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Hosts and Geographic Distribution of *Arceuthobium oxycedri*

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Abstract

Data on hosts and geographic distribution of the juniper dwarf mistletoe, *Arceuthobium oxycedri*, are updated in light of changes in host nomenclature, political geography, and interpretation of reports and labels. Seventeen species of *Juniperus*, 3 *Chamaecyparis*, 5 *Cupressus*, and 1 *Platycladus* are reported as hosts. Infestations on several juniper hosts and all of its non-juniper hosts have resulted from introductions to areas within the natural range of the mistletoe. This dwarf mistletoe is reported from 31 countries across northern Africa, western Europe, the Balkans, Russia and other former Soviet Republics, the Near East, the Indian subcontinent, and western China. Previous reports from Bhutan and Hungary are corrected, and a report from Afghanistan is considered questionable. Located collection sites are shown on 13 regional and country maps. Juniper dwarf mistletoe is or is potentially an important disease agent in arid forests of numerous countries. Information on its hosts and distribution can help to make good decisions for maintaining forest health and productivity.

References

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Brian W. Geils is Research Plant Pathologist with the Rocky Mountain Research Station in Flagstaff, AZ. He attended Utah State University and University of Idaho, and he has a Ph.D. in botany and plant pathology from Colorado State University. He has published on the biology and management of various mistletoes, edited a monograph on the dwarf mistletoes, and curates the Forest Pathology Herbarium at Fort Collins (FPF-FC). Current assignments include describing the epidemiology and ecology of mistletoes and improving methods for assessing their effects.

Robert P. Adams is the Director of the Pacific Center for Molecular Biodiversity, Bishop Museum in Honolulu, HI. He attended the University of Texas at Austin (B.A., math; Ph. D., botany/biochemistry). He has been studying systematics and evolution of *Juniperus* for the past 36 years and is preparing a monograph of the genus. He is currently working on terpenes and DNA fingerprinting and DNA sequencing for *Juniperus*, *Cupressus*, and other Cupressaceae genera.

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Hosts and Geographic Distribution of *Arceuthobium oxycedri*

Introduction

Trees and woody shrubs of the genus *Juniperus* form pure or nearly pure forests over extensive areas of northern Africa, Mediterranean Europe, the Near East, central Asia, the Indian subcontinent, and western China. They typically occur in arid regions where growth is slow. The future health and existence of many juniper forests is threatened by excessive human use, grazing by domestic livestock, insects, and diseases.

One of the major disease agents of Old World junipers and other Cupressaceae is the juniper dwarf mistletoe, *Arceuthobium oxycedri* (DC.) M. Bieb. (Figure 1). *Arceuthobium oxycedri* is the type species of the genus and one of three Old World dwarf mistletoes that parasitize *Juniperus* spp. and other Cupressaceae (Hawksworth and Wiens 1976, 1996). *Arceuthobium oxycedri* also has the most extensive geographic distribution of the 42 recognized species of *Arceuthobium.* Its range extends over 100º of longitude or about 10,000 km from Spain and Morocco to western China.

In their updated monograph on *Arceuthobium*, Hawksworth and Wiens (1996) describe their frustrations in summarizing available records for the hosts and distribution of *A. oxycedri.* The labels on many early collections are scarcely legible and in unfamiliar languages. The political geography of Europe, northern Africa, the Near East and central Asia has changed significantly, resulting in changes in national borders and place names, since *A. oxycedri* was first described in 1819.

Therefore, many collection sites are difficult, if not impossible, to locate on present day maps. In addition, new information on relationships in *Juniperus* has led to taxonomic revisions. Consequently, the Hawksworth and Wiens (1996) summary of this important Old World mistletoe is much outdated.

We review here information on the hosts and geographic distribution of *A. oxycedri* based on literature, collections, and new species definitions for the junipers. Hosts and geographic information are organized by region:

We plan to update this information periodically and welcome additional information from colleagues knowledgeable of the distribution and hosts of *Arceuthobium oxycedri* for inclusion in future versions of this paper.

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Methods

We obtained and reviewed host reports and distribution information for *Arceuthobium oxycedri* using the Mistletoe Literature Database (online), original publications, and collections from several herbaria:

Index Herbariorum*	**Institution**
BIEL	University of Bielefeld
BREM	Ðbersee Museum, Bremen
FPF	Forest Pathology Herbarium-Fort Collins
FR	University of Frankfurt
GOET	Herbarium Goettingen
HAL	Martin Luther University, Halle-Wittenberg
HBG	Herbarium Hamburg
HCW	Herbarium Marburg
IPK-GAT	Institut für Pflanzengenetic und Kulturepflanzenforschung, Gatersleben
K	Royal Botanical Gardens at Kew
M	University of Munich
* see http://www.nybg.org/bsci/ih/	

In addition, the records of a small herbarium maintained by the Forest Department, Turkish Cyprus at the Alevkaya Forest Station were examined.

We adapted a species definition for *Juniperus* based on published taxonomy (Rushforth 1987; Welch and Haddow 1993; Farjon 1998) and the present work of one of us (Adams) using leaf essential oils and RAPDs (Adams 1999, 2000; Adams and Demeke 1993; Adams and Turuspeckov 1998). We attempted to identify each distribution report or collection record on current or historical maps (e.g., Guldescu 1970) to establish precise geographic location, modern spelling, and type (i.e., political unit, human settlement, or physiographic feature). Identified locations are presented in tables and maps; dubious reports and unidentified locations (*in italics*) are presented in the text.

Many references (e.g., Turrill 1920) review or repeat information from other references, collections or original reports. Although we examined as many references as we could obtain, we did not intend to generate an all-inclusive list of citations or collections. Rather, we strived to construct a comprehensive distribution-one in which all countries and regions where juniper dwarf mistletoe could be found are represented and significant populations are mapped. We present the numerous, unidentified sites we report as a challenge for others to locate. The extensive and discontinuous juniper forest from Morocco to China is a vast region where others might discover additional populations of this parasite.

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Results

Hundreds of papers have been published on the hosts and distribution of *Arceuthobium oxycedri* (Mistletoe Literature Database) and many date to the 1800s (for example, Duthie 1885; Boissier 1879; Loret 1895). A few summaries have attempted to provide a global perspective of its hosts and distribution (Rios Insua 1987; Hawksworth and Wiens 1976, 1996; Ciesla 1997). Distribution maps have been published for Spain (Bolòs and Vigo 1990; Castillo 1993), France (Girerd 1978), Mediterranean Europe (Markgraf 1934; Jalas and Souminen 1976), Montenegro (Mijuskovic 1973), Pakistan (Zakaullah 1977; Zakaullah and Badshah 1977; Ciesla and others 1998), and China (Kiu and Ren 1982; Mo-Mei Chen 1985). Hawksworth and Wiens (1996) incorrectly state the map of Bakshi and Puri (1971) illustrates the distribution of *A. oxycedri*; the map describes *A. minutissimum*.

Hosts

Arceuthobium oxycedri infects trees and shrubs of the family Cupressaceae. Its hosts are various species of *Juniperus*, *Chamaecyparis*, *Cupressus*, and *Platycladus*. *Juniperus* consists of approximately 60 recognized species distributed across the northern hemisphere in North America, Bermuda and the West Indies, the Azores, the Canary Islands, Europe, northern and eastern Africa, the Near East, and Asia (Farjon 1998). The *Juniperus* spp. of North America and Europe are relatively well understood taxonomically; however, species indigenous to the republics of the former Soviet Union, the Near East, and Asia are not as well understood. Many host reports for *A. oxycedri* either simply refer to "*Juniperus* spp." or cite obsolete, invalid names and synonyms. For example, juniper hosts in India and Pakistan are reported as *J. excelsa* (Duthie 1885), *J. polycarpos* (Beg 1973; Bhattacharyya and Uniyal 1982), *J. macropoda* (Bor 1953; Zakaulla and Badshah 1977), and *J. excelsa* var. *polycarpos* (Stewart 1972). Similar confusing records exist for several republics of the former Soviet Union.

According to the currently accepted taxonomy for the genus *Juniperus* (Adams 1999; Farjon 1998; Rushforth 1987; Welch and Haddow 1993), 17 *Juniperus* taxa are recorded as hosts of *Arceuthobium oxycedri* (Table 1). In addition, two taxa of *Chamaecyparis*, five *Cupressus*, and one *Platycladus* are known hosts of *A. oxycedri* (Table 2). All non-*Juniperus* hosts of *A. oxycedri* are exotic to the natural range of this parasite and result from natural infection (Spaulding 1956), artificial inoculation (Heinricher 1930), or grafting (Beer 1951). We found no records of occurrence of *A. oxycedri* on *Cupressus sempervirens*, the single member of the genus *Cupressus* native to the eastern Mediterranean region and widely planted as an ornamental in Italy, southern France, and other areas within its range.

Northern Africa: Algeria and Morocco; Tunisia

Western Europe: Portugal; Spain; France; Italy

Balkans: Former Yugoslav Republics; Macedonia; Albania; Bulgaria; Greece

Russia and Other Former Soviet Republics: Ukraine; Russia; Caucasus -- Armenia, Azerbaijan, and Georgia; Central Asia -- Turkmenistan, Uzbekistan, Kyrgystan, and Tajikistan

Near East: Cyprus; Turkey; Lebanon and Syria; Iraq; Iran

Indian Subcontinent and Western China: Afghanistan; Pakistan; India; China

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Results: **Northern Africa**

Algeria and Morocco

Arceuthobium oxycedri is reported from the northern mountain regions of Morocco and Algeria on *Juniperus oxycedrus* L. and *J. phoenicea* L. (Hawksworth and Wiens 1996; Maire 1961; Turrill 1920) from a number of locations (Table 1, Table 3, Map 1). Reported collection sites that could not be located on maps include for Morocco--*Gada* and *Gor Boubon* (K) and *Ait Bougoummen* (collection at M) and for Algeria--*Gharrouban* (Turrill 1920 and cited as *Gharroubau* by Hawksworth and Wiens 1996 for a collection at K); *Montagnes du Haut Tell* and *Montes de Bou-Saada* (or *Bou-Sarda*) (Maire 1961); *Ain Aissa, Aumale,* and *Tafaroua* (K).

Tunisia

Both *Juniperus phoenicea* and *J. oxycedrus* are indigenous to northern Tunisia (Khaldi and others 2000), but we have been unable to obtain confirmed reports of infection by *Arceuthobium oxycedri* in the country.

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Results: **Western Europe**

Juniper dwarf mistletoe is reported from Portugal, Spain, France, and Italy on *Juniperus communis* L., *J oxycedrus*, *J. phoenicea*, *J. thurifera*, and *Cupressus arizonica* (Brilli-Cattarini and Gubellini 1983; Castillo 1993; Catalan 1997; Girerd 1978; Rios Insua 1987) (Table 1). Hess and others (1976) records *Arceuthobium oxycedri* beyond its natural range in Switzerland; Beer (1951) and Heinricher (1930) report successful infection of the exotic hosts *Chamaecyparis thyoides* (L.) B.S.P. and *Platycladus orientalis* L. (Table 2).

Portugal

A single specimen resides at FPF labeled as *Arceuthobium oxycedri* from Portugal. Unfortunately, this specimen is in poor condition and unidentifiable. The label only indicates the date as 1917 and host as *Juniperus oxycedrus.* Turrill (1926) indicates that juniper mistletoe is "said to occur in Portugal but no trustworthy records have been traced."

In 2001, *Arceuthobium oxycedri* was collected from *Juniperus communis* near the village of Vila-Nova de Paiva in the Serra do Montemouro in the Beira-Alta Region of northern Portugal (Table 4, Map 2). This collection represents the first confirmed report of A. oxycedri from Portugal (Lopez Saez, personal communication). Other reports of an *Arceuthobium* from Portugal all refer to *A. azoricum* (formerly submerged under *A. oxycedri*) from the Portuguese territory of the Azores (Hawksworth and Wiens 1976, 1996).

Spain

Arceuthobium oxycedri is widespread across Spain with numerous reported collection sites (Bolòs and Vigo 1990; Castillo 1993; Hawksworth and Wiens 1996; Rios Insua 1987; Turrill 1920) (Table 4, Map 2). Catalan (1997) reports the parasite to be present in 19 provinces of Spain and doubtful in the province of Badajoz. Of particular interest is a cluster of sites in central Spain northwest of Madrid (Map 3). Rios Insua (1987) presents a good summary of information on *A. oxycedri* and suggests the mistletoe is common in Spain because of favorable environmental conditions and aggressiveness on ornamental *Cupressus arizonica* E. Greene. Reported sites we were unable to locate include: *Pallars Jussà*, *Ports de Beseit*, and *l'Alcalatèn* (Bolòs and Vigo 1990); *Pantano del Burgillo*, *Pinar del Valle de Iruelas*, *Cortijo del Robledal*, *Puebla de Beleña a Tamajón*, *Fueba*, *Sierra de Balces*, *Barranco de Andrebot*, *"Barnadès, Valpregona"*, *Santa Maria del la Alameda*, *Zarzalejo*, *Las Machotas*, *Celigueta*, *Larequi*, *Burgui*, and *Fuente de la Canalenta* (Castillo 1993).

Land use changes, resulting in a disappearance of junipers from the vicinity of Sanlucar de Barameda, (Cadiz Province) have eliminated the obligate host for *A. oxycedri* since its report from this location (Catalan 1997, Robredo 1999).

Hosts reported from Spain include *Juniperus communis*, *J. oxycedrus*, *J. phoenicea*, *J. sabina* (rare), *J. thurifera* (rare), and *Cupressus arizonica* (Bolos and Vigo 1990; Catalan 1997; Castillo 1993; Hawksworth and Wiens 1996; Rios Insua 1987).

France

Several reports of *Arceuthobium oxycedri* from southern France in the Departments of Alpes-de-Haute Provence, Bouches-du-Rhone, Var, and Vaucluse (Girerd 1978; Hawksworth and Wiens 1996; Rouy and Foucaud 1910; Turrill 1920,) have been published (Table 5, Map 4). In addition, several papers (e.g., Rouy and Foucaud 1910; Fiori 1923-29) refer to the occurrence of *A. oxycedri* at an undetermined location on the island of Corsica. Brilli-Cattarini and Gubellini (1983) and Pignatti (1982) also mention the occurrence of *A. oxycedri* on Corsica but regard the report as questionable. Hawksworth and Wiens (1996), however, report collections of *A. oxycedri* from *Juniperus communis* from an undetermined location on Corsica residing in the Botanisches Museum Dahlem, Berlin, Germany (B) and the California Academy of Sciences in San Francisco, California, USA (CAS). A collection from Corsica also reportedly resides at the herbarium of the University of Munich (M).

Mandin (2003), reports the discovery of *Arceuthobium oxycedri* in two locations in the Department of Ardéche in the National Park des Cévennes. This location is considerably north and west of the main body of known sites for this parasite in France. Mandin (2003) also lists the location of all sites in France where *A. oxycedri* is known to occur including the Departments of Alpes-de-Haute Provence, Ardéche, Bouches-du-Rhone, Var and Vaucluse. He also cites two locations in the Department of Pyrénées-Orientales, on the north slope of the Pyrenees Mountains but states these locations are doubtful because they are based on an 1864 record (Companyo 1864) and *Arceuthobium oxycedri* has not been reported from this Department in recent years. Moreover, Mandin (2003) regards the occurrence of *A. oxycedri* on the island of Corsica as questionable because the plant has not been observed there during the past century.

Italy

Brilli-Catarini and Gubelini (1983) report the occurrence of *Arceuthobium oxycedri* from a cluster of sites along the border between Tuscany and the Marches known as the Massa Trabaria (or Trabaria Massif). Elevations of the collection sites range between 575 and 1,000 meters. Host are *Juniperus communis* and *J. oxycedrus*. This area was revisited by one of the authors of this paper (W.M. Ciesla) in March and April 2001. *Arceuthobium oxycedri* was collected at four sites, two previously unreported locations and two new sites (Table 6, Map 5). This is the only known location of this parasite between the Istrian Peninsula (Slovenia and Croatia) and Corsica (France).

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Hosts and Geographic Distribution of *Arceuthobium oxycedri*

Results: **Balkans**
Note: actual spelling available for linked words.

Countries in the Balkan Peninsula for which confirmed reports of *Arceuthobium oxycedri* exist include: the former Yugoslav Republics of Slovenia, Croatia, Bosnia-Herzegovina, and Yugoslavia (Serbia, Kosovo and Montenegro), as well as Macedonia, Albania, Bulgaria, and Greece. Mapping collection sites in this region is particularly challenging because of the region's turbulent history. Political boundaries and place names have changed repeatedly. In the past century, portions of the Balkan Peninsula have been under Austro-Hungarian, Italian, and Turkish influences; areas have been incorporated into Yugoslavia and then gained independence (Stanley 1989). References to "Macedonia" (e.g., Hayck 1924) may refer to either the country or the Greek province.

Former Yugoslav Republics

Arceuthobium oxycedri is reported from the present day Balkan states of Slovenia, Croatia, Bosnia-Herzegovina, and Yugoslavia on *Juniperus communis*, *J. drupacea* Labillard, and *J. oxycedrus* (Bondev and Lybenova 1984; Boissier 1879; Hawksworth and Wiens 1996) (Table 1). Spaulding (1956) reports *Chamaecyparis thyoides*, an exotic planted in Croatia, is also infected (Table 2).

Turrill (1920, 1926) and Hawksworth and Wiens (1996) report *Arceuthobium oxycedri* from sites in present day Slovenia and Croatia (including Istria and Dalmatia, Table 7 and Map 6). The locations *Lika-Krbava* and *Valle Senjska* reported by Hawksworth and Wiens (1996) in Hungary are probably the same as *Lika Krbava* above *Zengg* reported earlier by Turrill (1926) and now known as Senj. Several references are made to a site between Buccariza and Porto Ree, (or Porto Ré) (Turrill 1920, 1926; HAL; HBG) and near Fiume and Porto Ree (HAL). Buccariza is presently known as Bakarac and Fiume is the present day city of Rijeka. Porto Ree is presently known as Kraljevica (Steinhof 2001). Reported Slovenian or Croatian collection sites we were unable to locate include: *Carcauzze* (Turrill 1920, 1926; Hawksworth and Wiens 1996); *Vanderinga* Valley and *Borutto* (Turrill 1920, 1926); *Lensia* and "near *Trebocconi* and *Klujuc*" (Turrill 1926); and *Abazia* and *Padena-Kastel* (M).

Occurrence of juniper dwarf mistletoe in Bosnia-Herzegovina (Table 7; Map 6) is reported by Turrill (1920, 1926) and by Hawksworth and Wiens (1996). Turrill (1920) cites a report for Stol, Serbia which we believe to be the community of Stolac in the southern part of present day Bosnia-Herzegovina. Turrill (1926) lists Magliç as a site in Serbia; this is probably Magliç in Bosnia-Herzegovina. Locations not found include: *Tasovcic*, *Zitomislic*, *Dubrava* Forest, *Citluk*, *Krucevic* on the Narenta River (present day Neretva River), and *Neum* (Turrill 1926); and *Urncenci* in *Valle Narontis* (Hawksworth and Wiens 1996).

Collections and reports from Yugoslavia (Serbia, Kosovo, and Montenegro) are presented in Table 7 and Map 6 (Hawksworth and Wiens 1996; Josifovic 1973; Mijuskovic 1973; Turrill 1920, 1926). Sites reported by Turrill (1926) not located are: Serbia -- *Demeronji*, *Zimovinku*, and *Borju*; Montenegro -- *Gomsice*. Hawksworth and Wiens (1996) identify a site for Yugoslavia in German as "*Tajashihe oberhalt Autostrasse bei Tadronova*."

Macedonia

Hayck (1924), Turrill (1920, 1926), and Hawksworth and Wiens (1996) identify the mistletoe as occurring in Macedonia (Table 7; Map 6); but which Macedonia is unclear. Although Turrill (1920, 1926) distinguishes between a north Macedonia and south Macedonia, we located several sites from his "north Macedonia" in Greece. Hawksworth and Wiens (1996) describe a site three miles north of Ochoida which refers to either the city, Ohrid, or the lake, Ohridsko Jezero. We were unable to locate a site described as *Wodno* from HBG.

Albania

Arceuthobium oxycedri collection sites in Albania that could be located on maps are summarized in Table 8 and Map 6 (Hawksworth and Wiens 1996; Turrill 1920, 1926). One site is variously cited as in District *Janina*, between *Paleochori* and *Syrareon* by Turrill (1920) and as *Jamina* District, between *Paleschori* and *Sryanoni* by Hawksworth and Wiens (1996). Other locations not found include: District *Hoti* and

Bukovik (Turrill 1920); and *Loussou* (Hawksworth and Wiens 1996).

Bulgaria

The occurrence of *Arceuthobium oxycedri* in Bulgaria is reported from several sources (Bondev and Lyubenova 1984; Hawksworth and Wiens 1996; Turrill 1920, 1926; HAL; HBG; M) (Table 9). These reports are almost exclusively from southern and western Bulgaria including a number of records from the Rhodope Mountains, a range that spans the frontiers of Bulgaria, Macedonia (Map 6), and Greece (Map 7). Collection sites that could not be located on country maps include: above *Stanimaka* (Turrill 1920), a site that he later places in the Rhodope Mountains (as Rodope massif) (Turrill 1926). He also reports a site south of *Daridere* that could not be located. Other Bulgarian collection sites not located are: *Simorovo* and *Delbocko* (Bondev and Lyubenova 1984); *Karlik Dagh* in the Rhodope Mts. (Hawksworth and Wiens 1996); *Canopo* (HBG); and *Chovjna* in the Rhodope Mountains (HAL).

Greece

Arceuthobium oxycedri is reported from many locations in Greece including the Provinces of Attica, Epirus (Ipiros), Macedonia (Makedonia), Peleponnese (Peloponissos), Thrace (Thraki), and Thessaly (Thessalia) by Boissier (1879), Hawksworth and Wiens (1996), and Turrill (1920, 1926). The located sites are identified in Table 10 and Map 7. Reported sites we were unable to locate on country maps are: *Klinovo*, *Sermeniko* in Pindus, and *Mt. Xerolivadon* (Turrill 1920, 1926); and *Tonsenitza* (Hawksworth and Wiens 1996). Turrill (1926) lists *Phthiotidis*, *Nidze Planinai*, slope of *Bermic* Ridge, south of *Vodena*, *Belasitsa Planina* in South Macedonia and *Tekir Dagh*, *Canakca*, *Kalfa-Keoi*, near *Domouzdere*, *Bodoma*, and *Dervant* in Thrace. Most of these last names appear to be Turkish and may refer to sites actually in Turkey. Miller (1982) identifies Domouzdere as a collection site in the Istanbul region.

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Results: **Russia and Other Former Soviet Republics**

As in the Balkans, the regions of Crimea (Ukraine), the Caucasus (Armenia, Azerbaijan, Georgia, and Russia), and Turkestan (present day Central Asian republics of Kyrgystan, Tajikistan, Turkmenistan, and Uzbekistan) have experienced significant political re-organization with the dissolution of first the Russian and Turkish empires and recently the Soviet Union. Moreover, translations of place names from the original Cyrillic alphabet into English often appear under different spellings on maps published in western European languages.

Arceuthobium oxycedri has long been known from numerous hosts in Crimea, the Caucasus, and Turkestan. Reported native and exotic hosts (Table 1 and Table 2) are *Juniperus excelsa* Bieb., *J. oblonga* Knight & Perry, *J. oxycedrus*, *J. pseudosabina* Fisher & Meyer, *J. sabina* L., *J. semiglobosa* Regel, *J. thurifera* L., *J. polycarpos*, *J. virginiana* L., *Chamaecyparis funebris* Endlicher, *Cupressus arizonica*, *C. lusitanica* Mill., *C. lusitanica* var. *benthamii*, *C. macnabiana* A. Murry, *C. macrocarpa* Gordon, and *Platycladus orientalis* (Botschantev 1953; Fataliev 1987; Hawksworth and Wiens 1996; Isikov 1986; Isikov and Zaharenko 1988; Lazarev and Grigorov 1980; Ovchinnikov 1968; Zefirov 1955).

Ukraine

Significant populations of juniper mistletoe occur in the mountains of Crimea (Table 11, Map 8) on *Juniperus oxycedrus* and on relict populations of *J. excelsa* (Lazarev and Grigorov 1980). Hawksworth and Wiens (1996) report collections from Taura. This name apparently refers to the Taurians, the name of a civilization that occupied Crimea 3000 years ago and is an old name for part of the Crimean Peninsula. Other reports cite the region as Jaltensis, Yalta, and Sudak. Lazarev and Grigorov (1980) identify specific locations at the *Batlliman* Natural Preserve, Cape *Martyan* area, *Livadij* (perhaps same as *Lyasni* reported by Voronihin 1908), and *Yaltinsk* Mountain Forest Reserve (elevation 400500 m). Turrill (1920) adds *Mt. Pertsch* as a collection site. Interest and attention over the juniper mistletoe continues in this region due to recent work by Isikov (1986) and Iskov and Zakhareno (1988).

Russia

Collection sites for *A. oxycedri* in Russia are confined to a narrow strip of land between the Black Sea and the Caucuses Mountains and include Tamanskij Bay, Anapa, Novorriysk, Marykh Pass, North Ossetia, and Avarsky Koisu (Dagestan) (Kaupush and Tavasiev 1979; Voronihin 1908) (Table 11, Map 8).

Caucasus--Armenia, Azerbaijan, and Georgia

There are reports of *Arceuthobium oxycedri* from the Caucasus region by Kaupush and Tavasiev (1979) and Voronihin (1908), from Armenia by Hawksworth and Wiens (1996) and Takhtadijan (1973), from Azerbaijan by Fataliev (1987), and from Georgia by Turrill (1920) (Table 11, Map 8 and Map 9).

Takhtadijan (1973) describes the distribution of plants in Armenia by 12 floristic provinces and reports the occurrence of *Arceuthobium oxycedri* in low to medium elevation zones in three of these provinces: Idjevan in northeastern Armenia, Erevan in the southwest, and Zangezur in the south (Map 9). Reported hosts are *J. oblonga* and *J. sabina*. Other reported collection sites from Armenia are *Ritzagadsch* (Turrill 1920) and "*Rossiea Siedlitz Riltzagash*" (Hawksworth and Wiens 1996). *Rossiea* may be a reference to Russia; *Siedlitz* may be the name of botanist who made this collection. The site *Alliper Dagh* given by Hawksworth and Wiens (1996) could be a reference to Alidag, a 3135 m mountain south of Kars and north of the Aras River in what is today eastern Turkey (Map 8).

The collection site Elizavetpolskii Creek reported by Voronihin (1908) is near the community known presently as Ganca in northern Azerbaijan (Map 8). This community was originally known as Ganja; it was renamed Elizavetpol by the Russians and later called Kirovabad. Today it appears on maps under various alternative spellings including Gonja, Gyanja, and Gäncä (Allen and Muratoff 1953).

Central Asia--Turkmenistan, Uzbekistan, Kyrgystan, and Tajikistan

Portions of the central Asian countries are located in the western Himalayas and contain extensive juniper forests (Figure 2). *Arceuthobium oxycedri* collection sites are reported by Botschantev (1953); Hawksworth and Wiens (1996), Ovchinnikov (1968), and Voronihin (1908) (Table 11, Map 10). Locations not found include: *Burogan* River, *Kusavli Sai*, and *Mausarif* (Ovchinnikov 1968); and *Mossarif* (Voronihin 1908). The latter two collections may refer to Mazar-I-Sharif, a large city in northern Afghanistan (Map 11) near the border of Uzbekistan.

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Results: **Near East**
Note: actual spelling available for linked words.

Arceuthobium oxycedri is reported from the Near East countries of Turkey (Table 12), Syria, Lebanon, Iraq, and Iran (Table 13). Host species include *Juniperus drupacea, J. excelsa, J. foetidissima, J. oxycedrus,* and *J. sabina* (Hawksworth and Wiens 1996; Miller 1982; Mouterde 1966; Parsa 1947; Townsend 1980) (Table 1).

Cyprus

Four species of juniper, *Juniperus excelsa, J. foetidissima, J. oxycedrus,* and *J. phoenicea,* and one cypress, *Cupressus sempervirens,* are known to occur on the eastern Mediterranean island of Cyprus (Sfikas 1998). Discussions with representatives of the Forest Departments of both Greek and Turkish Cyprus and examination of records in the herbarium of the Turkish Cypriot Alevkaya Forest Station by one of the authors (W.M. Ciesla) indicate that there are no records of the occurrence of *Arceuthobium oxycedri* from Cyprus. Moreover, casual observations of extensive forests of *Juniperus phoenicea* on the Karpas Peninsula and of *J. foetidissima* near the summit of Mt. Olympus in the Trodos Massif failed to reveal the presence of *A. oxycedri.*

Turkey

Arceuthobium oxycedri is widespread in Turkey (Boissier 1879; Hawksworth and Wiens 1996; Miller 1982; Turrill 1920). Sites located on maps are summarized in Table 12 and Map 8.

Some confusion arises because many old collections identify locations in "Turkey" meaning the Ottoman Empire, which included portions of the Balkans, Caucasus, and Near East. For example, reference to a 1911 collection from "Insula Thasos" listed under Turkey by Hawksworth and Wiens (1996) undoubtedly refers to the Greek island of Thasos (see section on Greece). Hawksworth and Wiens (1996) also misplace a number of sites within Turkey: Artvin and Cortuh Gorge are in Çoruh region not near Constantinople; Batman (for Bittyma) is in Bitlis region not the Bolu region; Antalya (for Antlya or Anatolia) is not clearly identified as the region where "Gombe, Sutlegen, and Yayla Cavda" are located. The name "Ak Dag" occurs often on Turkish maps and means "white mountain." At least two sites designated by this name are collection sites for *A. oxycedri.* Hawksworth and Wiens (1996) cite the Ak Dagliar mountains of the Antalya region. Miller (1982) and Turrrill (1920) list a site that may be either a village or mountain in the Amaysa region. Collection sites listed by Hawksworth and Wiens (1996) that could not be found are *Bei* at *Krucevic* (possibly the same site reported by Turrill 1926 and HBG as "*Krucevic* on the Narenta [or Neretva] River in Bosnia-Herzegovina) and District *Czebiz, Bostran Cuckur*. Collection sites given by Miller (1982) that could not be located include: *Mermerköy*, (Tekirdag region), *Domusdere* or *Belgrad* Forest (Istanbul region), and *Dokhana*. Miller's (1982) listing of *Mermerköy* could be in reference to Dermerköy, a city in European Turkey, south of the Bulgarian frontier.

Lebanon and Syria

Hawksworth and Wiens (1996) and Mouterde (1966) report *Arceuthobium oxycedri* from Lebanon and Syria (Table 13 and Map 8). Mouterde 1966 lists *Col de Nebi-Younès* and *Col de Freiket* for Syria. Thiebaut (1953) gives *Ansarieh* as a collection site; we believe this to refer to Jebel Ansariya, a mountain range near the Mediterranean Sea between Turkey and Lebanon. Turrill (1920) lists Amanus (present day Turkey), *Akher Dagh* (possibly Turkey), and Lebanon under Syria. Mouterde (1966) reports *A. oxycedri* from several sites in Lebanon on *Juniperus drupacea* and *J. oxycedrus*.

Iraq

Al-Rawi (1964), Hawksworth and Wiens (1996), and Townsend (1980) report *Arceuthobium oxycedri* from the Al'Amadiyah (Amadiyah or Amadia District) of northern of Iraq (Table 13, Map 8). Collection sites not located are the valleys of *Nazarki* and *Sapna* (Townsend 1980).

Iran

Boissier (1879) lists several sites in northern Iran (Persia) where juniper dwarf mistletoe was collected (Table 13, Map 8). Turrill (1920) cites a collection from Oroomah, in the Kurdistan ethnic region of Iran; Hawksworth and Wiens (1996) identify the site Groomah. The present day name of this site is Orumiyeh.

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Results: **Indian Subcontinent and Western China**

Juniper mistletoe is reported from Pakistan, India, and China (Beg 1973; Hawksworth and Wiens 1996; Kiu 1985). There are also two unconfirmed reports for a site believed to be in Afghanistan (Ovchinnikov 1968; Voronihin 1908). Reported hosts are now recognized as *Juniperus convallium* Rehder & E.H. Wilson, *J. tibetica* Komarov, *J. polycarpos*, *J. squamata* Buch.-Ham. ex D. Don, and *J. wallichiana* Hooker f & Thomas ex Parlatore (Table 1). Hawksworth and Wiens (1996) report *Arceuthobium oxycedri* in Bhutan, but we now believe this is an error. While Hawksworth was drafting the monograph, he was also investigating the identity of several purported *A. oxycedri* collections from Bhutan. He eventually determined these to be *A. minutissimum* and *A. sichuanense*.

Afghanistan

Hawksworth and Wiens (1996) suggest that *Arceuthobium oxycedri* probably occurs in Afghanistan but provide no documentation. Ovchinnikov (1968) reports the occurrence of *Arceuthobium oxycedri* from *Mausarif* in Tajikistan; and Voronihin (1908) reports *Mossarif* as a collection site but does not give a country designation. These reports could be in reference to Mazar-I-Sherif, a large city in northern Afghanistan near the border of Uzbekistan (Table 14, Map 11). However, this has not been confirmed. It is also not clear if these collections were made in or near Mazar-I-Sherif or in the hills in Uzbekistan north of the city. Therefore, the presence of *A. oxycedri* in Afghanistan must be considered questionable.

Pakistan

Arceuthobium oxycedri in Pakistan is known from a single location, the 88,000 hectare Ziarat forest in Balochistan Province (Table 14, Figure 3, Map 11, Map 12). Its occurrence was first reported by Beg (1973). As documented by Ciesla (1997) the infected juniper has variously been described as *Juniperus polycarpos*, *J. macropoda*, *J. excelsa*, and *J. excelsa* var. *polycarpos*. Recent DNA analysis (Adams 2001), however, indicate that these junipers should be referred to as *J. polycarpos*. Surveys conducted in 1977 by the Pakistan Forest Institute established that the parasite was confined to relatively small areas in the Chasnak and Sasnamana Valleys of the Ziarat Forest (Zakaullah 1977; Zakaullah and Badshah 1977). A detailed survey conducted in 1997 mapped the distribution to the upper headwaters of the Chasnak, Sasnamana, and adjoining four valleys, an area of 3,500 ha (4% of the Ziarat Forest) at elevations between 1,980 and 3,350 m (Ciesla and others 1998; Map 12). Extensive natural forests, including dry temperate juniper forests are also found in northern Pakistan (Aftab Majeed 2000). *A. oxycedri* has not been reported from northern Pakistan, but it may occur here.

India

Arceuthobium oxycedri is reported only from the northern Indian state of Himachal Pradesh (Bhattacharyya and Uniyal 1982; Bor 1953; Duthie 1885; Hawksworth and Wiens 1996; Rau 1975; Turrill 1920) (Table 14, Map 11). Although the host has been referred under several names (Table 1; Ciesla 1997), if it is the same juniper as found in Pakistan, it should be referred to as *Juniperus polycarpos* (Adams 2001). The dwarf mistletoe occurs along the upper Chenab River and its tributaries the Chandra and Bhaga in the greater Lahul valley. The geography of this small area is complicated by the administrative structure (Lahul and Pangi) and variations in place names. Bhattacharyya and Uniyal (1982) conducted a botanical expedition of the region and describe the extent of the juniper host (as *J. polycarpos*) along opposite sides of the river from above the famous shrine at Triloknath up the valley to the wind-swept ridges above Kylang (about 40 km). They characterize the mistletoe infestation as not widespread but very damaging to infected trees, and they identify a single localized infestation near Thirot at 2600 m. Bor (1953) locates what may have been a second, severe infestation near the larger community of Keylang (as Kyelang). Earlier reports by Duthie (1885), Rau (1975), and Turrill (1920) only locate the mistletoe in the general region of Lahul. Hawksworth and Wiens (1996) cite collections from Kashmir as Lahaul, Sumdo, and Tispa; these likely refer to Lahul, Sissoo, and Thirot.

China

Hawksworth and Wiens (1996), Kiu (1984), Kiu and Ren (1982), and Mo-Mei Chen (1985) report on *Arceuthobium oxycedri* in southwestern China, Xizang Province (Tibet) (Table 14 and Map 11). Kiu (1984) identifies the hosts as *Juniperus wallichiana* and *J. tibetica*; he also indicates that this dwarf mistletoe occurs from 3,000 to 3,500 m. Mo-Mei Chen (1985) reports an additional site near the Bhutan border, 30 km southwest of Lhozhag (Luozha) where 34% of 126 trees were infected. Collection records at GOET give two locations and three hosts: the Yamzho Yumco Pensinsula southwest of Chawa on *J. squamata* and *J. tibetica* and the Yarlung Tsangpo Gorge, east of Sangri on *J. convallium*.

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Discussion

Distribution and Hosts

Unlike most species of *Arceuthobium*, which tend to be relatively host specific (Hawksworth and Wiens 1996), *A. oxycedri* has a wide host range (Table1 and Table 2). The most commonly reported hosts are various *Juniperus* species. Seventeen taxa of *Juniperus* are reported as host plants including several exotic species (e.g., *Juniperus virginiana*, a North American species reported as a host in the Ukraine). These data suggest that virtually any species of *Juniperus* is a potential host of *A. oxycedri.* Other genera of the family Cupressaceae, including species of *Chamaecyparis*, *Cupressus*, and *Platycladus* are also hosts of *A. oxycedri*. It is interesting to note that the other two known *Juniperus* infesting species of *Arceuthobium*, *A. azoricum* of the Azores Islands (Portugal) and *A. juniperi-procerae* of Ethiopia and Kenya, each have only a single reported host (Hawksworth and Wiens 1976, 1996).

Arceuthobium oxycedri is confirmed from 31 countries, including 2 in northern Africa, 4 in Mediterranean Europe, 8 in the Balkan Peninsula, 9 from Russia and other former Soviet Republics, 5 in the Near East, and 3 from the Indian subcontinent and western China (Map 13). One country, Afghanistan, is considered questionable. There is also a possibility of the additional occurrences of this dwarf mistletoe in parts of northern Pakistan and the Himalayan Region of India, Nepal, and Bhutan (Map 13). This dwarf mistletoe is found over a wide elevation range, from near sea level along the Mediterranean and Black Seas to elevations from 575 to 1,000 m in Italy, 700 to 900 m in Iraq, 2,600 m in northern India and 3,000 to 3,500 m in western China. Geographically, there appear to be two broad patterns of regional distribution-dispersed or restricted. It appears to be widely dispersed throughout the range of its host plants in northern Africa, Spain, the Balkans, Turkey and adjacent countries, central Asia, and southwestern China. Its distribution is more restricted in France, Italy, Pakistan, and India. Some differences may arise from the intensity of collecting, but mistletoes commonly exist as isolated populations. Interest in the *A. oxycedri* seems especially keen in Spain, Crimea, and Pakistan. Its broad distribution suggests climate is usually not limiting if a juniper host is present. The range of this dwarf mistletoe appears to generally coincide with its hosts, but the junipers themselves occur in many regions as widely separated populations. Although the ballistic dispersal of dwarf mistletoes assures good local spread, its dioecious habit and rare vectoring by birds makes long distance dispersal very problematic. The distribution of juniper dwarf mistletoe reflects a history of migration with its host and of persistence in some populations and extinction in others.

Management Implications

Juniper forests occur over extensive, regions of northern Africa, Mediterranean Europe, the Near East, central Asia, the Indian subcontinent, and western China. In these arid regions forest growth is slow and regeneration is uncertain. The continued health and even existence of many of these forests is threatened by excessive human use, grazing by domestic livestock, insects, and diseases. One of the major disease agents of Old World junipers and other Cupressaceae is *Arceuthobium oxycedri*. This dwarf mistletoe has the most extensive natural range of any species in this genus, occurring over a large land area from northern Africa and Mediterranean Europe to western China. Since its original description in 1819, national boundaries within its range have changed significantly, new countries have been established and others have disappeared. The names of many communities and physiographic features of the landscape have also changed. Moreover, there have been significant changes in the nomenclature of some of the host plants of this important parasite. Consequently, existing records require updating to reflect today's geo-political boundaries and taxonomic designations. This will enable research scientists and applied biologists concerned with pest management in juniper forests to readily identify locations where this plant is found, its hosts, where established pest management methods have been developed, and where the socio-economic impacts for this parasitic plant have been studied.

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Hosts and Geographic Distribution of *Arceuthobium oxycedri*

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Figure 1 -- *Arceuthobium oxycedri* on *Juniperus polycarpos*, Ziarat Forest, Pakistan (photo by W. Ciesla).

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Figure 2 -- High elevation juniper forest in the Krgyz Atta National Park, Pamir Alay Range, Kyrgystan (photo by W. Ciesla).

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Figure 3 -- *Juniperus polycarpos* forest near Mt. Ararat, Ziarat Forest, Pakistan (photo by W. Ciesla).

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Map 1 -- Distribution of *Arceuthobium oxycedri* in Morocco and Algeria.

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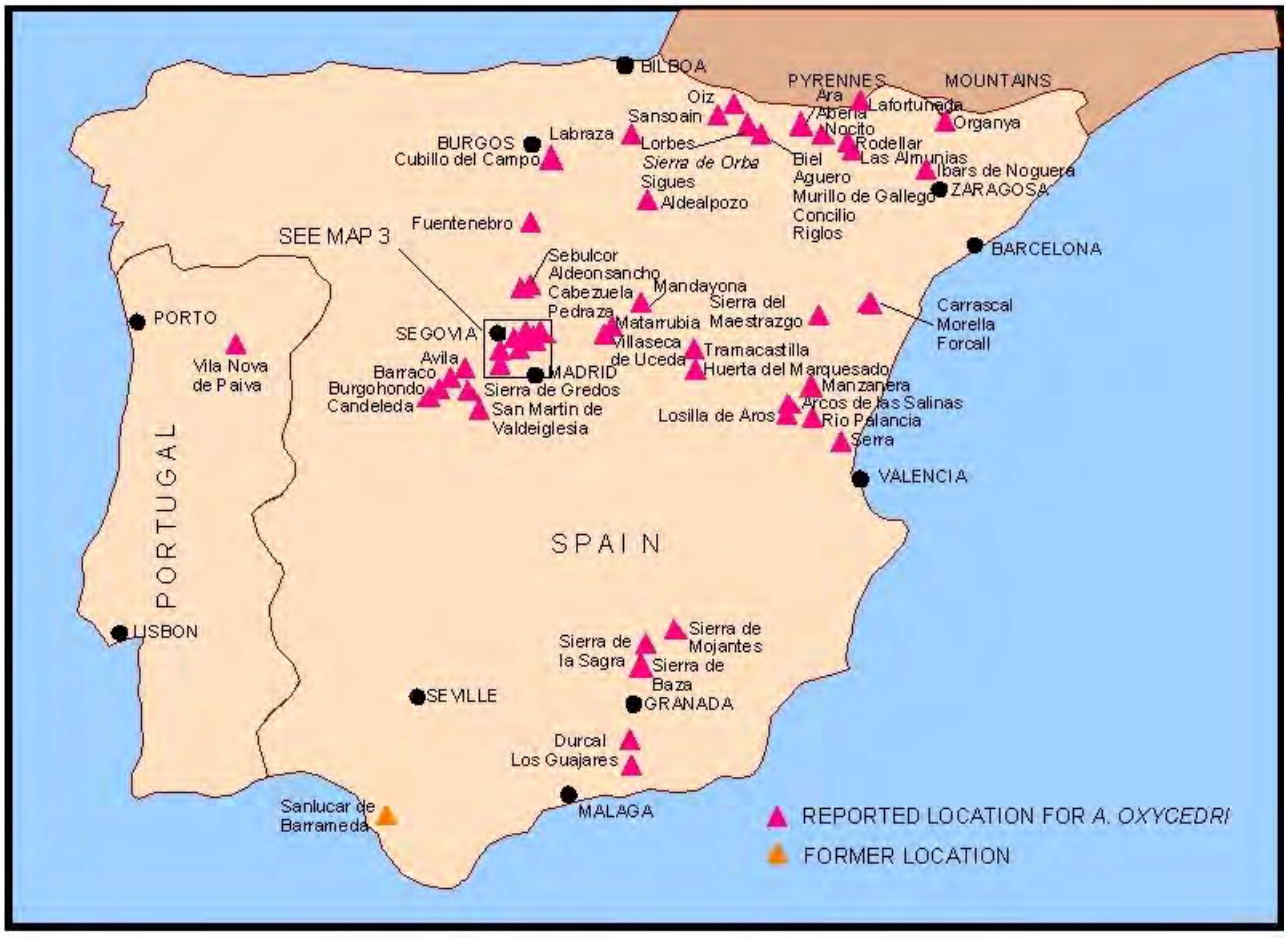
Map 2 -- Distribution of *Arceuthobium oxycedri* in Portugal and Spain (Note: Because of the many collections reported for Spain, not all locations are shown).



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Title: RMRS-RN-11WWW: Map 2
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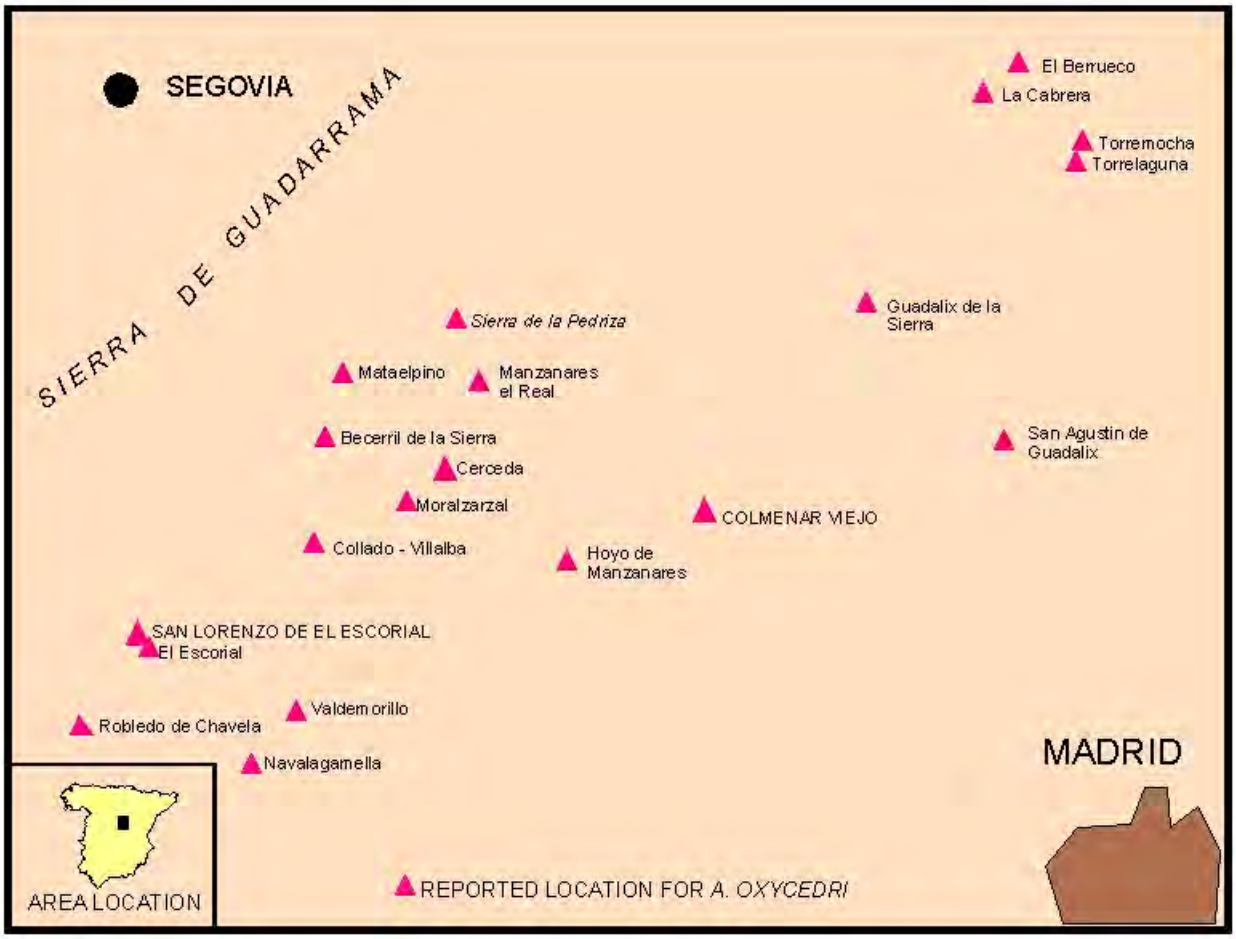
Map 3 -- Distribution of *Arceuthobium oxycedri* northwest of Madrid, Spain.



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Title: RMRS-RN-11WWW: Map 3
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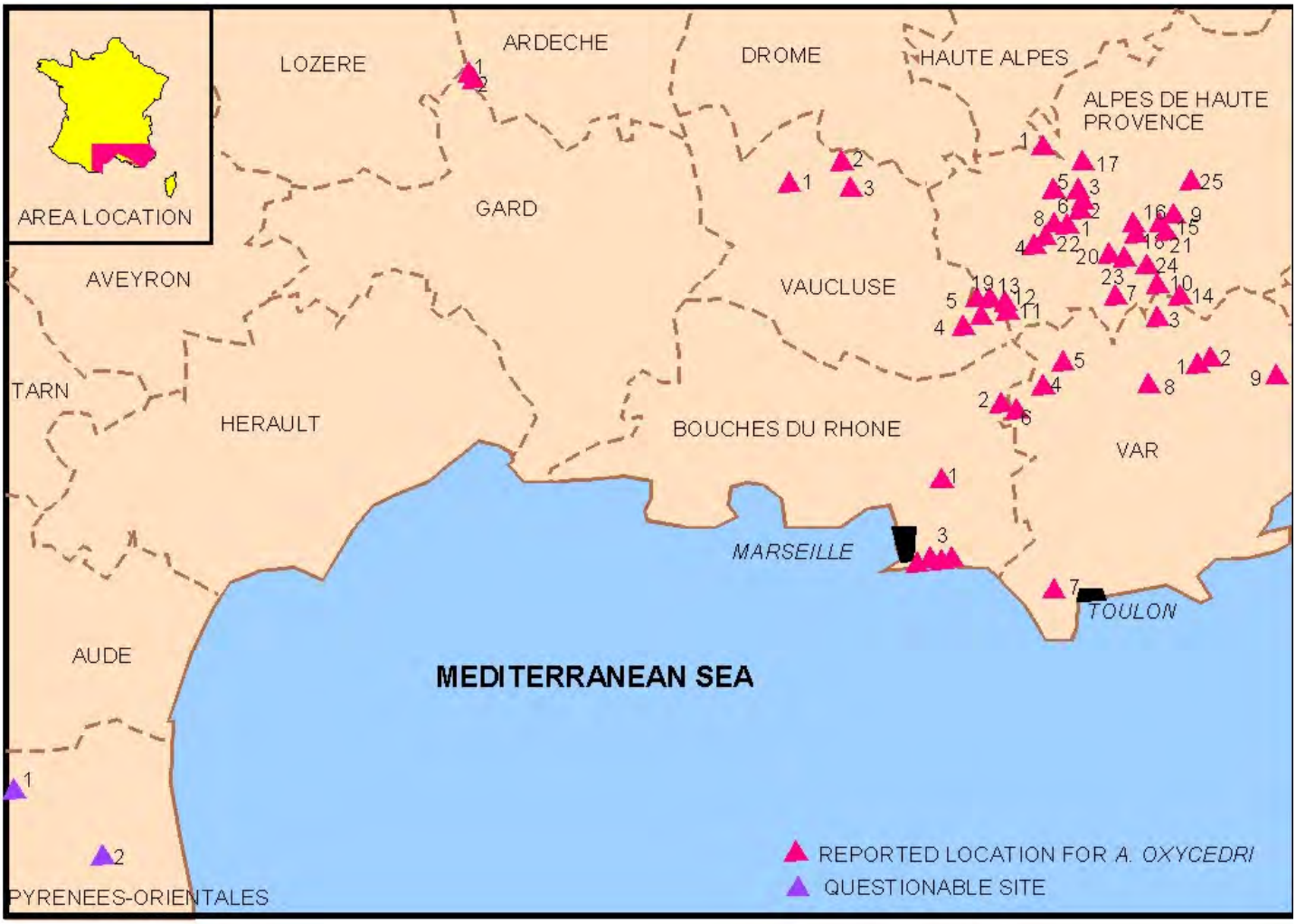
Map 4 -- Distribution of *Arceuthobium oxycedri* in southeastern France. See Table 5 for numbered locations.



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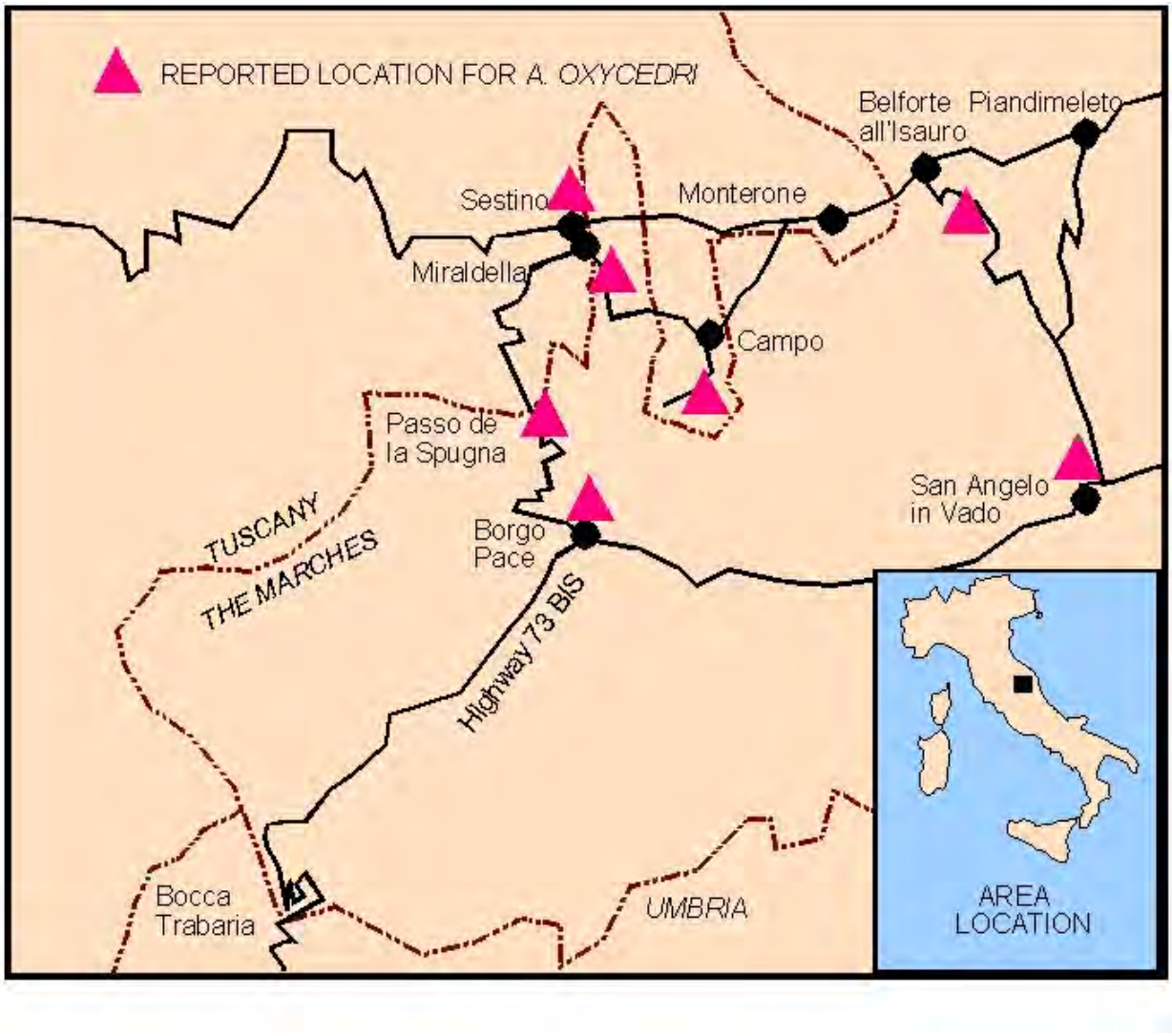
Map 5 -- Distribution of *Arceuthobium oxycedri* in Tuscany and the Marches, Italy.



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Title: RMRS-RN-11WWW: Map 5
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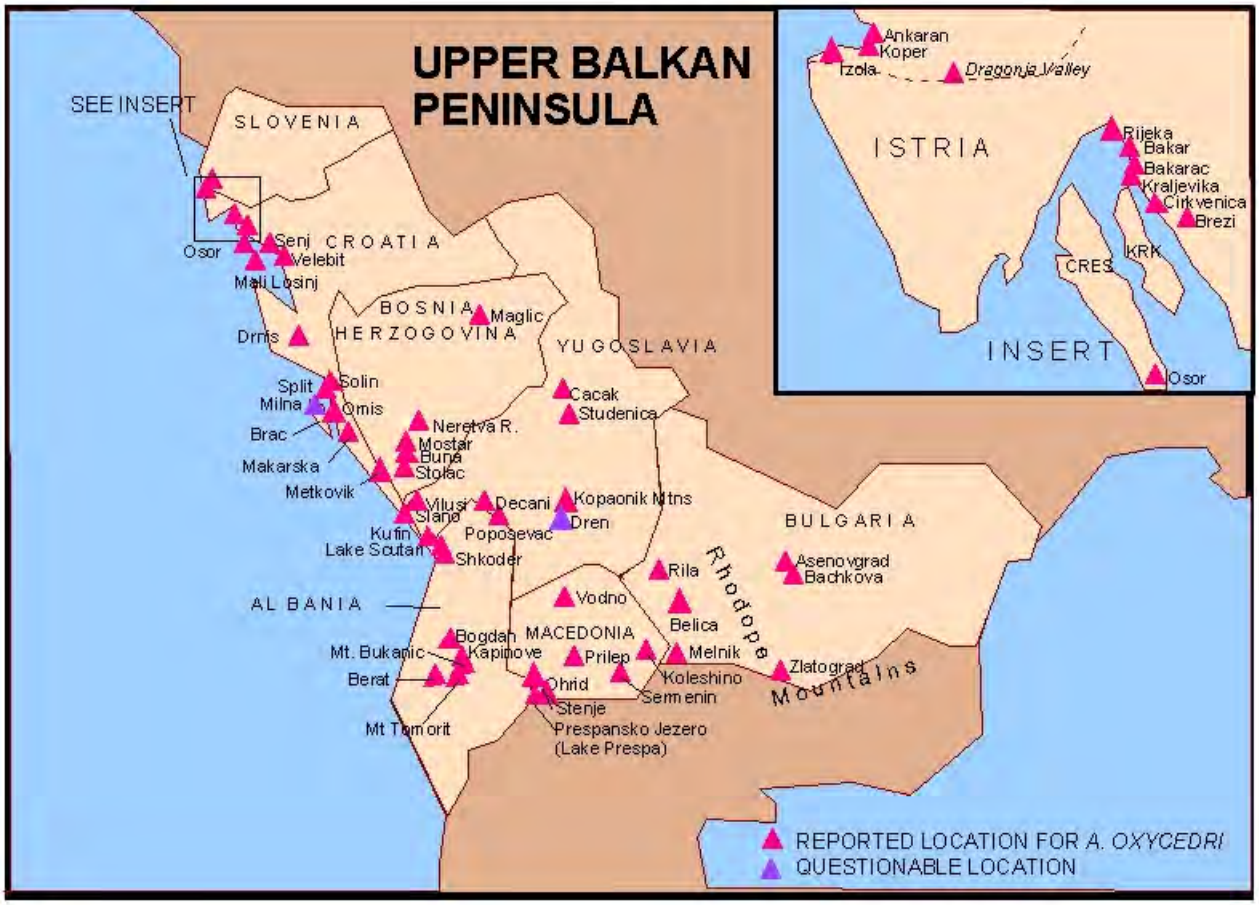
Hosts and Geographic Distribution of *Arceuthobium oxycedri*

Map 6 -- Distribution of *Arceuthobium oxycedri* in Slovenia, Croatia, Bosnia-Herzegovina, Yugoslavia, Macedonia, Albania, and Bulgaria.



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Map 7 -- Distribution of *Arceuthobium oxycedri* in Greece.

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Map 8 -- Distribution of *Arceuthobium oxycedri* in Ukraine, Russia, Georgia, Azerbaijan, Turkey, Syria, Lebanon, Iraq, and Iran.

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Map 9 -- Distribution of *Arceuthobium oxycedri* in Armenia.

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Map 10 -- Distribution of *Arceuthobium oxycedri* in Central Asia (adapted from Takhadjian 1973).

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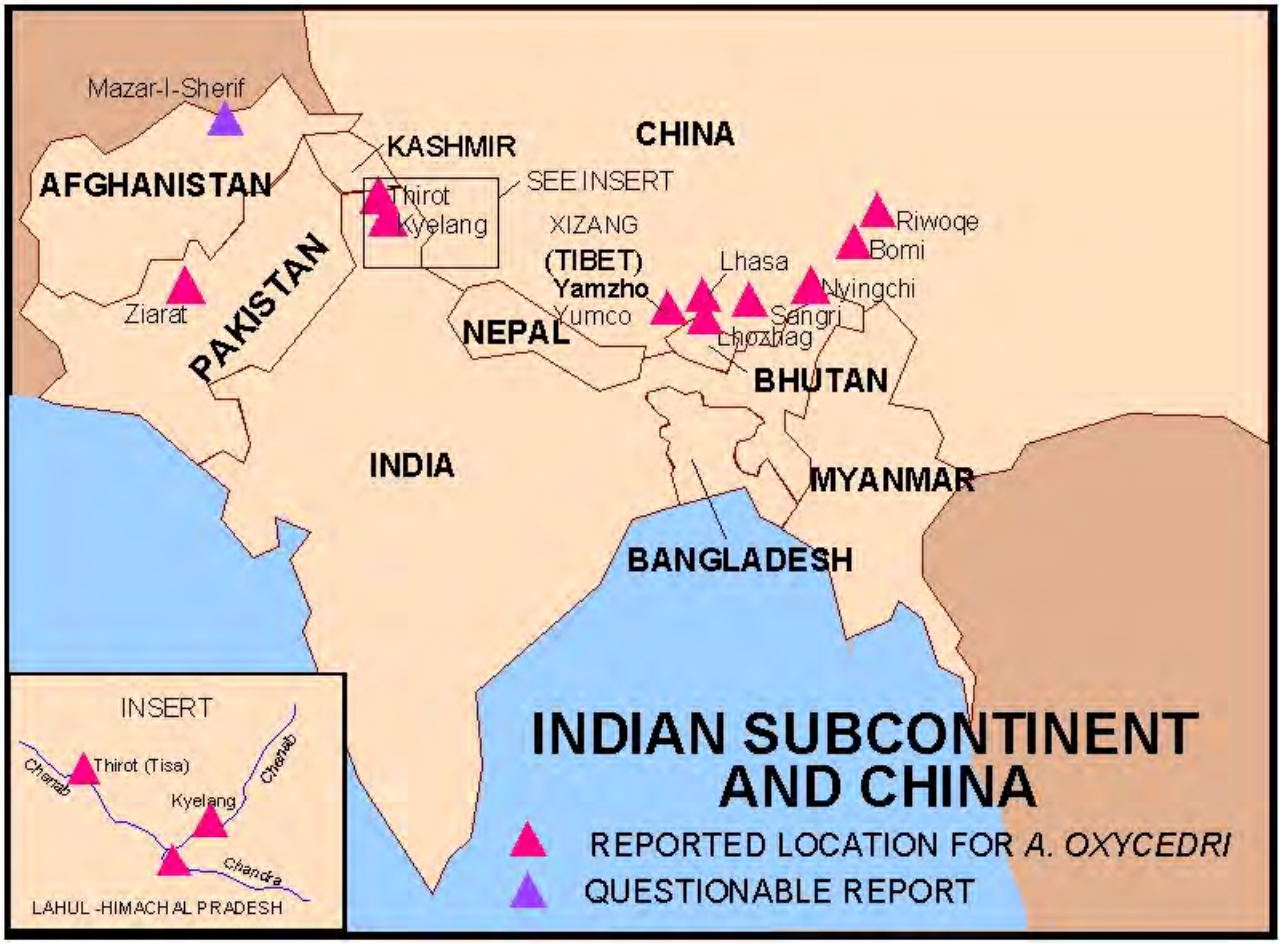
Map 11 -- Distribution of *Arceuthobium oxycedri* in Afghanistan, Pakistan, India, and China.



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Title: RMRS-RN-11WWW: Map 11
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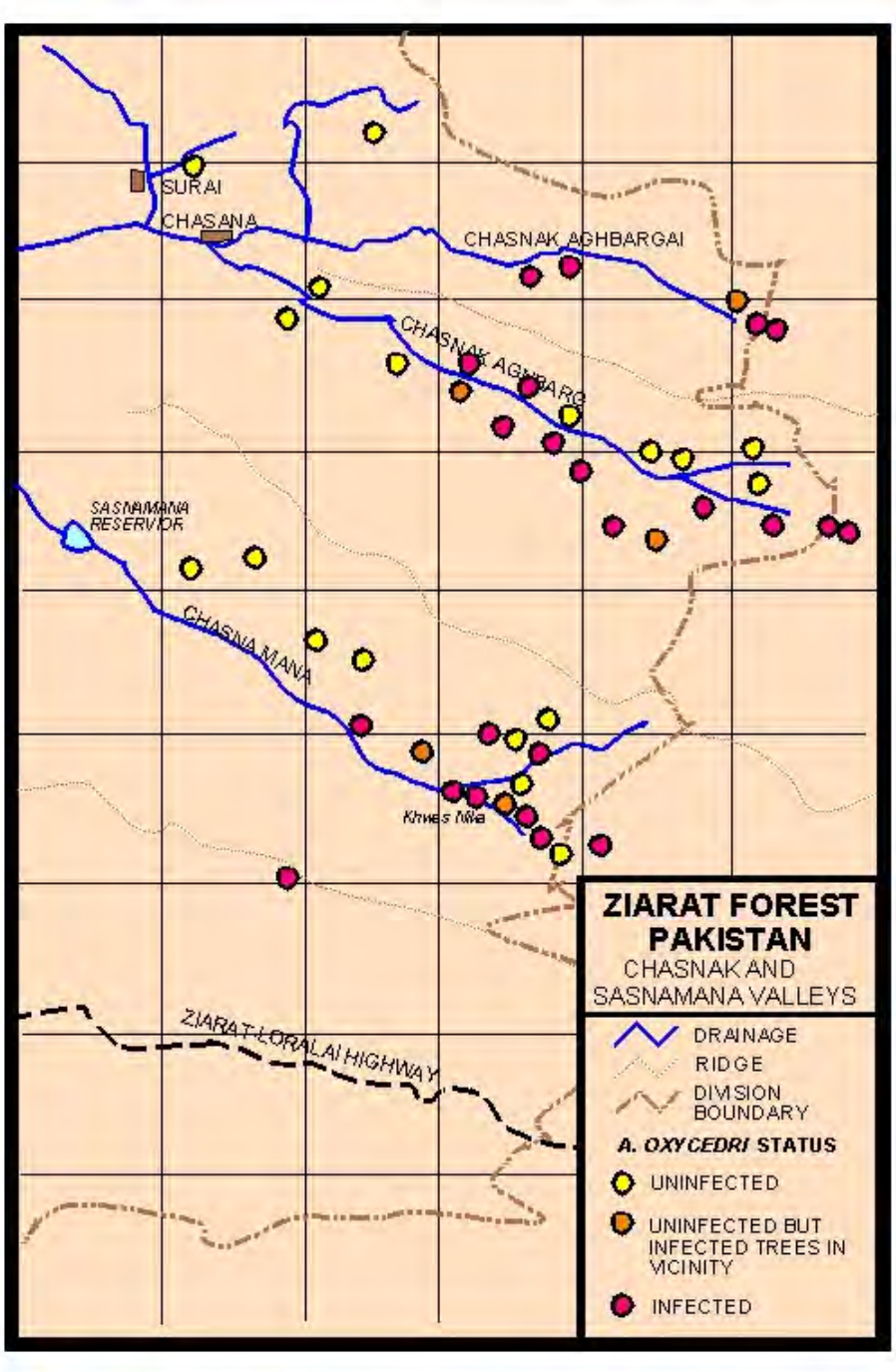
Map 12 -- Distribution of *Arceuthobium oxycedri* in the Ziarat Forest, Pakistan (from Ciesla and others 1998).



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Title: RMRS-RN-11WWW: Map 12
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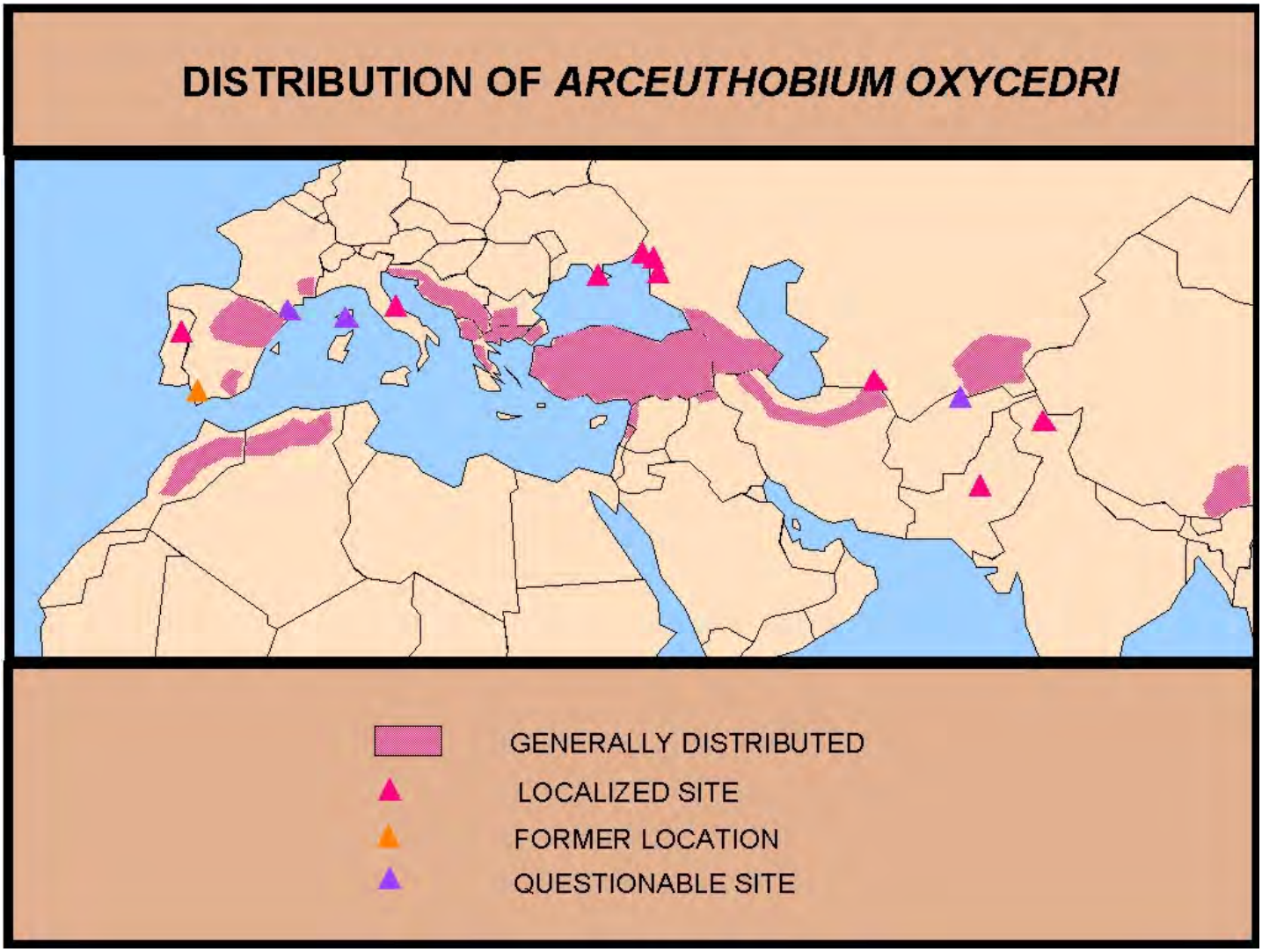
Map 13 -- World distribution of *Arceuthobium oxycedri*.



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Title: RMRS-RN-11WWW: Map 13
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Table 1 -- *Juniperus* hosts of *Arceuthobium oxycedri*.

Preferred name	Name cited	Region and country of report	Reference[a]
1. *J. communis* (Common juniper)		**Western Europe**	
	J. communis	Portugal	Lopez Saez, per. comm.
	J. communis	Spain	19, 20, 58
	J. communis	France	31
	J. communis	Italy	18
		Balkans	
	J. communis	Slovenia and Croatia (Istria)	31
	J. communis	Bulgaria	15, 31
2. J. convallium		**Indian subcontinent and western China**	
	J. convallium	China (Tibet)	GOET
3. *J. drupacea* (Syrian juniper)		**Balkans**	
	J. drupacea	Greece	13
		Russia and Former Soviet Republics	
	J. drupacea	Ukraine (Crimea)	44
		Near East	
	J. drupacea	Turkey	49
	Arceuthos drupacea	Lebanon	52
4. *J. excelsa* (Grecian juniper)		**Russia and Former Soviet Republics**	
	J. excelsa	Ukraine (Crimea)	35, 36, 44
		Near East	
	J. excelsa	Turkey	31
5. *J. polycarpos*		**Russia and Former Soviet Republics**	
	J. polycarpos	Azerbaijan	27
	J. seravschanica	Ukraine (Crimea)	35, 36, 44
	J. seravschanica	Uzbekistan	17
	J. seravschanica	Tajikistan	54
		Indian subcontinent and western China	
	J. excelsa	Pakistan	21, 22
	J. macropoda	Pakistan	75
	J. polycarpos	Pakistan	11, 31
	J. excelsa	India	24
	J. macropoda	India	14, 31
	J. polycarpos	India	12, 31
6. *J. foetidissima* (Stinking juniper)		**Russia and Former Soviet Republics**	
	J. foetidissima	Ukraine (Crimea)	44
		Near East	
	J. foetidissima	Turkey	31

Preferred name	Name cited	Region and country of report	Reference[a]
7 *J. oblonga*		**Russia and Former Soviet Republics**	
	J. oblonga	Azerbaijan	26
8 *J. oxycedrus* (Prickly juniper)		**Northern Africa**	
	J. oxycedrus	Morocco	31, 47
	J. oxycedrus	Algeria	47
		Western Europe	
	J. oxycedrus	Spain	14, 19, 20, 31, 58
	J. oxycedrus	France	27, 31
	J. rufescens	France	60
	J. oxycedrus	Italy	18
		Balkans	
	J. oxycedrus	Croatia (Istria)	31
	J. oxycedrus	Bulgaria	15
	J. rufescens	Greece	31
		Russia and Former Soviet Republics	
	J. oxycedrus	Ukraine (Crimea)	35, 36, 44
	J. oxycedrus	Ukraine (Crimea)	35, 36, 44
	J. rufescens	Ukraine (Crimea)	31
	J. marschallianus	Ukraine (Crimea)	31
		Near East	
	J. oxycedrus	Turkey	31, 49
	J. oxycedrus	Syria	52
	J. oxycedrus	Lebanon	52
	J. oxycedrus	Iraq	31, 69
8a. *J. oxycedrus* ssp. *macrocarpa*	*J. macrocarpa*	Turkey	M
9. *J. phoenicea* (Phoenician juniper)		**Northern Africa**	
	J. phoenicea	Morocco	47
		Western Europe	
	J. phoenicea	Spain	19, 20
	J. phoenicea	France	28, 31
10. *J. pseudosabina* (Xinjiang juniper)		**Russia and Former Soviet Republics**	
	J. turkestanica	Tajikistan	54
11. *J. sabina* (Savin or Savin juniper)		**Western Europe**	
	J. sabina	Spain (rare)	20
		Russia and Former Soviet Republics	
	J. sabina	Ukraine (Crimea)[b]	36, 44
		Near East	
	J. sabina	Iran	55
12. *J. semiglobosa*		**Russia and Former Soviet Republics**	

Preferred name	Name cited	Region and country of report	Reference[a]
(Russian juniper)	*J. semiglobosa*	Ukraine (Crimea)[b]	44
	J. semiglobosa	Uzbekistan	17
	J. semiglobosa	Tajikistan	54
13. *J. squamata*		**Indian subcontinent and western China**	
	J. squamata	China (Tibet)	GOET
14. *J. tibetica* (Tibet juniper)		**Indian subcontinent and western China**	
	Sabina tibetica	China (Tibet)	42, GOET
15. *J. thurifera* (Spanish juniper)		**Western Europe**	
	J. thurifera	Spain (rare)	20
		Russia and Former Soviet Republics	
	J. thurifera	Ukraine (Crimea)[b]	36, 44
16. *J. virginiana* (Eastern red-cedar)		**Russia and Former Soviet Republics**	
	J. virginiana	Ukraine (Crimea)[b]	36
17. *J. wallichiana* (Wallich juniper)		**Indian subcontinent and western China**	
	Sabina wallichiana	China (Tibet)	41

[a] See References and Methods.

[b] Host not native to the reported country.

Table 2. Taxa of *Chamaecyparis*, *Cupressus*, and *Platycladus* reported as hosts of *Arceuthobium oxycedri*.

Preferred name	Name cited	Natural range	Country of report	Reference[a]
1. *Chamaecyparis funebris* (Chinese weeping cypress)	*Cupressus funebris*	China	Ukraine (Crimea)	36
2. *Chamaecyparis thyoides* (Atlantic white-cedar)	*Chamaecyparis sphaeroides* var. *pendula*	Atlantic coast, USA	Central Europe	10[b], 33[c]
	Chamaecyparis thyoides		Croatia	63
1. *Cupressus arizonica* (Arizona cypress)	*Cupressus arizonica*	Southwest USA	Spain	58
	Cupressus arizonica		Ukraine (Crimea)	36
2. *Cupressus lusitanica*	*Cupressus lusitanica*	Portugal[d]	Ukraine (Crimea)	36
3. *Cupressus benthamii*	*Cupressus lusitanica* var. *benthamii*	Mexico	Ukraine (Crimea)	36
4. *Cupressus macnabiana* (MacNab cypress)	*Cupressus macnabiana*	California, USA	Ukraine (Crimea)	36
5. *Cupressus macrocarpa* (Monterey cypress)	*Cupressus macrocarpa*	California, USA	Ukraine (Crimea)	36, 75
1. *Platycladus orientalis* (Oriental arbor-vitae)	*Biota orientalis*	North and west China and Korea	Central Europe	10[b]
	Platycladus orientalis		Ukraine (Crimea)	36

[a]See References and Methods.
[b]Record based on transmission by graft from *Juniperus communis*.
[c]Record based on artificial inoculation.
[d]Recent analysis of leaf essential oils and DNA fingerprinting of planted *C. lusitanica* near Bussaco, Portugal indicate that it is different from populations of *Cupressus* in Mexico and Central America, previously believed to be the origin of this plantation (Adams et al 1997).

Table 3. Collection sites for *Arceuthobium oxycedri* in northern Africa.

Country	Present name	Name cited	Feature[a]	Reference[b]
Morocco	Annoceur	Anoceur	H	K
	Azilal	Azilal	H	K
	Beni Snassen	Monts des Beni Snassen	MR	47
	Bin-el-Ouidane	Lac de Ouiouiane	L	K
	Debdou	Monts de Debdou	H	47, K
	Grand Atlas	Le Grand Atlas	MR	47
	Ifrane	South of Iframe	H	31, K, FPH-FC
	Ighil M'Goun	Atlas Mgoun	M	M
	Jebel Ayachi	Atlas Ayachi	MR	M
	Khénifra	El Kriba near Khenifra	H	K
	Middle Atlas	Le Moyen Atlas	MR	47
	Msoun	Haut Masoun	H	K
	Rif Mountains	Montagnes du Rif	MR	47
	Pays Laër Zaïane	Monts des Zaian	MR	47
	Taddert	Tandled; Tadlest;	H	31, K
Algeria	Aflou	Aflar	H	K
	Ain el Hadjar	Ain el Hadjar	H	GOET
	Aurés Massif	Les Aures	MR	47, 70, K
	Batna	Atlas Range above Batna; near Batna, Batna, Pic des Cedres	MR; H, M	31, 70, K, H
	Boghar	Autour de Boghart; Boghar	H	31, K
	Constantine	Constantine	PS	K
	Dhaya	Environs de Bossuet Broussailes, Dhaya	H	31, 70
	Djebel Chélia	Djebel Cheliah		K
	Djebel Tougour	Djebell-Tougour near Batna	MR	31, GOET
	Lalla-Khedidja	Lella-Khadidja	MR	70
	Oran	Prov. Oran; Provance Oronan	PS	31, 70
	Saharan Atlas	Atlas Saharien	MR	70
	Saida	Coteaux a'Vaida; Vaida; Coteaux a'Saida	MR; H; H	31, 70, K
	Teniet El-Had	Teniet; Teniet el-Haad	H	70, K

[a]Type of feature is designated as H for human settlement (city, town, village), M for mountain, MR for mountain range, L for lake, or PS for political subdivision.
[b]See References and Methods.

Table 4 -- Collection sites for *Arceuthobium oxycedri* in Portugal and Spain.

Country	Region	Present name	Name cited	Feature[a]	Reference[b]
Portugal	**Belira-Alta**	Vila-Nova de Paiva in Serra do Montemouro	Vila-Nova de Paiva in Serra do Montemouro	H	Lopez Saez, per. comm.
Spain	**Alava**	Labraza	Labraza	H	19
	Avila	Avila	Avila	H	31
		Burgohondo	Between Burgohondo and Barraco	H	19
		Candeleda	Candeleda	H	19
		Sierra de Gredos	Sierra de Gredos	MR	31, FPF
	Burgos	Cubillo del Campo	Cubillo del Campo	H	19
		Fuentenebro	Fuentenebro	H	19, 31, M
	Castellón	Carrascal	Carrascals de la Comarca Els Ports	M	58
		Cinctorres	Cinctorres	H	19
		Forcall	Forcall	H	19, M
		Morella	Morella	H	19, M
		Rio Palencia	Alt Palància	R	14
		Serra	els Serrans	H	14
	Cuenca	Huerta del Marquesado	Huerta del Marquesado	H	19
	Cádiz	Sanlúcar de Barrameda	Sanlúcar de Barrameda; S. Lucar de Barrameda	H	19, 70
	Granada	Dúrcal	Dúrcal	H	19
		"Los Guájares" (Guájar Alto, Guájar Faraguit, Guájar Pondón)	"Los Guájares"	H	19
		Sierra de Baza	Sierra de Baza	MR	19
		Sierra de la Sagra	Sierra de la Sagra	MR	53
	Guadalajara	Mandayona	Mandayona	H	19
		Matarrubia	Matarrubia	H	19
		Villaseca de Uceda	Villaseca de Uceda	H	19
	Huesca	Abena	Abena	H	19
		Agüero	Agüero	H	19
		Ara	Ara, Abena	H	19
		Las Almunias	Las Almunias	H	19
		Concilio	Concilio	H	19
		Lafortunada	Lafortunada	H	19

Country	Region	Present name	Name cited	Feature[a]	Reference[b]
		Murrillo de Gallego	Murrillo de Gallego	H	19
		Nocito	Nocito, río Guatizamela	H	19
		Riglos	Riglos	H	19
		Río Flúmen	Gargantes del río Flúmen,	R	19
		Rodellar	Rodellar	H	19
		Sierra de Rufas	Sierra de Rufas	MR	19
	Lérida	Organyà	Alt Urgell; Organyà	H	14, 19
		Ibars de Noguera	Ibars de Noguera	H	19
	Logroño	No specific location given		PS	20
	Madrid	Becerril de la Sierra	Becem l'de la, Becerril de la Sierra	H	31, 58, FPF
		El Berrueco	Berrueco	H	19
		La Cabrera	La Cabrera; Caberos; Cabreros	H	19, 31, 70
		Cerceda	Cerceda a Navacerrada	H	19
		Collado-Villalba	Villalva; Collado-Villalba, Villalba	H	19, 58, M
		Colmenar Viejo	Colmenar Viejo	H	58
		El Escorial	El Escorial	H	19, 70
		Guadalix de la Sierra	Guadalix de la Sierra	H	19
		Hoyo de Manzanares	Hoyo de Manzanares	H	19, 58
		Manzanares el Real	Manzanares el Real, Pedriza de Manzanares	H	19, 58, M
		Mataelpino	Mataelpino	H	31, FPF
		Moralzarzal	Moralzarzal	H	19
		Navalgamella	Navalgamella	H	19
		La Pedriza de Manzanares	La Pedriza de Manzanares	H	19
		Robeldo de Chavala	Robeldo de Chavala, Robledo de Chavela	H	19, 31, FPF
		San Agustin de Guadalix	San Agustin de Guadalix	H	19
		San Martín de Valdeiglesias	San Martín de Valdeiglesias	H	19
		Torrelaguna	de Torrelaguna al Berrueco	H	19

Country	Region	Present name	Name cited	Feature[a]	Reference[b]
		Torremocha	Torremocha de Jarama	H	19
		Valdemorillo	Embalse de Valquemado, near Valdemorillo	H	19
	Murica	Sierra de Mojantes	Sierra de Mojantes, Caravaca	MR	19, M
	Navarra	Oiz	Oíz	H	19
		Sánsoain	Sánsoain	H	19
	Segovia	Aldeonsancho	Aldeonsancho	H	19
		Cabezuela	Cabezuela	H	19
		Pedraza	Pedraza	H	19
		Sebúlcor	Sebúlcor	H	19
	Soria	Aldea del Pozo	Aldea del Pozo	H	19
	Teruel	Camarena	Camarena	H	19
		Manzanera	Manzanera	H	19
		Rubielos de Mora	Rubielos de Mora	H	19
		Sierra del Maestrazgo	El Meastrat	MR	59
		Tramacastilla	Tramacastilla	H	19
	Valencia	Arcos de las Salinas	Puerto de la Losilla a Arcos de las Salinas	H	19
		Losilla de Arcos	Puerto de la Losilla	H	19
	Zaragoza	Biel	Biel	H	19
		Concilio	Concilio, Ca. de Concilio	H	19, M
		Lorbés	Lorbés	H	19
		Sierra de Orba	Sierra de Orba	MR	19
		Sigüés	Sigüés, Sierra de Orba	H	19

[a] Type of feature is designated as H for human settlement (city, town, village), PS for political subdivision, MR for mountain range, M for mountain peak, or R for river.

[b] See References and Methods.

Table 5 -- Collection sites for *Arceuthobium oxycedri* in southern France. *

Department	Location	Feature
Alpes-de-Haute Provence	Augés - between Clément and Praconteau (1)	Community
	Peyruis, below Praconteau (Possibly same as preceding location) (1)	Community
	Versant, north end of Vallée du Béon by Praconteau (Possibly same as preceding location) (1)	Community
	Between Augés and Montfort (Possibly same as preceding location) (1)	Community
	Montford (2)	Community
	Châteaux-Arnoux (3)	Community
	On mountain between Forcalquier and Fontienne (4)	Communities
	Between Pierrerue and Fontienne Praconteau (Possibly same as preceding location) (4)	Communities
	Chateaunuef-Val-Donnat (5)	Communities
	Between St. Auban and Monford (6)	Communities
	Between Sainte-Croix-du-Verdon and Montpezat (7)	Communities
	Montagne de Lure, between Saint-Étienne-les-Orgues et Cruis, Clément and Praconteau (8)	Mountain
	Estoublon (9)	Community
	Gorges du Verdon below Moustier-Sainte-Marie (10)	Canyon
	On plateau bordering road from Montfuron to Bastide-des-Jourdans Forcalquier (Vaucluse) (11)	Plateau
	Along road 907 near Villemus (12)	Road
	Crest of the northeastern end of the Luberon, commune of Volx (13)	Mountain
	Palud-sur-Verdon (14)	Community
	Bras-d'Asse (15)	Community
	Vallée de l'Asse at Entrevennes, road 101 (16)	Valley
	Vançon, near community of Sourribes (17)	Riverbed
	Chapelle Notre-Dame, commune of Entrevennes (18)	Community
	Montjustin (19)	Community
	Valensole, Plateau de Valensole (20)	Community
	Têle, Commune of Bégude-la-Blanche (21)	Community
	Sigonce (22)	Community
	Between Sigonce and Montlaux (22)	Community
	Between Valensole and Riez (23)	Communities
	Riez (24)	Community
	Rocher des Morres between Forcalquier and Fontienne (4)	Rock formation
	Digne (25)	Community
	Les Mées	?
Ardeche	Montselgues - Vers-d'en-Bas (1)	Community

	Montselgues - Serre de la Ventouse (2)	Community
Bouches-du-Rhône	Mimet - Notre Dame des Anges (1)	Community
	Ste-Victoire, between Col des Portes and Puits de Rians (Var) (2)	Mountain Range
	Several locations between Marseille and Cassis including (3):	
	Grando Candelo in the Massif Tête-Puget Gardiole	Mountain
	Calenque de Sugitton	Forest area
	GR 98, between col de la Candelle and col de l'Oule	Inlet Road
	Vallon de Sormiou	Valley
	Caldeiron Plateau	Plateau
Hautes-Alpes	Ribiers	Community
Pyrénées Orientales **	Caladroy: presumably the Chateau Caladroy in the community of Belesta (1)	Community
	M. de Ginestois	?
	Vallée du Réart (2)	Valley
Var	Aups - along road to Bauden (1)	Community
	Vérignon (2)	Community
	Bauden - at edge of Lac de Ste Croix (3)	Community
	Rians (4)	Community
	Between Vinon and Ginasservis (5)	Communities
	Between Col des Portes and Puits de Rians (Same site as (2) described under Bouches du Rhone) (6)	Mountain Range
	Evenos, by Broussan (between Toulon and Beausset et Signes) (7)	Communities
	Fox-Amphoux at Défens (8)	Community
	Ampus - Le Grand Puits	Community
Vaucluse	Dentelles de Montmirail - Gigondas (1)	Mountain, community
	Mont Ventoux - Veaux (2)	Mountain, community
	Mont Ventoux - Bédoin (3)	Mountain, community
	Grambois (4)	Community
	Between Grambois and La Bastide des Jourdans (5)	Community

* All locations cited are from Mandin (2003), numbers at location sites are tied to locations shown on Figure 4. Unnumbered sites could not be located.

** The existence of *Arceuthobium oxycedri* in Pyrénées Orientales is based on old records and is considered doubtful.

Table 6. Collection sites for *Arceuthobium oxycedri* in Italy.

Region	Location	Detailed description	Feature[a]	Reference[b]
Marches	Borgo Pace	Borgo Pace and l'Oratorio della Colobraia	H	18
	Passo della Spugna	Passo della Spugna	MP	18, FPF
	San Angelo in Vado	Between Montebello and Calmancino	H	18
	Belforte all'Isauro	Approximately 1.5 km south, on road leading to San Angelo in Vado.	H	FPF
	Monterone	On road heading south from Campo.	H	FPF
Tuscany	Miraldella	Miradella di Sestino	H	18, FPF
	Sestino	Casale di Sestino, Martigliano di Sestino	H	18

[a]Type of feature is designated as H for human settlement (city, town, village) or MP for mountain pass.
[b]See References and Methods.

Table 7. Collection sites for *Arceuthobium oxycedri* in the former Yugoslav Republics and Macedonia.

Country	Present name	Name cited	Feature[a]	Reference[b]
Slovenia	Ankaran	*Timme*, Felsen bei Ankrnica (Rocks by Ankrinica)	H	31
	Dragonja Valley	Dragogna Valley	V	71
	Izola	Corte d'Isola	H	70
	Koper	District Capodostria, Capodistria	H	70, M
	(Capodistria)	*Puzzole* near Capodostria	H	HBG, M
Croatia	Bakar	Bakar, *Kvarner* above Bakar	H	31, M
	Bakarac	Bakarac, Buccarica, Buccariza	H	31, BREM, GOET, HAL
	Brač	Insel (Island) Brazza	I	GOET, HBG
	Brezi[c]	Between Brezzi and *Puzzole*	H	31, 70
	Cirkvenica	Cirkvenica	H	71
	Cres	Insel (Island) Cherso	I	GOET
	Dalmatia	Dalmatia	PS	HBG
	Drniš	Dernis	H	71
	Kraljevica	Between Buccariza & Porto Ree	H	70, BREM, HAL, HBG
	Makarska	Macarsa	H	71
	Mali Lošinj	Lussinpiccolo	H	31, M, IPK-GAT
	Metcovic	on hills from Metcowich in the Marcuto District	H	GOET
	Milna?	Mihia on the island of Brazza (Brac)	H	GOET
	Osor	Mt. Ossero, Osero, Island Ossero	H, I	31, 71, M, IPK-GAT
	Omis	Omis	H	FR
	Rijeka	near Fiume, Fiume	H	70, 71, M, BREM, HAL, HCW
	Senj	Lika-Krbava, Valle Senjska; Lika Krava above Zengg, near Senj	L, H	31, 70, 71, H
	Slano	Slano	H	71
	Split, near Solin	Spalato near Salona	H	M
	Velebit (Paklenka National Park)	Velebit, road from Jurjevo to Krasno	MR	M
Bosnia–	Magliç	Maglič, Serbia	H	71
Herzegovina	Mostar and Buna	near Mostar between Bura and *Zitomišlic*	H	71
	Neretva River	near Kručevič on the Narenta	R	71, HBG, IPK-GAT
	Stolac	Stol, Serbia; Stolac District	H	70, 71
Yugoslavia	Čačak[d]	Čačak[d]; Čačaker; Čačanskoj	H	38, 70, 71
	Dečani[d]	Dečani[d]	H	38
	Dren (Koscovo)?	Drenovoo (Macedonia)	H	HBG
	Kopaonik Mts.	Kopaonik	MR	70
	Kufin	Kufin (coast of Montenegro)	H	48
	Popoševac	Between Ponosevac and Café Morena	H	M
	Studenica[d]	Studenica[d]	R, Sh	38
	Viluse	Crna Gora 10 km west of Viluse	H	GOET
Macedonia	Koseshino (Near Strumica)	Koleshino, Belasica Mtn.	M	39
	Ohrid and Ohridsko Jezero	3 miles north of Ochoida	H, L	31

Country	Present name	Name cited	Feature[a]	Reference[b]
	Prilep	Pass Pietvar E of Prilep	MP, H	GOET, M
	Prespansko Jezero	East of Lake Prespa, NW side of Lake Prespa	L	70, BIEL
	Sermenin	Sermenin, Kozhuf Mtn	M	39
	Stenje	Stenje, Galicha Mtn.	M	39
	Vodno Mtn.	Vodno Mtn., near Skopje	M	39

[a]Type of feature: PS for political subdivision, H for settlement, V for valley, L for lake, R for river, MP for mountain pass, MR for mountain range, or Sh for shrine.
[b]See References and Methods.
[c]There are two communities northeast of Novi Vinoldolski known as Brezi (20 km apart, near coast or in foothills).
[d]Translated from Cryllic.

Table 8. Collection sites for *Arceuthobium oxycedri* in Albania.

Present name	Name cited	Feature[a]	Reference[b]
Berat	Vodice, Berat	H	M
Bogdan I Poshtëm or Bogdan e Sipërm	Bogdan, near *Loussou*; Bogdan under Mt. Tomor	H	31, 70, M
Kapinovë	Below Kapinova, ascent of Tomor	H	31
Lake Scutari (Shkoder)	NE of Lake Scutair; near Scutari	L, H	31, 70
Mt. Bukanik	Mt. Bukovic	M	M
Mt. Tomorit (Maja e Tomorit)	Mt. Tomor	M	70, 71

[a]Type of feature is designated as L for lake, H for human settlement (city, town, village), M for mountain.
[b]See References and Methods.

Table 9. Collection sites for *Arceuthobium oxycedri* in Bulgaria.

Present name	Name cited	Feature[a]	Reference[b]
Asvenograd	Rhodopen Asvenograd	H	HAL
Bachova	above Bačkova, Rhodopen, monastery Batschkovo, Rhodope at Backovo	H	31, 70, H,HAL, HBG, IPK-GAT
Belica[c]	Belica[c]	H	15
Melnik	Melnik	H	HAL
Rhodope Mountains	Central Rhodope; Rhodopae Orientalis; Rodope Massif	MR	31, 70, 71
Rila[c]	Rila[c]	H	15
Zlatograd	Rhodopae Orientalis, Zlatograd	MR, H	31, IPK-GAT

[a]Type of feature is designated as, H for human settlement (city, town, village), MR for mountain range.
[b]See References and Methods.
[c]Translated from Cryllic.

Table 10. Collection sites for *Arceuthobium oxycedri* in Greece.

Province	Present name	Name cited	Feature[a]	Reference[b]
Attica	Mt. Oeta (Oros, Othris)	Mt. Oeta; Oeta	M	31, 70, 71, M
	Mt. Parnassos	Parnassi; Parnafsi Region; Mt. Parnassus; Parnassus, Mt Parnas	M	13, 31, 70, 71, GOET, M
	Phokis (Fokida)	Phokis, Monte Parnassi Region	PS	31
Epirus	Siráko, Mt. Peristeri	Near Syraku, foot of Mt. Peristeri	H, M	70, 71
Macedonia	Náousa	Naoussa (south Macedonia)	H	71
	Péla	Pellis, Mt. Pinovon	PS, M	31
	Mt. Profitis Elias (Poligiros)	Mt. Elias (north Macedonia)	M	71
	Seres, Ori Vrondous	N of Serrai at road to Kato Vrontu	H, M	M
	Thásos (Thassos)	Thasos (north Macedonia)	I	71
Thrace	Alexandroupoli	Dedeagač	H	71
Thessaly	Chálki, Hálki	Chaliki	H	70, 71
	Krania	Krania	H	70, 71
	Ioanina to Trilkala	Between Ioannina and Trikala	H	M
	Pindos	Sermeniko in Pindus	MR	70, 71

[a]Type of feature is designated as M for mountain, PS for political subdivision, H for human settlement (city, town, village), MR for mountain range, or I for island.
[b]See References and Methods.

Table 11. Collection sites for *Arceuthobium oxycedri* in Russia and other former Soviet Republics.

Country	Present name	Name cited	Feature[a]	Reference[b]
Ukraine	Crimea	Crimea	PS	31, 35, 36, 44, 70, 72
	Gurzuf	Gursuf, Gurzivsk	H	44, FR
	Massandra	Massandra	H	HAL
	Nikitsky Botanical Gardens (8 km E of Yalta)	Nikitsk Gardens	G	44
	Sudak	Sudak	H	31, FR, M
	Yalta	Yalta, Jalta, District Jaltensis	H, PS	31, M
Russia	Anapa[c]		H	72
	Avarsky Koisu (Dagestan)		R	72
	Novorossiysk		H	72
	North Ossetia		PS	40
	Tamanskij zaliv (Tamanskii Bay)		B	72
Georgia	Borzhomi (Borjomi, Borjom)		H	72
	Marykh (Marukh) Pass (on Russia/Georgia frontier)		MP	72
	T'blisi	Tiflis	H	70
Armenia	Idjevan[c]		FP	67
	Erevan		FP	67
	Zangezur		FP	67
Azerbaijan	Altyagać[c]	Ansheron, near Altyagach	H	26
	Artvarshen[c]	Vartaschenski District	H	26
	Chaltan[c]	Kubinsky Region, near Khaltan	H	25
	Gäncä (Gyanja, Gonja) [c]	Elizavetpolskii Creek	H	72
Turkmenistan	Kopetag Mountains[c]		MR	54
Uzbekistan	near city of Kokand		PS	72
	Pamir Alai		MR	17
	Samarkand	Province Samarkand	PS, H	17, 31
	Syr-Day Insky[c]		H	17
	Tashkent[d]		H	17
	Zaamin[c]		H,R	17
	Zervashanski Range	Alpes Sarawschen	MR	31
Kyrgyzstan	Kirgiskty Krebet, Kirgiz[c] Range		MR	54
	Lyailyak		R	54
	Tian Shan[c]		MR	54
Tajikistan	Duckdon	Duckdon	MR	54
	Iskanderkul[c]	Ipsander Kul	L	31, 54, 72
	Turkestanski Range	Turkestanski Range, Kusavli Canyon	MR	54, FPF
	Pamir Ali[c]		MR	54

[a]Type of feature is designated as C for canyon, FP for floristic province, PS for political subdivision, H for human settlement (city, town, village), G for garden, PL for plateau, L for Lake, MR for mountain range, MP for mountain pass, R for river.
[b]See References and Methods.
[c]Translated from Cryllic.
[d]Possible location.

Table 12. Collection sites for *Arceuthobium oxycedri* in Turkey.

Region	Present Name	Name cited	Feature[a]	Reference[b]
Agri	Allidag	Alliperdag (Armenia)	M	31
Amaysa	Akdağ	Ak Da; Amasia, Ak Dagh	H	49, 70 GOET
Antalya	Ak Dağ	Ak Dag, north of Yayla Cavda	M	31, FPF
	Antalya to Beyşehir	Antalya to Beyshehir	H	BIEL
	Beden (Bey Dağliari)	Beydan (northeast of Alanya)	H	49
	Cavdir & Sütlegen	Between Yayla Cavda & Sutlegen	R	31, FPF
	Gömbe & Sütlegen	ridge between Gombe & Sutlegen	R	31, FPF
	Sinekçibeli	Sinkepass	H	31
	Toros Dagliari (Taurus)	Taurus	M	70
Bitlis	Batman	Bittyma, Dalmas	H	31
	Bitlis	Dokhana to Bitlis	H	49
Bolu	Bolu	Nordl Bolu; N of Bolu	H	31, 49 GOET
Çoruh	Artvin, Çoruh Gorge	Artvin, Coruh Gorge; Coruh gorge	H, G	31, 49
	Artvin	18 km from Artvin to Hopa	H	49
Denizli	Cukur to Kizilhizar	Cukorköy to Kizilhizar	H	49
Hatay	Amanos dağl	Amanus	MR	49
	Civegözü Gates	Cilicicus; Cilician Gates	MP	70
Içel	Gülek Boğazi	Gülek; Gülek Boğazi, Güllek	MP	70, GOET
Istanbul	Istanbul	Constantinople	H	BREM, M
	Yeniköy	Yeniköy	H	49
Izmir	Mt. Sipil (Sipil Daği)	Mt. Sipylos (Manisa Da.)	M	49
Kars	Sarikamiş	Sarikamiş	H	49
Siirt	Siirt	valley east of Siirt	V	49
	Batman	Bittyma, Dalmas	H	31
Sivas	Sivas	Sivas	H	70
Tekirdağ	Tekirdağ	Tekirdağ	PS	49

[a]Type of feature is designated as H for human settlement (city, town, village), G for gorge, M for mountain, R for ridge, MP for mountain pass, MR for mountain range, or V for valley.
[b]See References and Methods.

Table 13. Collection sites for *Arceuthobium oxycedri* in the Near East.

Country	Present name	Name cited	Feature[a]	Reference[b]
Syria	Jebel Ansariya	Ansarieh	MR	68
	Slenfe	Slenfe	H	52
Lebanon	Ehden	above Ehden, Eden	H	52, GOET
	Ehden	For. of Ehden; Forêt d'Ehden	F	31, 52
	Ehmej-Laqlouq	between Ehmej and Laqlouq	H	52
	Jabel Oammouaa	Forêt de Qamou'a	F, MR	52
Iraq	Sersang	Sezank; Sersang	H	31, 69
	Suwara Tuka	Swaratuka; Suwara Tuka	H	31, 69
	Zawita Gorge	Zaiska Gorge; Zawita gorge	G	31, 69
Iran	Āb – Ali	Central Prov, Hezardacht near Ab-e- Ali	H	M
	Orūmīyeh (Urmia)	Oroomah, Kurdistan	H	69
	Radkan	Radkane	H	55, 69
	Reshteh-ye-Alborz (Elburz)	Elburzienne	MR	55

[a]Type of feature is designated as MR for mountain range, H for human settlement (city, town, village), F for forest, or G for gorge.
[b]See References and Methods.

Table 14. Collection sites for *Arceuthobium oxycedri* on the Indian subcontinent and western China.

Country	Present name	Name cited	Feature[a]	Reference[b]
Afghanistan[c]	Mazar-I-Sherif	Mausarif; Mossarif	H	57; 72
Pakistan	Chasnak Valley	Chasnak	F or V	21, 22, 75
	Sasnamana Valley	Sasnamana	F or V	11, 21, 22, 23, 31, 74, 75, FPF
	Ziarat Forest	Zirat	F	31
India	Keylang	near Kyelang	H	16
	Thirot	Thirot; Tispa	H	12, 31
China (Xizang Province or Tibet)	Bomi	Bombi; Bomi	H	31, 42, 43
	Lhasa	Lhasa	H	43
	Luozhag	30 km southwest of Lhozhag	H	51
	Nyginchi	Nyginchi	H	43
	Riwoge	Riwoqe; Riwoge	H	42, 43
	Yamco Yumco	Yamzho Yumco	P	GOET
	Yarlung Tsangpo Gorge, E of Sangri	Yarlung Tsangpo Gorge, E of Sangri	G	GOET

[a]Type of feature is designated as PS for political subdivision, F for forest, G for gorge, H for human settlement (city, town, village), P for peninsula between two rivers, V for valley or R for river.
[b]See References and Methods.
[c]Possible location for referred collection site.

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