practices:** In order to prevent damage to the black woodpecker population in an area, the felling of especially older trees must be avoided. This will ensure that the species' suitable nesting and feeding habitats increase and those already present are not harmed either. It is also necessary to leave the standing dry trees on the field, to help the species feed and build nests.



**Descriptive Characteristics:** The cinereous vulture is a very large bird. Its length is 100 – 110 cm and its wingspan is 250 - 295 cm. Its body and wings are completely dark brown, while in younger individuals they are close to black. Its tail is short, its head and neck are nearly bare, with fluffy hairs surrounding its neck. It has no prominent and frequent calling sound.

**Distribution:** In our country, the region with the densest cinereous vulture population is Türkmenbaba Mountains in Eskişehir (26 pairs). Turkey's second largest known colony is in Kızılcahamam (Ankara) forests (7 pairs). Their total population in Turkey is around 50 - 200 pairs. In addition to the abovementioned areas, other known areas the cinereous vulture uses for breeding are as follows:

Hamam Mountain (Eskişehir), 2-5 pairs; Murat Mountain (Uşak, Kütahya), 2-4 pairs; Kavaklı Mountain (Ankara, Bolu), 1-5 pairs; Doğu Karadeniz Mountains, 0-10 pairs; Sarıkamış Forests, 0-10 pairs;



Şemdinli Valley, 0-10 pairs; Ardahan Forest, 0-5 pairs; Akdağ Mountain (Denizli, Afyon), 0-4 pairs; Sündiken Mountain, 0-4 pairs; Kazankaya (Yozgat), 0-2 pairs; Dikmen Mountain (west of Ilgaz Mountain), 0-2 pairs; Acıgöl Lake (Afyon, Denizli) and Uludağ Mountain (Bursa).

**Population:** Around 50 to 200 pairs in Turkey. In entire Europe, their population is estimated to be around 1500 pairs at the most.

**Habitat:** the characteristics of the habitat it needs for feeding and nesting are different. It uses a wide range of open areas ranging from steppes, pastures, meadows and even bare/stony mountainous areas to search for food. Additionally, in-forest openings are also suitable areas for finding food. As a nest location, it usually selects the flattened tops of old trees in high forests. In Turkey, it breeds in forests located on an elevation of 600 meters to 2000 meters, which is dominated by pine trees or where pine is the part of the forest mix. It has been observed that it prefers trees facing the northeast or the east for building nests. Besides, it can also nest on rocky slopes or steep cliffs. For choosing its environment for searching for food, it often prefers forest covers made up of hardy trees and especially pine, juniper, or oak species. It avoids land that has been degraded and used by humans. Their nests and resting areas are usually in places where they can take off quickly and make better use of the airflow. Their movement on the ground is strong and fast. Although it is a very strong and robust species, its populations are threatened by the shrinking of the habitats they feed on.

**Home Range:** Its home range consisting of its nest located within or on the edge of the forest and the feeding territory around it can cover the area within a 30 km radius around the nest (~300,000 ha). However, the distance between nests varies from 30 meters to 1000 meters depending on population and habitat size. High density populations in which 25 pairs breed in an area of 300 hectares are also recorded. The average size of the area defended by a couple as a nesting area is about 1 hectare.

**Food:** It feeds in small groups mostly on medium and large sized carrion. It rarely feeds on live prey - in such cases it hunts slow or sick animals. They are known to return to the same carrion after a few days to feed. It looks for food in lower and more woody areas than griffon vultures, and often feeds on dead mammals, especially dead rabbits and sheep. The noticeable increase in wild boar numbers has also led them to the carcasses of these animals. Their diets also include insects and lizards. As the feeding area moves away from the nest, it can be observed that it also tends to different food sources due to differentiation in the hunting area. They are known to eat tortoises, for example. The maximum daily nutrient requirement of a breeding pair is 2.2 kg in late June - early July. The annual nutritional needs of a couple who successfully raise their nestlings is 600 kg.

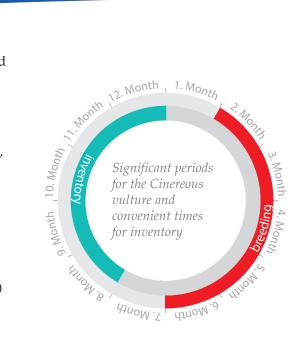
### **Seasonal Activity**

**Breeding:** Cinereous vultures are monogamous; they pair with the same mate all their lives, and also wander in pairs outside the breeding season. It usually reaches reproductive maturity at 5-6 years of age, and forms scattered colonies. It makes its large nest, where it lays its single egg, to the top of old pine, oak or juniper trees. It can rarely breed on cliffs as well. All known nests in Turkey are found on the flattened tops of old black pine trees. The elevation of the nest from the ground is 10 - 20 meters. Long before laying eggs, couples spend a long time together in the nest. Although the egg-laying period lasts from early February to the end of April, the period in which the most intensive egg-laying activity is observed is from the end of February to the beginning of March. During the 50 - 54 days long incubation period, both the male and the female incubate. The hatchling usually spends the first 100 days in the nest. It leaves the nest 2 - 3 months after it begins to fly. Reproductive success in areas without human impact is very high. The hatchlings feed on food digested by their parents.

**Inventory:** Since Cinereous vultures are forestdependent for nesting in particular, it is recommended that an inventory study be conducted to determine nest locations. Field surveys is required to determine the nests in the area. In field survey studies, areas with the suitable elevation and tree species that cinereous vultures may prefer for nesting are selected, and observation is carried out in these areas. The cinereous vulture uses old black pine trees with a flattened the top for nesting in Turkey.

But in areas where black pine does not exist, tree species that also has a flattened top can also provide a suitable nesting tree. Therefore, studies are carried out starting from the appropriate elevation (about 600 meters), in areas known to be inhabited by such trees.

Bare areas in high altitudes, and areas dominated by oak and shrubbery are not taken into account.



The period between October and December is suitable for carrying out observations, as it is the postbreeding period. If the weather and transportation conditions are not suitable, work may start at the end of July. The area is scanned with the help of binoculars and telescopes, and the nests are detected. Cinereous vultures observed while flying or feeding on the ground during studies are also included in the inventory. Information to be obtained from residents in the region also gives important information about the species' nest location and use of the area.

**Recommendations on Forestry Practices:** The protection of the cinereous vulture species is strictly dependent on the protection of forests. The continuation of the native tree species in the area should be ensured and older forests need to be conserved. No forestry activity should not be conducted at a diameter of 1 km or closer to the area where the species is known to nest during the breeding season. If forestry practices are required near the nest, times outside the species' breeding period should be preferred for these practices. Trees with nests should never be felled. Old pine trees whose tops are inclined to get flattened in the coming years and that have the potential to be used for nests in the future should be preserved and not cut down.

The natural forest closure should be maintained at least a 100-meter diameter around these types of trees. All kinds of human activity near nest sites (forestry, tourism, road construction, footpaths, road facilities, etc.), cause the Cinereous vulture not to use these areas. Therefore, in forest areas that are determined to be important to the Cinereous vulture, human activities should be limited as much as possible, especially during the breeding period.

100

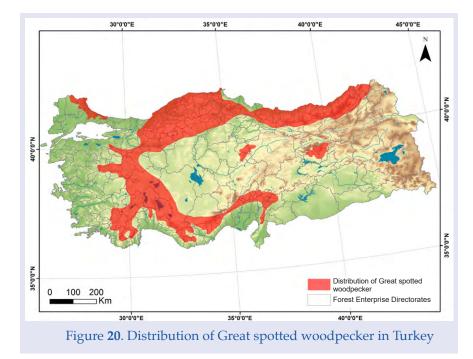


Great spotted woodpecker Dendrocopos major

© Ahmet Karataş

**Descriptive Characteristics:** It is a medium-sized spotted woodpecker. Its length is 20 to 23 cm. Its body and wings are black-and-white and spotted like other spotted woodpeckers. It has a slender long white plumage at the top of its wing. Its lower belly has a red patch. The top of the male's head is black but has a red band extending to the back. Next to its head is a curved black band that connects its neck with its beak. It has a flight pattern resembling a wave shape, which is unique to woodpeckers. The drumming "tock tock" sound which is heard when they rapidly peck at a tree trunk is easily distinguishable.

**Distribution:** Its general distribution in Turkey is in the Black Sea, Mediterranean and Inner Aegean regions. In addition, it is also observed on the Black Sea coast of Thrace and in certain areas in Central Anatolia.



**Population:** It is estimated that the breeding population in Europe consists of 12,000,000 – 18,000,000 pairs. Europe hosts 25-49% of the entire world population. In our country, its estimated population is 1000 – 10000 pairs. It is a native species.

**Habitat:** It lives in forest areas on the Mediterranean and alpine forest border, where there are tree types suitable for opening nesting holes. It prefers forests composed of large, broadleaf trees, as well as forests of conifers or mixed species of trees. It uses the forest's crown cover for feeding, rather than the forest floor. It has mastered in climbing the tree trunk. It is found in mountainous and moist forests in our country, especially in dense and coniferous forests.

**Home Range:** During the breeding season, the breeding pair defends their territory (territorial). The home range size of a pair during this period ranges from 4 - 60 ha. During the breeding season, especially during nestling care, pairs move within an area that is usually up to 100 - 600 m away from the nest. Outside the breeding season, the female and male use different territories. These areas may partially overlap and their size varies according to habitat type, and the habitat size of an individual is between 2 - 25 ha.

**Food:** It feeds mostly on insects, but its main nutrients in winter are the seeds of trees. In summer, it searches for insects by poking in tree crevices and peels tree barks using its beak as pliers.

In winter, it searched for insects by pecking at the tree, and drills holes in the tree with vertical hammerings. The holes it opens to reach insects and their larvae can reach a depth of 10 cm. Their tongues can extend up to 4 cm. It catches soft preys by stinging them like a harpoon, while hard-shelled insects will cling to their tongue. It specifically chooses insect infested or rotting trees to feed on. It can rarely be seen feeding on the ground and atop ant nests as well. It also eats fleshy fruits in summer and autumn, and can rarely feed on the eggs and nestlings of small birds. When compared to other woodpecker species, it uses the crown layer of the forest more to feed.

Its food sources of insects and other invertebrates include: Lepidoptera (*Cossidae, Notodontidae, Lymantriidae* and *Sesiidae* larvae), Diptera (*Oxyna*), Coleoptera (*Cerambycidae, Scolytidae, Lucanidae, Chrysomelidae, Buprestidae, Coccinellidae, Curculionidae, Carabidae*), Hemiptera (*Aphidoidea, Coccoidea*), Hymenoptera (*Siricidae, Tenthredinidae, Cynipidae* larvae), mayflies (*Ephemeroptera*), spiders (*Araneae*), isopods (*Isopoda*), and worms (*Oligochaeta*). It also feeds on the seeds of pines and (*Pinus spp.*) and spruce trees belonging to the coniferous species; and the seeds and nuts from deciduous species such as hazelnuts, hornbeams, oaks, beeches, almond and walnut trees.

**Daily Activity:** Active during the day, rests at night. The early hours of the morning are when they are most active. They feed heavily during the early hours of the morning and in the afternoon.

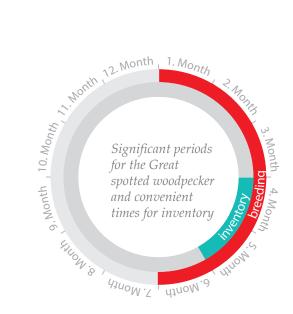
### **Seasonal Activity**

**Breeding:** The mating period starts at the beginning of April and continues until the end of June. Its nest which is located in holes in tree trunks 3 - 5 m above ground has an entrance width of 5 - 6 cm, a 25 - 35 cm depth and an inner diameter of 11 - 12 cm. Nests, which take an average of 2 - 4 weeks to build, can be used again in coming years. Both pairs are involved in nest construction, but the male works more. Females lay eggs once a year, laying one egg every other day and reaching a total of 3 – 8 eggs a year. Incubation begins with the laying of the last egg, and goes on for 8 to 16 days.

Both sexes incubate, but the male takes on more responsibility. The hatchlings become ready to fly after a feathering period of 20 to 24 days. Within two to three weeks after completing the feathering, nestlings become independent of the nest.

**Inventory:** April-May period which covers the breeding period, is the most suitable time interval for inventory works.

Inventory studies can be carried out by playing a prerecorded wood-pecking or calling sound of the great spotted woodpecker, and then listening the possible response from the species. It would be useful to leave a 600-meter space between sampling areas where the recording was played. The record is played for a duration of 3 minutes, followed by 5 minutes of silence for listening whether an answer comes or not. This method applies to all sampling areas. The study can also be carried out by walking along transects or driving along forest roads. The response to the sound, its location, direction and distance are recorded and individuals or their nest areas are identified. The morning hours when the great spotted woodpecker is the most active are the best time to work, but results can also be obtained by continuing to work during the rest of the day as well.



**Recommendations on Forestry Practices:** During forest rejuvenation and maintenance works, the removal of rotting, standing dry, felled and old trees from the forest causes a decrease in food resources. Standing dry trees and old trees should not be removed from the forest as part of forest rejuvenation / maintenance works which encompass a wide area.

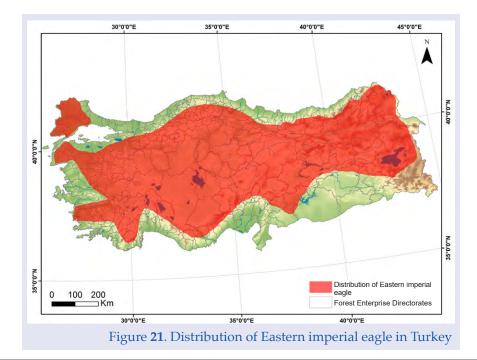


© Ahmet Karataş

**Descriptive Characteristics:** It is a large bird with broad wings and a large tail. Its length is 72 – 83 cm and its wingspan is 190 - 210 cm. Its wings and body are brown. Adults have white spots on their shoulders and their necks are in lighter color.

On the tip of its wings are prominent (finger-like) feathers. It keeps its wings flat as it rotates and rises, occasionally lifting them slightly upwards. It sometimes calls in the form of 'kraw kraw' sound.

**Distribution:** It shows a holistic distribution in Central Anatolia, Northeastern Anatolia and inner Black Sea regions. It has a more scattered distribution further in the south.



**Population:** 5200 - 16800 individuals are estimated to live in the world and their numbers are steadily decreasing. In many countries in Europe their numbers have decreased, and in some countries, they have even become extinct. As a result of the dedicated conservation efforts carried out in Slovakia and Hungary, the species' status has improved in these countries.

**Habitat:** It breeds in flat and mountainous forests, at an altitude of about 200 – 1000 m. It is predominantly a lowland species. It is not found in rocky areas, as the golden eagle does, but can rarely to use its habitat in places where there is no golden eagle. As their nest location, eastern imperial eagles generally prefer trees that are not covered with other trees and where they can watch the environment comfortably and unhindered; and as their wintering place, they prefer forests near water bodies. Although they generally prefer low altitudes for their habitat, they have been forced to live their lives at higher altitudes over time, due to their original habitat narrowing as a result of forest rejuvenation and hunting practices.

**Home Range:** The eastern imperial eagle lives in solitary and defends its territory (territorial) and their home range can go up to 5000 hectares. Since they feed in the open areas (such as steppes, fields) around the nests they make in the forest, the size of their home range varies according to the abundance of food sources in the area. The distance between its nests in the forest varies from 300-1500 meters. The home range of an individual can fall down to 300 hectares, and 4 pairs can be found in an area of 1000 hectares.

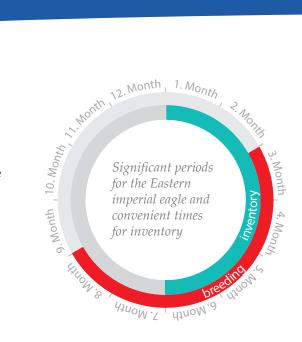
**Food:** It feeds on small and medium-sized mammals, especially during the breeding season. These are usually squirrels, hares, Asia Minor ground squirrels (Spermophilus xanthoprymnus), and other rodents (e.g. mouse types). It also feeds on water birds and small birds where wetlands are found. It also feeds on carrion in wintering areas and during migration. It rarely feeds on reptiles. They form groups of 10 to 20 around carrion. It watches its prey on the ground from a low roost in a tree, or over an elevation like a pile of hay on which it perches. Prefers preys weighing 25 to 1450 grams. Daily nutrient requirement is 400 to 600 gr and it can take up to 1200 grams of food per day.

**Daily Activity:** During the breeding season, the pair spend the night in the nest or rather close to the nest. It hunts between 5:00 - 9:00 in the morning and 17:00 - 19:00 in the evening in May – June. They were observed returning to the nest with a prey 3 hours after sunrise at the earliest. They can be seen resting on small hills in groups of 5 to 8.

### **Seasonal Activity**

**Breeding:** The eastern imperial eagle reaches reproductive maturity at the age of 4 - 5. Courtship behavior begins immediately when the breeding site is reached in the spring, but courtship flights can also be seen in the winter and autumn periods. Because they are monogamous, pair formation usually occurs in wintering areas. Both sexes participate in nest-building, incubation and brooding. After copulation and even during hatching, they continue to carry branches with green shoots to their nest. They can lay eggs from mid-March to mid-April. Their nests are 1 - 2.4 m in diameter and 60-180 cm high and 10 - 25 m above the ground. Nests are mostly reused, or 2 - 3 nests can be used alternately during each breeding period. A new nest is completed in about 10 days. It lays eggs once during each breeding period and lays a total of 2-3 eggs at intervals of 2 to 3 days. The incubation period is 43 days. The male and female go hunting in shifts to feed the eaglets. After 60 to 77 days, the eaglets get ready to fly away from the nest.

**Inventory:** The easiest way to determine whether the species is found in an area or not is to identify nest sites. In January - March, when the trees are leafless, possible nest locations can be identified by visiting the nest areas. A telescope is needed to be able to see the nest easily from a distance. After several nests have been found, the nest or the area around it should be explored to see whether any eastern imperial eagle is found, to be sure that the nest really belongs to an eastern imperial eagle. Nests are often found in large trees located near fields or roadsides. Nest detection can be done at any time of the day. After the detection of the nest, it can be revisited from end of April to May to confirm whether the nest has been used or not. Nest checks can be carried out early in the morning or in the evening.



Since the eastern imperial eagles make courtship flights in April-May, it is also beneficial for inventory studies to observe these flights that can be visible from a certain distance, as it can give clues about determining the breeding individuals in the area their approximate nest locations. During the field studies carried out as part of inventory works, the locations where the eastern imperial eagle is observed feeding, flying, perching in trees or on the ground should be recorded.

**Recommendations on Forestry Practices:** Habitat change resulting from planting/sowing exotic/foreign species instead of native plant species and the felling of large trees as part of forestry practices are among the main reasons that threaten the species. In areas around 0.5 - 1 km of nests, forestry practices like road opening etc. should not be carried out during breeding period. It is important to maintain in-forest openings and natural open spaces close to the forest, which they use for feeding purposes, in their natural structure.



# 6. Priority Amphibian& Reptile Species

As predators in ecosystems, reptiles (lizards, snakes, etc.) and amphibians (frogs, salamanders, etc.) assume a regulatory role over many small living species. They also play their part in communities as being a prey for other species. Reptiles and amphibians can also be used as indicator species in long-term monitoring studies in specific areas, reflecting ecosystem health.

The decline or extinction of some species in one area may point to negative factors that are difficult to spot in the short term, affecting the health of the entire ecosystem in that area. Moreover, the medicinal and biotechnological use of special proteins found in the poisons and body secretions of reptiles and amphibians is on the rise. It should be noted that each living species is a unique source of value that adds diversity to our world and a potential source of genes that can be used for human benefit.

© Deniz Yalçınkaya

In Turkey, there are currently 165 species of reptiles and amphibians. Many of these species exist in habitats that do not have any special conservation status but are within the jurisdiction of the forest enterprise directorates. When compared to the surface area of our country, conserved areas cover only around 5% of the surface area. Furthermore, the representation of existing conserved areas of the important habitat types that exist in our country is inadequate. For these reasons, it is very important that reptiles and amphibians are also taken into account in forestry activities, so that rare species can be conserved.

Only some of the reptile species living in our country are dependent on forest-type habitats which can be considered important in terms of forestry activities. Snakes, lizards and turtles, which are cold-blooded creatures, keep their body temperature in balance using variables of outdoor temperature. Sunbathing is a practical way of increasing body temperature for many of these creatures. Therefore, in countries located in the temperate zone, such as Turkey, the number of reptile species associated with forests is very small due to the fact that the sub-forest habitats in these countries are shady and poor in terms of places suitable for sunbathing. In general, rocky areas, steppes, and shrubberies or wooded areas with a low rate are closure are more preferred by reptiles.

Amphibians, which are also cold-blooded animals, have adapted to cool and humid environments, unlike reptiles. Thus, it can be asserted that amphibians' dependence on the forest is greater than that of reptiles.

However, the most determining factor for many species of amphibians living in Turkey is the presence of water resources. Except for a few species, all amphibian larvae need water resources to develop. Adults of many species are also dependent on water sources during mating period. There are also species of amphibians that have adapted to spend their terrestrial periods outside their aquatic period in steppe or alpine ecosystems.

Almost all of the reptile and amphibian species living in our country have been identified, but local fauna records are very few. Inventories formed for the conservation priority species of reptiles and amphibians living in areas managed by Forest Enterprise Directorates will enable basic distribution information to be obtained. In this section, some general information about the habitat characteristics required by species of reptiles and amphibians is provided, forestry activities that may have an impact on their habitat is evaluated and some suggestions are made.



© Deniz Yalçınkaya

In afforestation studies, it is recommended to use tree species that have a natural distribution in related areas. In addition, it is important to maintain existing ecosystem elements in newly reforested areas. For example, in areas with natural steppe characteristics, it is recommended that the afforestation practices should be limited and the species of trees that exist naturally in the area should be sparsely planted and conserved together with areas that retain natural characteristics.

Water resources are important for most amphibians. These sources may also be temporary ponds that dry up during the arid period, or sources with continuity, such as streams and lakes. Most frogs and salamanders need these sources in their breeding period.

Some of them live around these water bodies throughout the year with their larvae and adults. Most reptiles and amphibians use stone and rock bottoms for hiding purposes. Therefore, it is not a good idea to



remove stones and rocks in the areas in question. In woodland areas, practices such as machineploughing, hoeing, or the scraping of the decaying leaves on the ground, which all result in the loss of the cover on the ground, should be avoided if possible and carried out only when inevitable.

These practices cause the degradation of the habitat structure needed by species living on the forest floor.

During or after the planting/sowing preparation phase, complete removal of herbaceous and shrubtype plants from the area should be avoided. Instead, only a required size of area should be cleaned and the remaining vegetation should be kept. Shrubs in particular are frequently used by reptiles as feeding, hiding and nesting areas.

Remainders like tree logs and branch heaps that are left from silvicultural practices such as grove maintenance and pruning are used for hiding purposes by most of the reptiles and amphibians.

Dead tree logs can also function similarly.

For this reason, leaving some production waste in the forest is important for the support of reptile and amphibian habitats.

High forest closures can be a very important factor for some species of amphibians under certain

conditions. For example, in some low-altitude areas where the Caucasian salamander (*Mertensiella caucasica*) inhabits, forest closure can become a quite decisive factor.

However, most reptile species prefer forest borders in particular. This is because they need to sunbath in order to balance their body temperatures.

It may be useful to leave open spaces in dense woodlands to meet the habitat needs of these creatures. Nonetheless, instead of a single layer forest structure to be established for the purpose of wood production, a multi-layer forest structure consisting of grassy and woody plants, in which the under-forest cover is also maintained, should be preferred.

In addition, with applications such as rejuvenation and thinning, it should be preferred to make gradual cuts rather than making sudden dramatic changes with collective cuts in their habitat.

In some cases, habitat requirements of different species may appear to contradict one another. Some species need in-forest openings, while for some, closeness is important. In fact, this does not pose a major problem except in cases where sensitive species coexist in very small areas. It is known that many places rich in biological diversity are also rich in habitat diversity.

The needs of many species can be met at the same time by the co-conservation of various habitats in forest lands.

The use of existing forest roads for silvicultural practices and in the transport of forest assets obtained as a result of these practices will reduce habitat destruction. It should be taken into consideration that the diversity of wildlife will gradually decrease with increase in the number of roads in the forest, and the establishment of new roads should be avoided unless necessary. Although difficult, transportation and ground skidding works should be done with cattle, instead of tractors, in places where biological diversity is important or a priority. Especially in-forest ground skidding, which causes the dead cover and humus layer to be torn and the mineral soil to be carried away by water erosion should be avoided as much as possible. The flow direction of the water and the risk of erosion it may cause should be taken into consideration when planning ground skidding routes.

Selection (marking etc.) of trees to be removed from the area as part of silvicultural interventions and subsequent production activities should be carried out under the follow-up, control and supervision of technical personnel and conservation officers who have been informed about the rare and endangered species found in the area.

### Lyciasalamandra genuses

There are six Lyciasalamandra genuses observed in Turkey. Since there is limited information about these species and because their known basic characteristics are similar to each other, information about these six species has been given together.

### 6.1.1. Atıf's Lycian salamander

It is known as Atıf's Lycian salamander and lives only in areas around Akseki and Alanya (Antalya) at an altitude of 190 -1300 m.

### 6.1.2. Bille's Lycian salamander

103

### Lyciasalamandra billae:

It is known as Bille's Lycian salamander and lives only in a very narrow area around Akyarlar (Antalya) at an altitude of 15 - 230 m.

### 6.1.3. Antalya salamander

104 Lyciasalamandra antalyana:

It is known as the Antalya salamander and lives only in a very narrow area around Kedetler (Antalya) at an altitude of 120 - 650 m.



## 6.1.4. Fazıla's Lycian salamander105 Lyciasalamandra fazilae:

It is also known as the Göcek Lycian salamander. Lives around Gökçeovacık, Dalyan and Üzümlü (Muğla). A dense population inhabits the Domuz Island. A low-density population lives in the Tersane Island, where human activities are more intense.

### 6.1.5. Luschan's salamander

### 106 Lyciasalamandra luschani:

It is known as the Luschan's salamander and lives only in areas with an altitude of 60 - 840 m around Eşen Creek (Muğla - Antalya Provincial Border) and Finike (Antalya).

### 6.1.6. Marmaris salamander

107

### Lyciasalamandra flavimembris:

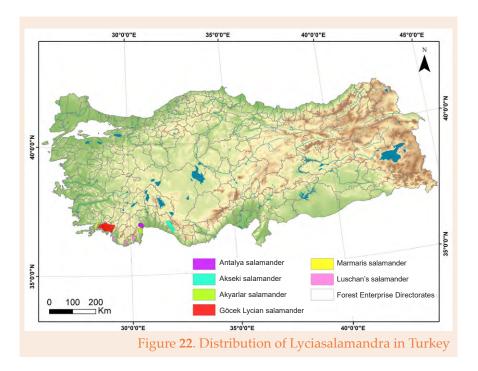
It is known as the Marmaris salamander and lives only in Marmaris, Ula (Muğla) around an altitude of 80 - 620.



Distribution: All Lyciasalamandra genuses spread in the Western Mediterranean region.

Population: There is no clear information about the population size of Lyciasalamandra genuses.

**Habitat:** They can be observed in very different habitats such as open areas formed as a result of grazing and cutting, stony areas, shrubs, flat farmlands, settlement borders, gardens and pristine pine forests. They prefer north-facing shady and humid environments more than south-facing open and dry environments. They live in crevices, hollows, under stones and earth, depending on the weather and the season. Especially the humidity in air and weather temperature are the determining factors for them to come out from the soil.



Food: They feed on various species of arthropods, such as insects, spiders, and small snails.

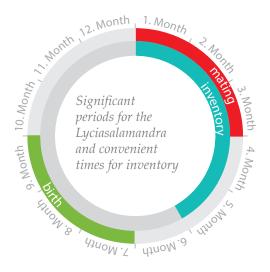
Daily Activity: They are active at night. During the day they hide under stones and rocks or in stone crevices.

**Seasonal Activity:** The most sensitive period for this species is the period between mid-December and mid-April. They have no aquatic periods. They remain above ground from December - January to April - May, and under the soil for the remaining months. The weather temperature and air humidity determine the start and end dates of these periods.

**Copulation and Birth:** The mating period is between 15 January and 15 March. After a gestation period lasting 7-8 months, they give birth to 1-2 babies which are 6-7 cm tall, starting from July to September.

**Inventory:** They can be easily picked on rainy days and nights between January and March, when the weather temperature is 5 - 15°C.

In fact, it is even possible to see these animals in the open area during the daylight hours when it rains. They can also be found in open areas and under stones below 5°C, as long as there is no frost.



After April, they are not likely to be seen as the weather becomes very sunny. It is almost impossible to observe these animals in the later months of the year.

However, in appropriate weather conditions (after strong rainfall lasting more than a day) they may be actively present on the soil surface or at points close to the surface until early May. Places to look at when doing inventory work are mostly places where calcareous rocks with moist and cool crevices are found to provide animals an escape during hot and arid times. They can be seen on the soil surface or actively climbing on rocks at night, especially in rainy or humid weather. They can hide themselves deep in the soil in long-term dry and windy weather during their active winter months. Even where the population is very dense, it is unlikely to observe this species at such times.

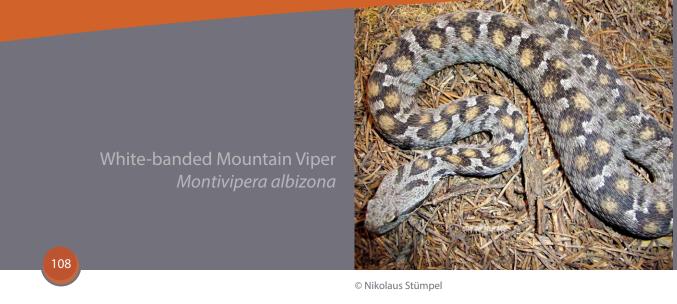
In suitable season and during daytime, places to watch out for during sampling is as follows:

Under the stones in rocky (calcerous) areas which are sparsely populated by pine trees and where plant species like the white asphodel (*Asphodelus spp.*), iris (*Iris spp.*) are abundantly found. If the stone to be observed is covered with moss, they are very likely to be under the stone. Since it is possible to see these animals in open terrain after dark, sampling should be done at night in these areas.

Individuals can be held gently directly by hand when it is necessary to capture them to classify the species and take a photograph record. As the secretions on their skins is not harmful, this creates an advantage for manual capture. However, it is not recommended to rub hands in delicate organs such as eyes and lips during the study due to poison released from the secretion glands in their skin; and hands should be washed after the study. Captured animals should be left where they have been captured in a short period of time.

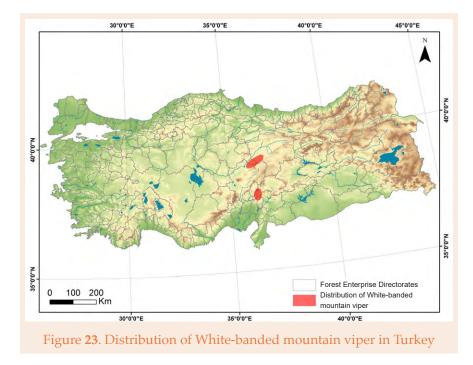
**Recommendations on Forestry Practices:** Practices like tillage, stone removal, clearing of the grassy cover (grasses and shrubs) as part of reforestation works should not be done in places known to host Lyciasalamandra genuses, as it will cause the destruction of their local habitats. As the dead cover on the ground (branches, leaves etc.) and felled trees provide a hiding and sheltering space for the species, it is also important to leave these areas untouched.

Since the period between October and June is the period when Lyciasalamandra genuses come out on the ground surface, it is important to limit forestry activities during this period in areas where they are known to live.



**Descriptive Characteristics:** Its length varies between 60-130 cm. It has a relatively big triangular head and a thin neck. There are two dark colored stripes on its head. There are also dark colored stripes on each sides of its head. Its back is grey. On its back, there are circular patterns which has brown spots in the middle circled by black color and there are white zones between each of them. Its abdominal side is pinkish grey and has dark spots.

**Distribution:** They can be observed in Kulmaç mountains around Sivas-Kayseri and mountainous areas of Kahramanmaraş. This animal is likely to be seen especially around Kahramanmaraş-Göksun.



Population: There is no clear information on the population size in Turkey.

**Habitat:** The species can live in regions where the altitude is up to 1500-1800 m above sea level. They prefer stony and rocky mountain slopes with sparse vegetation near regions where oak and black pine forests prevail.

**Food:** It feeds early in the morning and late in the evening. It feeds on small rodents, lizards and invertebrates.

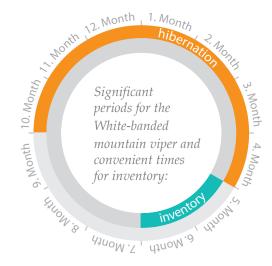
**Daily activity:** It hunts in the early in the day and late in the evening. In the daytime, it usually rests under stones and it may stay for long near the stone in order to sunbathe.

**Seasonal activity:** It is estimated that it emerges from hibernation in the beginning of May and that June is the most active period. It cannot be observed much after the weather gets cold.

**Inventory:** The best month for inventory studies is May. When seen, it can be distinguished by an expert who is familiar with the species. However, in some cases, it may need to be caught for species determination on condition that it is subsequently released in the same area .

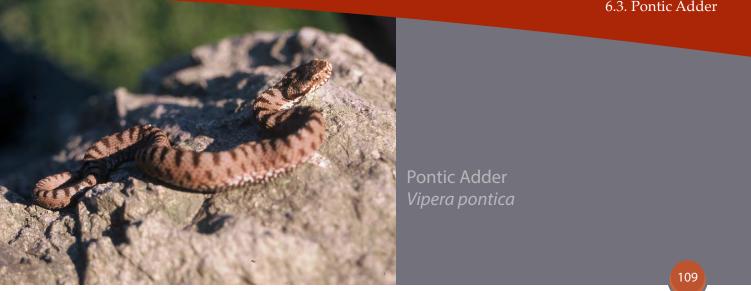
It is recommended to be careful when catching the animal since it is venomous. It does not bite instantly as it is a slow - moving animal. Sticks or iron bars that has an end in the shape of the letter "L" can be used to catch the animal. It is necessary to push its head down with the end of the stick. It is recommended to be careful to avoid its sharp and strong fangs which are on the roof of its mouth. Therefore, it should be held behind its head.

Gloves that are made of fabrics thick enough to prevent the fangs from penetrating and cover the forearm can also be used to catch the viper. It is also recommended to wear long boots that are resistant to bites.



**Recommendations on Forestry Practices:** Herbaceous plants and underbrushes are important components of the species' habitat and they should be conserved. It nestles under the stones or rocks like all reptiles; therefore, stones and rocks should not be collected, and the natural structure should not be destroyed in areas where they live. Practices such as ploughing, hoeing or scraping the surface covering the soil such as fallen leaves are not recommended since they have negative effects on the characteristics of the home range that the species need. These practices should be carried out at a minimum level.

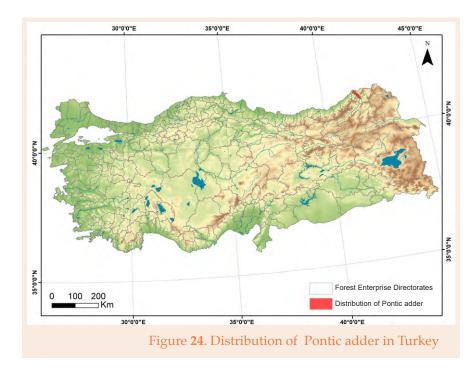
The tree density should be conserved during lumbering practices in areas where the species abounds. Using the existing forest roads to carry the trees cut down for sale will decrease the habitat destruction. Opening new roads or driving a tractor frequently in the area should be avoided. Practices such as dragging through downslope are not recommended.



© Oğuz Türkozan

Descriptive Characteristics: This short snake species is 40-50 cm in length. Its back is in beige tones and has horizontal dark brown (circled by black color) spots which are merged in places zigzagging on it. There are two spots on its head near the neck and they merge with the stripe on its back forming a thin line. Its abdominal side is black and has white spots on it. The tip of its tail is greenish yellow.

Distribution: The species can be observed near Çoruh Valley and Çamlıhemşin in Artvin province.



**Population:** Although their exact number is not known for sure, they are estimated to be few in number (less than 250).

Habitat: They can be observed in forestry areas (alnus glutinosa, beech, chestnut, hornbeam, elm tree, oak), areas with the Mediterranean vegetation and stony areas. It can expand up to 1000 m.

**Food:** Although it is not known for sure, it probably feeds on invertebrates, lizards and rodents (such as mouse) as in other viper species.

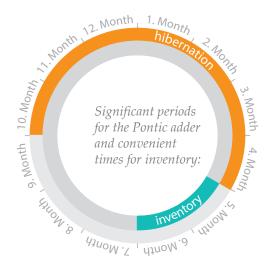
**Daily activity:** It is mostly active at nights. After rainy nights, it leaves its place to sunbathe. Other times, it can be found under stones during the daytime.

Seasonal activity: It is active during the period between May and September. It spends the *rest of the year hibernating*.

**Inventory:** On the days after rainy nights, it moves slowly. Therefore, this characteristic should be taken into consideration during inventory studies. On the other hand, as they usually prefer to be under stones during the day, plenty of stones should be removed in the area. The best month for inventory studies is May. When seen, it can be distinguished by an expert who is familiar with the species.

However, in some cases, it may need to be caught for species determination on condition that it is subsequently released in the same area.

It is recommended to be careful when catching the animal since it is venomous. It does not bite instantly as it is a slow - moving animal. Sticks or iron bars



that has an end in the shape of the letter "L" can be used to catch the animal. It is necessary to push its head down with the end of the stick. It is recommended to be careful to avoid its sharp and strong fangs which are on the roof of its mouth. Therefore, it should be held behind its head. Gloves that are made of fabrics thick enough to prevent the fangs from penetrating and cover the forearm can also be used to catch the viper. It is also recommended to wear long boots that are resistant to bites. **Recommendations on Forestry Practices:** At the beginning of forestation, it is recommended to avoid removing all of the herbaceous plants and bushy plants. Instead, only the necessary part of the area should be cleaned, and the rest vegetation should be conserved. It nestles under the stones or rocks like all reptiles; therefore, stones and rocks should not be collected, and the natural structure should not be destroyed in areas where they live. Practices such as ploughing, hoeing or scraping the surface covering the soil such as fallen leaves are not recommended since they have negative effects on the characteristics of the home range that the species need. These practices should be carried out at a minimum level.

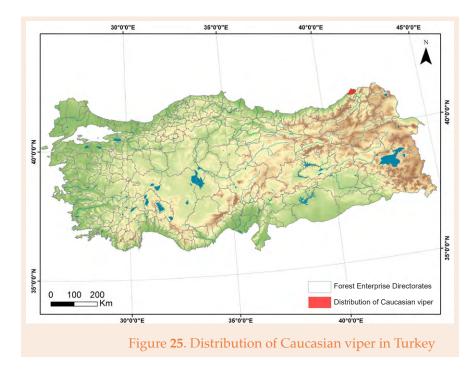
The tree density should be conserved during lumbering practices in areas where the species abounds. Using the existing forest roads to carry the trees cut down for sale will decrease the habitat destruction. Opening new roads or driving a tractor frequently in the area should be avoided. Practices such as dragging through downslope are not recommended.



© Boris Tuniyev

Descriptive Characteristics: It is a thick and short venomous snake species that can grow up to 65-70 cm in length. Adults are black and they have two distinctive stripes (in yellow, red or white tones) extending along their back and there is also a black, zigzagged or straight stripe between them. Young individuals, especially young females are lacking in back stripes and they are reddish brown.

Distribution: They can be observed in Hopa, Arhavi and Borçka in Artvin province in our country. It can also be found in Caucasus.



Population: There is no clear information on the population size in Turkey.

Habitat: It prefers low or medium altitude areas of the coastal Black Sea region and it can be observed in areas where the altitude is 1250 m at most. It is found in glades, on the slopes of broad - leaved forest (lime tree, chestnut, hornbeam, hazel, alnus glutinosa and oak), intense vegetation under the forest (such as blackberry, rhododendron, hedera, pterophyta), forest sides and stony, sunny parts of little meadows. It can also be observed in gardens, tea gardens and hazel gardens. At the high altitudes of its habitat (100 m and above), it can be found in needle leaved forests and forest sides. It is the venomous snake species that loves living in damp places the most among the terrestrial snakes in Turkey.

Food: It feeds on small rodents (such as mouse), lizards, amphibians and invertebrates.

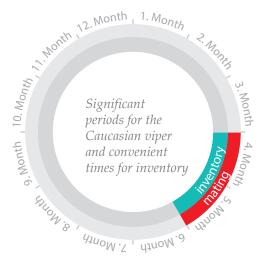
**Daily activity:** During the hot seasons when they are active, their carry out their daily activities in the morning and late afternoon.

**Seasonal activity:** They hibernate between November and March at low altitudes, and between October and May at high altitudes. The breeding period is between April and May. Babies *hatch* from their eggs in *August*.

**Inventory:** The best months for inventory studies are April and May. as these animals emerge from hibernation in March and April.

When seen, it can be distinguished by an expert who is familiar with the species. However, in some cases, it may need to be caught for species determination on condition that it is subsequently released in the same area.

It is recommended o be careful when catching the animal since it is venomous. It does not bite instantly as it is a slow - moving animal. Sticks or iron bars that has an end in the shape of the letter "L" can be used to catch the animal. It is necessary to push its



head down with the end of the stick. It is recommended to be careful to avoid its sharp and strong fangs which are on the roof of its mouth. Therefore, it should be held behind its head. Gloves that are made of fabrics thick enough to prevent the fangs from penetrating and cover the forearm can also be used to catch the viper. It is also recommended to wear long boots that are resistant to bites. It is most likely to be seen in Hopa and the near tea gardens. During studies to be carried out in the evening for a few hours, it is possible to observe 2-3 individuals.

**Recommendations on Forestry Practices:** Herbaceous plants and underbrushes are important components of the species' habitat and they should be conserved. It nestles under the stones or rocks like all reptiles; therefore, stones and rocks should not be collected, and the natural structure should not be destroyed in areas where they live. Practices such as ploughing, hoeing or scraping the surface covering the soil such as fallen leaves are not recommended since they have negative effects on the characteristics of the home range that the species need. These practices should be carried out at a minimum level.

The tree density should be conserved during lumbering practices in areas where the species abounds. Using the existing forest roads to carry the trees cut down for sale will decrease the habitat destruction. Opening new roads or driving a tractor frequently in the area should be avoided. Practices such as dragging through downslope are not recommended.

111

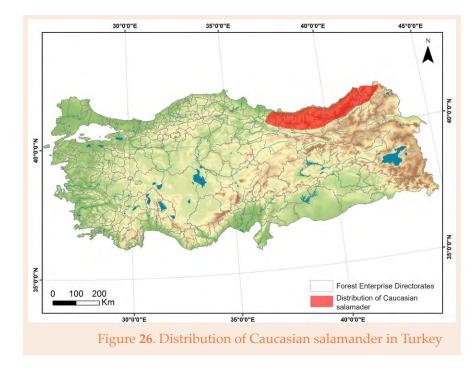


Caucasian Salamander Mertensiella caucasica

© Deniz Özüt

**Descriptive Characteristics:** Its length is 20 cm. It has a flat head, protruding eyes, and bright and smooth skin. Its back is brown - black and the color of its abdominal side varies between grey and brick color. There are yellowish, lime greenish spots arranged in two vertical rows on its back. Its abdominal side has whitish, ash grey spots. Males have a protuberance 2-3 cm over of the tail base.

Distribution: It is an endemic species in Caucasus, and it can be observed in the northeast of Turkey.



Population: There is no clear information on the population size in Turkey.

Habitat: It lives in stony areas and woodland on the sides of slow - moving streams at the altitude of 500-2800 m.

Home range: Under suitable habitat conditions, 40 individuals can live in 1-hectare area.

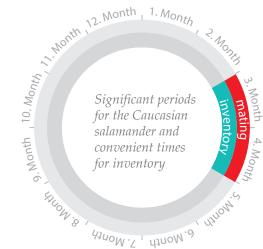
Food: It feeds at night.

**Daily activity:** It is active during nights in order to feed and breed. After it gets dark, it gets out of the stony and rocky areas where it hides. Especially in humid and rainy days, it can get out from its hiding place just before the evening.

**Seasonal activity:** It breeds in March and May. It is particularly active until the end of these months when the weather is rainy or humid.

**Inventory:** During an observation carried out a few hours at rainy nights in the period between March and May by using a suitable lamp to brighten the environment, it is possible to see 12-25 individuals. If you look under the stones or trees, this number can go up to 25-40.

The most important issue to be taken into consideration during inventory studies is choosing the suitable season and place. These animals love rain and humidity. That's why, it is recommended to act based on the altitude where the animal lives (500-2800 m) and the weather forecasts.



Conducting field work at night rather than in the daytime makes the exemplification easier. A point to be considered during the exemplification in the suitable season is to look under the stones on the sides of slow-moving water if it is daytime. At night, it is possible to see them in the open field without moving stones.

In order to obtain reliable information on the species, it is necessary to catch male, female and young individuals between March and May which coincide with the breeding period. These animals can be observed under stones on the sides of slow - moving streams and the underside of little stones and pebbles in the spring water. They do not leave their home range easily and get away from where they live.

They stay at the streams, brooks and water tanks where they were previously observed as long as there is water. In case the water dries up temporarily, they hide under the damp stones near the water.

**Recommendations on Forestry Practices:** Habitat destruction is the most serious threat for this species. It is important to conserve the streams and relating terrestrial habitat that the Caucasian salamander needs. Therefore, it is recommended to determine a corridor-shaped area as a core conservation area on two sides of the stream, which is approximately 50 meters long, 100-meterwide, vertical to the stream, in areas known to have Caucasian salamanders and to exclude forestry practices from this area. Some recommendations are listed below:

- In the preparation period for planting and inoculation, it is recommended to avoid removing all of the herbaceous plants and bushy plants. Instead, only the necessary part of the area should be cleaned, and the rest vegetation should be conserved.
- Caucasian salamander nestles under the stones or rocks; therefore, stones and rocks should not be collected, and the natural structure should not be destroyed in areas where they live.
- Practices such as ploughing, hoeing or scraping the surface covering the soil such as fallen leaves are not recommended since they have negative effects on the characteristics of the home range that the species need. These practices should be carried out at a minimum level.
- The tree density should be conserved during lumbering practices in areas where the Caucasian salamander abounds, especially in areas with low altitude.
- Remains such as logs and piles of branch after practices such as pruning and density care can be used by the species as shelters. Therefore, it is useful to leave some of these remains in the forest.
- Using the existing forest roads to carry the trees cut down for sale will decrease the habitat destruction. Opening new roads or driving a tractor frequently in the area should be avoided. Practices such as dragging through downslope are not recommended.

### 7. Priority Butterfly Species

Butterflies are commonly colorful and glamorous insects, and very easy to notice, being a group of animals that attract the human's attention the most with their tender structure and elegant flight. Along with their beauty, they play an important role in the ecosystem due to the role they have in the pollination of the herbaceous and woody plants. The butterfly larvae, their caterpillar form, are one of the most important consumers of some species of plants. They are also an important part of the food chain since they are the food source for predatory species such as beetles, spiders, bumblebees and birds. As they react very quickly to the environmental factors, they are accepted as important indicators of the ecological change and are used widely in conservation work.

Despite being such important creatures, the habitats of the butterfly show a rapid trend of extinction in direct relation with the intensity of human activities. According to the last European Red List of Butterflies 10% of their species are in an endangered (EN) state, whereas another 10% are in near threatened (NT) state (van Swaay et al., 2010).

With respect to butterfly diversity, sheltering 380 butterfly species, Turkey is the richest country in the geographic region it occupies. Turkey is a home to lots of endemic species and is center for butterfly diversity, since

- · It is at the meeting point of European, Asian and African species,
- · It harbors almost all of the Eastern Mediterranean species,
- · The mountains of Black Sea region were also a shelter during the Ice Age

Although until recent times Turkey's butterfly diversity did not receive the attention it deserved, recently organized conservation, education and ecotourism projects that aim at promoting this richness and the prepared relevant field guides are important steps towards formulating Turkey's Red List of Butterflies and national conservation strategy (Karaçetin et al., 2011). Since the habitats of the most of the butterflies of Turkey are comprised of mountainous, woodland areas, steppes with forests and bushy areas, it is important to expand the knowledge on the co-dependency of the lifestyles of the butterflies and the ecosystem services that the forests provide.

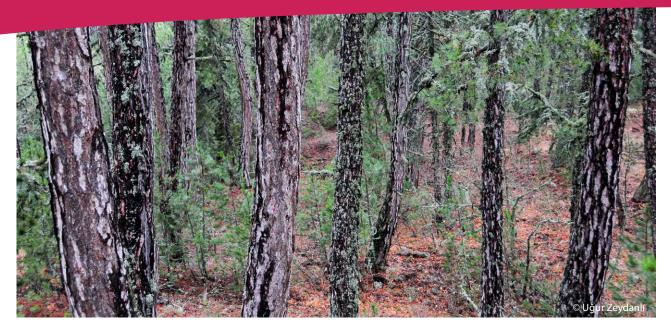
### **Recommendations on Forestry Practices that Conserve Butterflies**

#### Meadows and other open areas

The habitat of the many butterflies observed in Turkey is comprised of steppes, forested steppes, sparse maquis shrubland and forest clearings. Among these is the Ali Bali Blue of the Polyommatus genus that contains many species endemic to our country. Except for these, other habitats that are important for butterflies are subalpine and alpine meadows that are continuously harvested or where animal husbandry activities are performed. And these areas shelter species such as Apollo (*Parnassius apollo*) or Caucasian Apollo (*Parnassius nordmanni*). Since the forestry activities may cause the vegetation to change in these areas rich from butterfly diversity, experts must assess the possible impact of any and all practices on butterfly fauna.

### Forest trees and other woody species

Some butterfly species are directly dependent on forests. The larvae of these butterflies need certain forest trees in order to develop. This situation is true for many butterfly species whether they live at coastal or high mountainous ecosystems. For example, the habitat of some big brush-footed butterfly species (*Nymphalidae*) are wide-leaved forests and they lay their eggs on certain trees in those forests. One of the most common species among these is Camberwell Beauty (*Nymphalis antiopa*) which prefers birch or willow trees. Rarer species such as Large tortoiseshell (*Nymphalis polychloros*), Scarce Tortoiseshell (*Nymphalis xanthomelas*) and Compton tortoiseshell (*Nymphalis vaualbum*) often prefer to spend their larva phase on willow trees, yet it is also known that they also use elm and fruit-bearing rosaceae. However, some brush-footed species such as Freyer's Purple Emperor (*apatura metis*) and Ionian Emperor (*Thaleropis ionia*) that feed off willow species in their larva phase prefer downstream forests. Whereas the nettle tree butterfly (*Libythea celtis*) is dependent on nettletrees, the home range of the Two Tailed Pasha (*Charaxes jasius*) is limited with the forests, gardens



and bushes that have Strawberry Trees (*Arbutus*). While the host for the larvae of Ilex Hairstreak (Satyrium ilicis) are commonly oaks, White-letter Hairstreak (*Satyrium w-album*) feeds off purely and simply from elm. Other Hairstreak species often prefer shrubs and bushes. For example, Brown Hairstreak (*Thecla betulae*) is a rare species that can be observed in the forest clearings and steppes in which plum and bullace species (*Prunus spp.*) are common. While the sloe hairstreak (*Satyrium aceciae*) prefers wild plum species, the blue spot hairstreak (*Satyrium spini*) prefers buckthorn (*Rhamnus ssp.*) trees above others. Three butterfly species endemic to Turkey of the genus *Gonepteryx* still are related with wild plum and buckthorn trees and prefer to live in the regions where these are observed.

The even-age forests managed solely for wood harvesting shelter one or few proper forest tree species. Removing all other tree species and bushes in great amount from the forest with maintenance and rarefication activities that are not performed as the purpose and technique requires would harm the forest ecosystem's natural diversity and hence the existence of the butterflies. The butterfly species listed above only represent a small amount of the butterfly species that have a direct relation with the forest and forest trees. When the impact of forestry practices to be made on these species is considered, it is very important that the implementers have awareness on this issue. From this aspect, it is important to ensure the continuity of the natural vegetation in mixed stands and to support the development of other tree and bush species in the mix to develop in the remaining parts of the managed forests. Since forestry with non-native tree species rarely meet the food demands of the larvae of the natural butterfly species, this has a negative impact on the butterfly diversity in these areas.

### Forest micro-climate and micro-habitat areas

Although some butterflies are known as forest species, they are not in direct relation with the presence of forest trees and live a life more dependent on undergrowth vegetation. Climate conditions provided by the forest ecosystems have a very important place during the feeding of the butterflies in their larva phase and their completion of their development as adult individuals. An example to this situation is that many of the large heath species (*Argynnis, Boloria* etc.) are observed in the forests where violet species (*Viola spp.*), i.e. many of heath species' diet, grows. While despite the fact that some species of brush-foot butterflies are

known as scavengers in meadow areas, some species live especially only in pine forest clearings (*Hipparchia*, *Pseudochazara spp.*) or at the peripheries of wide-leaved forests. Although there is not much information on their ecologic needs, it is known that some micro-climate qualities need to be preserved in order to continue the presence of species. The best method to ensure the continuance of these micro-climate conditions is the preservation of structural diversity of the forest and micro-habitats.

Sparing small areas in which natural structure is preserved in the forest and making thinning to let the sunshine reach the live vegetation where there is so much enclosure may enable creating different vegetation and micro-climate areas. Many of the meso-thermophilic plants/weeds grow in this type of open (low enclosure) forests, woodland areas or gaps/openings in forests. Big herbivorous mammals have impact on the continuation of the forest clearings that hold a great place in supporting biological diversity. Today, continuing traditional grazing in areas where animal grazing activities play a similar role would positively impact the butterfly diversity existing in such areas that preserve their clearing. A rare species Balkan Clouded Yellow (*Colias cacuasica*) sets a good example in this regard. Although briars (*Chanaecytisus spp.*) that this species need for breeding grow in clearings of the pine forests on the mountains of Eastern Anatolian Region, due to the diminishing of traditional husbandry activities it is almost non-existent. A similar situation has been experienced in Central Europe. As a result of the disruption of husbandry activities in very big areas, the forest clearings are lost, and consequently butterflies of Colias myrmidone species went extinct. These two events show that changes in forest micro-climate is closely related with plant diversity and thereby the butterflies that are dependent on them.

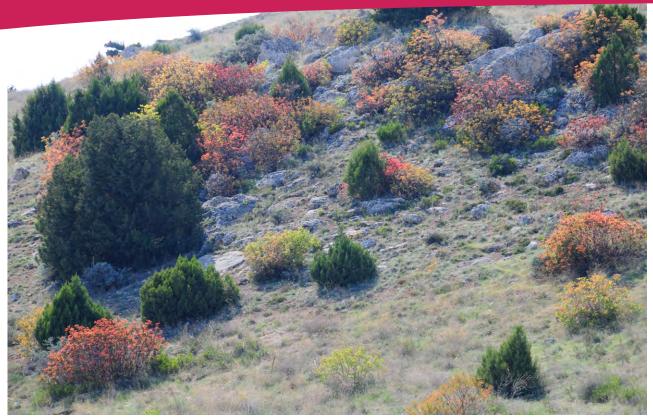
Since forestry activities of even-age forests that are focused on single species and collective cutoffs (such as shaving cuts) that cover wide areas destroy most micro-habitat areas, the structure of monoculture forests does not shelter the micro-habitat diversity found in natural forests. However, appropriate silvicultural interventions on existing even-age forests based on monoculture can provide diversity to the forest structure.

## Gaps and clearings in Forests

Natural forests shelter clearings and less closed areas in them depending on the soil, the existence of water or the variability of other conditions. When these clearings or gaps are big enough, they can shelter both forest and meadow species and thus are richer in butterfly diversity when compared with the inner regions of a forest. In these areas, the diversity of the vegetation is important as a food source. In more dry regions, these types of inner-forest clearings hold a higher plant diversity that better support butterflies when compared with the meadows outside a forest due to the humidity that a forest provides. In dry seasons, butterflies gather in these clearings that are rich in flower nectars. The continuity of these clearings can be ensured either by the foresters or allowing/hiring people for activities such as grazing and mowing. Preservation of small and big inner forest clearings and not planting trees there has great importance in conserving the butterfly diversity.

## Edges, cleared areas and home ranges

Linearly cleaned areas, also called as ecotones, for the purposes of clearing a road in the forest, laying energy transportation lines or for hunting are the regions that are important habitats for butterflies. These clear areas at the edge of the woodland areas are richer in meso-thermophilic herbaceous plants and bush species when compared with the inner regions of a forest due to the special transit-climate they have.



© Uğur Zeydanlı

Here are the some of the species typically observed at forest edges: Southern Festoon (*Zerynthia polyxena*), Caucasian Festoon (*Z. caucasica*), Orange Tip (*Anthocharis cardamines*) and Eastern Orange Tip (*A. damone*). In order to conserve such habitats for butterflies the officials must be informed of the maintenance of linear clearings in the forests. For example, it is recommended to leave a few meters of herbaceous regions beginning from the inner forest roads and the edges of the wide paths, as corridors for feeding and breeding of butterflies.

Outside human influence, these types of linear clearings can also occur naturally. The best examples of these are the clearings at the banks of creeks, streams and rivers. There are a lot of butterfly species that specifically prefer these areas for breeding and spreading. In mountainous regions such areas form due natural processes such as mudslides, landslides and avalanche and set the home range of butterflies.

#### Differences between machine processing and manual work

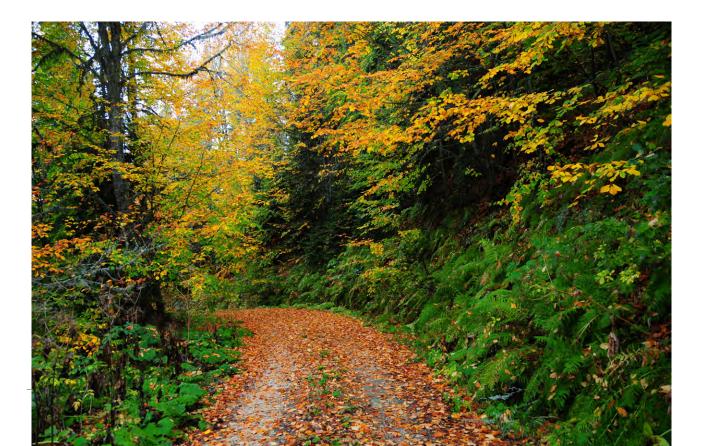
Despite not being economical, practices with heavy labor should be preferred over practices with machinery in forests with high biodiversity value. This is because practices such as plowing the forest floor with ploughs during forestry works destroy the herbaceous plants in forest floor, and are thus the practices that do the most harm to existence of butterflies. Since many butterfly species spend their lives from egg to pupa stage on the trunk or the leaves of the plants that are their forces, these types of practices (such as mulching) cause a great portion of butterflies in caterpillar stage to be destroyed. In addition, during bad weather conditions such as cloudy or rainy weather, the adult butterflies also spend time on herbaceous or bushy flora.

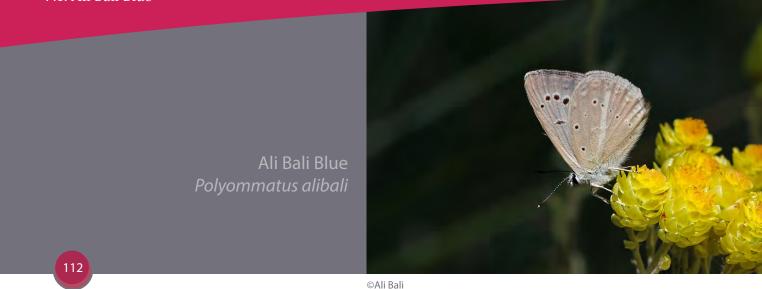
In these situations, since cutting/trimming the weeds and brushes by hand would not slice the vegetation in bigger pieces as a machine would do, it will cause less harm to the butterflies. In addition, while processing by hand, the caterpillars will have the chance to move from pieces cut to those uncut. Using heavy machinery while extracting (dragging) the cut trees from the forest causes serious harm to undergrowth forest, therefore using the traditional transportation methods such as by animals or airlines and pipeline systems would greatly reduce the harm done.

## Using insecticides

Insecticides and herbicides are used in forestry practices from time to time. Especially in the controlling lepidopterous species such as Gypsy Moth (Lymantria dispar) and Pine Processionary (Thaumatopoea pityocampa) insecticides are used employing spraying method. However, over-use of chemicals has great impact on butterfly population. Many species that are undesired in the juvenile stage of the butterfly such as the species from the stinging nettle and birthwort family brushes and stools from roots/stumps are actually food for many butterflies in caterpillar stage. Therefore, instead of using chemicals to clear out the weeds surrounding the saplings, manually removing them with tools such as pruning hooks and garden knives in a local/discriminatory manner will ensure the butterflies in caterpillar stage to suffer less harm.

Commonly used chemicals for lepidoperous caterpillars are chitin synthesis inhibitors/preventers. However, despite the fact that they are not widely known, these insecticides have negative impact not just on specific species but on all butterfly species in caterpillar stage. Use of these chemicals in wide areas is the biggest threat on butterfly population. Therefore, in order to prevent irreversible harm, chitin synthesis inhibitors must only be used when they are indispensable (at local areas where harm is observed), during suitable weather conditions (weather not being windy) and under absolute control.

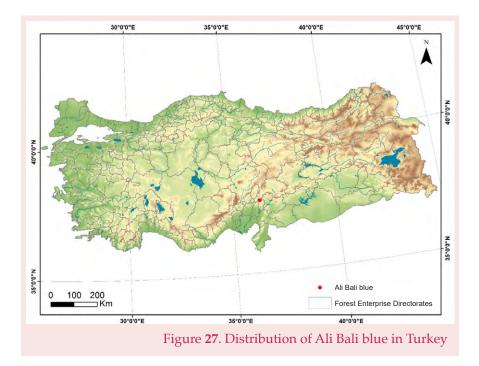


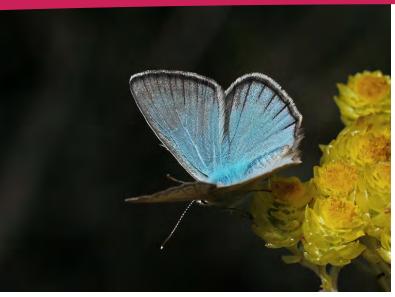


**Distribution:** The species has been identified in 2015. Currently the only known area of distribution is the Çığsar Village plateau of the Andırın district of Kahramanmaraş province. It is endemic to Turkey and is registered in one region.

**Population:** Detailed research is needed on its population.

**Habitat:** This butterfly is recorded to be at clearings of rocky forests of black pine, fir, cedar and juniper at elevations between 1450 – 1650 m. Also, closer to the region are fruit gardens. The impact of fruit production activities on butterfly population must be researched.





©Ali Bali

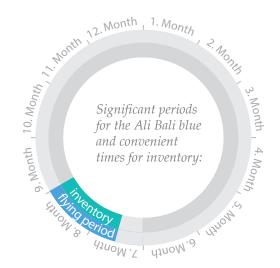
**Home Range:** It is recorded at clearings close to aquatic systems where healthy herbaceous plants of inner-forest are present.

**Food:** The host plant of caterpillars is unknown.

**Daily Activity:** Spotting and recording adult butterflies is directly correlated with weather conditions and temperature. The periods in which the weather is clear and the temperature is above 17°C are specified as the active periods for butterflies.

Seasonal Activity: The adults of this butterfly are spotted from mid-July and to end of August. Since it is a species still in process of identification, it needs detailed population research.

**Inventory:** The most suitable method of inventory for the species is the transect method. It is suggested that to count the individuals of this species, the recording should be done by walking through a line in the area it is spotted between mid-July and the end of August, with two fortnightly intervals at the most intense periods of observation between these dates.



**Recommendations on Forestry Practices:** Although the area this species is recorded is forest clearing, there is little information on it. Since female individuals are densely recorded in inner-forest areas, the possibility that its diet plant is one of the undergrowth species is highly likely. This might be an indicator that it has direct interaction with forestry activities.

Since the butterfly is recently recorded and its life-cycle is yet not known fully, there is no exact information how the forest activities can be shaped considering this butterfly. Therefore, especially the diet plant the caterpillars use must be identified and research works on identification of the relationship of this diet plant with the forestry activities must be performed. The recorded human activities in the region include fruit gardens and irrigation dam. In addition, research work on how these activities will have an impact on butterfly population must be done.

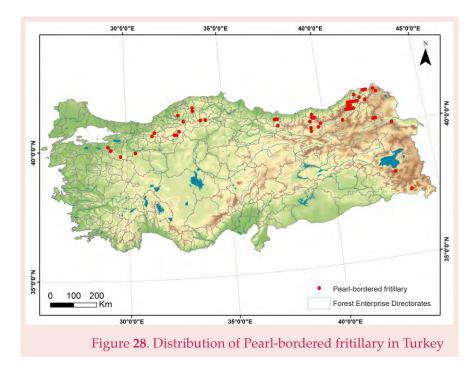
For further information, please see Chapter 9.2 for a table presenting the results from an assessment on the impact of general forestry practices in Turkey over conservation priority fauna species/groups.



**Distribution:** Their general distribution covers the northern sections of Turkey. They are also recorded in few numbers in Southeastern Anatolia.

Population: There is no certain information on the size and condition of their population in Turkey.

**Habitat:** This species lives in alpine meadows and pastures close to forested areas in Turkey. Along with these, the habitats they prefer are comprised of wide-leaved, needle-leaved and mixed forests and woodland areas, humid meadows and swamps.



Forest clearings (recently cut or managed as coppice forests), areas with ferns and bushes with high water permeability and pastures close to them that lie within the general forest structure form the habitat of the species. It is important that the vegetation structure must shelter violet species (Viola spp.) that are their host plant. They are observed at elevations between 30 – 2200 m.

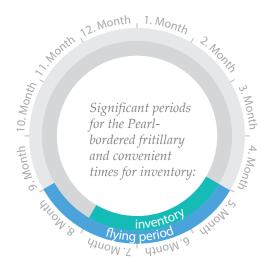
**Home Range:** It is identified that the individuals in general roam an area with a radius of 100 meter and go to different colonies within 4–5 km. The colony size can reach hundreds of individual, but there are also smaller colonies. In their main breeding area within suitable habitats, they can be observed dispersed in wide areas as interrelated different colonies.

Food: Caterpillars of the species feed off Viola genus plants of Violaceae family.

**Daily Activity:** The most active daily periods of the adult butterflies of the species are when the weather is clear and the temperature is 13°C and above. On the days when the weather is closed, these butterflies are active when the temperature is 17°C and above, depending on the temperature and whether the weather is closed, in the time period between 9:00 AM and 5:00 PM, all butterflies are in general active. They may appear earlier on hot and clear days, and later on cool and rainy days.

**Seasonal Activity:** Butterfly can produce one or two generations depending on the elevations. While adult individuals fly as single generation at early May and August, the mountainous, northern eastern populations of the species fly as single generation at early July and August. The eggs are left singly, mostly on dead and dry ferns in habitats where diet plant is present. However, it has been identified that some individuals leave their eggs directly on the diet plant. At lower elevations, the second generation, at higher elevations first generation feed off until the fourth larval period and spend the winter on a dead fern leave as caterpillar. The caterpillars that wake from hibernation with the coming of the spring feed off the fresh leaves of the violet (Viola spp.) plants. It is known that the larger caterpillars span tens of meters just to look for the diet plant. They cocoon amongst dry leaves.

**Inventory:** The most suitable method of inventory for the species is the transect method. Depending on the elevation, May – June are the best time for inventory. Equipment to use during inventory taking can be a camera and binoculars. The best time for inventory taking can be depending on the weather and temperature is between 9:00 am and 5:00 pm.



**Recommendations on Forestry Practices:** Pearl-bordered fritillary is a species directly interrelated with the forest and forestry since its home range is forest clearings.

Research abroad revealed one the reasons for the decrease in this species is the change in forestry activities. Stopping the coppice operations and the forestry practices that reduce the sunny clearings set an example to these. In some areas forestation (especially using needle-leaved foreign tree species) has ensured an increase in the number of individuals in butterfly populations in the first stage, yet, the eventual growth of planting locations and making the area dense, closed and shadow caused the butterflies go extinct in these plantation areas within 20 – 30 years.

These butterflies produce healthy population where both meadows areas and ferns are found together. Changes in forest management in some regions caused ferns to over-grow and the removal of grazing areas. And this in turn led to sudden decreases in butterfly populations. In another study, fern undergrowth was disrupted, and they were manured and opened for grazing. As a result, a decrease in butterfly population was observed again. Both meadow areas and regions with ferns and dry leaves are important for these species. In many areas, these types of environments are formed by continuation of traditional grazing in forest regions. Removal of grazing commonly results with the domination of the fern layer and the reduction of meadow areas. The basic method in conservation activities is continuance of the traditional grazing methods.

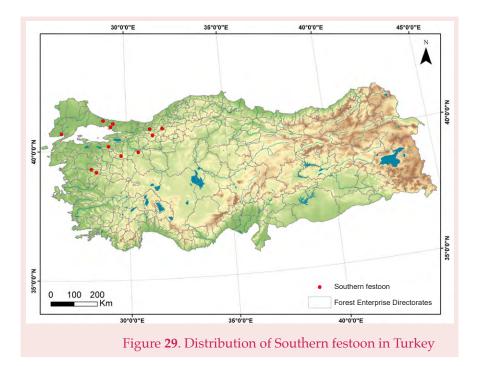
For further information, please see Chapter 9.2 for a table presenting the results from an assessment on the impact of general forestry practices in Turkey over conservation priority fauna species/groups.

## 7.3. Southern Festoon



**Distribution:** They are recorded in an area beginning with Thrace and rest of the Marmara region to include the provinces of Bolu and Eskişehir.

**Population:** Their population are local and the number of individuals may be high. Yet they might also have very small populations. When healthy populations are regularly visited, it was observed that they stay in the same region for years.



**Habitat:** They are generally observed in the humid meadows and the clearings of woodland areas with dense undergrowth and mixed deciduous forests, and sometimes close to plantations that host birthwort (*Arisolochia spp.*) that the species use as the host plant. They are not observed elevations above 1000 meter. The presence of host plant in the area is important for this species.

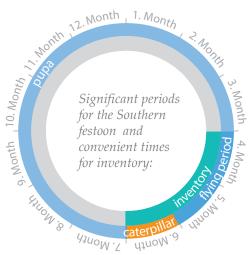
**Food:** The caterpillars of the species feed off birthwort (*Aristolochia spp.*). Research in Romania has shown that this butterfly is connected with Aristolochia clemetitis and this plant also forms very small colonies. This plant is found at the edges of roads and farms is considered a weed. Therefore, the agricultural herbicides employed against this plant near to the agriculture areas caused some local populations of the species go extinct in Romania.

**Home Range:** It is thought that all populations of this species live in an area of 560 km<sup>2</sup> in total in Turkey. This butterfly can be seen at suitable clearings within forest areas, meadows and roadsides. In its home range, there are main breeding points where host plants are present, and using inner-forest corridors (roads etc.) it for forms interconnected meta-populations. Depending on the distribution of the diet plant there might be small isolate populations as well.

**Daily Activity:** The temperature range in which the adult butterflies are most active has been defined by Pollard and Yates (1993) as the times the weather is clear and the temperature is 13°C and above. The same source also states that when the weather is closed more than 60%, the temperature is 17°C and above. Depending on the temperature and whether the weather is closed, in the time period between 9:00 AM and 5:00 PM, all butterflies are in general active. On the days when the temperature is higher and the weather is clear, they can appear early, and when the weather is cold and closed, they can appear late.

**Seasonal Activity:** These butterflies fly from mid-March to end of April. At the mountainous regions of Bolu, they can be seen until June. In their pupa period beginning from June and lasting till mid-March, they hibernate. In May, they are in the caterpillar stage.

**Inventory:** The most suitable method of inventory for the species is the transect method. This method provides the best results in the period that begins mid-March lasting till the end of April for adult individuals, and within May for caterpillars. Equipment to use during inventory taking can be a camera and binoculars. The places with highest possibility of observing them within their distribution area are humid forest clearings where Aristolochia species are present.



**Recommendations on Forestry Practices:** The home ranges of this butterfly recorded in Turkey are clearings inside the forests. These home ranges are traditionally used for grazing. However due to economic concerns, local people's animal husbandry activities began to decrease. The removal of the pressure of grazing in these areas can mean that the forest areas can turn into a forest in a short while due to the humid quality of the habitat. Right after the grazing stops, first, a rapid increase in populations can be observed. However due to the growth of ferns, bushes and trees in the clearing and the reduction of light transmittance with time, the populations can experience a serious decrease within a period of 10 - 20 years.

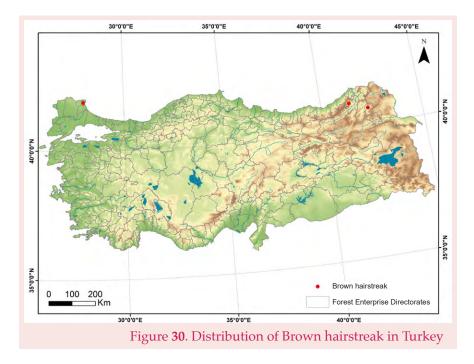
Other activities that have a negative impact on the species include the dam - pond constructions, road constructions, building constructions, closing of the forest clearings or intensive agriculture at suitable habitats that are amongst the human activities in forest areas of the Thrace Region.

For further information, please see Chapter 9.2 for a table presenting the results from an assessment on the impact of general forestry practices in Turkey over conservation priority fauna species/groups.



Distribution: In Turkey, there are records in Trabzon, Kırklareli, Bolu, Artvin, Erzurum and Kütahya.

**Population:** There is no information on the size and condition of their population in Turkey. Yet, there are detailed research on the European populations of the species and it is expected that they show similar characteristics in Turkey. From these researches, it is known that their colonies are very small and that the number of individuals rarely go above 300. These small colonies are in wide forest areas and they mix with neighboring colonies to form meta-populations. It has been recorded that in some cases, there are even smaller populations in isolation at a very small, suitable home range.



**Habitat:** They live on deciduous woodland areas and wide-leaved forests, at tree borders, in woodland scrubs and coppice forests that shelter the species of Rosaceae family, especially sloe (Prunus spinosa). In the forest areas where they are densely populated, there is little forestry activity observed. They are observed at elevations between 10 – 1700 m. An important quality of the habitat they prefer is that different forest structures (wide-leaved forest layer, bushes, clearing within the forest and its edge) are nested within each other.

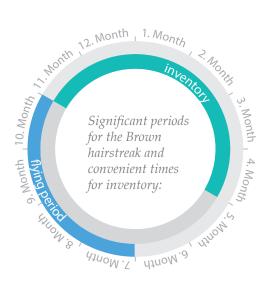
**Food:** The caterpillars of the species live off freshly grown leaves of plants from rosaceae such as Prunus spinosa, Padus avium, P. asiatica, Armeniaca mandshurica and Crataegus sanguine. Adult butterflies spend most of their either on the forest canopy or within the bushes. They can be observed on the bushes near forest edges, around their main meeting tree (commonly trees high-in sap, such as ash) for copulation, in small groups. In these types of habitats, adult butterflies feed off from the sap of these trees and rarely go down to a layer below. Therefore, it is harder to observe the adults. However, in some cases can go down below to feed off from the nectar of the plants in the forest sub-layer, such as blackberries. The female butterflies can be observed laying eggs on fresh branches of plants from rosaceae family.

**Home Range:** The size of the home range changes according to the suitable regions in the forest. Although it is known that in some cases, in very big forest areas there are interrelated meta-populations, the small areas can shelter them in small populations as well. However, since they prefer the same copulation point and do not colonize new areas, it is important to conserve the copulation and feeding areas of the adults and especially, to conserve the ash trees in these regions. There is little information about their movement range, yet it is known that while the females can span a few kilometers, males in general do not leave the copulation area. It is known that the colonies use the same copulation area every year, and their speed of colonizing new regions is very slow. Therefore, their existing copulation areas should not be disrupted and the trees such as ash trees that the adults use as copulation areas and feed off should not be cut.

**Daily Activity:** The temperature range in which the adult butterflies are most active has been defined by Pollard and Yates as the times the weather is clear and the temperature is 13°C and above. The same source also states that when the weather is closed more than 60%, the temperature is 17°C and above. Depending on the temperature and whether the weather is closed, in the time period between 9:00 AM and 5:00 PM, all butterflies are in general active. On the days when the temperature is higher and the weather is clear, they can appear early, and when the weather is cold and closed, they can appear late.

**Seasonal Activity:** They are observed from the end of July to mid-October. Adult individuals leave their eggs on the body of the host plant (Prunus spp.). From the eggs that wait from October to spring caterpillars come off in spring. The species goes through the caterpillar and pupa stage until Mid-July, and turns into an adult from the end of July to mid-October.

**Inventory:** It is not easy to identify this species in the interval they are active since they fly so high. The best method for inventory taking is to search for the eggs on host plant in the period between October and Spring. The inventory can be taken any time there is sunlight. It is easy to spot the host plants on which eggs are left.



**Recommendations on Forestry Practices:** Within the habitat, it is important to conserve the trees that are their meeting points and that provide sap, such as ash sap, to conserve the forest clearings and to conserve the bushy areas (especially, the plants of the rosaceae family that are the diet plant of its caterpillar) within these clearings in the regions where this butterfly is present and to keep the forestry activities at minimum in the areas this species is present. Since it is hard for this butterfly to settle in new areas, the lost copulation and diet points might cause serious dips in population.

The most important reason for the decrease of this species is the destruction of forest edges and bushy areas with intensive agriculture. At the same time, another reason for decrease is moving away from manual cutting of the bushes in these types of areas, which is the traditional method and beginning pruning with machinery. Since the female butterflies lay their eggs on young plants, the young plants with eggs on top are also cut during machine cutting and this causes serious dips in population. However, since during traditional bush cutting mostly old plants are cut, the butterflies and bush cutting practices could co-exist for centuries.

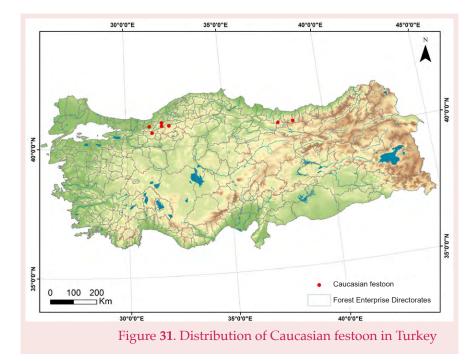
In order to meet the requirements of this butterfly, forestry management at landscaping level must be employed. Therefore, this species carries the qualities of a flag species in high-value agricultural activities that may be implemented in the forest.

For further information, please see Chapter 9.2 for a table presenting the results from an assessment on the impact of general forestry practices in Turkey over conservation priority fauna species/groups.



**Distribution:** This species is observed in the coastal regions of Black Sea, but it has a fragmented distribution area. It is suggested they also exist in Central Black Sea, but there are no records as of the date.

**Population:** Caucasian festoon butterfly population in Turkey is comprised of a western and an eastern population that is seriously fragmented. This, in turn, means that when there is no communication between populations and an isolated population goes extinct, the area in question cannot be re-colonized by individuals from other populations. It is estimated that the number of individuals in a population are low. When healthy populations are regularly visited, it was observed that they were in the same region from year to year.



In the evaluation of 1999 European Red List of Butterflies, it was estimated that there was a decrease in Turkey populations approximately in 20-50%. Following this evaluation, new populations have been found, yet it is thought that the present home range in Turkey is small enough to leave the butterflies vulnerable to external factors.

**Habitat:** The species habituates the wetland meadows and in the clearings of humid bushes between mixed and deciduous woodland areas that shelters birthwort (*Aristolochia spp.*) that is used as the host plant. They are also observed in regions habituated by humans. They were recorded at elevations at sea-level to 1700 meters (in general, between 800 – 1700 meters). The presence of its host plant and high humidity is especially important for this species.

Food: The caterpillars feed off birthwort (Aristolochia spp.)

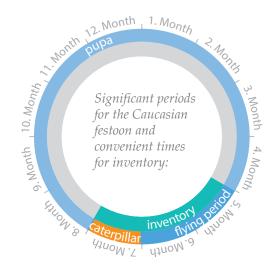
**Home Range:** It is thought the all the populations in Turkey live in an area that is about 20000 hectares. This butterfly can be observed at suitable clearings, meadows and humid roadsides within forested areas. In its home range, there are main breeding points where diet plants are present, and using inner-forest corridors (roads etc.) it for forms interconnected meta-populations. The experts estimate a single meta-population uses an approximately 20 km<sup>2</sup> area within a forest of 100 km<sup>2</sup>.

**Daily Activity:** The temperature range in which the adult butterflies are most active has been defined by Pollard and Yates as the times the weather is clear and the temperature is 13°C and above. The same source also states that when the weather is closed more than 60%, the temperature is 17°C and above. Depending on the temperature and whether the weather is closed, in the time period between 9:00 AM and 5:00 PM, all butterflies are in general active. On the days when the temperature is higher and the weather is clear, they can appear early, and when the weather is cold and closed, they can appear late.

**Seasonal Activity:** They are observed at coastal regions between March and June. It is in imago stage between mid-May and June, caterpillar stage in July, and the rest of the year, it is in pupa stage.

**Inventory:** The most suitable method of inventory for the species is the transect method. This method provides the best results in the period that begins in mid-May lasting till early June for adult individuals, and within July for caterpillars. Equipment to use during inventory taking can be a camera and binoculars. The best time for inventory taking can be depending on the weather and temperature is between 9:00 am and 5:00 pm. The places with highest possibility of observing them within their distribution area are humid forest clearings where Aristolochia species are present. In order to increase the success of inventory taking, correctly identifying the species and finding the host plants that are also easily identified with the eggs or caterpillars on it is very important.

Note: In its home range there are two species observed with similar appearance, the Eastern Steppe Festoon (*Zerynthia deyrollei*) and Eastern Festoon (*Zerynthia cerisyi*). However, it is easy to separate the species based on their appearances.



**Recommendations on Forestry Practices:** The home range in which this butterfly is present is the typical humid forest clearings of Black Sea region. These home ranges are generally used for grazing. However due to economic concerns, local people's animal husbandry activities began to decrease. The removal of the pressure of grazing in these areas can mean that the forest areas can turn into a forest in a short while due to the humid quality of the habitat. Right after the grazing stops, first, a rapid increase in populations can be observed. However due to the growth of ferns, bushes and trees in the clearing and the reduction of light transmittance with time, the populations can experience a serious decrease within a period of 10 - 20 years.

Another threat that this butterfly faces is the conversion of their home range into an agricultural area. It is also suggested that for western populations, recreation activities (picnics etc.) can form a pressure on the home range of the butterfly.

Forfeiting traditional grazing, the pollution created by the chemicals used for agriculture and other purposes (i.e. pesticides), fragmentation of their home ranges and the pressure of the recreational activities on the area are the basic threats on this species.

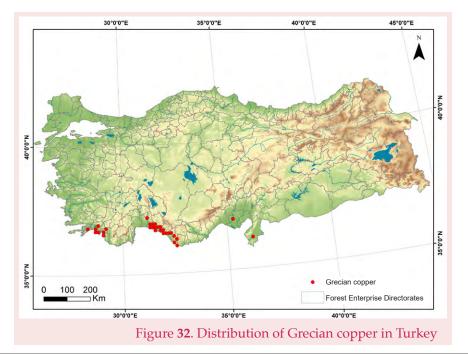
For further information, please see Chapter 9.2 for a table presenting the results from an assessment on the impact of general forestry practices in Turkey over conservation priority fauna species/groups.



© Hakan Yıldırım

Distribution: There are records of this species living in the Western Anatolia and the Balkans (Hesselbarth et al., 1995), in the south and the west parts of Turkey as well (Baytaş, 2007). Since 1980s there are records of the species in six provinces of Thrace and West Anatolian coasts. There are healthy populations along the Valley of Meriç River.

There are no records of the species in Balıkesir, Bursa or Istanbul for more than 140 years, and in Hatay for more than 40 years. This increases the chance that the species is not present in some provinces. However, since 2008, there have been new records of the species in three new provinces (Sakarya, Çanakkale, Edirne and Kırklareli).



**Population:** It is a very endemic species with small population. It is thought that European and Turkey populations are isolated. Its distribution in Turkey is seriously fragmented and sub-populations are isolated from each other. In Turkey, this population is a Red List species, categorized as vulnerable (VU).

Some populations of this species, previously found in meta-populations at the coasts of Aegean, Mediterranean and Marmara seas, are thought to have gone extinct due to tourism activities. Small and isolated sub-populations within its distribution area faces similar threats.

**Habitat:** In Europe, they are observed in general at humid valleys, at the wetlands near the deciduous woodland areas of Mediterranean coastal regions, maquis shrublands, wide-leaved woodlands, heathlands and bushes. The populations in Bulgaria and Greece are reported to be only in mountainous regions. In Turkey they live at wetlands with rich vegetation of low coastal regions, around deciduous forests and Mediterranean maquis shrublands. In more inner regions, they can be found at regions rich in vegetation and at the clearings of deciduous forests. For this species, it is important that region shelters sorrel (*Rumex spp.*) and water. They are recorded at elevations between 0 - 600 meters.

**Food:** During their caterpillar stage, the species feeds of sorrel, especially sheep's sorrel (*Rumex acetosella*). It leaves the eggs following five days. Early-caterpillars feed off only on the bottom epidermis, whereas the late-caterpillars can open big holes on the leave.

Adult individuals of the summer generation are recorded to receive nectar from the dwarf elder (Sambucus ebulus) and cistus (*Cistus spp*). Males are territorial and defend this territory form other males, therefore they are observed more than the females. Females with low activity are observed to prefer other regions of the home range after copulation. Therefore, females are hard to observe and are considered rarer than the males. Two generations fly each year.

**Home Range:** The size of their total home range in Turkey is calculated to be 57000 ha in average. There are two different environments in Edirne. The area in the region this species is present is known to comprise an interrelated healthy meta-population within a  $1000 \times 300$  m (300 decares) in general.

**Daily Activity:** The temperature range in which the adult butterflies are most active has been defined by Pollard and Yates as the times the weather is clear and the temperature is 13°C and above. The same source also states that when the weather is closed more than 60%, the temperature is 17°C and above. Depending on the temperature and whether the weather is closed, in the time period between 9:00 AM and 5:00 PM, all butterflies are in general active. On the days when the temperature is higher and the weather is clear, they can appear early, and when the weather is cold and closed, they can appear late.

**Seasonal Activity:** They are active from mid-April to mid-September. In a single flight period (April – September), two generation lives. Caterpillars with brown head capsule are at the start yellow, then green in color. Following a five-week caterpillar period, they cocoon themselves above ground or on a leave and enter the pupa stage. This period changes between 10 – 14 days.

**Inventory:** The most suitable methods of inventory for the species are the transect and the egg-sampling methods. Imagoes are observable during their flight time between April-October. Equipment to use during inventory taking can be a camera and binoculars. They can be observed during day-time, between 9:00 am and 5:00 pm. This species can be observed in their distribution area, at humid clearings and at wetlands where their host plant is present. Significant periods for the Grecian copper and convenient times for inventory:

**Recommendations on Forestry Practices:** The most serious threat that this species faces in Turkey is the pressure and disturbance created by the recreational (especially tourism) human activities.

At Trakya University Campus that this species was recorded, grazing continues illegally at a small scale, yet it is known to be banned The removal of the pressure of grazing in these areas can mean that it can turn into a forest in a short while due to the humid quality of the home range and the fact that it is a forest clearing. Right after the grazing stops, first, a rapid increase in populations can be observed. However due to the growth of trees in the clearing and the transformation of their suitable home range into a closed area the populations can experience a serious decrease and go extinct. Indeed, at a region where a healthy population is recorded, at Edirne, Lalapaşa, it is noted that the grazing still continues.

Forestation can also have negative impact on this species. It is known that a portion of the recorded home range in Edirne, Lalapaşa is planted with needle-leaved trees. Also, the agricultural area close to the area within the Trakya University campus is too forested. This forestation activity is thought to have no adverse effect on the populations since it is not directly on the habitat and an old agriculture area is forested. There should be no forestation in the home range of the species and the surrounding areas must be forested conforming to its natural vegetation.

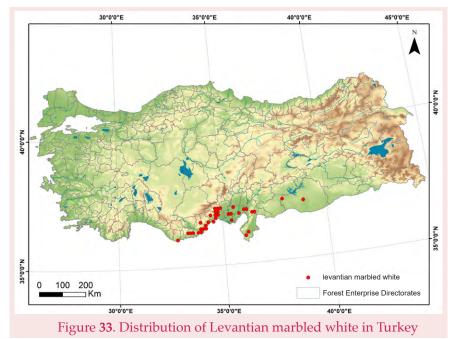
Since the area this species is present are creek banks, swamps and humid regions, situations in which the species is negatively affected with ponds, irrigation channels and similar activities are recorded. For further information, please see Chapter 9.2 for a table presenting the results from an assessment on the impact of general forestry practices in Turkey over conservation priority fauna species/ groups.



**Distribution:** This is a species endemic to Turkey. They show distribution in Mersin, Adana and Osmaniye regions.

**Population:** The individuals in a population vary, while in some years the number of individuals observed is high, in some it is low. Although its population trend is unknown, it is predicted that the number of individuals is decreasing due to pressure in their home range.

**Habitat:** The species is observed in the maquis shrublands and pine forest that are open and with many flowers in the Çukurova Delta and the southern region of the Taurus Mountains between Anamur and Osmaniye. A rich vegetation with species diversity is important for this species. They are not observed at elevations above 1000 meter.



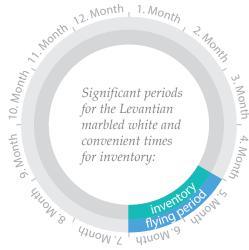
Food: It is thought that they feed of *Poaceae*.

**Home Range:** It is thought that they live in an area of 56000 hectare in Turkey. According to the scaling arrangement done for the Turkey's Red Book of Butterflies, the estimate is that for a meta-population within each 100 m<sup>2</sup> area, the species covers a home range of 40 km<sup>2</sup> at most. It is not known how much home range in average is needed for a single population.

**Daily Activity:** The temperature range in which the adult butterflies are most active has been defined by Pollard and Yates as the times the weather is clear and the temperature is 13°C and above. The same source also states that when the weather is closed more than 60%, the temperature is 17°C and above. Depending on the temperature and whether the weather is closed, in the time period between 9:00 AM and 5:00 PM, all butterflies are in general active. On the days when the temperature is higher and the weather is clear, they can appear early, and when the weather is cold and closed, they can appear late.

**Seasonal Activity:** Depending on seasonal conditions, they appear between the end of May and the end of June.

**Inventory:** The most suitable method of inventory for the species is the transect method. Imagoes are observable during their flight time between the end of May to the end of June. Equipment to use during inventory taking can be a camera and binoculars. They can be observed during day-time, between 9:00 am and 5:00 pm.



**Recommendations on Forestry Practices:** Basic threats on the species are: land requests to open agriculture areas, following drainage, over-use of chemicals and agricultural pollutions; housings, especially at coastal areas, roads and other infrastructure works, stone quarry management that destroy their home range at outcrops at the east of Çukurova plateau near Ceyhan.

This species is present at regions with rich maquis shrublands with plentiful flowers and pine forests. Therefore, it is thought that they will be impacted by the forestry activities in the region. It is thought that the forestation of clearings in the forests and at the forest edges would negatively impact the butterflies.

For further information, please see Chapter 9.2 for a table presenting the results from an assessment on the impact of general forestry practices in Turkey over conservation priority fauna species/groups.

# 8. Introduction of Other Biodiversity Elements and Recommendations on Forestry Practices

Along with prioritized species that are elements of biological diversity, some forest ecological processes and their special structures are elaborated on as the other elements of biological diversity within the scope of integration. The other elements are briefly addressed in the introduction chapter of the guide. In this chapter, the introductory pages that explain these eight elements and specify their qualities are provided with examples from Turkey. Also, in these pages there are explanations on methods for inventory-taking of these elements as well as Recommendations on Forestry Practices for these elements.

## 8.1. Old-Growth Forests

## **Descriptive Characteristics:**

Old-growth forests appear as one of the most important conservation elements in world forestry. Although the conservation priorities and conservation approaches vary between countries, the importance of oldgrowth forests is accepted without dispute. These areas are very rich from the aspect of ecological processes, they provide a living environment that many species cannot find anywhere else and they are exemplary reference points, similar to a laboratory, that reflect the natural state of the forest ecosystems of that region.

Old-Growth Forest can be defined as old forests;

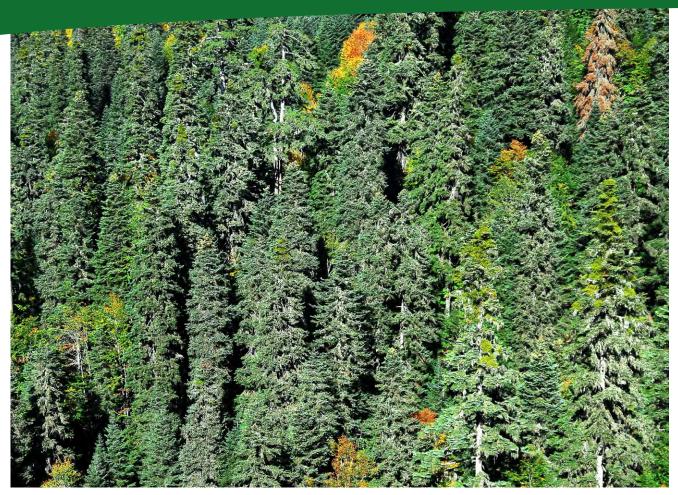
- in which no form of management aiming at producing wood or other forestry techniques are implemented,
- that most of the trees it contains reach natural maturity, and thereby it is distinctively separate in structure from the production forests with the excess of broken, fallen, rotten trees and snag along with the old trees it contains,
- · in which the human influence is not on a level to change the structural characteristics of the ecosystem,
- · in which the relations with the components that comprise it are in total continuance,
- · That are generally multilayered and various.

Some consider old growth forest as;

- synonymous with the "virgin" or "primary" forest that has never been harvested before or with no
  definite proof of human activity
- And for some, they are climax (the final form or stage in vegetation development in present environmental conditions) and advanced successional (close to climax that is the final stable balance in the consecutive changes of the forest) forests and their stand composition is quite rigid (stable).

Therefore, all forests must be conserved as old-growth forests, if:

- · Their average stand age is 100 years and above,
- There are older, monumental trees within the same area,
- They show in general more than one layer (despite not being an absolute condition),
- They appear different from the other, managed forests with the plentitude of snags, fallen and standing dead trees and broken branches and trunks,
- Their main ecosystem structure has been mostly conserved and undisturbed, owing to the fact that the area stayed clear from legal or illegal forestry activities due to certain reasons,
- Commonly at "d"(dbh: 36-52 cm) age, never subjected to serious maintenance, regeneration or pruning cuts.



©Uğur Zeydanlı

The benefits of conserving the old-growth forests can be explained as follows:

- · conserving natural/original forest structure;
- conserving biological diversity;
- · continuance of consecutive change processes;
- · conserving habitats;
- · conserving genetic resources;
- · forming reference stands for scientific studies;
- observing forest development/transformation processes;
- · forming natural shelters for fauna;
- · potential for aesthetical quality and tourism;
- · water and land conservation function;
- forming micro-climate;
- · acting as a prestige source;

conserving endangered saproxylic (dependent on decaying wood) insect species.

**Inventory:** The most efficient way to identify old-growth forests is basically to benefit from Forest Enterprise Directorate staff who knows the region well. The areas they recommend should be recorded as potential old-growth forest. In addition, the stands that contain the legend "d" in the stand map sheets must listed to be added as potential old-growth forest. Later, these areas must be visited in the field to identify whether they really have natural old-growth forest characteristics. The stands that can be accepted as old-growth forest must have the following characteristics:

- · composed of individuals with extraordinary age and length,
- · composed of double-layered structure,
- · has snags,
- · has dead, fallen, inclined individuals.

**Recommendations on Forestry Practices:** This type of forest is the most important asset for your management from the aspect of biological diversity. However, it is not quite possible to find sites with this characteristic. But, far from villages where roads have not reached due to several reasons, these sites in which the original forest structure is conserved can be present. Therefore, the road planning or other forestry practices must be cancelled and sites such as these must be strictly conserved.



©Uğur Zeydanlı

**Descriptive Characteristics:** Tree species diversity can be considered an indicator of biodiversity for a forest ecosystem and also a representation of the ecological process. The areas rich in tree species are also considered areas rich in ecological processes.

- Areas that provide a rick living environment to shelter different tree species also shelter many different species, therefore these areas can be considered rich in ecological processes as well,
- Different tree species can be a host to different living beings. And this also means that the richness in species and ecological processes will increase in that area.

While foregrounding this characteristic, an evaluation that considers all unique characteristics of each ecological region must be performed. For example, while more than 4 – 5 tree species carry value for diversity of a wide-leaved forest ecosystem in Western Black Sea Region, two or more species can be important for diversity in case of a Calabrian Pine or black pine forest in Western Mediterranean region.

**Inventory:** In defining the areas that shelter high tree species richness, the suggestions of the experts that know the region and the results from the analysis carried out in GIS medium must be employed.

**GIS Analysis:** Looking at the existent stand maps, stands that are comprised of more than normal amount of species must be identified. Therefore, stand legends must be checked and stands that are formed of the greatest number of tree species should be allocated as areas with rich tree species diversity. If these areas are comprised of three or less species, it will be stated that the relevant Forest Enterprise Directorate does not harbor areas with rich tree species diversity.

**Expert View:** When some species are not attributed importance as forest trees, when their ration in the mix is below 10% and when they are located in the intermediate layer, they are not placed in the stand legend. Since the analysis above cannot provide the exact desired result in identifying the areas with rick forest species, it is best to benefit from the view of an expert who knows the area well.

The areas identified as a result of these two studies would potentially be the areas rich in woody species. The areas must be visited later to calculate the number of woody species.

**Recommendations on Forestry Practices:** There should not be any intervention done to these types of areas. The interventions can foreground some species or since they would disrupt the characteristics of the area, they can negatively impact the species composition and ecological processes.



©DKM archive

## 8.3. Stands Different in Tree Species Composition

**Descriptive Characteristics:** However even within this dynamic and changing process, one can spot some self-recurring formations. Examples to these are oak and hornbeam co-existing in a mix in areas up to 1000 m elevations; Scotch pine, black pine, fir, beech and oak occurring together at West Black Sea Region; Calabrian Pine forming a mix with elements of maquis at the coastal belt of Mediterranean.

However, it is possible to observe more different formations or stands with a much different species composition. For example, Scotch Pine and Calabrian Pine, again Scotch Pine and Sandalwood and Calabrian Pine and Spruce stands can be considered areas with different species compositions. Some species might have a distribution left over from the Ice Age or enclave ecosystems or some species might have come together at the farthest distribution points; whatever the causes of these differences, these types of stands are priority stands from the aspect of conservation.

**Inventory:** For this study, first the stand legends must be checked to identify stands with different compositions. Then reviewing these stands with the experts from Forest Enterprise Directorate, the rarity or the regularity of these types of stands must be questioned. If they are rare, then these areas must be verified with field work and be mapped. These are the basic principles for rarity evaluation:

- non-existence of stands with this composition in other Forest Enterprise Directorates,
- non-existence of stands with these characteristics in other branches of the relevant Forest Enterprise Directorate,
- The total area of places with these qualities being under 100 hectares.

Following a filtering in consideration of these criteria, the specified stands must be identified as "Areas with Different Species Composition".

**Recommendations on Forestry Practices:** It is important not to intervene in any areas with different species composition. Such interventions must cause disruption to the ecological balance in the stand and perhaps not in short term, but in medium or long term, might cause the rare species that give the stand its characteristics to go extinct.

# 8.4. Large forest blocks and connecting corridors

Real Mary

©DKM archive

**Descriptive Characteristics:** One of the basic elements that ensure species richness, the continuity of the species in the area and the richness of the ecological process is the size of the area based on the principles of "Landscape Ecology" and "Island Bio-geography". Therefore, undisrupted, integrated forest blocks and the pieces of forest that provide connection between these blocks must also be considered important assets.

The areas with these characteristics must be specifically targeted in planning and management of forest ecosystems. The evaluation regarding the size of the habitat blocks must be performed relative to the general state of the forests in the ecological region studied.

**Inventory:** Identification of the large habitat blocks must be done at GIS medium, using digital stand map. For this purpose, each sub-compartment must be calculated and later, the biggest 10 polygons must be defined as large habitat blocks. These blocks will not be used directly in the analysis for defining conservation goals, but they would be considered in the general practices, from the aspects of conserving the home range quality and the precautions against fragmentation.

The corridors with critical importance that connect these blocks within themselves and with others will again be defined in GIS medium. Each of these corridors will be defined as conservation goal in the analysis process.

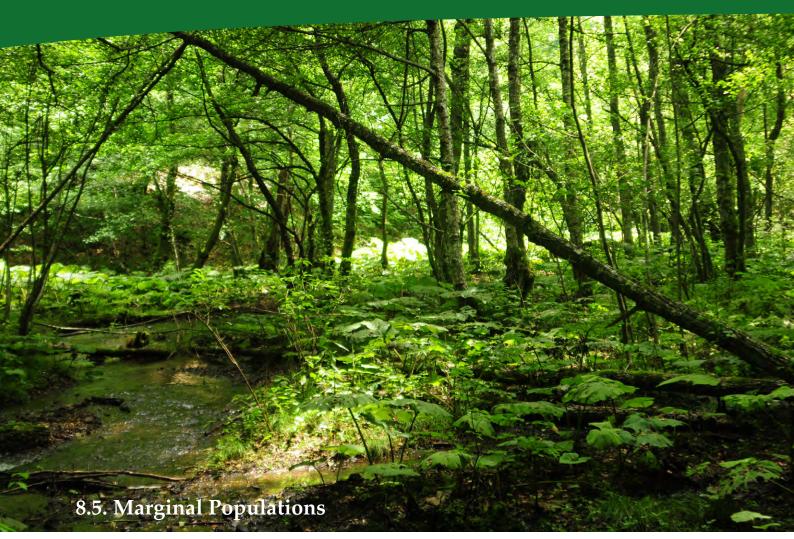
**Recommendations on Forestry Practices:** The most important elements to pay attention to in managing these areas are not fragmenting the big blocks, and conserving the areas that act as corridors, because fragmentation may typically result in the edge effect that might harm especially the flora and fauna with ecological importance in the inner regions. As long as the interventions do not cause the destruction of the forest floor, there is no problem for the continuity of this ecological process.

However, for the continuity of the transitivity function provided by the corridors with critical importance, it is important to conserve the living environment quality in these corridors. Therefore, the areas with this quality must be intervened minimally, the canopy closure must not be broken, the old and big trees must be able to continue their presence in the stand.



©DKM archive

An example to forest floor that is fragmented and with low integrity (Google Earth Image)



©DKM archive

**Descriptive Characteristics:** Natural systems are in a constant state of change both due to their inner dynamics and external factors. Long-term presence of species is dependent upon their ability to keep up with this change, that is, their genetic diversity. This diversity is analyzed and measured on population level.

The differentiation in the gene pools of the species within natural systems occurs either as a result of random processes based on chance or in the adaptation process to biological conditions. Under the light of this basic knowledge, one might assume populations at places with different ecological conditions will have different genetic structure. In fact, this concept is one of the fundamental concepts employed in forestry, including our country. For example, seed transfer zoning is an approach based on this assumption. Taking this assumption as the foundation, the populations successfully colonizing in different ecological conditions must be accepted to be important in biological diversity.

An example to this is the beech stands growing at 2800 m elevation at Forest Sub-District Directorate of Altıparmak. Although the beeches are at this elevation in the form of bushes, they must be considered a valuable asset in management plan since it is a special stand that can grow in these conditions. Again, the Scotch pines that go down to the sea level or down to elevations at 300-400 m in Hatila Valley of Artvin, in the border of Rize and Artvin provinces and in the region called as Çamburnu (Pinebay) in Trabzon province can be considered an example to this. The Scotch pine stands in Pinarbaşı, Kayseri, Cedar stands in Niksar, Calabrian Pine stands in Black Sea Region, black pine forests in Beynam, Ankara are formations that can be regarded as having similar qualities.

**Inventory:** In defining the marginal populations, the views of the experts who know the region and the knowledge of the foresters in the area must be taken. Also, it must be evaluated according to:

- Existing stand map,
- Elevation,
- Bedrock,
- Geographical location

to reveal the possible marginal populations.

Following this, the areas must be visited in situ and the list must be given its final shape, and these areas must be placed in the map of a 1/25.000 scale.

**Recommendations on Forestry Practices:** It is important to note that there should not be any interventions to stands that shelter the marginal populations of the species and these areas must be evaluated under strict conservation zone.

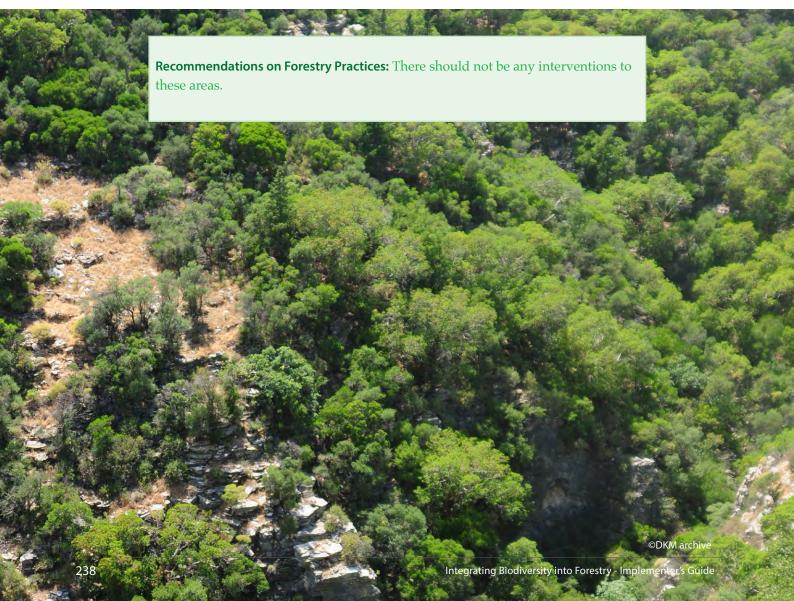
## 8.6. Forests with Special Micro-climate

**Descriptive Characteristics:** The pieces of forest or stands that are distinguished with different characteristics depending on the local climate characteristics within forest areas, especially within the valley floors or rocky and cavern ecosystems, are important representations of the ecological processes.

Setting these areas apart is important for the conservation of micro-climates that have different structure and function inside the forest and the species endemic to this area.

**Inventory:** The preliminary identification of these areas should again be performed together with the Forest Enterprise Directorate staff. Later, these areas should be identified in situ to give the list its final shape.

©DKM archive



### 8.7. Relic Ecosystems

**Descriptive Characteristics:** Relic forest ecosystems are the projections of the changes experienced in vegetation due to climate changes in geological times into today. Due to cooling experienced in the geological times, the vegetation of the northern belt is distributed to southern latitudes. In later periods of warming, the vegetation endemic to northern latitudes began to retreat from the area and left their places to plant species that have adapted to the warmer climate.

However, in some sheltered valleys and places where precipitation and humidity conditions are suitable, the northern belt vegetation can continue its existence. An example to this can be given as the areas in which European-Siberian elements are present, such as the beech, boxwood and yew trees upon Amanos Mountains.

The exact opposite of this event has been experienced in the Black Sea Region. In the warming up period following the Ice Age, the southern belt species began to colonize the northern latitudes. However, during a later cooling period, these species became extinct in these areas. Again, in sheltered valleys, the Mediterranean vegetation could continue its existence until today. Examples to this can be found in the areas that contain Mediterranean elements such as sandalwood and olives in Çoruh Valley, Hatila Valley National Park and Barhal Valley.

**Inventory:** In identifying relic ecosystems, a relic ecosystem map of Turkey showing the known relic ecosystems must be inspected to evaluate the possibility of such an event in the region.

Following this, information must be sought from Directorate experts.

If information regarding the existence of a relic ecosystem is obtained, then field work must be done.

**Recommendations on Forestry Practices:** All forms of intervention must be avoided in relic ecosystems. The worst improper intervention in these types of areas is especially the forestry works with different species within the scope of improvement activities. However, if the area has been degraded due to heavy pressure, then the works must be done taking into account the species composition of the relic ecosystem, density ratios of the species and its structural characteristics with an ecological improvement approach. In the improvement activities, the seeds and the branches to take root must be from the individuals of the species in the region. From the aspect of conserving genetic diversity, the seeds and the branches to be planted from other regions should not be preferred.

It is important that these areas are evaluated under strict conservation zone.

### 8.8. Water resources and peatlands of the forest

©Uğur Zeydanlı

**Descriptive Characteristics:** Although the terrestrial systems dominate most of the earth's surface, their continuity is dependent on their relations with the aquatic systems. Cycles of many elements inside terrestrial systems and their transfer inside these systems are dependent on the aquatic systems.

Again, the mobility and distribution of many species are realized through valleys. Valley systems play an important role with their topographic structure and climate qualities in the changes in species within the context of ecological and evolutionary processes and in their mobility within the context of bio-geographical dynamics.

Peatlands are aquatic ecosystems formed of dead and decaying plant materials in conditions with high water saturation, characterized by the accumulation of organic material called "peat". Although species diversity is low in peatlands, the amount of characteristic species is very high when compared with the dry ecosystems within the same bio-geographic region.

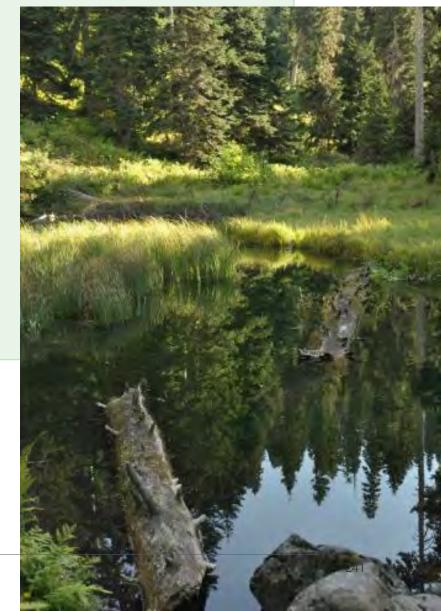
Therefore, for the continuity of the forest ecosystems, the conservation of the aquatic systems in the area and the peatlands, ensuring they are minimally influenced by forestry activities and their conservation against other factors are very important.

**Inventory:** The places in the area where there are streams, other water resources and peatlands must be specified using topographic maps in 1/25,000 scale. If there are elements that can be considered very important between these wetlands and creeks, they must be identified as assets.

In assessing the values of these areas, the views of the Forest Enterprise Directorate officials, along with experts and academicians who know the region well must be obtained. The areas known to be in use by wild animals of the region and birds must be given importance.

**Recommendations on Forestry Practices:** Streams and other aquatic ecosystems inside a forest are the systems that are most influenced by the activities surrounding them. Especially the sediment flow in creeks and ponds and water quality are influenced heavily by the forestry activities around the edge and the coastal habitats. These types of qualities of aquatic ecosystems can be easily disturbed as a result of forestry interventions. And the restoration works targeting harmed peatlands require very intensive and expensive implementations. Consequently, interventions to sub-compartments surrounding stream beds and other aquatic systems must be avoided as much as possible. Interventions to

these types of areas might cover a very small site, yet when their role in the ecosystems of the aquatic systems is considered, they might have bigger impacts. Therefore, the surroundings of ponds and streams within a forest and a certain zone of peatlands must be spared as strict conservation zone. The size of the zone may change according to the inclination of the area, the quality of the vegetation and the characteristics of the habitat. However, in general, a zone of size between 35 – 100 m is formed. This zone can occasionally be bigger.



©DKM archive

# 9. Priority Species and Their Distribution Amongst Forest Enterprise Directorates

The table for forest species with conservation priority, their distribution amongst Forest Enterprise Directorates and the habitat demands of the species that can be placed in the secondary zone (areas with restricted management) are summarized in the tables below.

A CALLER AND A CAL

©DKM archive

# 9.1. Table for Forest Species with Conservation Priority

IUCN Categories

LC: Least Concern

NT: Near Threatened

VU: Vulnerable EN: Endangered

CR: Critically Endangered

| 9.1. Table for Forest Species with Conservation Priority |   |   |                    |                                       |  |  |  |  |
|--|---|---|--------------------|---------------------------------------|--|--|--|--|
| No   | Name of the Species                             | Name of the Species (In Latin)                  | Endemism           | IUCN<br>National Red<br>List Category |  |  |  |  |
| Plant  | Plants - Woody                                  |   |                    |                                       |  |  |  |  |
| 1  | Balkan maple                                    | Acer hyrcanum subsp. reginae-<br>amaliae        | Endemic            | EN                                    |  |  |  |  |
| 2  | Acer cappadocicum subsp.<br>divergens           | Acer divergens                                  | Endemic            | VU                                    |  |  |  |  |
| 3  | (Cytisus gueneri)                               | Cytisus gueneri                                 | Endemic            | CR                                    |  |  |  |  |
| 4  | (Genista sandrasica)                            | Genista sandrasica                              | Endemic            | EN                                    |  |  |  |  |
| 5  | (Gonocytisus dirmilensis)                       | Gonocytisus dirmilensis                         | Endemic            | EN                                    |  |  |  |  |
| 6  | (Colutea melanocalyx subsp.<br>melanocalyx)     | Colutea melanocalyx subsp.<br>melanocalyx       | Endemic            | EN                                    |  |  |  |  |
| 7  | Sageretia spinosa                               | Sageretia spinosa                               | Regionally Endemic | VU                                    |  |  |  |  |
| 8  | Aleppo Pine (Pinus<br>halepensis)               | Pinus halepensis                                | Regionally Endemic | VU                                    |  |  |  |  |
| 9  | Trojan fir                                      | Abies nordmanniana subsp.<br>equi-trojani       | Endemic            | NT                                    |  |  |  |  |
| 10   | Flueggea anatolica Gemici                       | Flueggea anatolica                              | Endemic            | CR                                    |  |  |  |  |
| 11   | Rhododendron ungernii                           | Rhododendron ungernii                           | Regionally Endemic | VU                                    |  |  |  |  |
| 12   | Epigaea gaultherioides                          | Epigaea gaultherioides                          | Regionally Endemic | VU                                    |  |  |  |  |
| 13   | Amygdalus kotschyi                              | Amygdalus kotschyi                              | Regionally Endemic | VU                                    |  |  |  |  |
| 14   | Cerasus erzincanica                             | Cerasus erzincanica                             | Endemic            | CR                                    |  |  |  |  |
| 15   | Field rose                                      | Rosa arvensis                                   | Regionally Endemic | VU                                    |  |  |  |  |
| 16   | Pyrus anatolica                                 | Pyrus anatolica                                 | Endemic            | EN                                    |  |  |  |  |
| 17   | Pyrus yaltirikii                                | Pyrus yaltirikii                                | Endemic            | EN                                    |  |  |  |  |
| 18   | Serik Cab (Pyrus serikensis)                    | Pyrus serikensis                                | Endemic            | EN                                    |  |  |  |  |
| 19   | Sweetgum (Liquidambar<br>orientalis) tree       | Liquidambar orientalis                          | Endemic            | VU                                    |  |  |  |  |
| 20   | Lonicera nummulariifolia<br>subsp. Glandulifera | Lonicera nummulariifolia subsp.<br>glandulifera | Endemic            | NT                                    |  |  |  |  |
| 21   | Alnus glutinosa subsp.<br>betuloides            | Alnus glutinosa subsp. betuloides               | Endemic            | NT                                    |  |  |  |  |
| 22   | Alnus glutinosa subsp.<br>Antitaurica           | Alnus glutinosa subsp.<br>antitaurica           | Endemic            | NT                                    |  |  |  |  |
| 23   | Betula browicziana                              | Betula browicziana                              | Endemic            | VU                                    |  |  |  |  |

| 9.1. Table for Forest Species with Conservation Priority |   |  |                           |                                       |  |  |  |  |
|--|---|--|---------------------------|---------------------------------------|--|--|--|--|
| No   | Name of the Species                           | Name of the Species (In Latin)               | Endemism                  | IUCN<br>National Red<br>List Category |  |  |  |  |
| 24   | Euonymus latifolius subsp.<br>cauconis        | Euonymus latifolius subsp.<br>cauconis       | Endemic                   | EN                                    |  |  |  |  |
| 25   | Zelkova                                       | Zelkova carpinifolia                         | Regionally Endemic        | VU                                    |  |  |  |  |
| 26   | Kasnak oak                                    | Quercus vulcanica                            | Endemic                   | NT                                    |  |  |  |  |
| 27   | Pontine Oak                                   | Quercus pontica                              | Regionally Endemic        | VU                                    |  |  |  |  |
| 28   | Juniperus oxycedrus subsp.<br>macrocarpa      | Juniperus oxycedrus subsp.<br>macrocarpa     | Regionally Endemic        | VU                                    |  |  |  |  |
| 29   | Salix caucasica                               | Salix caucasica                              | Regionally Endemic        | VU                                    |  |  |  |  |
| 30   | Fraxinus pallisae                             | Fraxinus pallisae                            | <b>Regionally Endemic</b> | VU                                    |  |  |  |  |
| 31   | Fraxinus excelsior L. subsp.<br>coriariifolia | Fraxinus excelsior subsp.<br>coriariifolia   | Regionally Endemic        | VU                                    |  |  |  |  |
| 32   | Osmanthus decorus                             | Osmanthus decorus                            | Regionally Endemic        | VU                                    |  |  |  |  |
| Plants   | s - Herbaceous                                |  |                           |                                       |  |  |  |  |
| 33   | Glycyrrhiza flavescens subsp.<br>antalyensis  | Glycyrrhiza flavescens subsp.<br>antalyensis | Endemic                   | CR                                    |  |  |  |  |
| 34   | Astragalus spitzenbergeri                     | Astragalus spitzenbergeri                    | Endemic                   | CR                                    |  |  |  |  |
| 35   | Astragalus bozakmanii                         | Astragalus bozakmanii                        | Endemic                   | CR                                    |  |  |  |  |
| 36   | Trigonella cassia                             | Trigonella cassia                            | Endemic                   | CR                                    |  |  |  |  |
| 37   | Astragalus albertshoferi                      | Astragalus albertshoferi                     | Endemic                   | CR                                    |  |  |  |  |
| 38   | Astragalus altanii                            | Astragalus altanii                           | Endemic                   | CR                                    |  |  |  |  |
| 39   | Satureja amani                                | Satureja amani                               | Endemic                   | CR                                    |  |  |  |  |
| 40   | Thymus cariensis                              | Thymus cariensis                             | Endemic                   | CR                                    |  |  |  |  |
| 41   | Salvia sericeotomentosa                       | Salvia sericeotomentosa                      | Endemic                   | EN                                    |  |  |  |  |
| 42   | Salvia nydeggeri                              | Salvia nydeggeri                             | Endemic                   | EN                                    |  |  |  |  |
| 43   | Nepeta conferta                               | Nepeta conferta                              | Endemic                   | CR                                    |  |  |  |  |
| 44   | Thymus pulvinatus                             | Thymus pulvinatus                            | Endemic                   | CR                                    |  |  |  |  |
| 45   | Cyclamen mirabile                             | Cyclamen mirabile                            | Endemic                   | EN                                    |  |  |  |  |
| 46   | Rindera dumanii                               | Rindera dumanii                              | Endemic                   | CR                                    |  |  |  |  |
| 47   | Anchusa limbata                               | Anchusa limbat                               | Endemic                   | CR                                    |  |  |  |  |
| 48   | Rough comfrey                                 | Symphytum asperum                            | Endemic                   | CR                                    |  |  |  |  |
| 49   | Alkanna dumanii                               | Alkanna dumanii                              | Endemic                   | CR                                    |  |  |  |  |
| 50   | Gypsophila pilulifera                         | Gypsophila pilulifera                        | Endemic                   | CR                                    |  |  |  |  |
| 51   | Silene koycegizensis                          | Silene koycegizensis                         | Endemic                   | CR                                    |  |  |  |  |
| 52   | Acantholimon koeycegizicum                    | Acantholimon koeycegizicum                   | Endemic                   | CR                                    |  |  |  |  |

| 9.1. Table for Forest Species with Conservation Priority |                            |                                       |          |                                       |  |  |  |
|--|----------------------------|---------------------------------------|----------|---------------------------------------|--|--|--|
| No   | Name of the Species        | Name of the Species (In Latin)        | Endemism | IUCN<br>National Red<br>List Category |  |  |  |
| 53   | Acantholimon birandii      | Acantholimon birandii                 | Endemic  | CR                                    |  |  |  |
| 54   | Rubia davisiana            | Rubia davisiana                       | Endemic  | CR                                    |  |  |  |
| 55   | Muscari macbeathianum      | Muscari macbeathianum                 | Endemic  | EN                                    |  |  |  |
| 56   | Scilla sardensis           | Scilla sardensis                      | Endemic  | CR                                    |  |  |  |
| 57   | Asparagus lycicus          | Asparagus lycicus                     | Endemic  | CR                                    |  |  |  |
| 58   | Ornithogalum microcarpum   | Ornithogalum microcarpum              | Endemic  | CR                                    |  |  |  |
| 59   | Chaerophyllum aksekiense   | Chaerophyllum aksekiense              | Endemic  | CR                                    |  |  |  |
| 60   | Ferulago isaurica          | Ferulago isaurica                     | Endemic  | CR                                    |  |  |  |
| 61   | Ferula coskunii            | Ferula coskunii                       | Endemic  | CR                                    |  |  |  |
| 62   | Ferula amanicola           | Ferula amanicola                      | Endemic  | CR                                    |  |  |  |
| 63   | Prangos turcica            | Prangos turcica                       | Endemic  | CR                                    |  |  |  |
| 64   | Allium elmaliense          | Allium elmaliense                     | Endemic  | CR                                    |  |  |  |
| 65   | Galanthus koenenianus      | Galanthus koenenianus                 | Endemic  | EN                                    |  |  |  |
| 66   | Galanthus cilicicus        | Galanthus cilicicus                   | Endemic  | EN                                    |  |  |  |
| 67   | Centaurea antalyensis      | Centaurea antalyensis                 | Endemic  | CR                                    |  |  |  |
| 68   | Centaurea ptosimopappoides | Centaurea ptosimopappoides            | Endemic  | CR                                    |  |  |  |
| 69   | Anthemis macrotis          | Anthemis macrotis                     | Endemic  | EN                                    |  |  |  |
| 70   | Anthemis adonidifolia      | Anthemis adonidifolia                 | Endemic  | CR                                    |  |  |  |
| 71   | Ophrys isaura              | Ophrys isaura                         | Endemic  | EN                                    |  |  |  |
| 72   | Ophrys lyciensis           | Ophrys lyciensis                      | Endemic  | CR                                    |  |  |  |
| 73   | Ophrys amanensis subsp.    | Ophrys amanensis subsp.<br>iceliensis | Endemic  | CR                                    |  |  |  |
| 74   | Iceliensis                 | Verbascum freynii                     | Endemic  | CR                                    |  |  |  |
| 75   | Verbascum freynii          | Verbascum prusianum                   | Endemic  | CR                                    |  |  |  |
| 76   | Verbascum prusianum        | Verbascum adenocaulon                 | Endemic  | CR                                    |  |  |  |
| 77   | Verbascum adenocaulon      | Crocus abantensis                     | Endemic  | CR                                    |  |  |  |
| 78   | Crocus abantensis          | Crocus adanensis                      | Endemic  | CR                                    |  |  |  |
| 79   | Crocus adanensis           | Fritillaria forbesii                  | Endemic  | EN                                    |  |  |  |
| 80   | Fritillaria forbesii       | Fritillaria kittaniae                 | Endemic  | EN                                    |  |  |  |

| 9.1. Table for Forest Species with Conservation Priority |                          |                                   |                     |                                       |  |  |  |  |
|--|--------------------------|-----------------------------------|---------------------|---------------------------------------|--|--|--|--|
| No   | Name of the Species      | Name of the Species<br>(In Latin) | Endemism            | IUCN<br>National Red<br>List Category |  |  |  |  |
| Large  | Mammals                  |                                   |                     |                                       |  |  |  |  |
| 81   | Fallow deer              | Dama dama                         | Non-endemic         | EN                                    |  |  |  |  |
| 82   | Brown bear               | Ursus arctos                      | Non-endemic         | LC                                    |  |  |  |  |
| 83   | Chamois                  | Rupicapra rupicapra               | Endemic sub-species | VU                                    |  |  |  |  |
| 84   | European roe deer        | Capreolus capreolus               | Non-endemic         | LC                                    |  |  |  |  |
| 85   | Caracal                  | Caracal caracal                   | Non-endemic         | LC                                    |  |  |  |  |
| 86   | Red deer                 | Cervus elaphus                    | Non-endemic         | LC                                    |  |  |  |  |
| 87   | Wolf                     | Canis lupus                       | Non-endemic         | LC                                    |  |  |  |  |
| 88   | Eurasian lynx            | Lynx lynx                         | Non-endemic         | LC                                    |  |  |  |  |
| 89   | Wild goat                | Capra aegagrus                    | Non-endemic         | LC                                    |  |  |  |  |
| Small  | Mammals                  |                                   |                     |                                       |  |  |  |  |
| 90   | Asia Minor spiny mouse   | Acomys cilicicus                  | Endemic             | EN                                    |  |  |  |  |
| 91   | Caucasian mole           | Talpa caucasica                   | Regionally Endemic  | LC                                    |  |  |  |  |
| 92   | Levantine mole           | Talpa levantis                    | Regionally Endemic  | LC                                    |  |  |  |  |
| 93   | Major's pine vole        | Microtus majori                   | Regionally Endemic  | LC                                    |  |  |  |  |
| 94   | Robert's snow vole       | Chionomys roberti                 | Regionally Endemic  | LC                                    |  |  |  |  |
| Birds  |                          |                                   |                     |                                       |  |  |  |  |
| 95   | White-tailed eagle       | Haliaeetus albicilla              | Non-endemic         | CR                                    |  |  |  |  |
| 96   | White-backed woodpecker  | Dendrocopos leucotos              | Non-endemic         | VU                                    |  |  |  |  |
| 97   | Northern goshawk         | Accipiter gentilis                | Non-endemic         | NT                                    |  |  |  |  |
| 98   | Black woodpecker         | Dryocopus martius                 | Non-endemic         | NT                                    |  |  |  |  |
| 99   | Cinereous vulture        | Aegypius monachus                 | Non-endemic         | EN                                    |  |  |  |  |
| 100  | Great spotted woodpecker | Dendrocopos major                 | Non-endemic         | LC                                    |  |  |  |  |
| 101  | Eastern imperial eagle   | Aquila heliaca                    | Non-endemic         | EN                                    |  |  |  |  |

|       | 9.1. Table for Forest Species with Conservation Priorit |                                   |                    |                                       |  |  |  |  |  |  |
|-------|---|-----------------------------------|--------------------|---------------------------------------|--|--|--|--|--|--|
| No    | Name of the Species                                     | Name of the Species<br>(In Latin) | Endemism           | IUCN<br>National Red<br>List Category |  |  |  |  |  |  |
| Amph  | nibians and Reptiles                                    |                                   |                    |                                       |  |  |  |  |  |  |
| 102   | Atıf's Lycian salamander                                | Lyciasalamandra atifi             | Endemic            | EN                                    |  |  |  |  |  |  |
| 103   | Bille's Lycian salamander                               | Lyciasalamandra billae            | Endemic            | CR                                    |  |  |  |  |  |  |
| 104   | Antalya salamander                                      | Lyciasalamandra antalyana         | Endemic            | EN                                    |  |  |  |  |  |  |
| 105   | Fazıla's Lycian salamander                              | Lyciasalamandra fazilae           | Endemic            | EN                                    |  |  |  |  |  |  |
| 106   | Luschan's salamander                                    | Lyciasalamandra luschani          | Endemic            | VU                                    |  |  |  |  |  |  |
| 107   | Marmaris salamander                                     | Lyciasalamandra flavimembris      | Endemic            | EN                                    |  |  |  |  |  |  |
| 108   | White-banded mountain viper                             | Montivipera albizona              | Endemic            | EN                                    |  |  |  |  |  |  |
| 109   | Pontic adder  | Vipera pontica                    | Regionally Endemic | EN                                    |  |  |  |  |  |  |
| 110   | Caucasian viper   | Vipera kaznakovi                  | Regionally Endemic | EN                                    |  |  |  |  |  |  |
| 111   | Caucasian salamander                                    | Mertensiella caucasica            | Regionally Endemic | VU                                    |  |  |  |  |  |  |
| Butte | rflies  |                                   |                    |                                       |  |  |  |  |  |  |
| 112   | Ali Bali blue   | Polyommatus alibali               | Endemic            | CR                                    |  |  |  |  |  |  |
| 113   | Pearl-bordered fritillary                               | Boloria euphrosyne                | Non-endemic        | LC                                    |  |  |  |  |  |  |
| 114   | Southern festoon  | Zerynthia polyxena                | Non-endemic        | LC                                    |  |  |  |  |  |  |
| 115   | Brown hairstreak  | Thecla betulae                    | Non-endemic        | LC                                    |  |  |  |  |  |  |
| 116   | Caucasian festoon                                       | Zerynthia caucasica               | Non-endemic        | NT                                    |  |  |  |  |  |  |
| 117   | Grecian copper  | Lycaena ottomana                  | Non-endemic        | VU                                    |  |  |  |  |  |  |
| 118   | Levantian marbled white                                 | Melanargia wiskotti               | Endemic            | VU                                    |  |  |  |  |  |  |

# 9.2 The Evaluation Table for The Impact of General Forestry Practices in Turkey on Fauna Species/Groups with Conservation Priority

A summary forestry practice table is prepared from the documents such as prospectus and communiques etc. on general forestry practices regarding forestation, natural and artificial regeneration, maintenance, rehabilitation and conversion to forest. The practices in this table are evaluated by the experts on conservation priority fauna species regarding their positive and negative impact on the relates species and put to a simple scoring. For some practices additional explanations are provided.

The species scored in the table are given with their species numbers. The species numbers are the numbers given in Table 9.1. For an easy reading of the table, the practices that might have negative impact are given in red tones, and that might have positive impact are given in green tones. For each practice a number is given, and the numbers for practices that have additional explanations are given in yellow color with the related explanations. Some practices are colored in different tones of blue in consecutive order. These practices are alternative to each other, and regarding their impact on the species, they are highlighted to facilitate choosing the practice with the least negative impact.

This table may act as a guide for Chiefs of Forest Enterprise Directorates in choosing the practices for the forest areas in which there are related conservation priority species and in evaluating their impact on these species.



|                         | ∞            |                                  |                                       |   |   |   |   |   |
|-------------------------|--------------|----------------------------------|---------------------------------------|---|---|---|---|---|
|                         | 7 118        | Points                           | ŝ                                     | -   | 7   | m   | 7   | m   |
| *                       | 117          | Points                           | 4                                     | ε   | 7   | m   | 7   | C)  |
| flies                   | 116          | Points                           | m                                     | m   | 7   | 7   | 7   | 4   |
| Butterflies*            | 115          | Points                           | m                                     | m   | -   | 7   | 2   | m   |
| B                       | 114          | Points                           | m                                     | m   | 2   | 7   | 7   | 4   |
|                         | 113          | Points                           | 4                                     | 7   | 2   | m   | m   | m   |
| iles                    | 111          | Points                           | ъ                                     | ъ   | H   | 7   |   | 2   |
| Rept                    | 110          | Points                           | ъ                                     | 7   |   | 7   | T   | 7   |
| and                     | 109          | Points                           | S                                     | 7   | <del>, .</del>  | 7   | -   | 7   |
| ians                    | 108          | Points                           | ъ                                     | 5   | -   | 7   | -   | 7   |
| Amphibians and Reptiles | 102-107      | stnio9                           | Ŋ                                     | 7   | 1   | 2   | Ţ   | H   |
| Birds                   | 95-101       | stnio9                           | ъ                                     | <del>, ,</del>  | 7   | 4   | 7   | m   |
| als                     | 94           | Points                           | 4                                     | 2   | ←   | m   | 7   | m   |
| ш<br>ш                  | 93           | Points                           | 4                                     | 2   | H   | m   | 7   | m   |
| Small Mammals           | 92           | Points                           | 4                                     | 7   | -   | m   | 7   | c,  |
| nall                    | 91           | Points                           | 4                                     | 7   | -   | m   | 7   | Ω.  |
| Sn                      | 06           | Points                           | 4                                     | 2   |   | m   |   | 7   |
|                         | 89           | Points                           | 4                                     | ε   | -   | 7   | 7   | Ω.  |
|                         | 88           | Points                           | 4                                     | m   |   | 7   | 7   | Ω.  |
| lals                    | 87           | Points                           | 4                                     | 7   |   | 7   | 7   | Ω.  |
| Large Mammals           | 86           | Points                           | 4                                     | 7   | -   | 7   | 7   | co.   |
| Ma                      | 85           | Points                           | 4                                     | m   |   | 7   | 7   | Ω.  |
| arge                    | 84           | Points                           | 4                                     | 7   | -   | 7   | 7   | τ.<br>Γ   |
| Ľ                       | 83           | Points                           | 4                                     | m   | -   | 7   | 7   | m   |
|                         | 82           | Points                           | 4                                     | m   |   | 2   |   | 7   |
|                         | 81           | Points                           | 4                                     | 7   | H   |   |   | 7   |
| Species Group →         | Species No → | FORESTRY PRACTICE<br>EXPLANATION | Using tree species<br>of the locality | Using exotic tree<br>species other than<br>previous /natural<br>tree species in that<br>site. | Total clearing out of<br>weeds and bushes<br>with machinery | Clearing weeds and<br>bushes manually on<br>a thin belt with 3m<br>spacing. | Clearing stones and<br>rocks with machinery | Clearing stones and<br>rocks manually on<br>a thin belt with 3m<br>spacing. |
|                         |              | Sub-Practice                     | səi:                                  | Tree Spec   |   | σιλ Cutting   | Preparat                                    |   |
|                         |              | Ргастісе                         |                                       |   | gnitnel9 bne g  | βniwo2  |   |   |
|                         |              | o<br>Z                           | 7                                     | 7   | m   | 4   | ы   | 9   |
|                         |              |                                  |                                       |   |   |   |   |   |

| 7   | m  | 7             | m   | m  | m                                  | m  | m   | m  |
|---|--|---------------|---|--|------------------------------------|--|---|--|
| 7   | m  | 7             | m   | m  | m                                  | n  | m   | m  |
| 7   | 4  | S             | m   | m  | m                                  | ε  | 4   | 7  |
| 2   | 7  | m             | m   | m  | 7                                  | 2  | 7   | 7  |
| 7   | 4  | m             | m   | m  | m                                  | m  | 4   | 7  |
| 2   | m  | m             | m   | m  | m                                  | m  | m   | m  |
|   | 5  | 7             | m   | m  | m                                  | m  | m   | m  |
| 2   | 5  | m             | m   | m  | m                                  | m  | m   | m  |
| 2   | 5  | m             | m   | m  | m                                  | m  | m   | m  |
| 7   | 5  | m             | m   | m  | m                                  | m  | m   | m  |
| H   | 7  | 7             | m   | m  | m                                  | m  | κ   | m  |
| H   | m  | 2             | m   | m  | m                                  | m  | m   | m  |
| 7   | m  | 7             | ς   | m  | 2                                  | m  | 7   | m  |
| 2   | m  | 7             | m   | m  | 7                                  | m  | 2   | m  |
| 7   | m  | 2             | n   | m  | 2                                  | m  | 2   | m  |
| 2   | m  | 2             | m   | m  | 2                                  | m  | 2   | m  |
| m   | m  | 2             | m   | m  | m                                  | m  | 2   | m  |
| 7   | m  | 2             | m   | m  | m                                  | m  | m   | m  |
| 2   | m  | 2             | m   | m  | m                                  | m  | m   | m  |
| 7   | m  | 7             | m   | m  | m                                  | m  | m   | m  |
| 7   | m  | 2             | m   | ε  | ε                                  | m  | m   | m  |
| 7   | ς  | 2             | m   | ς  | ς                                  | m  | m   | m  |
| 7   | m  | 2             | m   | ε  | ε                                  | m  | m   | ε  |
| 7   | ς  | 2             | m   | n  | ς                                  | m  | m   | Ω  |
| 7   | ς  | 2             | m   | m  | ς                                  | m  | m   | m  |
| <del>, -</del>  | n  | 7             | m   | m  | m                                  | m  | m   | m  |
| Tilling the soil with<br>machinery on a<br>line 60-80cm up to<br>inclinations of 30%. | Terracing manually<br>(pick-spade)<br>at places with<br>inclination above<br>40% | Seed dressing | Scattering the seeds to the prepared area | Sapling planting<br>with or without its<br>own soil. | Weed clearing close<br>to saplings | hoeing sapling base<br>and its surrounding | Repeating these<br>processes in the<br>first year for fast<br>growing species | Repeating these<br>processes in the<br>coming years for<br>slow growing<br>species |
|   |  |               |   | gniiqe2<br>Britnel9                                  |                                    |  | General   |  |
|   | gnitnel9 bne g   | ∃niwo2        |   |  |                                    | μ  | o gninnidT  |  |
| ~   | ∞  | თ             | 10  | 11   | 12                                 | 13   | 14  | 15   |
|   |  |               |   |  |                                    |  |   |  |

| Integrating Biodiversity into Forestry - Practitioner' | 's Guide |
|--|----------|
|--|----------|

| 118                             | Points                              | m   | 2-3   | m   | m  | m  |
|---------------------------------|-------------------------------------|---|---|---|--|--|
| 117                             | Points                              | m   | 2-3   | m   | m  | m  |
| lies*<br>116                    | Points                              | 2   | m   | m   | m  | m  |
| Butterflies*<br>4 115 116       | Points                              | 7   | 5   | m   | 7  | m  |
| But<br>114                      | Points                              | 2   | m   | m   | m  | m  |
| 113                             | Points                              | m   |   | m   | m  | m  |
|                                 | Points                              | m   | 7   | m   | 7  | ы  |
| Repti<br>110                    | Points                              | m   |   | m   | N  | ц  |
| and  <br>109                    | Points                              | m   |   | m   | N  | ц  |
| ians a                          | Points                              | m   |   | m   | N  | ы  |
| Amphibians and Reptiles         | Points                              | m   | 2   | m   | 7  | ы  |
| Bird<br>95-101                  | Points                              | m   | T.  | m   | m  | ы  |
| ls<br>94                        | Points                              | m   | m   | m   | m  | m  |
| 1ma<br>93                       | Points                              | m   | m   | m   | m  | m  |
| Small Mammals<br>90 91 92 93 94 | Points                              | m   | m   | m   | m  | m  |
| all N<br>91                     | Points                              | m   | m   | m   | m  | m  |
| Sm<br>90                        | Points                              | m   | m   | m   | m  | m  |
| 89                              | Points                              | m   | 7   | m   | m  | m  |
| 88                              | Points                              | m   | <del>, .</del>  | 2   | m  | 4  |
| ls<br>87                        | Points                              | m   | 2   | m   | m  | 4  |
| 1ma<br>86                       | Points                              | m   | <del>, .</del>  | Ν   | m  | 4  |
| Jan<br>85                       | Points                              | m   | ÷   | m   | m  | 4  |
| Large Mammals<br>83 84 85 86 8  | Points                              | m   | 2   | m   | m  | 4  |
| Lar,<br>83                      | Points                              | m   | 2   | m   | m  | m  |
| 82                              | Points                              | m   | 2   | 2   | m  | 4  |
| 81                              | Points                              | m   | 7   | m   | m  | 4  |
| Species Group →<br>Species No → | FORESTRY<br>PRACTICE<br>EXPLANATION | Maintenance<br>between Spring and<br>Autumn | aiming at an even-<br>aged and mono-<br>layered forest. | Cutting non-<br>elite individuals<br>(warped bole,<br>enormous over-<br>branched trees<br>etc.) | Removing a great<br>ratio of trees cut<br>during precommercial<br>thinning from the<br>forest and distributing<br>forel. | Leaving a great<br>ratio of trees<br>cut during<br>thinning where<br>they are felled |
|                                 | Sub-Practice                        | General                                     |   |   | General  |  |
|                                 | Ргастісе                            | tuo gninnidT                                |   | (gniqqຣາວ2) ສູເ   | Precommercial Thinnir  |  |
|                                 | °<br>Z                              | 16  | 17  | 18  | 19   | 20   |

| m   | m  | 7                                    | 2  | m   | m   | m  |
|---|--|--------------------------------------|--|---|---|--|
| m   | m  | 7                                    | 2  | m   | m   | m  |
| m   | m  | 7                                    | 2  | m   | m   | m  |
| 7   | m  | m                                    | ς  | m   | n   | n  |
| m   | m  | 7                                    | 7  | m   | ς   | m  |
| m   | m  | 7                                    | 2  | m   | m   | m  |
| m   | 4  | 7                                    | 2  | m   | m   | m  |
| m   | 4  | 7                                    | 7  | m   | m   | m  |
| m   | 4  | 2                                    | 2  | m   | m   | m  |
| m   | 4  | 2                                    | 2  | m   | m   | m  |
| m   | 4  | 7                                    | 7  | ſ   | m   | n  |
| m   | Ŋ  | 7                                    | 7  | n   | 4   | n  |
| m   | m  | m                                    | m  | m   | m   | m  |
| m   | m  | m                                    | m  | m   | m   | m  |
| m   | m  | m                                    | m  | m   | m   | m  |
| m   | m  | m                                    | m  | m   | m   | m  |
| m   | m  | m                                    | m  | m   | m   | m  |
| m   | 4  | 7                                    | m  | m   | m   | m  |
| N   | 4  | 7                                    | 2  | m   | m   | m  |
| 3   | 4 4  | 2                                    | 3  | 3 2   | m<br>m  | m<br>m   |
| m   | 4  | m<br>m                               | m<br>m   |   | 4   | ი  |
|   | 4  | 2                                    | 2  | m   | 4   | m  |
| m   | 4  | N                                    | m  | m   | m   | m  |
| N   | 4  | 2                                    | 2  | 7   | m   | m  |
| m   | 4  | 2                                    | 2  | m   | 4   | m  |
| In a period of 10<br>- 20 years, that<br>is a plan period,<br>precommercial<br>thinning 2-3 times<br>in the same site<br>(for trees with<br>diameter at breast<br>height < 8cm) | Carrying cut trees<br>by cable hauling<br>or on the backs of<br>animals. | Skidding the cut<br>trees by tractor | Skidding or rolling<br>downhill the cut<br>trees | Cutting trees that<br>pressure final crop<br>tree | Leaving guarantee/<br>substitute trees for<br>final crop tree | carrying cut trees<br>to warehouse and<br>selling them there |
| General   |  |                                      |  | Later Thinnings (General)                         |   |  |
| g (Scrapping)   | ninnidT leiɔrər  | Precomn                              |  |   | (gniceq2) gnir  | ınidT  |
| 21  | 22   | 23                                   | 24   | 25  | 26  | 27   |
|   | 1  |                                      |  |   |   |  |

|                         | 118          | Points                              | m  | m  | 2   | m   |
|-------------------------|--------------|-------------------------------------|--|--|---|---|
|                         | 117          | Points                              | m  | m  | 7   | m   |
| lies*                   | 116          | Points                              | m  | m  | m   | m   |
| Butterflies*            | 115          | Points                              | m  | m  | m   | 7   |
| BL                      | 114          | Points                              | m  | m  | m   | m   |
|                         | 113          | Points                              | m  | n  | m   | m   |
| les                     | 111          | Points                              | m  | m  | m   | m   |
| Repti                   | 110          | Points                              | m  | n  | m   | m   |
| and                     | 109          | Points                              | m  | m  | m   | m   |
| ians a                  | 108          | Points                              | m  | m  | m   | m   |
| Amphibians and Reptiles | 102-107      | Points                              | m  | m  | m   | m   |
| Bird                    | 95-101       | stnioq                              | 7  | 4  | ы   | 7   |
| SIE                     | 94           | Points                              | m  | m  | m   | m   |
| ш                       | 93           | Points                              | m  | m  | m   | m   |
| Small Mammals           | 92           | Points                              | m  | m  | m   | m   |
| all                     | 91           | Points                              | m  | m  | m   | m   |
| Sm                      | 06           | Points                              | m  | m  | m   | m   |
|                         | 89           | Points                              | m  | m  | 4   | m   |
|                         | 88           | Points                              | m  | m  | 4   | m   |
| sle                     | 87           | Points                              | 7  | m  | 4   | m   |
| nma                     | 86           | Points                              | m  | m  | 4   | m   |
| Mar                     | 85           | Points                              | m  | m  | 4   | m   |
| Large Mammals           | 84           | Points                              | m  | m  | 4   | m   |
| Lar                     | 83           | Points                              | m  | m  | 4   | m   |
|                         | 82           | Points                              | 2  | m  | 4   | m   |
|                         | 81           | Points                              | m  | m  | 4   | m   |
| Species Group →         | Species No → | FORESTRY<br>PRACTICE<br>EXPLANATION | "Planted sales" of<br>the trees in the<br>compartment to<br>be process | removing the bark<br>of the most tree<br>species cut | leaving branch,<br>conifer, leaves,<br>barks other than<br>the log of the tree<br>on site as they are | removing the sick<br>boles of the whole<br>Grade 5 boles<br>and Grade 2 boles<br>about to die |
|                         |              | Sub-Practice                        |  | Later Thinnings<br>(General)                         |   | AFAW  |
|                         |              |                                     |  | hinning (Spacing)                                    |   | (.2) gninnidT<br>gninnidT woJ   |
|                         |              | Practice                            |  |  |   |   |
|                         |              | °<br>Z                              | 28   | 29   | 30  | 31  |

| m   | m  | 7   | m   | e<br>S                    | m  |
|---|--|---|---|---------------------------|--|
| m   | m  | 7   | m   | m                         | m  |
| m   | m  | 7   | m   | n                         | m  |
| m   | m  | 7   | m   | e                         | m  |
| m   | m  | 7   | m   | ε                         | m  |
| m   | m  | 7   | m   | e                         | m  |
| m   | m  | 7   | m   | m                         | m  |
| m   | m  | 7   | m   | m                         | m  |
| m   | m  | 7   | m   | e                         | m  |
| m   | m  | 7   | m   | m                         | m  |
|   |  |   |   |                           |  |
| m   | m  | 7   | m   | ε                         | m  |
|   |  |   |   |                           |  |
| 7   | 7  | 7   | 7   | 2                         | 2  |
| m   | m  | 7   | m   | e                         | m  |
| m   | m  | 7   | m   | e                         | m  |
| m   | m  | 2   | m   | n                         | m  |
| m   | m  | 2   | m   | m                         | m  |
| m   | m  | 2   | m   | n                         | Ω  |
| m   | m  | 2   | m   | n                         | m  |
| m   | m  | 2   | m   | n                         | m  |
| m   | m  | 2   | m   | n                         | m  |
| m   | m  | 2   | m   | e                         | m  |
| m   | m  | 2   | m   | m                         | m  |
| m   | m  | 2   | m   | m                         | m  |
| m   | m  | 2   | m   | e                         | m  |
| m   | m  | 7   | m   | e                         | m  |
| m   | m  | 2   | m   | n                         | Υ  |
| Removing Grade<br>5, Grade 4, Grade<br>2.a,b,c,d,e trees as<br>long as they harm<br>Grade 1 trees and<br>no gaps in stand<br>are left | Removing Grade<br>4, Grade 4, Grade<br>3, Grade 2 boles<br>that harm Grade<br>that will not leave<br>any gaps. | Removing<br>undesired tree<br>species from the<br>stand | in order to remedy<br>the denseness,<br>in removing some<br>of the densely<br>clumped Grade 1<br>boles. | Removing Grade 5<br>trees | Removing fungi<br>and insect infested<br>individuals of<br>Grade 4 and 3<br>trees. |
| muibeM  | 1-grong-1  | Strong-2  | Strong-3  | ι                         | nuibeM   |
|   | gninnidT wol   |   |   | Buir                      | nnidT dgiH   |
|   | (gnice   | q2) ጿninnidT  | -   |                           |  |
| 32  | e<br>B   | 34  | 35  | 36                        | 37   |
|   |  |   |   |                           |  |

| _                       | ~            |                                     |   |                                       |  |   |  |  |
|-------------------------|--------------|-------------------------------------|---|---------------------------------------|--|---|--|--|
|                         | 118          | Points                              | m   | n                                     | m  | n   | 4  | <b>↔</b>                                 |
| ×                       | 117          | Points                              | m   | m                                     | m  | m   | 4  | 7  |
| Butterflies*            | 116          | Points                              | с   | m                                     | ε  | n   | m  | 7  |
| utter                   | 115          | Points                              | m   | m                                     | m  | n   | 4  | 7  |
| B                       | 114          | Points                              | m   | m                                     | m  | m   | 4  | 7  |
|                         | 113          | Points                              | m   | m                                     | m  | m   | 4  | t -                                      |
| les                     | 111          | Points                              | m   | m                                     | m  | m   | 7  | $\leftrightarrow$                        |
| Repti                   | 110          | Points                              | m   | m                                     | m  | m   | m  |  |
| and l                   | 109          | Points                              | m   | m                                     | m  | m   | m  | 7  |
| ians                    | 108          | Points                              | m   | m                                     | m  | m   | m  | 2  |
| Amphibians and Reptiles | 102-107      | stnio9                              | m   | m                                     | m  | m   | m  | 1  |
| Bird                    | 95-101       | Points                              | 5   | 5                                     | 7  | 7   | m  | 2  |
| als                     | 94           | Points                              | m   | m                                     | m  | m   | m  | 2  |
| лш                      | 93           | Points                              | m   | m                                     | m  | m   | m  | 7  |
| Small Mammals           | 92           | Points                              | m   | n                                     | m  | m   | m  | 7  |
| all                     | 91           | Points                              | m   | m                                     | m  | Ω   | m  | 2  |
| Sm                      | 06           | Points                              | m   | m                                     | m  | m   | m  | 2  |
|                         | 89           | Points                              | m   | 7                                     | m  | Ω   | m  | <b>←</b>                                 |
|                         | 88           | Points                              | m   | 7                                     | m  | Ω   | 5  | 2  |
| als                     | 87           | Points                              | m   | m                                     | m  | m   | 7  | 2  |
| ,<br>mm                 | 86           | Points                              | m   | 7                                     | m  | m   | 7  | 2  |
| Mar                     | 85           | Points                              | m   | m                                     | m  | m   | m  | 2  |
| Large Mammals           | 84           | Points                              | m   | m                                     | m  | m   | m  | 7  |
| Lai                     | 83           | Points                              | m   | m                                     | m  | m   | m  |  |
|                         | 82           | Points                              | Υ   | m                                     | m  | Υ   | 5  | 7  |
|                         | 81           | Points                              | m   | m                                     | m  | m   | 5  | H  |
| Species Group →         | Species No → | FORESTRY<br>PRACTICE<br>EXPLANATION | Thinning out the<br>frequency of dense<br>trees of Grade 4<br>and 3 | Removing Grade 2<br>that harm Grade 1 | Thinning out<br>tightly clumped<br>Grade 1 trees | In addition to<br>Medium Grades,<br>removing some<br>individuals of<br>Grade 1, leaving<br>the best on site | Cutting trees to<br>remove clumping<br>and reducing the<br>crown closure | Clearing by<br>rooting out<br>vegetation |
|                         |              | tice<br>tice                        |   | muibeM                                |  | Strong  | Brittu<br>Brittu<br>Cutting  | ูร. Logging                              |
|                         |              | Practice<br>Sub-Prac-               |   |                                       | q2) gninnidT<br>nidT dgiH                        |   | Regeneration<br>Preparatory  |  |
|                         |              |                                     | <u> </u>  |                                       |  |   |  |  |
|                         |              | °Z<br>Z                             | 38  | 39                                    | 40   | 41  | 42   | 43                                       |

| N   | <b>→</b>   | m   | 4  | 7   |
|---|--|---|--|---|
| N   |  | m   | 4  | ъ   |
| 7   | 7  | m   | ы  | m   |
| 2   | N  | m   | 4  | m   |
| 7   | N  | m   | 4  | m   |
| ъ   | H  | m   | 4  | N   |
| ъ   | H  | m   | m  | m   |
| ъ   | H  | m   | ъ  | m   |
| ъ   | H  | m   | 7  | m   |
| m   | 7  | m   | m  | m   |
| N   | H  | m   | m  | m   |
| 4   | 2  | m   | N  | m   |
| m   | 7  | m   | m  | m   |
| m   | N  | m   | m  | m   |
| m   | 2  | m   | m  | m   |
| m   | N  | m   | m  | m   |
| m   | 2  | m   | m  | m   |
| N   | m  | m   | m  | m   |
| m   | m  | m   | 7  | m   |
| m   | 7  | m   | 2  | m   |
| m   | ς,   | ς,  | 2  | m   |
| m   | m  | m   | m  | m   |
| m   | m  | m   | m  | m   |
| N   | m  | m   | m  | m   |
| m   | 7  | ς   | 7  | m   |
| m   | κ  | m   | 2  | m   |
| Clearing out<br>vegetation in<br>belts and piling up<br>rooted vegetation<br>belts<br>belts | Hoeing the soil: if<br>inclination is high,<br>instead hoeing<br>with terraces | Cutting Primary<br>Tree Species<br>during seeding<br>year | If the light<br>demands of<br>primary tree<br>species are high,<br>dense cuts and<br>dense cuts and<br>greatly reducing<br>crown closure | If the light<br>demands of<br>primary tree<br>species are low,<br>light cuts and not<br>greatly reducing<br>crown closure |
|   | D gnibəə2  | tuጋ gri   | I  |   |
| noitera   | อกอฐอภิ โธามวัธท   |   |  | Natural Re  |
| 4 4 5 4 6 4 4 7 4 7 4 7 4 7 4 7 4 7 4 7 4 7 4   |  |   | 47   | 84  |
| 4   | 4  | 4   | 4  |   |

Integrating Biodiversity into Forestry - Practitioner's Guide

| -                       | ~~~          |                                     |  |   |  |
|-------------------------|--------------|-------------------------------------|--|---|--|
|                         | 118          | Points                              | m  | m   | m  |
| ×                       | 117          | Points                              | m  | m   | m  |
| lies                    | 116          | Points                              | 4  | 4   | m  |
| Butterflies*            | 115          | Points                              | m  | m   | m  |
| B                       | 114          | Points                              | m  | m   | m  |
|                         | 113          | Points                              | m  | m   | m  |
| iles                    | 111          | Points                              | m  | m   | m  |
| Rept                    | 110          | Points                              | m  | m   | m  |
| and                     | 109          | Points                              | m  | m   | m  |
| ians                    | 108          | Points                              | m  | m   | m  |
| Amphibians and Reptiles | 102-107      | stnioq                              | m  | m   | m  |
| Bird                    | 95-101       | Points                              | 4  |   | m  |
| als                     | 94           | Points                              | m  | m   | m  |
| Small Mammals           | 93           | Points                              | m  | m   | m  |
| Ma                      | 92           | Points                              | m  | m   | m  |
| llar                    | 91           | Points                              | m  | m   | m  |
| Sn                      | 06           | Points                              | m  | m   | m  |
|                         | 89           | Points                              | 2  | m   | m  |
|                         | 88           | Points                              | m  | m   | m  |
| als                     | 87           | Points                              | 2  | 7   | 4  |
| Large Mammals           | 86           | Points                              | m  | m   | m  |
| Mai                     | 85           | Points                              | m  | m   | m  |
| гgе                     | 84           | Points                              | m  | m   | m  |
| La                      | 83           | Points                              | 7  | ε   | m  |
|                         | 82           | Points                              | 7  | 7   | 4  |
|                         | 81           | Points                              | m  | m   | m  |
| Species Group →         | Species No → | FORESTRY<br>PRACTICE<br>EXPLANATION | If there are<br>primary tree<br>species that<br>have naturally<br>arrived prior to<br>rejuvenation or<br>other rejuvenating<br>species in the<br>rejuvenation<br>site, cutting<br>the individuals<br>with undesired<br>characteristics<br>(degraded) | Making the<br>operations prior<br>to seed dropping<br>time of primary<br>tree species | Covering the seeds<br>with soil following<br>seed dropping |
|                         |              | -Drac-<br>tice                      | tuጋ gnibe  | θS  |  |
|                         |              | Practice                            | า กอนักอาการ เกิด เกิด เกิด เกิด เกิด เกิด เกิด เกิด   | Natura  |  |
|                         |              | e<br>P<br>Z                         | 49   | 50  | 51   |
| _                       |              |                                     | -  |   |  |

| 4   | m  | m  | m   |  |  |  |
|---|--|--|---|--|--|--|
| 4   | m  | m  | m   |  |  |  |
| ы   | m  | m  | m   |  |  |  |
| 4   | m  | m  | 7   |  |  |  |
| 4   | 4  | 4  | m   |  |  |  |
| 4   | m  | m  | m   |  |  |  |
|   |  |  |   |  |  |  |
| 3   | m  | m<br>m   | 3   |  |  |  |
|   |  |  |   |  |  |  |
| m   | m  | m  | 2   |  |  |  |
| m   | m  | m  | m   |  |  |  |
| m   | m  | m  | m   |  |  |  |
| m   | m  | m  | m   |  |  |  |
| m   | m  | m  | m   |  |  |  |
| m   | m  | m  | m   |  |  |  |
| m   | m  | m  | m   |  |  |  |
| m   | m  | m  | m   |  |  |  |
| m   | m  | m  | m   |  |  |  |
| 3   | m  | 7  | N   |  |  |  |
| 7   | m  | 7  | 2   |  |  |  |
| 7   | N  | N  | 2   |  |  |  |
| ъ   | m  | 7  | N   |  |  |  |
| 3   | m  | 7  | 2   |  |  |  |
| 7   | m  | N  | 2   |  |  |  |
| 2   | m  | 7  | N   |  |  |  |
| 3   | 7  | 7  | 2   |  |  |  |
| 7   | m  | 7  | 2   |  |  |  |
| Reducing crown<br>closure with cuts<br>at one, two or<br>three different<br>times (with 3-4-<br>year intervals) | At sites with<br>good growing<br>environment,<br>after saplings<br>reach 3-4 years<br>age, completely<br>removing shelter-<br>wood from site<br>in the coming<br>5-15 years (final<br>cutting) | At sites with<br>bad growing<br>environment,<br>after saplings<br>reach 3-4 years<br>age, completely<br>removing shelter-<br>wood from site<br>in the coming<br>few years (final<br>cutting) | At sites with<br>bad growing<br>environment,<br>following skyline<br>yarding, keeping<br>only few safety<br>trees on site |  |  |  |
|   | BrittuD leni   | l bns tuጋ gnitdgiJ   |   |  |  |  |
|   | nonsian  | อฐอЯ โตามวัธป  |   |  |  |  |
| 52  | 5 <u>3</u>   | 2<br>2<br>2  | 25  |  |  |  |
| LO<br>LO  | <u>م</u>   | <u>ں</u>   | <u>ل</u> م  |  |  |  |
|   |  |  |   |  |  |  |

|                         | ~            |                                     |   |  |   |
|-------------------------|--------------|-------------------------------------|---|--|---|
|                         | 118          | Points                              | m   | 5  | m   |
| *                       | 117          | Points                              | m   | 5  | m   |
| lies                    | 116          | Points                              | 2   | 5  | m   |
| Butterflies*            | 115          | Points                              | 4   | р  | m   |
| Bſ                      | 114          | Points                              | m   | Я  | m   |
|                         | 113          | Points                              | m   | Я  | m   |
| iles                    | 111          | Points                              | m   | m  | m   |
| Rept                    | 110          | Points                              | m   | m  | m   |
| and F                   | 109          | Points                              | m   | m  | m   |
| ians                    | 108          | Points                              | m   | m  | m   |
| Amphibians and Reptiles | 102-107      | Points                              | m   | m  | m   |
| Bird                    | 95-101       | stnioq                              | 4   | 7  | 4   |
| als                     | 94           | Points                              | m   | m  | m   |
| Small Mammals           | 93           | Points                              | m   | m  | m   |
| Mar                     | 92           | Points                              | m   | m  | m   |
| all                     | 91           | Points                              | m   | m  | m   |
| Sm                      | 06           | Points                              | m   | m  | m   |
|                         | 89           | Points                              | m   | 5  | 4   |
|                         | 88           | Points                              | m   | 5  | 4   |
| sle                     | 87           | Points                              | m   | 7  | 4   |
| Large Mammals           | 86           | Points                              | m   | 7  | 4   |
| Mar                     | 85           | Points                              | m   | m  | 4   |
| ge<br>ge                | 84           | Points                              | m   | m  | 4   |
| Lai                     | 83           | Points                              | m   | 7  | 4   |
|                         | 82           | Points                              | m   | <del>, ,</del>   | 4   |
|                         | 81           | Points                              | m   | m  | 4   |
| Species Group →         | Species No → | FORESTRY<br>PRACTICE<br>EXPLANATION | Beginning cuts<br>from stand center<br>to periphery | Opening skidding<br>roads 3-4m wide<br>and with two<br>tree-height (50m)<br>intervals to skid<br>out the cut trees | No clear-cutting in<br>sites that comprise<br>a block of more<br>than 10-15 hectare |
|                         |              | Sub-Prac-<br>tice                   | gnittu⊃ leni <sup>-</sup>                           | l bns វuጋ នូពដ៧នូរJ  | General   |
|                         |              | Ргастісе                            | ทอเวอา  | เอซูอริ โธามร์ธท   | กоทรายการอุยุครายเป็นหาย  |
|                         |              | °Z                                  | 56  | 57   | 28  |
|                         |              |                                     |   |  |   |

| 4  | m<br>m   | m<br>m  |
|--|--|---|
| m  | N  | m   |
| 4  | m  | m   |
|  |  |   |
| 4  | m  | m   |
| 4  | m  | m   |
| 4  | N  | m   |
| ы  | M  | m   |
| ы  | m  | m   |
| ы  | m  | 7   |
| 4  | m  | m   |
| Ю  | р  | 4   |
| 4  | m  | m   |
| 4  | m  | m   |
| 4  | m<br>m   | ო<br>ო  |
| 4  | m  | m   |
| ы  | m  | m   |
| ы  | m  | m   |
| ы  | m  | m   |
| ы  | m  | m   |
| ы  | m  | m   |
| ы  | m  | m   |
| ы  | M  | m   |
| ы  | m  | m   |
| ы  | m  | m   |
| Conserving<br>species as<br>individuals or<br>as groups that<br>are endemic<br>species to natural<br>vegetation and<br>species such as<br>chestnut, juniper,<br>wild cherry, and<br>also species that<br>have medical or<br>aromatic qualities | Casting out dry<br>and degenerate<br>individuals within<br>inside-creek leaved<br>vegetation and<br>rehabilitating<br>existing species | Subjecting species<br>with offshoots<br>such as oak<br>and beech to<br>rejuvenation<br>cuts, parallel<br>to the contour<br>lines at specific<br>intervals of width<br>and length, and<br>perpendicular<br>to the prevailing<br>wind direction |
|  | General  |   |
|  | Artificial Regeneration  |   |
| <br>۵<br>د   | 00   | 61  |
|  |  | <u> </u>  |

|                         | 118          | Points                              | m   | 7  | 4   | 7   |
|-------------------------|--------------|-------------------------------------|---|--|---|---|
| ×                       | 117          | Points                              | m   | 7  | 4   | 2   |
| flies                   | 116          | Points                              | m   | 7  | m   | m   |
| Butterflies*            | 115          | Points                              | m   | 2  | m   | m   |
| Bu                      | 114          | ti stniog w                         |   | N  | m   | m   |
|                         | 113          | Points                              | m   | N  | 4   | m   |
| iles                    | 111          | Points                              | m   | m  | 4   | 4   |
| Rept                    | 110          | Points                              | m   | m  | 4   | 4   |
| and                     | 109          | Points                              | m   | m  | 4   | 4   |
| ians                    | 108          | Points                              | m   | m  | 4   | 4   |
| Amphibians and Reptiles | 102-107      | stnioq                              | m   | m  | 4   | 4   |
| Bird                    | 95-101       | Points                              | ы   | 7  | 4   | 4   |
| als                     | 94           | Points                              | m   | 7  | m   | m   |
| шш                      | 93           | Points                              | m   | 7  | m   | m   |
| Small Mammals           | 92           | Points                              | m   | 7  | m   | m   |
| Jall                    | 91           | Points                              | m   | 7  | m   | m   |
| Sn                      | 06           | Points                              | m   | 7  | m   | m   |
|                         | 89           | Points                              | m   | 7  | 4   | 4   |
|                         | 88           | Points                              | m   | 7  | 4   | 4   |
| als                     | 87           | Points                              | m   | 7  | m   | m   |
| Large Mammals           | 86           | Points                              | m   | 7  | 4   | 4   |
| Ma                      | 85           | Points                              | m   | 7  | ε   | 4   |
| rge                     | 84           | Points                              | m   | 7  | ε   | 4   |
| La                      | 83           | Points                              | m   | 7  | 4   | 4   |
|                         | 82           | Points                              | m   | 7  | m   | m   |
|                         | 81           | Points                              | m   | 7  | m   | 4   |
| Species Group →         | Species No → | FORESTRY<br>PRACTICE<br>EXPLANATION | Conserving<br>saplings healthy<br>saplings on site<br>that are able<br>to adopt to<br>the artificially<br>rejuvenating site<br>by their age | Preferring<br>machinery at sites<br>where it is suitable | Gathering and<br>piling litter after<br>final cutting | Leaving litter that<br>decay easily on site<br>after final cutting. |
|                         |              | Sub-Prac-<br>tice                   | General   |  |   | Litter Clea   |
|                         |              | Practice                            |   | ทดนี้ธาอกอฐอภิ ไเ  | ыстігіта<br>Г   |   |
|                         |              | °<br>Z                              | 62  | 63   | 64  | 65  |
|                         |              |                                     |   | I  |   | ]   |

| 1         1         2  |   |  |   |                  |  |   |
|--|---|--|---|------------------|--|---|
| Having out and<br>planting out and<br>systems         Additional systems           Having out and<br>planting out and<br>systems         Additional systems           Planting out and<br>systems         Additional systems           Planting out and<br>systems         Planting out and<br>systems         Additional systems           Planting out and<br>systems         Planting out and<br>systems         Additional systems           Planting out and<br>systems         Planting out and<br>systems         Additional systems           Planting out and<br>systems         Planting out and<br>systems         Additional systems         Additional systems           Planting out and<br>systems         Planting out and<br>systems         Additional systems         Additional systems         Additional systems           Planting out and<br>systems         Planting out and<br>systems         Additional systems         Additional systems         Additional systems           Planting out and<br>systems         Planting out and<br>systems         Additional systems         Additional systems         Additional systems         Additional systems           Planting out and<br>systems         Planting out and<br>systems         Planting out and<br>systems         Additional systems         Additional systems         Additional systems           Planting out and<br>systems         Planting out and<br>systems         Planting out and<br>systems         Planting out and<br>systems         Planting out and<br>s   | -   | 4  | m   | -                | 4  | m   |
| Image: control (c) (c) (c) (c) (c) (c) (c) (c) (c) (c)   | <del>, ,</del>  | m  | m   | -                | 4  | n   |
| Harving out and<br>publication of the solution<br>of busining places         Antimital Antimital Antimital Antimation           Harving out and<br>publications uctions         Parting places           Prima places         Prima places           Prima places  | -   | 4  | m   | -                | 4  | m   |
| Heaving out and<br>thereing places         Image           Heaving out and<br>the public places         Heaving out and<br>the public places           Heaving out and<br>the public places         Person of the public places           Sequencing places         Person of the public places           Sequencing places         Person of the public places           Sequencing places         Person of the public places           Sequencing places         Person of the places           Sequencing places         Person of the places           Sequencing places         Person of the places           Sequencing places         Person of the places           Sequencing places         Person of the places           Sequencing places         Person of the places           Sequencing places         Person of the places           Sequencing places         Person of the places           Sequencing places         Person of the places           Sequencing places         Person of the places           Sequencing places         Person of the places           Sequencing places         Person of the places           Sequencing places         Person of the places           Sequencing places         Person of the places           Sequencing places         Person of the places           Sequencing places<  | 7   | 4  | m   | t.               | 4  | m   |
| Heaving out and<br>officiality fields         Heaving out and<br>officiality fields         Heaving out and<br>officiality fields           Heaving out and<br>officiality fields         Heaving out and<br>officiality fields         Heaving out and<br>officiality fields         Heaving out and<br>officiality fields         Heaving out and<br>officiality fields         Heaving out and<br>officiality fields         Heaving out and<br>officiality fields         Heaving out and<br>officiality fields         Heaving out and<br>officiality fields         Heaving fields         Hea   | 7   | 4  | m   | <del>, i</del>   | 4  | m   |
| Image: constraint of the solution of t   | H   | 4  | m   | t-               | 4  | m   |
| Попритивность потредатиль         Попритивность портредатиль         ""><td>5</td><td>7</td><td>4</td><td><b>.</b></td><td>m</td><td>m</td></th<>  | 5   | 7  | 4   | <b>.</b>         | m  | m   |
| Heaving out and<br>of businitie<br>of businitie<br>of businitie<br>of businitie<br>of businitie<br>of businitie<br>of businitie<br>of businitie<br>of businitie<br>of businitie<br>of businitie<br>of businitie<br>of businitie<br>of businitie<br>of businitie<br>of businitie<br>of businitie<br>of businitie<br>of businitie<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businitie<br>potes; roots etc. by<br>of businit<br>potes; roots etc. by<br>of businitie<br>potes; roots e  | 7   | N  | m   | m                | m  | m   |
| Amount of the proving out and function of the proving out and function of the proving precess of the precess of the preces  | 7   | 2  | m   | m                | m  | m   |
| Antificial Reference in the solution of the solutio  | 7   | 2  | m   | m                | m  | m   |
| Intervention in the solution of and of the solution out and believes on weedlike or weedlike or weedlike or weedlike or weedlike or weedlike to 'vegetation' such as close or weedlike vegetation such as close or weedlike vegetation as close or vegetation as close or   | 7   | m  | 4   | L                | m  | m   |
| Heaving out and<br>oblighting places       Activitical Activities Activities         Heaving out and<br>of bushlike<br>or weedlike<br>vegetation such as<br>vegetation such as<br>vegetation such as<br>vegetation such as       I         Vegetation such as<br>vegetation such as<br>vegetation such as       I         Vegetation such as<br>vegetation such as<br>vegetation such as       I         Vegetation such as<br>vegetation such as<br>vegetation such as       I         Vegetation such as<br>vegetation activity bushlike       I         Vegetation such as       I         Vegetation such as       I         Vegetation such as       I         Vegetation such as       I         Vegetation active as       I         Vegetation active as       I         Vegetation active as       I         Vegetation active as       I         Vegetation active as       I         Vegetation active as       I         Vegetation active as       I         Vegetation active as       I         Vegetation active as       I         Vegetation active as       I         Vegetation active as       I         Vegetation active as       I         Vegetation active as       I         Vegetation active as       I         Vegetation active a   | 7   | ы  | 4   |                  |  | <del>r</del> i                                |
| Heaving out and<br>piling pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busining pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing pieces<br>or busing piece  | 7   | m  | 4   | 7                | co<br>C  | ო   |
| Artificial Reservation out and piling pieces         Heaving out and piling pieces       Artificial Reservation such as like         or bushlike       or bushlike         or bushlike       or bushlike         or bushlike       or bushlike         or bushlike       or bushlike         or bushlike       or bushlike         or bushlike       or bushlike         or bushlike       or bushlike         or bushlike       boles, roots etc. by       1         manually       manually         cuthing bushlike       2       2       2         manually       cuthing bushlike       2       2       2       2         mot touching 5-       not touching 5-       15-meter-wide       2       2       2       2         mot touching 5-       15-meter-wide       8       4       4       4       4       4       4       4       4       4       4       4       3 </td <td>7</td> <td>m</td> <td>4</td> <td>7</td> <td>m</td> <td>m</td>  | 7   | m  | 4   | 7                | m  | m   |
| Heaving out and piling pieces         of bushing pieces         of voighting pieces         of voighting pieces         of voighting pieces         of voighting pieces         of voighting pieces         of voighting pieces         of voighting pieces         of voighting pieces         vegetation such as         pinong pieces         vegetation such as         pinong pieces         vegetation such as         vegetation such as         vegetation such as         vegetation such as         vegetation such as         vegetation such as         vegetation such as         vegetation such as         vegetation such as         vegetation on         vegetation on         vegetation on         vegetation on         vegetation on         vegetation on         vegetation on         vegetation on         vegetation on         vegetation on         vegetation on         vegetation on         vegetation on         vegetation on         vegetation on         verek banks         a d d y   | 7   | m  | 4   | 7                | m  | m   |
| Heaving out and<br>of bushlike<br>or bushlike<br>or bushlike<br>or bushlike<br>or bushlike<br>or bushlike<br>or bushlike<br>or bushlike<br>or bushlike<br>or weedike<br>tractor (rakes)       I         Heaving out and<br>pling pieces       Heaving out and<br>of bushlike<br>or weedike       I       1       2       1       1       2         Manually<br>tractor (rakes)       I       2       1       2       1       2       1       1         Manually<br>tractor (rakes)       manually<br>tractor (rakes)       I       2   | 7   | m  | 4   | 7                | ო  | m   |
| Heaving out and pling pieces       Antificial Regetation such as the solution of bushlike         or weadilite       or weadilite         or weadilite       or weadilite         or weadilite       1         or weadilite       1         or weadilite       1         or weadilite       1         nanually       1         ractor (rakes)       1         nanually       1         restricting bushlike       2         or weadilite       2         not touching 5       1         to the ground as       2         or weadilite       2         not touching 5       1         to the ground as       2         not touching 5       1         to the ground as       2         not touching 5       1         to the ground as       2         not touching 5       2         to the ground as       3         not touching 5       2         to the ground as       3         not touching 5       2         to the ground as       3         not touching 5       2         not touching 5       2         not touching 5   | 7   | m  | m   | 7                | m  | m   |
| Heaving out and of bushlike of bushlike of bushlike of bushlike of bushlike of bushlike of bushlike of bushlike of bushlike of bushlike of bushlike of bushlike of bushlike of bushlike of wegetation such as boles roots effections actives is tractor (rakes).       Heaving bushlike of bushlike of bushlike of bushlike or wegetation such as boles roots effection as close of the ground as close of   | H   | 7  | 4   | 7                | 4  | m   |
| Heaving out and of bushlike       Adding pleces         of bushlike       of bushlike         of bushlike       of bushlike         of bushlike       of bushlike         of bushlike       of bushlike         of bushlike       of bushlike         of bushlike       of bushlike         of bushlike       vegetation such as         tractor (rakes)       1         manually       tractor (rakes)         tractor (rakes)       1         manually       tractor (rakes)         manually       tractor (rakes)         manually       tractor (rakes)         manually       tractor (rakes)         manually       tractor (rakes)         manually       tractor (rakes)         manually       tractor (rakes)         manually       tractor (rakes)         manually       tractor (rakes)         manually       tractor (rakes)         manually       tractor (rakes)         manually       tractor (rakes)         manually       tractor (rakes)         manually       tractor (rakes)         manually       tractor (rakes)         manually       tractor (rakes)         manually   | H   | 7  | 4   | m                | 4  | m   |
| Heaving out and of bushlike       Artificial Regetation         of bushlike       or weedlike         or weedlike       or weedlike         or weedlike       vegetation such as         or weedlike       vegetation such as         or weedlike       vegetation such as         or weedlike       vegetation such as         vegetation such as       vegetation such as         poles, roots etc. by       1         manually       manually         ractor (rakes)       1         poles, roots etc. by       1         manually       manually         cutting bushlike       out touching 5 -         not touching 5 -       15-meter-wide         not touching 5 -       15-meter-wide         not touching 5 -       15-meter-wide         not touching 5 -       1         not touching 5 -       1         not touching 5 -       1         not touching 5 -       1         not touching 5 -       1         not touching 5 -       1         not touching 5 -       1         not touching 5 -       1         not touching 5 -       1         nont touching 5 -       1         nont touching 1   | 7   | 7  | 4   | m                | 4  | m   |
| Heaving out and of bushlike         of bushlike         of bushlike         of bushlike         of bushlike         or weedlike  | →   | 7  | 4   | m                | 4  | m   |
| Pitter MathematicationHeaving outAntificial Regetation such as<br>vegetation such as<br>boles, roots etc. by<br>vegetation such as<br>tractor (rakes)Heaving outAntificial Regetation such as<br>vegetation such as<br>tractor (rakes)PruningPlantingTilling the soilAntificial Regetation on<br>or weedlike<br>vegetation as close2PruningPlanting<br>possibleAAt dry growth<br>pruning<br>pruning3At dry growth<br>pruning3At dry growth<br>pruning3At dry growth<br>pruning4At dry growth<br>pruningAt dry growth<br>pruningAt dry growth<br>pruningAt dry growth<br>pruningAt dry growth<br>pruningAt dry growthAt dry growth<br>pruningAt dry growth<br>pruningAt dry growth<br>pruningAt dry growthAt dry growth<br>pruningAt dry growthAt dry  |   | 7  | 4   | n                | 4  | m   |
| Other MaintenancePruningPleaving out and<br>of bushlike<br>or weedlike<br>vegetation such as<br>poles, roots etc. by<br>tractor (rakes)1PruningPlantingTillage33PruningPlantingIlling the soil33At dry growth<br>pruning<br>pruningAt dry growth<br>speriod ends and<br>period ends and<br>pruning33   | 7   | 7  | 4   | m                | 4  | m   |
| Other MaintenanceOther MaintenancePruning <trtr>PruningPruning<trt< td=""><td><math>\rightarrow</math></td><td>7</td><td>4</td><td>n</td><td>4</td><td>m</td></trt<></trtr>   | $\rightarrow$   | 7  | 4   | n                | 4  | m   |
| Other Maintenance<br>Pruning<br>Pruning<br>At dry growth<br>pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruning<br>Pruni | 7   | 7  | 4   | m                | 4  | m   |
| Other Maintenance Pruning Planting Tillage Tillage Vegetation Clearing   | H   |  | 4   | m                | 4  | m   |
| Other Maintenance Artificial Regeneration<br>Pruning Planting Tillage Vegetation Clearing  | Heaving out and<br>piling pieces<br>of bushlike<br>or weedlike<br>vegetation such as<br>boles, roots etc. by<br>tractor (rakes) | manually<br>cutting bushlike<br>or weedlike<br>vegetation as close<br>to the ground as<br>possible | not touching 5 -<br>15-meter-wide<br>vegetation on<br>creek banks | Tilling the soil | Beginning planting<br>in Autumn or<br>winter months<br>when vegetation<br>period ends and<br>completing it in<br>Spring months | At dry growth<br>areas, mechanical<br>pruning |
|  |   |  |   | agelliT          | Bnitnel9   |   |
| 2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2   |   | eration  | Artificial Regen  | l                | 1  | Other Maintenance                             |
|  | 66  | 70   | 71  |                  |  |   |

| _                           |              |                                     |  |  |   |   |   |  |
|-----------------------------|--------------|-------------------------------------|--|--|---|---|---|--|
|                             | 118          | Points                              | m  | m  | ς,  | m   | m   | m  |
|                             | 117          | Points                              | m  | m  | m   | m   | m   | m  |
| Butterflies*                | 116          | Points                              | m  | m  | m   | m   | m   | m  |
| itterf                      | 115          | Points                              | m  | m  | m   | m   | m   | m  |
| Br                          | 114          | Points                              | m  | m  | m   | m   | m   | m  |
|                             | 113          | Points                              | m  | m  | m   | m   | m   | m  |
| iles                        | 111          | Points                              | m  | m  | m   | m   | m   | m  |
| Rept                        | 110          | Points                              | m  | m  | m   | m   | m   | m  |
| and                         | 109          | Points                              | m  | m  | m   | m   | m   | m  |
| ians                        | 108          | Points                              | m  | m  | m   | m   | m   | m  |
| Amphibians and Reptiles     | 102-107      | stnioq                              | m  | ς  | m   | m   | n   | m  |
| Bird                        | 95-101       | stnio9                              | m  | Ţ  | 4   | ı   | I   | 4  |
| als                         | 94           | Points                              | m  | m  | co  | m   | m   | m  |
| Small Mammals               | 93           | Points                              | m  | m  | m   | m   | m   | m  |
| Mai                         | 92           | Points                              | m  | m  | m   | m   | m   | m  |
| llall                       | 91           | Points                              | m  | m  | ε   | ε   | m   | m  |
| Sn                          | 06           | Points                              | m  | m  | ς,  | κ   | m   | m  |
|                             | 89           | Points                              | m  | 7  | co  | ε   | m   | m  |
|                             | 88           | Points                              | m  | 7  | co  | κ   | m   | m  |
| als                         | 87           | Points                              | m  | 7  | ς,  | ε   | m   | m  |
| Large Mammals               | 86           | Points                              | m  | 7  | co  | ς   | m   | n  |
| Mai                         | 85           | Points                              | m  | 7  | co  | ς   | m   | m  |
| rge                         | 84           | Points                              | m  | 2  | co  | ς   | m   | m  |
| La                          | 83           | Points                              | m  | 7  | m   | ς   | m   | m  |
|                             | 82           | Points                              | m  | 7  | n   | m   | m   | m  |
|                             | 81           | Points                              | m  | 7  | m   | m   | κ   | m  |
| Species Group $\rightarrow$ | Species No → | FORESTRY<br>PRACTICE<br>EXPLANATION | Beginning pruning<br>on trees with 15<br>cm diameter at<br>breast height | being able to<br>perform dry<br>preforming any<br>time in a year | performing green<br>pruning in Autumn<br>and Winter<br>months | Pruning 200 - 400<br>individuals/hectare<br>at wide-leaved<br>stands. | Pruning 400 - 800<br>individuals/hectare<br>at needle leaved<br>stands. | implementing<br>only silvicultural<br>maintenance<br>precautions |
|                             |              | Sub-Prac-<br>tice                   |  |  | gninur  | d   |   | Group 1  |
|                             |              | Ргастісе                            |  |  | aonenatrieN   | Other N   |   | .dɛhəЯ   |
|                             |              | e<br>Z                              | 72   | 73   | 74  | 75  | 76  | 1  |
|                             |              |                                     |  |  |   |   |   | ·I   |

| m  | m   | m   | 4   | 4  | 4   |
|--|---|---|---|--|---|
| m  | m   | m   | 4   | 4  | 4   |
| co.  | m   | m   | m   | n  | m   |
| m  | m   | m   | m   | 4  | en en en en en en en en en en en en en e  |
| m  | m   | m   | m   | m  | m   |
| m  | m   | m   | 4   | 4  | 4   |
|  | m   | m   | m   | Ω.   | 7   |
| m  | m   | m   | m   | Ω  | m   |
| m  | m   | m   | m   | m  |   |
|  | m   | m   | m   | m  | m   |
|  |   |   |   | (1)  |   |
| m  | m   | m   | m   | m  | m   |
| m  | m   | m   | 2/4   | 4  | m   |
| 7  | ε   | m   | 2   | m  | m   |
| 7  | m   | m   | N   | m  | m   |
| 7  | co  | m   | 2   | Ω.   | m   |
| 7  | n   | m   | 2   | Ω.   | Υ   |
| 7  | n   | m   | 2   | C)   | Υ   |
| 7  | n   | m   | m   | 4  | Υ   |
| m  | m   | m   | m   | 4  | m   |
| 7  | m   | m   | N   | m  | m   |
| m  | m   | m   | m   | 4  | m   |
| m  | ε   | m   | m   | 4  | m   |
| m  | ε   | m   | m   | 4  | m   |
| 7  | ε   | m   | m   | 4  | m   |
| 7  | ε   | m   | 2   | m  | m   |
| cn   | m   | m   | 7   | 4  | Υ   |
| Practicing<br>additional<br>measures for<br>regeneration along<br>with maintenance | Cutting and<br>removing<br>individuals at c<br>and d age in due<br>time | Removing older<br>(and bad quality)<br>individuals that<br>oppress a and b<br>age young trees<br>of understory in<br>due time | Opening<br>maintenance<br>paths (where<br>regeneration and<br>precommercial<br>thinning are<br>going to be<br>going to be | Conserving<br>understory where<br>frequency and<br>thinning activities<br>are going to be<br>implemented | Reducing crown<br>closure in older<br>groups where<br>natural youth has<br>a chance to rise |
|  |   |   | Group 2   |  |   |
|  |   | uo  | itetilidedəA  |  |   |
| 78   | 79  | 80  | 81  | 82   | 83  |
|  |   |   |   |  |   |

| Integrating | <b>Biodiversity</b> into | Forestry - Pra | ctitioner's Guide |
|-------------|--------------------------|----------------|-------------------|
| integrating | Diodiversity into        | TOICSUY TTU    | cutioner 5 Guiae  |

|                         | 118          | Points                              | m  | m  | m   | m   | m  |
|-------------------------|--------------|-------------------------------------|--|--|---|---|--|
|                         | 117          | Points                              | m  | m  | m   | m   | m  |
| lies*                   | 116          | Points                              | 7  | m  | m   | m   | m  |
| Butterflies*            | 115          | Points                              | m  | m  | m   | m   | m  |
| B                       | 114          | Points                              | 7  | m  | m   | m   | m  |
|                         | 113          | Points                              | m  | m  | m   | m   | m  |
| les                     | 111          | Points                              | m  | m  | m   | m   | m  |
| Repti                   | 110          | Points                              | cn   | m  | 2   | m   | m  |
| and F                   | 109          | Points                              | m  | m  | 2   | m   | m  |
| ans a                   | 108          | Points                              | m  | m  | 7   | m   | m  |
| Amphibians and Reptiles | 102-107      | Points                              | m  | m  | m   | m   | m  |
| Bird                    | 95-101       | Points                              | 7  | 7  | m   | ε   | m  |
| als                     | 94           | Points                              | 2  | m  | m   | m   | m  |
| Small Mammals           | 93           | Points                              | 2  | Ω  | Υ   | m   | m  |
| Mar                     | 92           | Points                              | 7  | m  | m   | m   | m  |
| all I                   | 91           | Points                              | 5  | Ω  | m   | m   | m  |
| Sm                      | 06           | Points                              | 5  | Ω  | m   | m   | m  |
|                         | 89           | Points                              | 7  | κ  | 7   | m   | m  |
|                         | 88           | Points                              | 7  | κ  | 7   | m   | m  |
| als                     | 87           | Points                              | 7  | κ  | 7   | 7   | m  |
| шш                      | 86           | Points                              | 7  | κ  | 7   | m   | m  |
| Ma                      | 85           | Points                              | 7  | m  | 7   | 7   | m  |
| Large Mammals           | 84           | Points                              | 7  | m  | 7   | 7   | m  |
| La                      | 83           | Points                              | 7  | m  | 7   | m   | m  |
|                         | 82           | Points                              | 7  | m  | 7   | 7   | m  |
|                         | 81           | Points                              | 7  | m  | 7   | m   | m  |
| Species Group →         | Species No → | FORESTRY<br>PRACTICE<br>EXPLANATION | where natural<br>youth does not<br>have a chance<br>to rise, planting<br>clumps to bring<br>new youth at<br>clearings bigger<br>than 0.5 hectare | Removing<br>individuals that<br>are stool offshoot | Removing<br>enormous trees<br>and others with<br>undesired format | Removing<br>individuals with<br>damaged crown<br>offshoot | Leaving 6 – 10<br>individuals at each<br>clump |
|                         |              | рсе дос                             | ودoup ک  | (sqmulɔ ni pnitudirtsib                            |   |   | Areas of 1st Type (Tree area                   |
|                         |              | Sub-Prac-                           |  |  | k<br>k forest   | 80  |  |
|                         |              | o<br>Practice                       | A<br>Rehab.  | <u>ل</u>   |   |   |  |
|                         |              | °<br>Z                              | 84   | 85   | 86  | 87  | 8  |

| m  | 7  | 2  | m  | m  | 1  | 2   |  |  |  |  |
|--|--|--|--|--|--|---|--|--|--|--|
| m  | 7  | 2  | m  | m  | i i  | 2   |  |  |  |  |
| m  | 7  | m  | I.   | m  | m  | 7   |  |  |  |  |
| m  | m  | m  | I  | m  | m  | 7   |  |  |  |  |
| m  | 2  | m  | I.   | m  | m  | 7   |  |  |  |  |
| m  | Ν  | m  | m  | m  | I.   | 7   |  |  |  |  |
| m  | m  | m  | m  | m  | m  | m   |  |  |  |  |
| m  | m  | m  | m  | m  | m  | m   |  |  |  |  |
| m  | m  | m  | m  | m  | m  | m   |  |  |  |  |
| m  | m  | m  | m  | m  | m  | m   |  |  |  |  |
| m  | m  | m  | m  | m  | m  | m   |  |  |  |  |
| 4  | 7  | ſ  |  | <del>L</del>   | 2  | 7   |  |  |  |  |
| m  | m  | m  | Ω.   | m  | ε  | m   |  |  |  |  |
| m  | m  | m  | m  | m  | m  | m   |  |  |  |  |
| m  | m  | m  | m  | m  | m  | m   |  |  |  |  |
| m  | m  | m  | m  | m  | m  | m   |  |  |  |  |
| m  | m  | m  | m  | m  | m  | m   |  |  |  |  |
| m  | m  | m  | m  | 2  | 2  | 7   |  |  |  |  |
| m  | m  | m  | m  | 2  | 2  | 7   |  |  |  |  |
| 4  | 4  | 4  | 7  | 2  | 7  | 7   |  |  |  |  |
| m  | m  | m  | Ω.   | 7  | 7  | 2   |  |  |  |  |
| m  | m  | m  | ε  | 2  | ε  | 2   |  |  |  |  |
| m  | Ω.   | m  | ε  | 2  | κ  | 7   |  |  |  |  |
| m  | Ω.   | m  | ε  | 2  | 7  | 7   |  |  |  |  |
| 4  | 4  | 4  | 7  | 2  | 7  | 7   |  |  |  |  |
| m  | 7  | m  | ε  | 2  | ε  | 7   |  |  |  |  |
| If all individuals<br>in a clump are<br>harmed, cutting<br>tree above soil<br>leave (to ensure<br>new offshoots) | filling the gaps<br>between clumps<br>primarily with<br>seed sowing or<br>sapling planting | Giving priority<br>to species other<br>than oak in plant-<br>ing or sowing | making inter-<br>ventions to the<br>same area for<br>planting-sowing<br>works at 4-5-year<br>intervals | removing very old,<br>rotten, hollowed<br>or enormous indi-<br>viduals | choosing good<br>individuals at 3 – 5<br>meter intervals<br>and removing all<br>the other individ-<br>uals | forestation of gaps<br>that are 0.5 ha and<br>bigger with plant-<br>ing or sowing |  |  |  |  |
| (sdmulɔ ni pnituditsib l   | s sporter than 2m and  | ee areas with tree   | Areas of 1st Type (Tr  | (.m 2-2 thish  | (סמך מנסאפּז איוַנָץ ן   | Areas of 2nd Type   |  |  |  |  |
|  |  | າເອາດ  | h hgid of noisrevr   | มอา  |  |   |  |  |  |  |
| 68   | 06   | 91   | <u> </u>   | 6  | 94   | 95  |  |  |  |  |
| 0  | 6  | 6  | <u>م</u>   | 6  | <u>م</u>   | <u> </u>  |  |  |  |  |

|                         | 118                             | Points                              | 2  | m  | N   | 7  | m   | m                                |
|-------------------------|---------------------------------|-------------------------------------|--|--|---|--|---|----------------------------------|
|                         | 117 1                           | Points                              | 2  | m  | 2   | 7  | m   | ε                                |
| ies*                    | 116 1                           | Points                              | m  | m  | 2   | m  | m   | m                                |
| Butterflies*            | 115 1                           | Points                              | m  | m  | 2   | m  | en en en en en en en en en en en en en e                | ε                                |
| But                     |                                 | Points                              | m  | <br>ო  | 5   | m  | m   |                                  |
|                         | 3 114                           |                                     |  |  |   |  |   | n                                |
|                         | 1 113                           | Points                              | m  | m  | 7   | m  | Ω.  | 3<br>C                           |
| otiles                  | 0 111                           | Points                              | m  | m  | m   | m  | ς,  | ε                                |
| l Rep                   | 110                             | Points                              | m  | m  | m   | m  | m   | Ω.                               |
| and                     | 109                             | Points                              | m  | m  | m   | m  | n   | ε                                |
| ians                    | 108                             | Points                              | m  | Υ  | m   | m  | m   | ε                                |
| Amphibians and Reptiles | 102-107                         | Points                              | m  | m  | n   | m  | n   | ĸ                                |
| Bird                    | 95-101                          | Points                              | m  | m  | 5   | 4  | 5   | Ŋ                                |
| lals                    | 94                              | Points                              | m  | C)   | m   | m  | m   | m                                |
| mm                      | Small Mammals<br>90 91 92 93 94 | Points                              | m  | m  | m   | m  | Ω.  | 3<br>C                           |
| Ň                       | 1 92                            | Points<br>Points                    | m  | m<br>m   | m   | m  | m<br>m  | m<br>m                           |
| mal                     | 90 91                           | Points                              | ო<br>ო   | m<br>m   | ო<br>ო  | ო<br>ო   | m<br>m  | 3<br>3                           |
|                         | 6 68                            | Points                              |  |  | 0   |  | ,<br>m  | 4                                |
|                         | 88                              | Points                              | m  | Ω.   | N   | m  | m   | 4                                |
| <u>s</u>                | 87 8                            | Points                              | 4  | m  | 2   | 4  | m   | 4                                |
| Large Mammals           | 86                              | Points                              | m  | m  | 2   | m  | m   | 4                                |
| Man                     | 85                              | Points                              | m  | m  | 7   | m  | m   | 4                                |
| rge                     | 84                              | Points                              | m  | m  | 7   | m  | n   | 4                                |
| La                      | 83                              | Points                              | m  | m  | 5   | m  | m   | 4                                |
|                         | 82                              | Points                              | 4  | m  | 7   | 4  | n   | 4                                |
|                         | 81                              | Points                              | m  | 4  | 7   | m  | m   | 4                                |
| Species Group →         | Species No →                    | FORESTRY<br>PRACTICE<br>EXPLANATION | Giving priority to<br>species other than<br>oak in planting or<br>sowing | Identifying final<br>crop trees at 7 –<br>10m interval and<br>conserving them,<br>removing out the<br>others | Forestation of gaps<br>that are 0.5 ha<br>and bigger with<br>planting or sowing | Giving priority to<br>species other than<br>oak in planting or<br>sowing | Cutting broken or<br>damaged offshoots<br>at soil level | Conserving other<br>tree species |
|                         |                                 | Sub-Prac-<br>tice                   | .T bnS <u>t</u> o .A   |  |   | Areas of 3rd Type (Are   | T 1st T   |                                  |
|                         |                                 | Practice                            |  |  | Conversion to<br>Oal  |  | Gech<br>Drest   | 1 I                              |
|                         |                                 |                                     |  | 2000 dpid  | 8<br>8<br>01 00i379400  | 6  | 10<br>10<br>10<br>10<br>10<br>10                        |                                  |
|                         |                                 | 0<br>N                              | 96   | 66   | 10  | 101  |   |                                  |

| m m m m m m m  |  |                              |   |  |  |  |  |  |  |  |  |
|--|--|------------------------------|---|--|--|--|--|--|--|--|--|
|  |  |                              |   |  |  |  |  |  |  |  |  |
| C)   | m  | °,                           | m   | Ω.   | m  | m  | m  | m  |  |  |  |
| ε  | 7  | °,                           | m   | Υ.   | m  | m  | Ω.   | en en en en en en en en en en en en en e       |  |  |  |
| ε  | 2  | Υ                            | m   | ε  | m  | m  | 2  | n  |  |  |  |
| m  | 7  | n                            | m   | m  | m  | m  | m  | m  |  |  |  |
| ε  | 2  | n                            | m   | m  | m  | m  | 7  | m  |  |  |  |
| ς  | 2  | Ь                            | m   | m  | m  | m  | m  | m  |  |  |  |
| m  | 7  | m                            | m   | m  | m  | m  | m  | m  |  |  |  |
| n  | 2  | m                            | m   | m  | m  | m  | m  | m  |  |  |  |
| m  | 2  | e                            | m   | m  | m  | m  | m  | m  |  |  |  |
|  |  |                              |   |  |  |  |  |  |  |  |  |
| ε  | 7  | Υ                            | m   | m  | m  | m  | m  | e<br>M   |  |  |  |
|  |  |                              |   |  |  |  |  |  |  |  |  |
| 4  | 7  | 4                            | ы   | ŝ  | 7  | C)   | 7  | ъ  |  |  |  |
| m  | 2  | m                            | m   | m  | m  | m  | m  | m  |  |  |  |
| e  | 2  | S                            | m   | ε  | m  | m  | m  | m  |  |  |  |
| m  | 2  | n                            | m   | ε  | m  | m  | m  | m  |  |  |  |
| m  | 2  | e                            | m   | m  | m  | m  | m  | m  |  |  |  |
| m  | 2  | e                            | cn  | m  | m  | m  | m  | m  |  |  |  |
| 4  | 2  | e                            | 4   | 7  | m  | 2  | 2  | m  |  |  |  |
| 4  | 2  | 4                            | 4   | 7  | m  | 2  | 2  | 7  |  |  |  |
| m  | 7  | m                            | 4   | 2  | 4  | 2  | 2  | 7  |  |  |  |
| 4  | 2  | 4                            | 4   | 2  | m  | 2  | 2  | 7  |  |  |  |
| m  | 2  | m                            | 4   | 5  | m  | 2  | 2  | m  |  |  |  |
| m  | 2  | m                            | 4   | 5  | m  | 2  | 7  | m  |  |  |  |
| 4  | 2  | m                            | 4   | 5  | m  | 2  | 7  | m  |  |  |  |
| m  | 2  | e                            | 4   | 2  | 4  | 2  | 2  | 7  |  |  |  |
| m  | 2  | n                            | 4   | 7  | m  | 2  | 2  | m  |  |  |  |
| conserving every<br>species that do<br>not harm the<br>youth | preventing<br>the growth of<br>brambles and<br>other ferns | conserving tree<br>frequency | ស្រ្ត<br>ចោក leaving density<br>ស thinning to natural<br>b development<br>process | being able to<br>sow and plant in<br>clearings | Being able touse<br>tree species other<br>than beech in<br>planting-sowing | Thinning at<br>inclined places<br>under heavy snow<br>pressure | opening paths<br>(for maintenance<br>works) at thinning<br>areas that are 2-3<br>m wide with 20-30<br>m intervals. | repeating thinning<br>works every 3-5<br>years |  |  |  |
| y ng b<br>Vo sp  | of pu  |                              |   | cle so   | ple tre  |  | а к<br>а к<br>с<br>с<br>с<br>с<br>с<br>с<br>с<br>с<br>с<br>с<br>с  | rel<br>ve                                      |  |  |  |
|  | (\$7   | атат 9                       | vit andt rylloma  | n:<br>neinhte e                                | ch areas with  | aaA) anvT tsL  | Areas of   |  |  |  |  |
|  |  |                              |   |  | conversion to  | <br>ז  |  |  |  |  |  |
| õ  | ũ  | 4                            |   |  |  |  | 6  | 0  |  |  |  |
| 102  | 103  | 104                          | 105   | 106  | 107  | 108  | 109  | 110  |  |  |  |

| Integrating Biodiversity into Forestry - Practitioner's Guid | е |
|--|---|
|--|---|

|                         | ~            |                                     |  |  |                       |  |   |   |
|-------------------------|--------------|-------------------------------------|--|--|-----------------------|--|---|---|
|                         | 118          | Points                              | m  | m  | Ω.                    | Υ  | m   | m   |
| *                       | 117          | Points                              | m  | m  | m                     | m  | m   | m   |
| lies                    | 116          | Points                              | m  | m  | n                     | m  | m   | m   |
| Butterflies*            | 115          | Points                              | m  | m  | e                     | m  | m   | m   |
| B                       | 114          | Points                              | m  | m  | n                     | m  | m   | m   |
|                         | 113          | Points                              | m  | m  | 4                     | 4  | m   | m   |
| iles                    | 111          | Points                              | m  | m  | n                     | m  | m   | m   |
| Rept                    | 110          | Points                              | m  | m  | n                     | m  | m   | m   |
| and                     | 109          | Points                              | m  | m  | n                     | m  | m   | m   |
| ians                    | 108          | Points                              | m  | m  | n                     | m  | m   | m   |
| Amphibians and Reptiles | 102-107      | Points                              | ß  | m  | ε                     | m  | m   | m   |
| Bird                    | 95-101       | Points                              | ъ  | 35   | 2                     | 2/4  | m   | m   |
| als                     | 94           | Points                              | m  | n  | m                     | co.  | κ   | m   |
| ШÜ                      | 93           | Points                              | m  | n  | n                     | κ  | ε   | m   |
| Small Mammals           | 92           | Points                              | m  | n  | n                     | n  | ε   | m   |
| all                     | 91           | Points                              | m  | n  | m                     | n  | ε   | m   |
| Sm                      | 06           | Points                              | m  | m m m  |                       | m  |   |   |
|                         | 89           | Points                              | 4  | 7  | n                     | 7  | ε   | m   |
|                         | 88           | Points                              | 4  | 7  | n                     | 7  | ε   | m   |
| als                     | 87           | Points                              | 4  | 7  | m                     | 7  | ε   | m   |
| шШ                      | 86           | Points                              | 4  | 7  | n                     | 7  | m   | m   |
| Mar                     | 85           | Points                              | 4  | 7  | n                     | 7  | m   | m   |
| Large Mammals           | 84           | Points                              | 4  | 7  | n                     | 7  | m   | m   |
| La                      | 83           | Points                              | 4  | 7  | n                     | 7  | m   | m   |
|                         | 82           | Points                              | 4  | 2  | n                     | 5  | κ   | m   |
|                         | 81           | Points                              | 4  | 2  | n                     | 7  | κ   | m   |
| Species Group →         | Species No → | FORESTRY<br>PRACTICE<br>EXPLANATION | leaving density<br>thinning to natural<br>development<br>process | Making thinning<br>cuts if there is<br>danger of breaking<br>or falling due to<br>snow | Making<br>maintenance | opening<br>maintenance paths<br>(where there are<br>rejuvenation and<br>precommercial<br>thinning<br>operations) | opening<br>maintenance<br>paths<br>perpendicular to<br>the road at level<br>areas | opening<br>maintenance<br>paths in<br>inclination<br>direction at<br>inclined areas |
|                         |              | tice<br>tice                        |  | (.m 0 <u>1</u> -2  | รานุชีเอเ             | eech areas with l  | reas of Znd Type (b   | Υ   |
|                         |              | Sub-Prac-                           |  |  | 10                    | rsion to high fore<br>Beech  | 241102  |   |
|                         |              | Practice                            |  | 7  |                       | 1  |   |   |
|                         |              | No                                  | 111  | 112  | 113                   | 114  | 115   | 116   |

| m  | m                                  | m                       | m                         | m  | m   | m  | m                                      |
|--|------------------------------------|-------------------------|---------------------------|--|---|--|--|
| m  | m                                  | m                       | ε                         | m  | m   | m  | m                                      |
| m  | m                                  | m                       | ε                         | m  | m   | m  | m                                      |
| m  | m                                  | m                       | m                         | m  | m   | m  | m                                      |
| m  | m                                  | m                       | m                         | m  | m   | m  | m                                      |
| 4  | m                                  | 4                       | e                         | m  | m   | m  | m                                      |
| m  | m                                  | m                       | m                         | m  | m   | m  | m                                      |
| m  | m                                  | m                       | ε                         | m  | m   | m  | m                                      |
| m  | m                                  | m                       | m                         | m  | m   | m  | m                                      |
| m  | m                                  | m                       | m                         | m  | m   | m  | m                                      |
| m  | m                                  | œ                       | m                         | m  | m   | m  | m                                      |
| m  | ы                                  | ε                       | 2                         | 2  | 2   | 7  | 7                                      |
| m  | m                                  | n                       | ε                         | m  | m   | m  | m                                      |
| m  | m                                  | n m m                   |                           | m  | m   | m  |  |
| m  | m                                  | m                       | m                         | m  | m   | m  | m                                      |
| m  | m                                  | m                       | ε                         | m  | m   | m  | m                                      |
| m  | m                                  | n                       | e                         | m  | m   | m  | m                                      |
| 7  | 4                                  | n                       | e                         | m  | m   | 7  | m                                      |
| 7  | 4                                  | m                       | e                         | m  | m   | 2  | m                                      |
| 7  | 4                                  | m                       | ε                         | m  | m   | m  | m                                      |
| 7  | 4                                  | m                       | ε                         | m  | m   | 2  | m                                      |
| 7  | 4                                  | m                       | ε                         | m  | m   | m  | m                                      |
| 7  | 4                                  | m                       | ε                         | m  | m   | m  | m                                      |
| 3  | 4                                  | m                       | ε                         | m  | m   | m  | m                                      |
| 7  | 4                                  | ε                       | S                         | m  | Υ   | m  | m                                      |
| 7  | 4                                  | m                       | ε                         | m  | Υ   | m  | m                                      |
| Supportive<br>thinning for<br>final crop tree<br>for<br>for<br>findividuals, etc.) | Conserving mixed<br>species groups | Medium High<br>Thinning | Removing Grade 5<br>trees | ដើម Removing fungi<br>២ and insect infested<br>២ individuals of<br>២ Grade 4 and 3 | Thinning out dens<br>Grade 4 and 3<br>trees | Removing Grade<br>2 trees that harm<br>Grade 1 trees | Thinning out<br>dense Grade 1<br>trees |
| T bu Z ho .A   |                                    | ter)                    | əm Ot n                   |  | eroves with hei                             | do998) 9avT b  | Areas of 3rd                           |
|  |                                    |                         | 162101                    | Beech<br>Beech   | 102   |  |  |
| <u> </u>   | ∞                                  | <u></u>                 |                           |  |   | m  | 4                                      |
| 117  | 118                                | 119                     | 120                       | 121  | 122   | 123  | 124                                    |

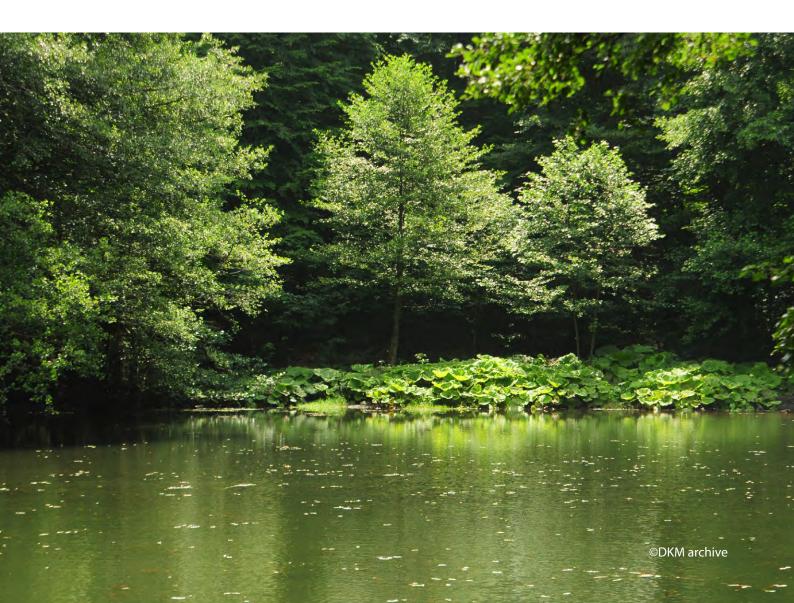
\* The butterfly species numbered 112, Ali Bali Blue was introduced to the world of science in 2015. Since the relation of the species with forestry practice is not known quite well yet, this species is not mentioned in the table.

> Score 1: This should never be preferred since this has negative impact. Score 2: This should not be preferred, since this might have negative impact Score 3: This can be preferred since this does not have negative impact. Score 4: This might be practiced, since this might have positive impact. Score 5: This must definitely be practiced since this has positive impact

| Notes                    |  |
|--------------------------|--|
| No: 9                    | For the small mammals that eat the dressed seeds and be poisoned with them and for predator birds feeding off other birds, seed dressing will be risky. In regions with conservation priority species seed dressing should be avoided.   |
| No: 28                   | In areas where there are conservation priority species: restrictions such as breeding period (i.e. no production during breeding period), soil conservation (i.e. no skidding) and etc. should be observed. In the areas subject to sales with planted trees, these restrictions should also be observed.            |
| No: 30,<br>65            | If the remains of cut assets such as barks and branches etc. cover the floor vegetation densely, this would negatively impact butterfly caterpillars.  |
| No:<br>31-41,<br>119-124 | In order to conserve the structural diversity of the forest during high and low thinning, 2-5 species of trees must be left at a certain density. If the harm done by fungi and insects is not widespread, it is suggested that a certain number of trees on which these types of "thinners" should be left on site. |
| No: 47                   | timing should other than the breeding period of the species breeding in the area. When considering the conservation of birds, the forestry activities must be preferred to be performed in Autumn-Winter periods.  |
| No: 52                   | The cutting activities would cause large mammals to keep away from the area. If these types of activities are frequently implemented in the same area, they will inhibit the use of the area by large mammals for a long term.   |
| No:58                    | When clear-cutting is no bigger than a few hectares, it might have a positive impact for some butterfly species. However, in general there should not be block clear-cutting larger than 5-10 hectares.  |
| No: 60                   | Dry trees (such as alder) planted close to water sources must be left on site for woodpeckers and invertebrates.   |
| No: 81,<br>114           | Forming paths might have positive impact since this will provide habitat diversity for bird species, this can also have negative impact on bird species, since during forming the clearing process, especially the fruit and nesting trees and bushes are harmed and the activities might disturb them.              |
| No: 84                   | The natural clearings inside the forest must be conserved and not be forested.   |

# 9.3. Table for Distribution of Species with Conservation Priority amongst Forest Enterprise Directorates and Regional Forest Directorates (as of 1 January 2019)

The distribution of conservation priority species amongst Regional Forest Directorates and Forest Enterprise Directorates that are under them are given in Table 9.3. Following the alphabetically listed species of Regional Forest Directorates, which species exist in Forest Enterprise Directorates of the region are stated in columns separated for species groups with the species number of the species in question.



| Butterflies                            | 118        |                             |                             |                    |                             |                         |                             |                        |                    |
|--|------------|-----------------------------|-----------------------------|--------------------|-----------------------------|-------------------------|-----------------------------|------------------------|--------------------|
| Amphibians<br>and Reptiles             |            |                             |                             |                    |                             |                         | 108                         | 108                    |                    |
| Birds                                  | 97         | 95, 96, 97, 98,<br>100, 101 | 95, 96, 97, 98,<br>100, 101 | 95, 97, 98,<br>100 | 95, 96, 97, 98,<br>100, 101 | 96, 97, 98,<br>100, 101 | 95, 96, 97, 98,<br>100, 101 | 95, 96, 97, 98,<br>100 | 96, 97, 98,<br>100 |
| Small<br>Mammals                       |            |                             |                             |                    |                             |                         |                             |                        |                    |
| Large<br>Mammals                       | 85, 87, 89 | 86, 87                      | 84, 87                      | 82, 84, 86, 87     | 82, 84, 86, 87              | 82, 84, 86, 87          | 82, 86, 87                  | 84, 86, 87             | 85, 86, 87, 89     |
| Plants -<br>Herbaceous                 |            | 68                          |                             |                    | 60, 61, 76                  | 66                      | 66, 68                      | 53                     |                    |
| Plants -<br>Woody                      | 8          |                             | 8, 10, 22                   | 15, 22             |                             |                         |                             |                        |                    |
| Forest<br>Enterprise<br>Directorate    | ADANA      | FEKE                        | KOZAN                       | OSMANİYE           | POS                         | POZANTI                 | SAİMBEYLİ                   | KADIRLİ                | KARAİSALI          |
| Regional<br>Directorate of<br>Forestry |            |                             |                             |                    | ADANA                       |                         |                             |                        |                    |

| Butterflies                            |                         |                         |                         |                             |                     |                           |                         |             |                             |                |                         |
|--|-------------------------|-------------------------|-------------------------|-----------------------------|---------------------|---------------------------|-------------------------|-------------|-----------------------------|----------------|-------------------------|
| Amphibians<br>and Reptiles             |                         |                         |                         |                             |                     | 111                       |                         |             |                             |                |                         |
| Birds                                  | 96, 97, 99,<br>100, 101 | 96, 97, 99,<br>100, 101 | 96, 97, 99,<br>100, 101 | 96, 97, 98, 99,<br>100, 101 | 97, 99, 100,<br>101 | 96, 97, 98,<br>100, 101   | 96, 97, 99,<br>100, 101 | 97, 99, 101 | 96, 97, 98, 99,<br>100, 101 | 97, 101        | 96, 97, 98,<br>100, 101 |
| Small<br>Mammals                       | 92, 93, 94              | 92                      |                         |                             |                     | 92, 93, 94                | 92, 93, 94              |             | 92, 93, 94                  |                | 92, 93, 94              |
| Large<br>Mammals                       | 84, 87                  | 82, 85, 87, 89          | 82, 84, 86, 87          | 85, 86, 87                  | 84, 86, 87          | 82, 83, 84,<br>86, 87, 89 | 82, 86, 87, 89          | 84, 86, 87  | 84, 85                      | 82, 84, 86, 87 | 82, 83, 86,<br>87, 89   |
| Plants -<br>Herbaceous                 |                         |                         |                         |                             |                     |                           |                         |             |                             |                |                         |
| Plants -<br>Woody                      |                         | 30                      |                         |                             |                     |                           | 30                      |             |                             |                |                         |
| Forest<br>Enterprise<br>Directorate    | AMASYA                  | BAFRA                   | ÇORUM                   | KARGI                       | iskilip             | NİKSAR                    | SAMSUN                  | ТОКАТ       | VEZİRKÖPRÜ                  | ALMUS          | ERBAA                   |
| Regional<br>Directorate of<br>Forestry |                         |                         |                         |                             |                     | AMASYA                    |                         |             |                             |                |                         |

| Butterflies                            |                     |                             | 113                     |                         |                         | 113                     | 113                     |                             |                             |                |                |
|--|---------------------|-----------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-----------------------------|-----------------------------|----------------|----------------|
| Amphibians<br>and Reptiles             |                     |                             |                         |                         |                         |                         |                         |                             |                             |                |                |
| Birds                                  | 97, 99, 100,<br>101 | 95, 97, 98, 99,<br>100, 101 | 97, 98, 99,<br>100, 101 | 97, 98, 99,<br>100, 101 | 97, 98, 99,<br>100, 101 | 97, 98, 99,<br>100, 101 | 97, 98, 99,<br>100, 101 | 95, 97, 98, 99,<br>100, 101 | 96, 97, 98, 99,<br>100, 101 | 99, 101        | 99, 101        |
| Small<br>Mammals                       |                     |                             |                         |                         |                         |                         |                         |                             | 92                          |                |                |
| Large<br>Mammals                       | 82, 86, 87          | 82, 83, 84,<br>87, 89       | 82, 84, 86, 87          | 82, 84, 86, 87          | 82, 84, 86, 87          | 84, 86, 87              | 82, 84, 86, 87          | 82, 83, 84,<br>87, 89       | 82, 83, 87, 89              | 82, 84, 86, 87 | 82, 84, 86, 87 |
| Plants -<br>Herbaceous                 |                     |                             |                         |                         |                         |                         | 72                      | 35                          |                             |                | 48             |
| Plants -<br>Woody                      |                     |                             |                         |                         |                         |                         |                         |                             |                             |                |                |
| Forest<br>Enterprise<br>Directorate    | ANKARA              | BEYPAZARI                   | ÇAMLIDERE               | ÇANKIRI                 | ÇERKEŞ                  | ILGAZ                   | KIZILCAHAMAM            | NALLIHAN                    | ESKIPAZAR                   | KIRIKKALE      | KIRŞEHİR       |
| Regional<br>Directorate of<br>Forestry |                     |                             |                         |                         |                         | ANKARA                  |                         |                             |                             |                |                |

| Butterflies                            |                             | 117                         |                         |                       |                         | 117                    | 117                         |                         |                     |                         | 117            |                        | 117                    |
|--|-----------------------------|-----------------------------|-------------------------|-----------------------|-------------------------|------------------------|-----------------------------|-------------------------|---------------------|-------------------------|----------------|------------------------|------------------------|
| Amphibians<br>and Reptiles             | 102                         | 102                         | 103, 104                |                       | 106                     |                        | 102                         | 106                     | 104                 | 103                     |                |                        |                        |
| Birds                                  | 95, 96, 97, 98,<br>100, 101 | 95, 96, 97, 98,<br>100, 101 | 95, 96, 97,<br>100, 101 | 95, 97, 100,<br>101   | 95, 96, 97,<br>100, 101 | 95, 96, 97, 98,<br>100 | 95, 96, 97, 98,<br>100, 101 | 95, 96, 97,<br>100, 101 | 95, 97, 100,<br>101 | 95, 96, 97,<br>100, 101 | 95, 96, 97, 98 | 95, 96, 97, 98,<br>100 | 95, 96, 97, 98,<br>100 |
| Small<br>Mammals                       |                             |                             |                         |                       |                         |                        |                             |                         |                     |                         |                |                        |                        |
| Large<br>Mammals                       | 84                          | 82, 84, 86, 87              | 82, 84, 86, 87          | 82, 85, 86,<br>87, 89 | 82, 86, 87              | 82, 84, 87, 89         | 82, 85, 87, 89              | 82, 84, 86, 87          | 82, 84, 86, 87      | 82, 85, 87, 89          | 82, 85, 87, 89 | 82, 87                 | 82, 84, 86, 87         |
| Plants -<br>Herbaceous                 |                             | 57, 65                      | 48, 58                  | 46, 7                 | 34, 42, 52,<br>55, 62   |                        |                             |                         | 37, 78              |                         |                |                        |                        |
| Plants -<br>Woody                      |                             |                             | 7, 18, 20               |                       | 7                       |                        |                             | 19, 2                   |                     | 20                      |                | 18, 19                 |                        |
| Forest<br>Enterprise<br>Directorate    | AKSEKİ                      | ALANYA                      | ANTALYA                 | ELMALI                | Finike                  | GAZİPAŞA               | GÜNDOĞMUŞ                   | KAŞ                     | Korkuteli           | KUMLUCA                 | MANAVGAT       | SERİK                  | TAŞAĞIL                |
| Regional<br>Directorate of<br>Forestry |                             |                             |                         |                       |                         |                        | ANTALYA                     |                         |                     |                         |                |                        |                        |

| Butterflies                            | 113                 | 113                      | 113                          | 113                 | 113, 115                |                    |                     |                |                    |                         |             | 114                 |                     |
|--|---------------------|--------------------------|------------------------------|---------------------|-------------------------|--------------------|---------------------|----------------|--------------------|-------------------------|-------------|---------------------|---------------------|
| Amphibians<br>and Reptiles             | 109, 111            | 109, 111                 | 109, 110, 111                | 111                 | 111                     | 109, 110, 111      |                     |                |                    |                         |             |                     |                     |
| Birds                                  | 97, 98, 100,<br>101 | 96, 97, 98,<br>100, 101  | 96, 97, 98,<br>100           | 97, 98, 100,<br>101 | 96, 97, 98,<br>100, 101 | 96, 97, 98,<br>100 | 97, 98, 100,<br>101 | 97, 98, 101    | 96, 97, 98,<br>101 | 97, 98, 99,<br>100, 101 | 97, 98, 101 | 97, 98, 100,<br>101 | 97, 98, 100,<br>101 |
| Small<br>Mammals                       | 92, 93, 94          | 92, 93, 94               | 91, 92, 93, 94               | 92, 93, 94          | 92, 93, 94              | 91, 92, 93, 94     |                     | 92             | 92                 |                         | 92          |                     |                     |
| Large<br>Mammals                       | 82, 84, 86, 87      | 82, 84, 86, 87           | 82, 84, 87                   | 85                  | 87                      | 82, 84, 86, 87     | 84, 86, 87          | 82, 85, 87, 89 | 82, 85, 87, 89     | 82, 86, 87              | 82, 87, 89  | 82, 85, 87, 89      | 82, 83, 87, 89      |
| Plants -<br>Herbaceous                 |                     |                          |                              |                     |                         |                    |                     |                |                    | 43                      |             |                     |                     |
| Plants -<br>Woody                      | 2                   | 2, 11, 23, 27,<br>29, 32 | 2, 11, 12, 23,<br>27, 29, 32 |                     | 2                       |                    |                     | 6              | 6                  |                         | 6           |                     |                     |
| Forest<br>Enterprise<br>Directorate    | ARDANUÇ             | ARTVİN                   | BORÇKA                       | ŞAVŞAT              | YUSUFELİ                | ARHAVİ             | ALAÇAM              | BALIKESİR      | BANDIRMA           | DURSUNBEY               | EDREMIT     | SINDIRGI            | BiGADİÇ             |
| Regional<br>Directorate of<br>Forestry |                     |                          | Mintav                       |                     |                         |                    |                     |                |                    | BALIKESİR               |             |                     |                     |

| Butterflies                            |                    |                             | 113, 114, 116                   | 114, 116                |                                 |                             |                             | 116                         |                             | 113, 114, 116               |                       |                         |
|--|--------------------|-----------------------------|---------------------------------|-------------------------|---------------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------|-------------------------|
| Amphibians<br>and Reptiles             |                    |                             |                                 |                         |                                 |                             |                             |                             |                             |                             |                       |                         |
| Birds                                  | 96, 97, 98,<br>100 | 95, 97, 98, 99,<br>100, 101 | 95, 96, 97, 98,<br>99, 100, 101 | 96, 97, 98,<br>100, 101 | 95, 96, 97, 98,<br>99, 100, 101 | 95, 97, 98, 99,<br>100, 101 | 95, 97, 98, 99,<br>100, 101 | 96, 97, 98, 99,<br>100, 101 | 95, 97, 98, 99,<br>100, 101 | 95, 97, 98, 99,<br>100, 101 | 96, 97, 98,<br>100    | 96, 97, 98,<br>100, 101 |
| Small<br>Mammals                       | 92                 | 92                          | 92                              | 92                      | 92                              | 92                          |                             | 92                          |                             | 92                          | 92                    | 92                      |
| Large<br>Mammals                       | 82, 84, 86         | 84, 86, 87                  | 82, 84, 87                      | 82, 83, 87, 89          | 82, 84, 87, 89                  | 82, 85, 87, 89              | 82, 84, 86, 87              | 85, 89                      | 82, 85, 87, 89              | 82, 85, 87, 89              | 82, 83, 84,<br>87, 89 | 82, 84, 87, 89          |
| Plants -<br>Herbaceous                 |                    |                             |                                 |                         |                                 |                             |                             |                             |                             |                             | 75                    |                         |
| Plants -<br>Woody                      |                    |                             | 24                              |                         |                                 |                             |                             |                             |                             |                             |                       |                         |
| Forest<br>Enterprise<br>Directorate    | AKÇAKOCA           | ALADAĞ                      | BOLU                            | DÜZCE                   | GEREDE                          | GÖYNÜK                      | KIBRISCIK                   | MENGEN                      | SEBEN                       | MUDURNU                     | YIĞILCA               | GÖLYAKA                 |
| Regional<br>Directorate of<br>Forestry |                    |                             |                                 |                         |                                 |                             | DOLO                        |                             |                             |                             |                       |                         |

| Butterflies                            |                                 | 113, 114                    |                             |                             |                           |                        |        |         |                |                       |                | 114            |             |                |             |
|--|---------------------------------|-----------------------------|-----------------------------|-----------------------------|---------------------------|------------------------|--------|---------|----------------|-----------------------|----------------|----------------|-------------|----------------|-------------|
| Amphibians<br>and Reptiles             |                                 |                             |                             |                             |                           |                        |        |         |                |                       |                |                |             |                |             |
| Birds                                  | 95, 96, 97, 98,<br>99, 100, 101 | 96, 97, 98, 99,<br>100, 101 | 96, 97, 98, 99,<br>100, 101 | 96, 97, 98, 99,<br>100, 101 | 96, 97, 98, 99,<br>101    | 96, 97, 98, 99,<br>101 | 98     | 98, 101 | 97, 98, 101    | 97, 101               | 95, 97, 101    | 95, 101        | 97, 98, 101 | 97, 98, 101    | 97, 98, 101 |
| Small<br>Mammals                       | 92                              | 92                          | 92                          | 92                          | 92                        | 92                     | 92     | 92      | 92             | 92                    | 92             |                | 92          | 92             | 92          |
| Large<br>Mammals                       | 82, 83, 84,<br>87, 89           | 82, 84, 86, 87              | 84, 87                      | 82, 84, 86, 87              | 82, 83, 84, 86,<br>87, 89 | 82, 84, 86, 87         | 86, 87 | 87      | 82, 85, 87, 89 | 82, 83, 84,<br>87, 89 | 82, 84, 86, 87 | 82, 84, 86, 87 | 87          | 82, 84, 86, 87 | 86          |
| Plants -<br>Herbaceous                 |                                 |                             | 73                          |                             |                           |                        |        |         |                |                       |                |                |             |                |             |
| Plants -<br>Woody                      |                                 |                             |                             |                             |                           |                        |        |         | 6              |                       |                |                | 6           | 6              | 6           |
| Forest<br>Enterprise<br>Directorate    | Bilecik                         | BURSA                       | İNEGÖL                      | Keles                       | MUSTAFAKEMALPAŞA          | ORHANELİ               | YALOVA | AYVACIK | BAYRAMİÇ       | BIGA                  | ÇANAKKALE      | KEŞAN          | YENICE      | ÇAN            | KALKIM      |
| Regional<br>Directorate of<br>Forestry |                                 |                             |                             | BURSA                       |                           |                        |        |         |                |                       | CANAKKALE      | 'n             |             |                |             |

| Butterflies                            |                         |                         |                         |                     |                         |                       |                         |                |            |                | 113        | 113    |          |                |                       |
|--|-------------------------|-------------------------|-------------------------|---------------------|-------------------------|-----------------------|-------------------------|----------------|------------|----------------|------------|--------|----------|----------------|-----------------------|
| Amphibians<br>and Reptiles             |                         |                         | 105                     |                     |                         |                       |                         |                |            |                |            |        |          |                |                       |
| Birds                                  | 95, 96, 97,<br>100, 101 | 95, 97, 99,<br>100, 101 | 95, 96, 97,<br>100, 101 | 97, 99, 100,<br>101 | 95, 96, 97,<br>100, 101 | 95, 97, 100,<br>101   | 97, 98, 99,<br>100, 101 | 101            | 101        | 95, 101        | 95         | 101    | 100, 101 | 95, 101        | 101                   |
| Small<br>Mammals                       |                         |                         |                         |                     |                         |                       |                         |                |            |                |            |        |          |                |                       |
| Large<br>Mammals                       | 85, 89                  | 82, 84, 86, 87          | 82, 84, 86, 87          | 84, 87              | 82, 83, 84, 87          | 82, 83, 84,<br>86, 87 | 85, 87, 89              | 82, 84, 86, 87 | 82, 84, 87 | 82, 83, 87, 89 | 85, 87, 89 | 87, 89 | 81       | 82, 85, 87, 89 | 82, 83, 84,<br>87, 89 |
| Plants -<br>Herbaceous                 |                         |                         |                         |                     |                         |                       |                         |                |            |                |            |        |          |                | 37                    |
| Plants -<br>Woody                      | 20                      |                         |                         |                     |                         |                       | 16                      | 17, 21         | 21         |                | 13, 25     |        |          |                | 25                    |
| Forest<br>Enterprise<br>Directorate    | ACIPAYAM                | ÇAL                     | ÇAMELİ                  | DENİZLİ             | ESKERE                  | TAVAS                 | UŞAK                    | BİNGÖL         | BİTLİS     | ELAZIĞ         | HAKKARİ    | VAN    | TUNCELİ  | MALATYA        | Śnw                   |
| Regional<br>Directorate of<br>Forestry |                         |                         |                         | DENİZLİ             |                         |                       |                         |                |            |                |            | ELAZIĞ |          |                |                       |

| Regional Fr<br>Directorate of E<br>Forestry D | Forest<br>Enterprise<br>Directorate | Plants -<br>Woody | Plants -<br>Herbaceous | Large<br>Mammals | Small<br>Mammals | Birds                       | Amphibians<br>and Reptiles | Butterflies |
|---|-------------------------------------|-------------------|------------------------|------------------|------------------|-----------------------------|----------------------------|-------------|
|   | ERZİNCAN                            | 14                |                        | 82, 84, 87, 89   |                  | 100, 101                    |                            |             |
|   | ERZURUM                             | 2, 12, 21         |                        | 82, 83, 87, 89   | 92, 93, 94       | 97, 100, 101                | 111                        | 113         |
| (1)   | OLTU                                | 2                 |                        | 82, 84, 86, 87   | 92, 93, 94       | 97, 100, 101                | 111                        |             |
| 10  | SARIKAMIŞ                           |                   |                        | 82, 85, 87, 89   | 92               | 101                         |                            | 113         |
| 10  | ŞENKAYA                             |                   |                        | 85, 87, 89       | 92               | 101                         |                            | 115         |
| ∣⊲  | AĞRI                                |                   |                        | 85, 87, 89       |                  | 101                         |                            |             |
|   | ARDAHAN                             | 25, 27, 29        |                        | 82, 84, 86, 87   | 92, 93, 94       | 95, 97, 100,<br>101         | 111                        | 113         |
| . <u> </u>                                    | IĞDIR                               |                   |                        | 86, 87           |                  | 101                         |                            |             |
| $\mathbf{x}$                                  | KARS                                | 31                | 48                     | 82, 84, 86, 87   | 92               | 95, 101                     |                            | 113         |
|   | REFAHİYE                            |                   |                        | 82, 84, 86, 87   |                  | 95, 97, 100,<br>101         |                            |             |
| A   | AFYONKARAHISAR                      | 26                |                        | 82, 87, 89       |                  | 95, 97, 99,<br>100, 101     |                            |             |
| 2   | MİHALIÇCIK                          |                   |                        | 82, 85, 87, 89   |                  | 95, 97, 98, 99,<br>100, 101 |                            |             |
| Ш   | ESKİŞEHİR                           |                   |                        | 82, 84, 87, 89   |                  | 95, 97, 98, 99,<br>100, 101 |                            | 113, 114    |
| U I   | ÇATACIK                             |                   |                        | 82, 84, 86, 87   |                  | 95, 97, 98, 99,<br>100, 101 |                            |             |

| Butterflies                            |                         | 113                     |                     |                         | 113                     |                    |                         | 116                     | 113, 116                |                         |                             |                             |                         |                         |                             |                         |                         |
|--|-------------------------|-------------------------|---------------------|-------------------------|-------------------------|--------------------|-------------------------|-------------------------|-------------------------|-------------------------|-----------------------------|-----------------------------|-------------------------|-------------------------|-----------------------------|-------------------------|-------------------------|
| Amphibians<br>and Reptiles             | 111                     | 111                     | 111                 | 111                     | 111                     | 111                | 111                     | 111                     | 111                     | 111                     |                             |                             |                         |                         |                             |                         |                         |
| Birds                                  | 96, 97, 98,<br>100, 101 | 96, 97, 98,<br>100, 101 | 97, 98, 100,<br>101 | 96, 97, 98,<br>100, 101 | 96, 97, 98,<br>100, 101 | 96, 97, 98,<br>100 | 96, 97, 98,<br>100, 101 | 96, 97, 98,<br>100, 101 | 96, 97, 98,<br>100, 101 | 95, 97, 98,<br>100, 101 | 95, 96, 97, 99,<br>100, 101 | 95, 96, 97, 98,<br>100, 101 | 95, 96, 97,<br>100, 101 | 95, 96, 97,<br>100, 101 | 95, 96, 97, 98,<br>100, 101 | 95, 96, 97,<br>100, 101 | 95, 97, 99,<br>100, 101 |
| Small<br>Mammals                       | 92, 93, 94              | 92, 93, 94              | 92, 93, 94          | 92, 93, 94              | 92, 93, 94              | 92, 93, 94         | 92, 93, 94              | 92, 93, 94              | 92, 93, 94              | 93, 94                  |                             |                             |                         |                         |                             |                         |                         |
| Large<br>Mammals                       | 82, 84, 87              | 82, 84, 86, 87          | 82, 85, 87, 89      | 84                      | 81, 82, 85,<br>87, 89   | 82, 84, 86         | 82, 83, 86,<br>87, 89   | 82, 84, 87              | 82, 85, 86,<br>87, 89   | 82, 84, 86, 87          | 82, 84, 86, 87              | 82, 83, 87, 89              | 82, 84, 87, 89          | 84                      | 82, 85, 87, 89              | 82, 84, 86, 87          | 82, 85, 87, 89          |
| Plants -<br>Herbaceous                 |                         |                         |                     |                         |                         |                    |                         |                         |                         |                         |                             |                             | 44                      |                         | 44                          |                         |                         |
| Plants -<br>Woody                      | 32                      |                         |                     | 32                      |                         |                    | 32                      |                         |                         |                         |                             | 6, 26                       | 1, 5, 20                | 19                      | 9                           | 19                      |                         |
| Forest<br>Enterprise<br>Directorate    | GİRESUN                 | ORDU                    | ŞEBİNKARAHİSAR      | TİREBOLU                | ÜNYE                    | AKKUŞ              | ESPİYE                  | DERELİ                  | MESUDİYE                | KOYULHİSAR              | BURDUR                      | EĞİRDİR                     | GÖLHİSAR                | ISPARTA                 | SÜTÇÜLER                    | BUCAK                   | DİNAR                   |
| Regional<br>Directorate of<br>Forestry |                         |                         |                     |                         |                         | GIRESOIN           |                         |                         |                         |                         |                             |                             |                         | ISPARTA                 |                             |                         |                         |

| Butterflies                            |                       |                             | 115                         | 114        |                             |                             | 114                   |                |                    |                             |
|--|-----------------------|-----------------------------|-----------------------------|------------|-----------------------------|-----------------------------|-----------------------|----------------|--------------------|-----------------------------|
| Amphibians<br>and Reptiles             |                       |                             |                             |            |                             |                             |                       |                |                    |                             |
| Birds                                  | 100                   | 95, 96, 97, 98,<br>100, 101 | 95, 96, 97, 98,<br>100, 101 | 100        | 95, 96, 97, 98,<br>100, 101 | 95, 96, 97, 98,<br>100, 101 |                       |                | 95, 96, 97,<br>101 | 95, 96, 97, 98,<br>100, 101 |
| Small<br>Mammals                       | 92                    | 92                          | 92                          | 92         | 92                          | 92                          | 92                    | 92             |                    | 92                          |
| Large<br>Mammals                       | 81, 82, 85,<br>87, 89 | 82, 84, 86, 87              | 84, 87                      | 84, 86, 87 | 82, 84, 86, 87              | 87, 89                      | 82, 85, 86,<br>87, 89 | 82, 85, 87, 89 | 82, 83, 87, 89     | 84                          |
| Plants -<br>Herbaceous                 |                       |                             |                             |            |                             |                             |                       |                |                    |                             |
| Plants -<br>Woody                      |                       | 30                          |                             |            |                             |                             |                       |                |                    |                             |
| Forest<br>Enterprise<br>Directorate    | ВАНСЕКÖY              | ÇATALCA                     | DEMİRKÖY                    | İSTANBUL   | KIRKLARELİ                  | Vize                        | KANLICA               | Şile           | EDIRNE             | TEKİRDAĞ                    |
| Regional<br>Directorate of<br>Forestry |                       |                             |                             |            |                             | DOUNDUC                     |                       |                |                    |                             |

| Butterflies                            |                    |            |                         |             |        |                |                |            | 112                    | 118                |                         |                     |                    |                |             |
|--|--------------------|------------|-------------------------|-------------|--------|----------------|----------------|------------|------------------------|--------------------|-------------------------|---------------------|--------------------|----------------|-------------|
| Amphibians<br>and Reptiles             |                    |            |                         |             |        |                |                |            | 108                    |                    | 108                     | 108                 |                    |                |             |
| Birds                                  | 95, 97, 98,<br>101 | 67         | 97, 98, 99,<br>100, 101 | 97, 98, 101 | 95, 98 | 98, 99, 101    | 97, 101        | 95, 97, 98 | 95, 96, 97, 98,<br>100 | 95, 97, 98,<br>100 | 95, 97, 98,<br>100, 101 | 95, 98, 100,<br>101 | 95, 97, 98,<br>100 | 95, 98, 100    | 95, 98, 101 |
| Small<br>Mammals                       |                    |            |                         |             |        |                |                |            |                        |                    |                         |                     |                    |                |             |
| Large<br>Mammals                       | 82, 85, 87, 89     | 82, 87, 89 | 87                      | 85, 87, 89  | 87     | 82, 85, 87, 89 | 82, 84, 86, 87 | 82, 85, 89 | 82, 84, 87             | 82, 86, 87         | 82, 84, 87, 89          | 84, 87              | 82, 85, 87, 89     | 82, 84, 86, 87 | 82, 86, 87  |
| Plants -<br>Herbaceous                 |                    |            |                         |             |        | 54             |                |            |                        |                    | 36, 38, 59              |                     |                    | 40             |             |
| Plants -<br>Woody                      |                    | 6          |                         |             |        |                |                | 28         | 8, 1                   |                    | 22                      |                     |                    |                |             |
| Forest<br>Enterprise<br>Directorate    | BAYINDIR           | BERGAMA    | DEMİRCİ                 | GÖRDES      | izmir  | MANISA         | AKHİSAR        | MENDERES   | ANDIRIN                | ANTAKYA            | GÖKSUN                  | KAHRAMANMARAŞ       | DÖRTYOL            | Kilis          | GAZIANTEP   |
| Regional<br>Directorate of<br>Forestry |                    |            |                         | izmir       |        |                |                |            |                        |                    |                         | KAHRAMANMARAŞ       |                    |                |             |

| Butterflies                            |                             |                         |                    |                    | 113                     |                             |                    |                             |                         |                             | 113                     |
|--|-----------------------------|-------------------------|--------------------|--------------------|-------------------------|-----------------------------|--------------------|-----------------------------|-------------------------|-----------------------------|-------------------------|
| Amphibians<br>and Reptiles             |                             |                         |                    |                    |                         |                             |                    |                             |                         |                             |                         |
| Birds                                  | 96, 97, 98, 99,<br>100, 101 | 96, 97, 98,<br>100, 101 | 96, 97, 98,<br>100 | 96, 97, 98,<br>100 | 96, 97, 98,<br>100, 101 | 96, 97, 98, 99,<br>100, 101 | 96, 97, 98,<br>100 | 96, 97, 98, 99,<br>100, 101 | 96, 97, 98,<br>100, 101 | 96, 97, 98, 99,<br>100, 101 | 97, 98, 99,<br>100, 101 |
| Small<br>Mammals                       |                             | 92                      | 92                 | 92                 | 92                      |                             | 92                 | 92                          | 92                      | 92                          |                         |
| Large<br>Mammals                       | 82, 84, 86, 87              | 82, 85, 86,<br>87, 89   | 82, 84, 86, 87     | 82, 84, 86, 87     | 82, 84                  | 84                          | 84                 | 82, 84, 86, 87              | 82, 85, 87, 89          | 82, 84, 86, 87              | 82, 84, 86, 87          |
| Plants -<br>Herbaceous                 |                             |                         |                    |                    |                         |                             |                    |                             |                         |                             |                         |
| Plants -<br>Woody                      |                             |                         |                    |                    |                         |                             |                    | 29                          |                         |                             |                         |
| Forest<br>Enterprise<br>Directorate    | ARAÇ                        | AZDAVAY                 | CIDE               | ÇATALZEYTİN        | DADAY                   | İHSANGAZİ                   | İNEBOLU            | KASTAMONU                   | KÜRE                    | TAŞKÖPRÜ                    | TOSYA                   |
| Regional<br>Directorate of<br>Forestry |                             |                         |                    |                    |                         | KASTAMONU                   |                    |                             |                         |                             |                         |

| Butterflies                            |                         |                         |                    |                             |                         |                    |                             |                             |                    |                    |                        |
|--|-------------------------|-------------------------|--------------------|-----------------------------|-------------------------|--------------------|-----------------------------|-----------------------------|--------------------|--------------------|------------------------|
| Amphibians<br>and Reptiles             |                         |                         |                    |                             |                         |                    |                             |                             |                    |                    |                        |
| Birds                                  | 96, 97, 98,<br>100, 101 | 96, 97, 98,<br>100, 101 | 96, 97, 98,<br>100 | 96, 97, 98, 99,<br>100, 101 | 96, 97, 98,<br>100, 101 | 96, 97, 98,<br>100 | 96, 97, 98, 99,<br>100, 101 | 96, 97, 98, 99,<br>100, 101 | 96, 97, 98,<br>100 | 96, 97, 98,<br>100 | 96, 97, 98, 99,<br>100 |
| Small<br>Mammals                       |                         | 92                      | 92                 |                             | 92                      | 92                 | 92                          | 92                          | 92                 | 92                 | 92                     |
| Large<br>Mammals                       | 82, 84, 86, 87          | 82, 84, 86, 87          | 82, 84, 86, 87     | 82, 87, 89                  | 87                      | 82, 84, 86, 87     | 82, 84, 86, 87              | 82, 85, 86,<br>87, 89       | 82, 86, 87         | 82, 86, 87         | 82, 84, 87, 89         |
| Plants -<br>Herbaceous                 | 56, 72                  |                         |                    |                             | 56                      |                    |                             |                             |                    |                    |                        |
| Plants -<br>Woody                      |                         |                         |                    |                             |                         | 24                 |                             |                             |                    |                    |                        |
| Forest<br>Enterprise<br>Directorate    | SAMATLAR                | PINARBAŞI               | BOZKURT            | KARADERE                    | HANÖNÜ                  | AYANCIK            | BOYABAT                     | DURAĞAN                     | Sinop              | TÜRKELİ            | GERZE                  |
| Regional<br>Directorate of<br>Forestry |                         |                         |                    |                             |                         | KASTAMONU          |                             |                             |                    |                    |                        |

| Butterflies                            |                             |                                    |                |                           |                     |                     |                         |                         |                         |         |                     |
|--|-----------------------------|------------------------------------|----------------|---------------------------|---------------------|---------------------|-------------------------|-------------------------|-------------------------|---------|---------------------|
| Amphibians<br>and Reptiles             | 108                         |                                    |                | 108                       |                     | 108                 |                         |                         |                         |         |                     |
| Birds                                  | 95, 96, 97, 98,<br>100, 101 | 101                                | 97, 98, 101    | 97, 99, 100,<br>101       | 97, 99, 100,<br>101 | 95, 97, 100,<br>101 | 95, 97, 98,<br>100, 101 | 95, 97, 98,<br>100, 101 | 95, 97, 99,<br>100, 101 | 101     | 97, 98, 100,<br>101 |
| Small<br>Mammals                       |                             |                                    |                |                           |                     |                     |                         |                         |                         |         |                     |
| Large<br>Mammals                       | 82, 84, 86, 87              | 82, 84, 86, 87                     | 82, 83, 87, 89 | 82, 83, 84, 86,<br>87, 89 | 82, 84, 86, 87      | 82, 86, 87          | 82, 83, 84,<br>87, 89   | 82, 84, 87, 89          | 82, 84, 86, 87          | 84, 86  | 84, 87              |
| Plants -<br>Herbaceous                 | 51                          | 66, 76                             |                | 74                        |                     |                     |                         | 45                      | 47                      | 48      |                     |
| Plants -<br>Woody                      |                             |                                    |                |                           |                     |                     |                         |                         | 26                      |         | 26                  |
| Forest<br>Enterprise<br>Directorate    | KAYSERİ                     | NEVŞEHİR                           | NİĞDE          | YOZGAT                    | AKDAĞMADENİ         | Sivas               | BEYŞEHİR                | ERMENEK                 | KONYA                   | AKSARAY | KARAMAN             |
| Regional<br>Directorate of<br>Forestry |                             | KAYSERI<br>KONYA<br>KONYA<br>KONYA |                |                           |                     |                     |                         |                         |                         |         |                     |

| Butterflies                            | 113, 114                    |                         |   |                             |                         |                         |                        | 118                     |                         |                         | 118                     | 118                     | 118                     |             |
|--|-----------------------------|-------------------------|---|-----------------------------|-------------------------|-------------------------|------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------|
| Amphibians<br>and Reptiles             |                             |                         |   |                             |                         |                         |                        |                         |                         |                         |                         |                         |                         |             |
| Birds                                  | 96, 97, 98, 99,<br>100, 101 | 97, 98, 99,<br>100, 101 | 97, 98, 99,<br>100, 101   | 95, 97, 98, 99,<br>100, 101 | 97, 98, 99,<br>100, 101 | 97, 98, 99,<br>100, 101 | 95, 96, 97, 98,<br>100 | 95, 97, 98,<br>100, 101 | 96, 97, 98,<br>100, 101 | 95, 97, 98,<br>100, 101 | 95, 97, 98,<br>100, 101 | 96, 97, 98,<br>100, 101 | 96, 97, 98,<br>100, 101 | 95, 97, 100 |
| Small<br>Mammals                       |                             |                         |   |                             |                         |                         |                        |                         |                         |                         | 06                      |                         | 06                      |             |
| Large<br>Mammals                       | 85, 86, 87, 89              | 82, 83, 87, 89          | 82, 84, 87, 89  | 82, 85, 87, 89              | 82, 87, 89              | 85, 86, 89              | 82, 84, 86, 87         | 82, 85, 87, 89          | 81, 82, 85,<br>87, 89   | 82, 83, 84,<br>87, 89   | 87                      | 81, 82, 85,<br>87, 89   | 82, 83, 87, 89          | 82, 84      |
| Plants -<br>Herbaceous                 |                             |                         |   |                             |                         |                         |                        | 48                      | 69                      | 64, 71                  |                         |                         |                         |             |
| Plants -<br>Woody                      |                             |                         |   | 26                          |                         |                         |                        |                         |                         |                         |                         | 10                      |                         |             |
| Forest<br>Enterprise<br>Directorate    | DOMANİÇ                     | EMET                    | GEDİZ   | KÜTAHYA                     | Simav                   | TAVŞANLI                | ANAMUR                 | GÜLNAR                  | MERSIN                  | MUT                     | Silifke                 | TARSUS                  | ERDEMLİ                 | BOZYAZI     |
| Regional<br>Directorate of<br>Forestry |                             |                         | ,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>,<br>, | ATHAIDA                     |                         |                         | MERSIN                 |                         |                         |                         |                         |                         |                         |             |

| Butterflies                            |                | 117                |                |                       |                |                    |                           |                |                       |                    |                    |                         |
|--|----------------|--------------------|----------------|-----------------------|----------------|--------------------|---------------------------|----------------|-----------------------|--------------------|--------------------|-------------------------|
| Amphibians<br>and Reptiles             |                | 105, 106           | 105            | 107                   |                | 105, 107           |                           |                |                       |                    | 105                | 106                     |
| Birds                                  | 95, 97, 101    | 95, 96, 97,<br>100 | 95, 96, 97     | 95                    | 95, 97, 101    | 95, 96, 97,<br>101 | 97, 99, 101               | 95, 97, 101    | 95, 96, 97,<br>101    | 95, 96, 97,<br>101 | 95, 96, 97,<br>100 | 95, 96, 97,<br>100, 101 |
| Small<br>Mammals                       |                |                    |                |                       |                |                    |                           |                |                       |                    |                    |                         |
| Large<br>Mammals                       | 82, 84, 86, 87 | 82, 86, 87         | 82, 85, 87, 89 | 81, 82, 85,<br>87, 89 | 82, 85, 87, 89 | 82, 85, 87, 89     | 82, 83, 84, 86,<br>87, 89 | 82, 84, 86, 87 | 82, 83, 84,<br>87, 89 | 82, 84, 86, 87     | 82, 84, 87         | 82, 84, 86, 87          |
| Plants -<br>Herbaceous                 |                | 44                 | 77             | 39, 49, 50            | 77             | 67                 | 39                        |                | 44, 67                |                    |                    |                         |
| Plants -<br>Woody                      | 19             | 1, 19              | 3, 4, 6, 19    | 19                    | 19, 28         | ω                  |                           |                |                       |                    | 19                 |                         |
| Forest<br>Enterprise<br>Directorate    | AYDIN          | FETHİYE            | KÖYCEĞİZ       | MARMARIS              | Milas          | MUĞLA              | NAZILLİ                   | YATAĞAN        | AILANLI               | KAVAKLIDERE        | DALAMAN            | KEMER                   |
| Regional<br>Directorate of<br>Forestry |                |                    |                |                       |                |                    | MUĞLA                     |                |                       |                    |                    |                         |

| Butterflies                            |                      |                             |                             |                    |        |                       |                |                |                | 118       |                |            |                |            |
|--|----------------------|-----------------------------|-----------------------------|--------------------|--------|-----------------------|----------------|----------------|----------------|-----------|----------------|------------|----------------|------------|
| Amphibians<br>and Reptiles             |                      |                             |                             |                    |        |                       |                |                |                |           |                |            |                |            |
| Birds                                  | 96, 98               | 95, 96, 97, 98,<br>100, 101 | 95, 97, 98, 99,<br>100, 101 | 96, 97, 98,<br>100 | 96, 98 | 96, 97, 98            | 96, 98         | 101            |                | 95, 101   | 95             | 95, 101    | 95, 101        | 95, 101    |
| Small<br>Mammals                       | 92                   | 92                          | 92                          | 92                 | 92     | 92                    | 92             |                |                |           |                |            |                |            |
| Large<br>Mammals                       | 84, 85, 87, 89       | 82, 84, 86                  | 82, 84, 87                  | 84                 | 87     | 84, 85, 86,<br>87, 89 | 82, 84, 87, 89 | 82, 85, 87, 89 | 82, 85, 87, 89 | 85        | 82, 85, 87, 89 | 85, 87, 89 | 82, 85, 87, 89 | 82, 87, 89 |
| Plants -<br>Herbaceous                 |                      |                             |                             |                    |        |                       |                |                |                |           |                |            |                |            |
| Plants -<br>Woody                      |                      |                             |                             |                    |        |                       |                |                |                |           |                |            |                | 13, 25     |
| Forest<br>Enterprise<br>Directorate    | ADAPAZARI            | AKYAZI                      | GEYVE                       | HENDEK             | izmit  | KARASU                | GÖLCÜK         | BATMAN         | MARDIN         | ŞANLIURFA | ŞIRNAK         | ADIYAMAN   | DİYARBAKIR     | Siirt      |
| Regional<br>Directorate of<br>Forestry | SAKARYA<br>ŞANLIURFA |                             |                             |                    |        |                       |                |                |                |           |                |            |                |            |

| Butterflies                            | 113                     | 113  |                         |                         | 113                     | 113                |              | 113          |  |  |  |
|--|-------------------------|--|-------------------------|-------------------------|-------------------------|--------------------|--------------|--------------|--|--|--|
| Amphibians<br>and Reptiles             | 111                     | 111  | 111                     | 111                     | 111                     | 111                | 111          | 111          |  |  |  |
| Birds                                  | 96, 97, 98,<br>100, 101 | 96, 97, 98,<br>100, 101                                      | 96, 97, 98,<br>100, 101 | 96, 97, 98,<br>100, 101 | 96, 97, 98,<br>100, 101 | 96, 97, 98,<br>100 | 97, 100, 101 | 97, 100, 101 |  |  |  |
| Small<br>Mammals                       | 92, 93, 94              | 91, 92, 93, 94   | 91, 92, 93, 94          | 92, 93, 94              | 92, 93, 94              | 92, 93, 94         |              | 92           |  |  |  |
| Large<br>Mammals                       | 82, 85, 87, 89          | 82, 84, 86, 87   | 82, 86, 87              | 82, 86, 87, 89          | 82, 84                  | 82, 84, 86, 87     | 85, 87, 89   | 85, 87, 89   |  |  |  |
| Plants -<br>Herbaceous                 | 41                      |  |                         |                         | 63                      |                    |              |              |  |  |  |
| Plants -<br>Woody                      | 23, 32                  | 11, 12, 27, 32   | 27                      | 12, 25, 27              |                         |                    |              |              |  |  |  |
| Forest<br>Enterprise<br>Directorate    | MAÇKA                   | PAZAR  | Rize                    | SÜRMENE                 | TORUL                   | TRABZON            | BAYBURT      | GÜMÜŞHANE    |  |  |  |
| Regional<br>Directorate of<br>Forestry |                         | MAÇI<br>PAZA<br>RİZE<br>SÜRN<br>TORL<br>TORL<br>TRAB<br>BAYB |                         |                         |                         |                    |              |              |  |  |  |

| Butterflies                            |                    |                         | 116                     |                    | 113                         |                    |             |                    | 113                     |
|--|--------------------|-------------------------|-------------------------|--------------------|-----------------------------|--------------------|-------------|--------------------|-------------------------|
| Amphibians<br>and Reptiles             |                    |                         |                         |                    |                             |                    |             |                    |                         |
| Birds                                  | 96, 97, 98,<br>100 | 96, 97, 98,<br>100, 101 | 96, 97, 98,<br>100, 101 | 96, 97, 98,<br>100 | 96, 97, 98, 99,<br>100, 101 | 96, 97, 98,<br>100 | 97, 98, 101 | 96, 97, 98,<br>100 | 96, 97, 98,<br>100, 101 |
| Small<br>Mammals                       | 92                 | 92                      | 92                      | 92                 | 92                          | 92                 | 92          | 92                 | 92                      |
| Large<br>Mammals                       | 82, 85, 87, 89     | 82, 84, 87              | 86, 87, 89              | 82, 84, 87, 89     | 84, 86, 87, 89              | 85, 87, 89         | 87          | 82, 83, 87, 89     | 82, 86, 87              |
| Plants -<br>Herbaceous                 |                    |                         |                         |                    |                             |                    |             |                    |                         |
| Plants -<br>Woody                      |                    |                         |                         | 30                 | 24                          |                    | 6           | 24, 3              |                         |
| Forest<br>Enterprise<br>Directorate    | BARTIN             | DEVREK                  | DIRGINE                 | EREĞLİ             | KARABÜK                     | NLUS               | YENICE      | ZONGULDAK          | SAFRANBOLU              |
| Regional<br>Directorate of<br>Forestry |                    |                         |                         |                    | ZONGULDAK                   |                    |             |                    |                         |



# 10. References

#### Plants

The main sources used for the most recent taxonomic rank of plant species and their Turkish names:

Güner, A. (ed.) (2014). Resimli Türkiye Florası. Nezahat Gökyiğit Botanik Bahçesi, Flora Araştırmaları Derneği ve Türkiye İş Bankası Kültür Yayınları yayını, İstanbul.

Güner, A., Aslan, S., Ekim, T., Vural, m, Babaç, mT (edlr) 2012 Türkiye Bitkileri Listesi (Damarlı Bitkiler). Nezahat Gökyiğit Botanik Bahçesi ve Flora Araştırmaları Derneği Yayını. İstanbul.

### Woody Plants

Adams, R. P. 2011. Junipers of the World: Genus Juniperus. 3. Edition. Trafford Publ., Vancouver. Sayfa: 218 Aydınözü, D. 2004. Kasnak Meşesi (Quercus vulcanica)'nin Türkiye'deki ikinci Yeni Bir Yayılış Alanı.

Marmara Coğrafya Dergisi, sayı: 9.

Browicz, K. 1972. Amygdalus L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol 4: 26.

Browicz, K. 1972. Cretaegus L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 4: 135.

Browicz, K. 1972. Pyrus L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 4: 162.

Browicz, K. 1972. Pyrus L. in: Davis, P.H. Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 4: 165.

Browicz, K. 1982. Betula L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 7: 691.

Browicz K. ve Zielinski, J. 1982. Zelkova Spach in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 7: 649.

Brunner, H., Tanker, N., 1988. Eczacılık, Botanik ve Tıp Öğreniminde Yardımcı: Mesleki Latince. Ankara Üniversitesi Eczacılık Fakültesi Yayınları, Sayı 63, İkinci baskı, 164s.

Chamberlain, D.F. 1970. Colutea L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 3: 43.

Chamberlain D.F., Long, D. 1972. Lonicera L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 4: 547.

Coode, mJ.E. ve Cullen, J. 1965. Abies Mill. in: Davis, P.H. (ed). Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol.1: 70.

Coode, mJ.E., Cullen, J. 1965. Pinus L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. vol. 1:75

Coode, mJ.E., Cullen, J. 1965. Juniperus L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 1: 80.

Coode, mJ.E., Cullen, J. 1967. Euonymus L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 2: 551.

Croft, J.: A Short Botanical Glossary. Australian National Herbarium, Center for Plant Biodiversity Research. [http://www.anbg.gov.au/glossary/croft.html]

Çolak, A.H., Sorger, F., 2005. Türkiye Çiçekleri. Üçüncü Baskı, Ankara, 975-98699-O-X, 600s.

Davis, P.H., Mill, R.R., Tan, K. 1988. Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 10: 107.

Davis, P.H., Mill, R.R., Tan, K. 1988. Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 10: 215.

Davis, P.H., Mill, R.R., Tan, K. 1988. Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 10: 113.

Davis, P.H., Mill, R.R., Tan, K. 1988. Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 10: 138.

Davis P.H. 1967. Sageretia Brongn. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 2: 525.

Davis, P.H., Mill, R.R., Tan, K. 1988. Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 10: 137.

Eminağaoğlu, Ö., Kutbay, H.G., Özkan, Z.C., Ergül A. 2008. Flora of the Camili Biosphere Reserve Area (Borçka, Artvin, Turkey). Turk. J. Bot. (32), 43-90.

Gemici, Y. 2000. Flueggea Willd. in: Güner, A., Özhatay, N., Ekim, T., Başer, K.H.C. (eds), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 11:215.

Gibbs, P.E. 1970. Gonocytisus Spach in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 3: 22.

Gültekin, H. C., Akçaağaç (Acer L.) Türlerimiz ve Fidan, Üretim teknikleri, Çevre ve Orman Bakanlığı, AGM Fidanlık Tohum İşleri Daire Başkanlığı.

Güner, A. 2000. Alnus Mill. in: Güner, A., Özhatay, N., Ekim, T., Başer, K.H.C. (eds), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol 11: 216.

Hedge, I.E., Yaltırık, F. 1982. Quercus L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 7: 662.

Hedge, I.E., Yaltırık, F. 1982. Quercus L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 7: 670.

Malyer, H. 2000. Chamaecytisus Link in: Güner, A., Özhatay, N., Ekim, T., Başer, K.H.C. (eds), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 11: 77.

Mamıkoğlu, N.G. 2007. Türkiye'nin Ağaçları ve Çalıları, NTV Yayınları.

Nilsson, Ö. 1972. Rosa L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 4: 110.

Ok, T. ve Avşar, mD. 2007. Kadıncık Çalısının (Flueggea anatolica Gemici) Türkiye'deki Yeni Bir Yayılış Alanı. Süleyman Demirel Üniversitesi Orman Fakültesi Dergisi. Seri: A, Sayı: 2:102-106.

Ok, T. ve Avşar, mD. 2009. Kadıncık çalısının (Flueggea anatolica Gemici) Kahramanmaraş-Andırın yöresinde tespit edilen yeni yayılış alanları/Türkiye. BioDiCon 2/1: 65-70.

Ok, T., Bani, B., Adıgüzel, N. 2011. Threat status of a relict endemic species (Flueggea anatolica) in Turkey. BioDiCon 4/2: 60-66.

Peşmen, H. 1972. Liquidambar L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 4: 264.

Skvortsov, A.K. ve Edmondson, J.R. 1982. Salix L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 7: 709.

Stevens, P.F. 1978. Rhododendron L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 6: 91.

Stevens, P.F. 1978. Epigaea L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 6: 94.

Tedd, H. G. and W. B. Turrill 1935. Fraxinus pallisae and Its Relationships. Bulletin of Miscellaneous Information (Royal Gardens, Kew), Vol. 1935, No. 3, pp. 132-143.

Tuzlacı, E. 2002. Baba Dağı (Muğla) Florasi Ve Fethiye Yöresinde Halkin Yararlandığı Bitkiler Hakkında Bir Ön Araştırma, 14. Bitkisel İlaç Hammaddeleri Toplantısı, Bildiriler, 29-31 Mayıs 2002, Eskişehir.

Yaltrık, F. 1967. Acer L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol 2: 512.

Yaltırık, F. 1982. Alnus Mill. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 7: 692.

Yaltırık, F. 1978. Fraxinus L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 6: 150.

Yaltırık, F., 1978. Fraxinus L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 6: 154.

Yaltırık, F. 1978. Osmanthus Lour. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 6: 157.

www.orman.ktu.edu.tr/om/abds/obotanigi/\_herbaryum/tip/alnusglutinosa.htm

Zielinski, J. 2000. Cerasus L. in: Güner, A., Özhatay, N., Ekim, T., Başer, K.H.C. (eds), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 11: 100.

Zielinski, J. 2000. Pyrus L. in: Güner, A., Özhatay, N., Ekim, T., Başer, K.H.C. (eds), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 11: 115.

Zielinski J., Güner A. 2000. Zelkova Spach in: Güner, A., Özhatay, N., Ekim, T., Başer, KHC. (eds), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 11: 215.

#### Herbaceous plants

Akan, H., Aytaç, Z., Pınar, mN. ve Ekici, m 2007. Türkiye Trigonella (Leguminosae)'larının revizyonu. TÜBİTAK TBAG Proje 2099 101T142, 2007: 341s.

Aytaç, Z. Ve Mill, R.R. 2005. Two new species of Boraginaceae (tribe cynoglosseae) from Turkey. Edinburgh Journal of Botany 61 (2&3): 109–118.

Bani, B. 2009. Beydağ, Kızılgöl ve Soğanlı dağları (Tahtalı dağları, Adana/Kayseri) florası ve korunması. Gazi Üniversitesi, Fen Bilimleri Enstitüsü,Biyoloji Anabilim Dalı, Doktora Tezi. Ankara. 436 s.

Brickell, C.D. 1984. Galanthus L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol.8: 370

Chamberlain, D.F. 1978. Anchusa L. in: Davis, P.H. (ed.), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 6: 398.

Çolak, A.H. ve Sorger F. (ed.) 2005. Türkiye Çiçekleri. Lazer Ofset. İstanbul. 600 s.

Davis, P.H. 1984. Asparagus L. in: Davis, P.H. (ed.), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 8: 78.

Davis, P. H., Mill, R.R. ve Tan, K. 1988. Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 10: 116.

Davis, A.P. 2000. Galanthus L. in: Güner, A., Özhatay, N., Ekim, T., Başer, KHC. (ed.), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol.11: 267.

Davis, P. H., Mill, R.R. ve Tan, K. 1988. Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 10: 210.

Davis, P.H. 1982. Satureja L. in: Davis, P.H. (ed.), Flora of Turkey and the East Aegean Islands. Edinburgh University Press vol.7: 318.

Deniz, İ.G. ve Sümbül, H. 2004. Allium elmaliense (Alliaceae), a new species from SW Anatolia, Turkey. Ann. Bot. Fennici 41: 147–150.

Doğan, m ve Akaydın, G. 2001. A new species, Acantholimon birandii (Plumbaginaceae), from the Central Anatolian Steppe in Turkey. Nord. J. Bot. 21: 481-484.

Doğan, m ve Akaydın, G. 2003. Türkiye'nin Acantholimon Boiss. (Plumbaginaceae) Türlerinin Revizyonu. TBAG-1781(199 T 011). Sayfa: 67.

Doğan, m ve Akaydın, G. 2003. Two new species in Acantholimon sect. Staticopsis (Plumbaginaceae) from Turkey. Ann. Bot. Fennici 40: 53–58.

Duman, H. 2000. Chaerophyllum L. in: Güner, A., Özhatay, N., Ekim, T., Başer, KHC. (ed.), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol.11: 139.

Duman, H. ve Sağıroğlu, m 2005. A new species of Ferula (Apiaceae) from South Anatolia, Turkey. Bot J Linn Soc. 147: 357-361.

Duran, A. ve Duman, H. 2002. Two new species of Centaurea (Asteraceae) from Turkey. Ann. Bot. Fennici 39: 43–48.

Duran, A., Sağıroğlu, m ve Duman, H. 2005. Prangos turcica (Apiaceae), a new species from South Anatolia, Turkey. Ann. Bot. Fennici. 42: 67-72.

Ehrendorfer, F. ve Schonbeck-Temesy, E. 1972. Rubia L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol.7: 857.

Ekim, T. 2007. Türkiye'nin Nadir Endemicleri. Türkiye İş Bankası Kültür Yayınları. İstanbul. 537 s.

Göktürk, R.S., Düşen, O.D. ve Sümbül, H. 2003. A new species of Astragalus L. (Fabaceae/Leguminosae) from southwest Anatolia. Isr. J. Plant Sci. 51: 67-70.

Grierson, A.J.C. ve Yavin, Z. 1975. Anthemis L. in: Davis, P.H. (ed.), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol 5: 210.

Grierson, A.J.C. 1975. Matricaria L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 5: 294.

Güner, A. 2000. Alkanna L. in: Güner, A., Özhatay, N., Ekim, T., Başer, KHC. (ed.), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol.11: 190.

Hedge, I.C. ve Lamond, J.M. 1982. Nepeta L. in: Davis, P.H. (ed.), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol.7: 270.

Hedge, I.C. 1982. Salvia L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol.7: 432.

Huber-Morath, A. 1967. Gypsophila L. in: Davis, P.H. (ed.), Flora of Turkey and the East Aegean Islands. Edinburgh University Press vol. 2:155.

Huber-Morath, A. 1970. Trigonella L. in: Davis, P.H. (ed.), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 3: 482.

Huber-Morath, A. 1978. Verbascum L. in: Davis, P.H. (ed.), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 6: 491.

Huber-Morath, A. 1978. Verbascum L. in: Davis, P.H. (ed.), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 6 :506.

Huber-Morath, A. 1978. Verbascum L. in: Davis, P.H. (ed.), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 6:521.

Jalas, J. 1982. Thymus L. in: Davis, P.H. (ed.), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 7: 355.

Jalas, J. 1982. Thymus L. in: Davis, P.H. (ed.), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 7: 362.

Kreutz, C.A.J. 2000. Ophrys iceliensis, eine neue Art aus der mittleren Südtürkei. Jour. Eur. Orch. 32: 527-537.

Mathew, B. 1984. Crocus L. in: Davis, P.H. (ed.), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 8: 417.

Mathew, B. 1984. Crocus L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 8: 424.

Meikle, R.D. 1984. Chionodoxa Boiss. in: Davis, P.H. (ed.), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 8: 226.

Meikle, R.D. 1978. Cyclamen L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol.6: 130.

Özhatay, N., Byfield, A. ve Atay, S. 2005. Türkiye'nin 122 Önemli Bitki Alanı. WWF Türkiye. İstanbul. 476 s.

Özhatay, N. 2000. Fritillaria L. in: Güner, A., Özhatay, N., Ekim, T., Başer, KHC. (ed.), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 11: 243.

Özhatay, N. 2000. Fritillaria L. in: Güner, A., Özhatay, N., Ekim, T., Başer, KHC. (ed.), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 11: 244.

Özhatay, N. 2000. Muscari L. in: Güner, A., Özhatay, N., Ekim, T., Başer, KHC. (ed.), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol.11: 239.

Paulus, H.F., Gügel, E., Rückbrodt, D. ve Rückbrodt, U. 2001. Ophrys lyciensis H.F. Paulus, E.Gügel, D. Rückbrodt & U. Rückbrodt spec. nov., eine neue Art aus dem Ophrys holoserica-Artenkreis der STürkei (Orchidaceae). Ber. Arbeitskrs. Heim. Orchid. 18: 19-33.

Peşmen, H. 1972. Ferula L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 4: 450.

Peşmen, H. 1972. Ferulago W. Koch in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 4: 547.

Podlech, D. 2001. Contributions to the knowledge of the genus Astragalus L. (Leguminosae) VII-X. Sendtnera 7: 163-201.

Renz, J. Ve Taubenheim, D.G. 1984. Ophrys L. in: Davis, P.H. (ed), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 8: 499.

Rix, E.M. 1984. Fritillaria L. in: Davis, P.H. (ed.), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 8: 296.

Speta, F. 2000. Bemerkungen zu Ornithogalum sintenisii, Freyn (Hyacinthaceae) und ähnlichen Arten, Phyton (Horn), 40(1):115-140.

Sümbül, H., Tufan, Ö., Düşen, O.D, Göktürk, R.S. 2003. A new taxon of Glycyrrhiza L. (Fabaceae) from southwest Anatolia. Israel Journal of Plant Sciences 51:71–74.

Tekin, E. 2007. Türkiye'nin En Güzel Yabani Çiçekleri I. Cilt. Türkiye İş Bankası Kültür Yayınları. İstanbul. 638 s.

Terzioğlu, S. ve Coşkunçelebi, K. 2002. Tulipa gumusanica (Liliaceae), a new species from Turkey. Ann. Bot. Fennici 39: 149-151.

Vural, m ve Dönmez, A.A. 2002. Two new taxa of Silene (Caryophyllaceae) from Turkey. Annales Botanici Fennici 39: 153–158.

Wagenitz, G. 1975. Centaurea L. in: Davis, P.H. (ed.), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 5: 541.

Wickens, G.E. 1978. Symphytum L. in: Davis, P.H. (ed.), Flora of Turkey and the East Aegean Islands. Edinburgh University Press. vol. 6: 381.

#### Large Mammals

Albayrak, T., Giannatos, G. and Kabasakal, B., Carnivore and ungulate populations in the Beydaglari Mountains (Antalya, Turkey): border region between Asia and Europe. Pol. J. Ecol, 60(2), pp.419-428, 2012.

Avgan, B., Zimmermann, F., Güntert, M., Arıkan, F., and Breitenmoser, U., 2014. The first density estimation of an isolated Eurasian lynx population in southwest Asia. Wildlife biology, 20, 217-221.

Breitenmoser, C., P. Henschel, E. Sogbohossou. 2008. "The IUCN Red List of Threatened Species, 2008" (Online). Caracal caracal. Erişim: <a href="http://www.iucnredlist.org/details/3847.2017">http://www.iucnredlist.org/details/3847.2017</a>

Breitenmoser, U., Breitenmoser-Würsten, C., Lanz, T., von Arx, M., Antonevich, A., Bao, W. and Avgan, B., 2015. Lynx lynx. The IUCN Red List of Threatened Species 2015: e.T12519A50655266. http://dx.doi. org/10.2305/IUCN.UK.2015-2.RLTS.T12519A50655266.en. Downloaded on 25 August 2017.

Feldhammer, G.A., Farris-Renner, K.C. ve Barker, C.M. 1988. Dama dama, Mammalian Species, 317:1-8.

Foster, H., 2010. "Lynx lynx" (On-line), Animal Diversity Web. Accessed August 25, 2017 at http://animaldiversity.org/accounts/Lynx\_lynx/

Geist, V. 1998. Deer of the world: their evolution, behavior, and ecology, Mechanicsburg, PA: Stackpole Books. 450 sayfa.

Ghoddousi, A., Ghadirian, T. and Fahimi, H., Status of caracal in Bahram'gur Conserved Area, Iran. Cat news, 50, pp.10-3, 2009.

Ilemin, Y. and Gürkan, B., Status and activity patterns of the Caracal, Caracal caracal (Schreber, 1776), in Datça and Bozburun Peninsulas, Southwestern Turkey: (Mammalia: Felidae). Zoology in the Middle East, 50(1), pp.3-10, 2010.

Matyushkin, Ye.N. and Vaisfeld, M.A., 2003. The Lynx: Regional Features of Ecology and Protection, Nauka, Moscow, 523 p.

Myers P., Espinosa R., Parr, C. S., Jones, T., Hammond, G. S., Dewey, T. A., The Animal Diversity Web (Online). Erişim: http://animaldiversity.org. 2017

Nowak, Ronald M., 1999. Walker's mammals of the world. Vol. 1. JHU Press.

Patthey, P. 2003. Habitat and corridor selection of an expanding red deer (Cervus elaphus) population. PhD thesis. Institute of Ecology, University of Lausanne.

Putman, R. ve Putman, R.J., 1996. Competition and Resource Partitioning in Temperate Ungulate Assemblies, Chapman and Hall, London, 131 sayfa.

Soyumert, A. and Erturk, A., 2016. The lynx in the Western Black Sea Region of Anatolia: An update on local distribution, 3rd Ecology and Evolutionary Biology Symposium, Turkey 31 August – 01 September, Ankara, Türkiye.

Turan, N. 1981. Türkiye'nin Av ve Yaban Hayvanları - Memeliler. Ar Yayınevi, Ankara.

Wemmer, C. (ed) 1998. Deer Status and Survey Action Plan. IUCN/SSC Deer Specialist Group, IUCN, Gland, Switzerland, and Cambridge, UK, 106 sayfa.

Wilson, D.E. ve Reeder D.A.M. (ed.) 2005. Mammal Species of the World. A Taxonomic and Geographic Reference (3rd ed), Johns Hopkins University Press, 2201 sayfa.

#### Small Mammals

Doğramacı, S. 1989. Turkish mammal fauna. Ondokuz Mayıs Univ. Fen Dergisi, 1: 107-136.

Gavish, L. 1993. Preliminary observations on the behavior and ecology of free-living populations of the subspecies Sciurus anomalus syriacus (golden squirrel) on Mount Hermon, Israel. Israel J. Zool., 39: 275-280.

Kıvanç, E. 2006. Dikenli farenin (Acomys cilicicus Spitzenberger, 1978) Taksonomisi, Biyolojisi ve Yayılışı. Ankara Üniversitesi Bilimsel Araştırma Projesi Kesin Raporu, Ankara.

Krystufek, B. ve Vohralik, V. 2005. Mammals of Turkey and Cyprus. Rodentia I: Sciuridae, Dipodidae, Gliridae, Arvicolinae. Zalozba Annales, Koper, Slovenia.

Turan, N. 1981. Türkiye'nin Av ve Yaban Hayvanları – Memeliler. Ar Yayınevi, Ankara.

#### Birds

Bocca m, Carisio, L. ve Rolando, A. 2007. Habitat use, home ranges and census techniques in the Black Woodpecker Dryocopus martius in the Alps. Ardea 95 (1): 17-29.

Cramp, S. 1998. The Complete Birds of the Western Palearctic on CD-ROM. Oxford University Press, Oxford.

Czeszczewick, D. ve Walankiewicz, W. 2006. Logging affects the white-backed woodpecker Dendrocopos leucotos distribution in the Bialowieza Forest. Ann. Zool. Fennici, 34: 221-227.

Heinzel, H., Fitter, R.S.R., Parslow, J. 1995. Türkiye ve Avrupa'nın Kuşları. Harper Collins Publishers. Türkiye Doğal Hayatı Koruma Derneği. İtalya.

Heredia, B. 1996. Action plan for the Cinereous Vulture (Aegypius monachus) in Europe. BirdLife International, UK.

Jong, J. ve Lonnstad, J. 2002. White backed woodpecker landscapes and new nature reserves. National Board of Forestry Publishing Company.

Kennedy, L.P. 2003. Northern Goshawk (Accipiter gentilis atricapillus): A technical conservation assessment. USDA Forest Service, Rocky Mountain Region.

Kennedy, L.P. ve Stahlecker D.W. 1993. Responsiveness of nesting northern goshawk to taped broadcats 3 conspecific calls. Journ. Wildl. Manage. 57 (2): 249 – 257.

Bird Araştırmaları Derneği. 2004. Kara akbaba (Aegypius monachus) Türkiye Ulusal Koruma Eylem Planı. Ankara.

Snow, D.W. ve Perrins, C.M., (ed.) 1998. The Birds of the Western Palearctic, Concise Edition. Oxford University Press, Oxford, UK.

Yamaç, E. 2004. Türkmenbaba Dağı'ndaki Kara Akbaba Aegypius monachus L.'un Popülasyon Biyolojisi Üzerine Araştırmalar. Anadolu Üniversitesi, Fen Bilimleri Enstitüsü. Doktora tezi. Eskişehir.

www.iucnredlist.org

www.birdlife.org

#### Amphibians and Reptiles

Baran, İ. 2005. Türkiye Amfibi ve Sürüngenleri. TÜBİTAK. Ankara.

Billing, H., Nilson, G., ve Sattler U. 1990. Vipera pontica sp. n., a new viper species in the kaznakovi group (Reptilia, Viperidae) from northeastern Turkey and adjacent Transcaucasia. Zoologica Scripta 19 (2): 227-231.

Gautier, P., Olgun, K., Üzüm, N., Miaud, C. 2006. Gregarious behaviour in a salamander: attraction to conspecific chemical cues in burrow choice. Behav Ecol Sociobiol 59: 836–841.

Höggren, m, Nilson, G., Andren, C., Orlov, N., ve Tunjyev B.S. 1993. Vipers of the Caucasus: Natural history and systematic review. Herpetological Natural History 1 (2): 11-19.

Olgun, K, Miaud, C., Gautier, P. 2001. Age, growth, and survivorship in the viviparous salamander Mertensiella luschani from southwestern Turkey. Can J Zool 79:1559–1567.

www.iucnredlist.org

www.turkherptil.org

#### **Butterflies**

Asher, J., Warren, m, Fox, R., Harding, P., Jeffcoate, G. ve Jeffcoate, S. 2001. The Millenium Atlas of Butterflies in Britain and Ireland. Butterfly Conservation, Oxford University Press, New York.

Başaran, Ü. N. 2011. Edirne'de Osmanlı ateşi. Doğa Koruma Merkezi (DKM). Rapor. Baytaş, A. 2007. A field guide to the butterflies of Turkey. Istanbul, NTV Yayınları.

Clarck, S.A., Green, D.G., Bourn, N.A. & Hoare, D.J. 2011. Woodland management for butterflies and moths: a best practice guide. Butterfly Conservation, Wareham. 63 pp.

Dinca, V. ve Vila, R. 2008. Improving the knowledge on Romanian Rhopalocera, including the rediscovery of Polyommatus amandus (Schneider, 1792) (Lycaenidae) and an application of DNA-based identification. Nota lepid. 31 (1): 3 – 23 .200

Frank, T. (Ed.) 2000. Természet – Erdő – Gazdálkodás [Nature – Forest – Management] (in Hungarian) – Magyar Madártani Egyesület, Pro Silva Hungaria Egyesület, Eger. 162 pp.

Hesselbarth, G., van Oorschot, H. ve Wagener, S. 1995. Die Tagfalter der Türkei. Bocholt, Germany: Selbstverlag Sigbert Wagener.

Karaçetin, E. ve Baytaş, A. 2008. Türkiye'nin Kelebek Rehberi, Istanbul. 173 sy.

Karaçetin, E. ve Welch, H. J. 2011. Türkiye'deki Kelebeklerin Kırmızı Kitabı. Ankara, Turkey, Doğa Koruma Merkezi (DKM). Erişim: www.dkm.org.tr

Karaçetin, E., Welch, H. J., Turak, A., Balkız, Ö. ve Welch, G. 2011. Türkiye'deki Kelebeklerin Koruma Stratejisi. Ankara, Turkey, Doğa Koruma Merkezi (DKM). Erişim: www.dkm.org.tr.

Settele, J., Kudrna, O., Harpke, A., Kühn, I., van Swaay, C., Verovnik, R., Warren, m, Wiemers, m, Hanspach, J., Hickler, T., Kühn, E., van Halder, I., Velling, K., Vliegenthart, A., Wynhoff, I. ve Schweiger, O. 2008.

Climatic Risk Atlas of European Butterflies, Biorisk 1 (Special Issue), Sofia, Moscow: Pensoft.

Pollard, E. ve Yates, T.J. 1993. Monitoring Butterflies for Ecology and Conservation. Chapman & Hall.

Van Swaay, C., Cuttelod, A., Collins, S., Maes, D., Lopez Munguira, m, Šašić, m, Settele, J., Verovnik, R., Verstrael, T., Warren, m, Wiemers, m and Wynhof, I. 2010. European Red List of Butterfies. Luxembourg: Publications Office of the European Union. 60 pp.

Van Swaay, C. A.M, Wynhoff, I., Verovnik, R., Wiemers, m, López Munguira, m, Maes, D., Sasic, m, Verstrael, T., Warren, m ve Settele, J. 2009. Boloria euphrosyne. In: IUCN 2011. IUCN Red List of Threatened Species. Version 2011.1. www.iucnredlist.org.

Van Swaay, C.A.M ve Warren, mS. 1999. Red data book of European Butterflies (Rhopalocera). Nature and Environment. Strasbourg: Council of Europe Publishing, No:99.

#### Other Elements of Biodiversity

Çolak, A.H ve ark. 2011. Turbalıklar (Mire/Peatland-Moore). T.C.Orman ve Su İşleri Bakanlığı, Batı Karadeniz Ormancılık Araştırma Enstitüsü Müdürlüğü-Bolu, Çeşitli Yayınlar Serisi No.7, 471s.

## Evaluation Table for the Impact of General Forestry Practices in Turkey on Fauna Species / Groups with Conservation Priority

Orman Genel Müdürlüğü, 2014. Ekosistem Tabanlı Fonksiyonel Orman Amenajman Planlarının Düzenlenmesine Ait Usul ve Esaslar. 299 sayılı tebliğ. (Directorate General of Forestry, 2014. Procedures and Rules on the Regulation of Ecosystem Based Multi-Functional Forestry Management Plans, Communiqué no. 299)

Orman Genel Müdürlüğü, 2014. Silvikültürel Uygulamaların Teknik Esasları. 298 sayılı tebliğ. (Directorate General of Forestry, 2014. Technical Elements of Silvicultural Practices. Communiqué no. 298)

Integrating Biodiversity into Forestry - Practitioner's Guide

Integrating Biodiversity into Forestry Practitioner's Guide



