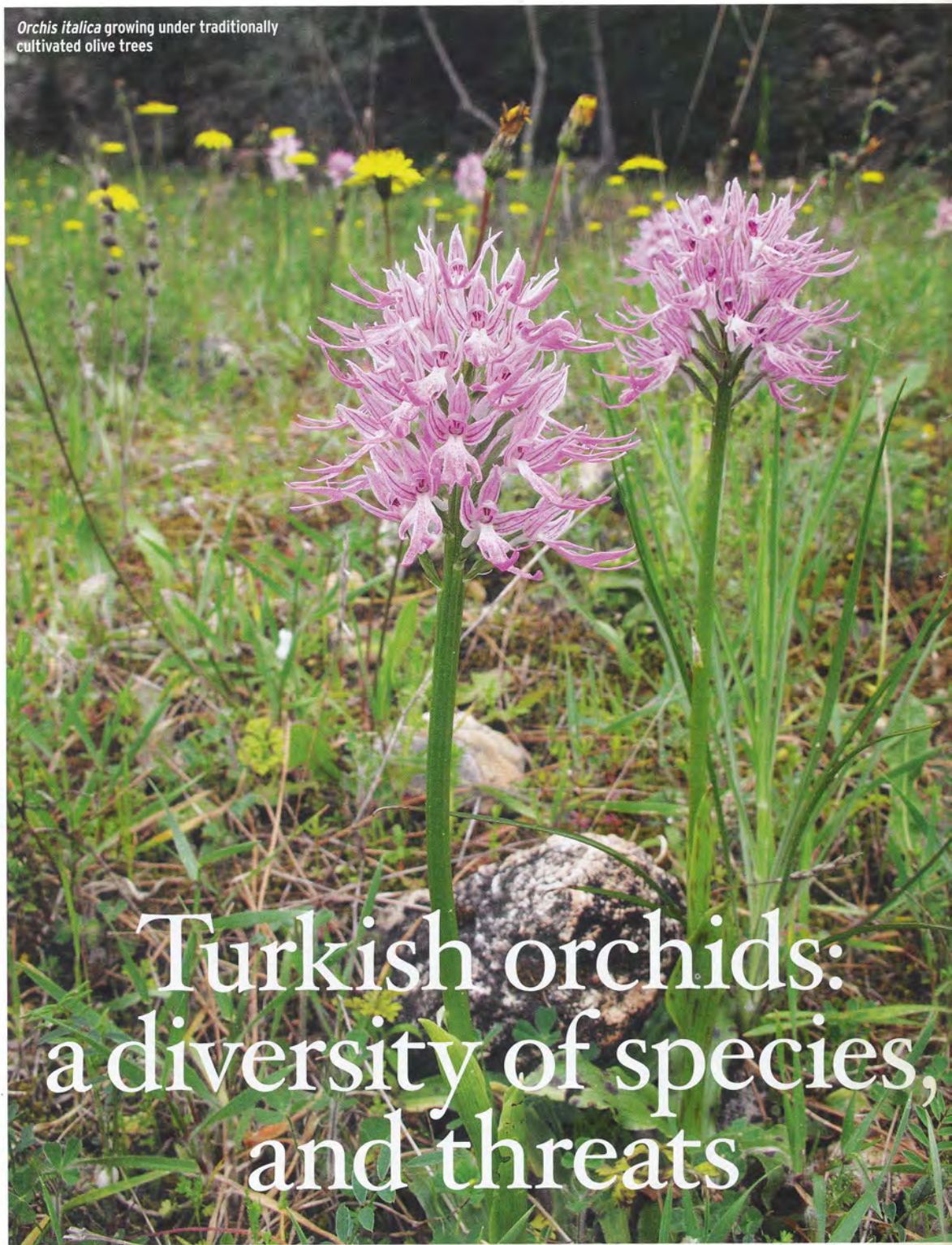


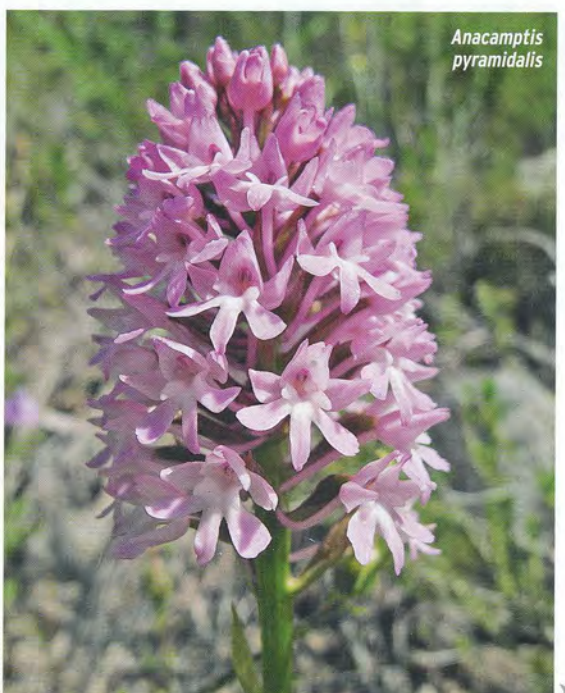
Orchis italica growing under traditionally cultivated olive trees



Turkish orchids: a diversity of species, and threats



SUSANNE MASTERS assesses the changes that are threatening orchid populations in Turkey, and highlights gaps in our current knowledge



TURKEY IS overlooked as an orchid hotspot, possibly because most of the orchid family grow in tropical parts of the world. Yet despite Turkey's temperate climate there are more than 100 species of native orchids. Even in Istanbul, Turkey's largest city with 13 million inhabitants, orchids can be seen growing wild. You can also see people consuming orchids. Many native orchids are used as ingredients in widely-consumed food products throughout Turkey. This is also the case, sometimes to a lesser extent, in other countries and regions that once formed the Ottoman Empire. Istanbul's complexity as the city spanning Europe and Asia mirrors not only the diversity of orchid species in Turkey, where European and Asian floras meet, but also the diversity of threats to orchids. In addition to consumption, other human activities that reflect societal change in Turkey are affecting orchid populations.

Geography

Turkey is one of the 20 most populous countries in the world with a predominantly urban population of 74.7 million. Joining two continents, Turkey bridges not only different cultures but also distinct regions of biological diversity. Occupying 783,560 sq km, with varied geology, a coastline that runs along three seas, and mountains that reach altitudes of 5,137m, it is no surprise that the climate and accompanying habitats vary greatly. For example, annual precipitation ranges from 2,200mm in the eastern Black Sea area, spread throughout the year, to less than 1,300mm on the Aegean and Mediterranean coasts, predominantly in winter months, and just 250mm on the central Anatolian plateau. Mugla province, on the

Aegean coast, is considered to be the richest area for orchid diversity in Turkey (Sezik 2002).

Biodiversity hotspot

Throughout the world there are 35 biodiversity hotspots – areas where the number of different species and endemism are high, and considered to be threatened (Mittermeier *et al.* 2011, Williams *et al.* 2011). Uniquely, almost all of Turkey is in a biodiversity hotspot, because three of them converge here: the Mediterranean Basin, Caucasus, and Irano-Anatolian plateau (Conservation International 2011).

Turkey has high plant diversity with approximately 11,000 plant taxa, of which more than 30% are endemic. This makes the Turkish flora richer than any other country in Europe, North Africa and the Middle East (Atay *et al.* 2000). Turkey's plant diversity is unusual for both a temperate country, and a country that is not an island (Özhatay 2002). The variety of climates and topographical

Three biodiversity hotspots converge in Turkey

Susanne Masters



A variant of *Ophrys fusca* that lacks red pigment, growing in a grazed pine forest



Mirror orchid, *Ophrys speculum* is wasp-pollinated

Susanne Masters

features combine to provide a range of habitats, as well as isolating some plant populations, thereby allowing a great diversity of plant species (*ibid.*, Pils 2006).

Species of orchids

The number of species native to Turkey has been cited as 150 or more (Sezik 2002, Kreutz 2009). However, developments in taxonomy, in particular Pedersen & Faurholdt's (2007) clarification of *Ophrys*, necessitate revision of this figure. There have been 242 species, hybrids and subspecies of orchids described from Turkey. Of these there are only 104 different species with currently accepted names (WCSP 2013). Genera represented, with number of species in brackets, are: *Anacamptis* (8), *Cephalanthera* (6), *Corallorhiza* (1), *Dactylorhiza* (10), *Epipactis* (10), *Epipogium* (1), *Goodyera* (1), *Gymnadenia* (1), *Himantoglossum* (7), *Limodorum* (2), *Neotinea* (3), *Neottia* (3), *Ophrys* (24), *Orchis* (13), *Platanthera* (3), *Serapias* (7), *Spiranthes* (1), *Stenopogon* (1) and *Traunsteinera* (2). Nine species of orchid are currently listed as endemic to Turkey:

Dactylorhiza nischkiorum, *Limodorum rubriflorum*, *Ophrys isaura*, *O. komyana*, *O. kreutzii*, *O. lycia*, *O. tremoris*, *O. ulupinara*, and *O. urtae*. Seven subspecies and varieties are listed as endemics: *Dactylorhiza euxina* subsp. *armeniaca*, *D. osmanica* var. *anatolica*, *Epipactis helleborine* subsp. *bithynica*, *E. helleborine* subsp. *densifolia*, *E. helleborine* subsp. *levantina*, *Ophrys fuciflora* subsp. *pallidiconi*, and *Ophrys umbilicata* subsp. *calcaeniensis*.

Current knowledge of species

While records indicate that these species either do, or have, existed in Turkey, knowledge of current distribution and regional variations is not comprehensive. No orchids are currently red-listed by the International Union for Conservation of Nature (IUCN) in Turkey. However, there is



substantial similarity between the floras of Greece and Turkey's Aegean region, and 16 orchids are red-listed in Greece. Many of the specified threats to red-listed orchids in Greece are factors currently affecting orchids in Turkey, including abandonment of pastoral activities, tourist development, plant collection, soil drainage, changes to forest management, urbanization, and grazing by domesticated animals (IUCN 2012). In addition, *Ophrys argolica* is listed as endemic to Greece on the IUCN red list but the WCSP notes it as found in Turkey (2012, 2013).

This highlights gaps in current knowledge of orchid distribution in Turkey.

Threats to biodiversity

Factors identified as threats in Turkey but yet to be considered specifically in relation to orchids include climate change, mining, recent legislation allowing building on forest classified as degraded, and construction of dams for hydroelectric power (Şekerçioğlu *et al.* 2011). Collection of tubers for consumption has been extensively documented as a threat to orchids in Turkey but the evidence suggests that changes to arable agriculture, animal grazing, and the wider food chain may also be associated with orchid population decline.

Collecting for consumption

Orchid tubers are collected to be dried and ground into a powder called salep. It is used to make ice cream, called maraş dondurma, and a hot drink that is also called salep (Kasperek & Grimm 1999). Tuber collection takes place during the flowering season when orchids are dug up; the young tuber is collected and the old tuber and top growth are discarded (Sezik 2002). Salep can be made from around 30–117 species (according to taxonomic 'lumpers' or 'splitters' respectively), from the genera *Ophrys*, *Orchis*, *Himantoglossum*, *Serapias*, *Anacamptis*, *Dactylorhiza* and *Neotinea* (*ibid.*, Kasperek & Grimm 1999). Whether orchids contribute particular flavour to the drink or ice cream is debated, but the orchid tubers endow both products with specific texture (*ibid.*, Tamer *et al.* 2006, Tekinşen & Güner 2010).

Tuber collection for salep has been cited as the cause of orchid population decline, and consequently cessation of consuming salep has been recommended, but this has not been checked salep consumption (Kasperek & Grimm 1999, Sari & Oguz 2002, Sezik 2002, Delforge 2006).

The unknown scale of collection

There is a scarcity of data on the scale of the wild orchid harvest. More than 15 tonnes of salep are believed to be produced annually, using tubers from 30 to 120 million orchid plants (Kreutz 2002, Sezik 2002). One difficulty in generating estimates is substitution of other wild-collected plants such as *Ranunculus ficaria* subsp. *ficariiformis* (lesser celandine) and *Colchicum cilicium*, and cultivated crops such as rice in place of orchids (*ibid.*). Mado, a company that sells maraş dondurma and salep in 240 outlets in Turkey and more in

Australasia, states that the orchids they use are cultivated on their farm, not wild-collected. Domestic use, where people collect orchid tubers themselves, or buy from collectors, local markets or aktars (herb shops) is absent from records. So, the scale of wild orchid collection cannot be assessed accurately on the basis of sales of salep and products containing salep. Other obstacles include the fact that some harvesting takes place in state-owned forest, which is illegal. This makes collection a covert behaviour and therefore even harder to monitor.

Unknown affects of collection

No quantitative measurement of the affect of tuber collection on orchid populations has been carried out. Wild plants collected for food tend to be abundant plants, and harvesting wild plants for consumption is not always the cause of population decline (Turner *et al.* 2011, Ticktin & Shackleton 2011). So, assumptions that collection of orchid tubers for salep is the cause of the population decline should be treated with caution.

With numerous species collected for salep, another relevant factor to be investigated is whether the different species are affected differently. It has been recommended that, to make harvesting sustainable, collectors should replant the leaf rosette with the old tuber after the fresh tuber has been collected. However, there is no data on whether this is effective or whether collectors are willing to do it.

Salep is a food, and also a medicinal product used for soothing coughs, and ailments of the digestive tract. It has been consumed in Turkey for hundreds of years. Orchid conservation that ignores the human factor cannot succeed. Conservation attempts must also acknowledge the principle of food sovereignty – people’s right to make their own food choices. It is possible that the greatest threat to Turkey’s orchids is not collection for salep, but focusing on collection for salep at the expense of ignoring the other threats.

Agricultural change

Intensification of agriculture has been cited as the main threat to internationally Important Plant Areas (IPAs) in Turkey, as well as a general threat to biodiversity in Turkey (Radford & Odé 2009, Şekerçioğlu *et al.* 2011). Landscapes managed by people through agriculture and grazing are a habitat for wild orchids in Turkey (Sevgi *et al.* 2012). All the photographs



Above Salep ice cream, maraş dondurma, for sale from an Istanbul shop front. Vendors twirl the ice cream from a metal bar, which attracts attention and demonstrates its strong chewy consistency. **Right** Salep powder at an aktar (herb shop).

Below A dug up immature specimen of an *Ophrys* species showing new tuber on the right and old tuber on the left.





Anacamptis papilionacea
growing between stones
in garrigue - low scrubland
vegetation on limestone



The flowering of *Spiranthes spiralis* heralds the onset of autumn in Turkey

of orchids in this article were taken in agricultural and pastoral areas.

Habitat loss is the greatest threat to orchid populations and species survival (Swarts & Dixon 2009). Traditionally managed olive groves in Turkey where fertilizer is not applied can provide a habitat that accommodates orchid species. Fertilizer application has been found to decrease orchid populations (Silvertown *et al.* 1994, Wotová *et al.* 2004). Water pipes being laid to divert water from springs in order to irrigate agricultural crops may have a negative impact on orchid species that require damp conditions (Tsiftis *et al.* 2008, Feldman & Pratt 2011).

It is not just agricultural intensification, but abandonment of agriculture as people move to cities, that influences orchid populations. For example, *Orchis anatolica* is found on abandoned agricultural lands but other *Orchis* species are not (Sevgi *et al.* 2012). This is related to the encroachment of competing plants as grazing, ploughing or vegetation cutting cease.

It is dangerous to assume salep is the sole cause of orchid population decline

Pastoral change

Grazing can both sustain and reduce orchid populations. In some areas of Turkey grazing by cattle, sheep and goats is deemed to have a negative impact on vegetation (FAO 2010). By contrast, some grazing or vegetation cutting regimes foster conditions favourable to orchids by keeping competing plants low and maintaining open areas in shrub vegetation (Kull & Hutchings 2006, Tsiftis *et al.* 2008). Areas in which orchids are actively being conserved often apply specific grazing regimes to maintain populations of orchid species that are also found in Turkey, for example Badbury Rings in Dorset, UK.

Trophic cascade

Research has documented how decline in predators at the top of the food web can cause changes in vegetation cover (Estes *et al.* 2011). Deer grazing on orchids in the Catoctin mountains in Maryland, USA, is one example of herbivores causing orchid populations to decline (Knapp 2012). Humans are not the only consumers of orchids in Turkey; wild boar and porcupines also dig them up to eat their tubers. Reduction of apex predators, such as wolves and bears, in Turkey may have had significant impact on vegetation due to an increase in the number of herbivores lower down the food chain.

Conserving Turkey's orchids

With numerous threats to Turkey's biological diversity, exclusively focusing on the collection of orchid tubers for human consumption is a means of ensuring that orchid populations decline, as it ignores the other factors that may also be having an affect on orchid populations. ➤

Orchid population decline may be an indicator of ecological change that is affecting numerous plant and animal species. For example, olive groves that provide a habitat for orchid species, including those used for salep, are also a habitat for other useful plants. Many of those plants are collected and used as part of local cuisine. Nettles (*Urtica* species) are consumed as leafy greens and to make medicinal tea. Members of the mint family (*Lamiaceae*) from *Mentha* species to *Lavandula stoechas* are collected for use as culinary ingredients. Bulb-forming species such as *Leopoldia comosa* are dug up for consumption, not only by people but also by wild boars. Orchids are just one example of Turkey's biological diversity being utilized by people.

Cultural significance

Biological and cultural diversity are linked (Maffi 2001 & 2005, Pretty *et al.* 2009). Loss of Turkey's orchids could also entail cultural loss, as the products made using orchids, as well as the processes that produce them



A pale form of *Anacamptis morio* in an olive grove



A dark form of *Anacamptis morio* in the same grove

would disappear. Despite urbanization and globalization, Turkey still consumes culturally meaningful products derived from native plants that are connected to the seasons, specific products and rituals. In the autumn and winter steaming hot salep is served up in cafés and on the streets of Istanbul, and in summer salep ice cream, maraş dondurma, is enjoyed.

Changes in season are marked by the flowering of orchids – *Limodorum abortivum* in spring, and *Spiranthes spiralis* in autumn on Çamlıca Hill, the highest point in Istanbul. Çamlıca's height makes it an ideal site for television and radio masts, as well as a home to wild plants that is popular for picnics and bird watching. Plans are proceeding to build a mosque

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Hot salep drink can be made with milk or water

Susanne Masters



A trader selling hot salep drink is a common sight in cool weather

Susanne Masters

on top of Çamlıca Hill that will have the world's highest minarets and be visible from the entire city. This means that another of Istanbul's remaining green spaces may not persist for much longer.

Urbanization, intensification of agriculture and other accoutrements of economic development threaten Turkey's wildlife. Conservation of

orchids in Turkey needs funding, capacity building, legislative protection and the foundation of more comprehensive knowledge on current species distribution, to ensure orchids can be enjoyed by future generations. ■

SUSANNE MASTERS is conducting PhD research on salep and orchids in Turkey

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