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Wild roses and hawthorns of urban area: a case study of Piła in Poland

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Abstract: The paper presents a study on the distribution of wild roses and hawthorns in the town of Piła (NW Poland). The main purpose of the study was to provide a full list of wild Crataegus and Rosa taxa growing in the researched area. Field studies (2014-2015) and formerly published data made it possible to recognize 19 taxa, among them 14 native taxa (including two rose nothospecies), 4 anthropophytes and 1 hybrid. Eleven new taxa were found in the explored area during the studies. These were: *Crataegus rhipidophylla*, *C.* ×*macrocarpa*, *C.* ×*subsphaericea*, *C.* ×*media* 'Rubra Plena', *Rosa majalis, R. villosa, R. rubiginosa, R.* ×*subcollina, R. glauca, R. rugosa, R. multiflora* and interspecific hybrid *Rosa canina* × *R. rubiginosa*.

Key words: *Rosa, Crataegus*, critical taxa, nothospecies, hybrid, native species, anthropohyte, distribution

1. Introduction

Being fairly common shrubby plants, roses and hawthorns are not so easy to recognize and quite complicated in systematics (Popek 1996). These genera are characterized by high species polymorphism. Hybridism, polyploidy and apomixis are factors contributing to the above character (Klášterská & Klášterský 1974; Ptak 1986, 1989; Wells & Phipps 1989; Christensen 1992; Nybom *et al.* 1997; Werlemark 2000).

Data on the distribution of roses and hawthorns in Poland are not complete (Zając & Zając 2001). The largest number of stands was reported for common species like: *Rosa canina* L., *R. dumalis* Bechst., *Crataegus monogyna* Jacq. or *C. laevigata* (Poir.) DC. (Zieliński 1985, 1987; Christensen 1992; Popek 1996, 2002). There is still a lack of evidence confirming the occurrence of rarer taxa in Poland, also of data concerning their distribution. Therefore, the subject requires further studies.

The earliest data concerning the distribution of roses in the examined area come from the first half of the 20th century. Such species as: *Rosa glauca* Vill. var. *complicata* Christ. (= *R. dumalis* Bechst.), *R. coriifolia* Fries. var. *typica* Christ. (= *R. dumalis* Bechst.), *R. subcanina* Hayek (= *Rosa* ×*subcanina* (H. Christ) R. Keller), *R. inodora* Schwertschl var. *genuina* Schwertschl (= *R. inodora* Fr. var. *inodora*), *R. canina* L. var. *dumalis* Baker and *R. dumetorum* Thuill. (= *R. canina* L.) (Frase 1935; Enderlein 1938; Abromeit *et al.* 1898-1940) were provided within the records; however, recently, they are mostly distinguished as synonymous ones (Popek 1966; Henker 2000). Later on, Zieliński (1981a) reported *Rosa sherardii* Dav. and confirmed the occurrence of *R. canina*. As far as hawthorns are concerned, the only data confirming *Crataegus monogyna* Jacq. and *C. laevigata* (Poiret) DC occurrence can be found in "Distribution Atlas of Vascular Plants in Poland" – ATPOL (Zając & Zając 2001).

The performed studies focused both on supplying and analyses of recent species content of critical genera *Crataegus* L. and *Rosa* L., occurring within the boundaries of the town of Piła (NW Poland).

2. Study area

Piła (102.7 km^2 area) is a town in northwestern Poland. It is situated in the Greater Poland Voivodeship – 53.149°N 16.739°E (Program... 2005-2012). According to the physico-geographical regionalization of Poland,

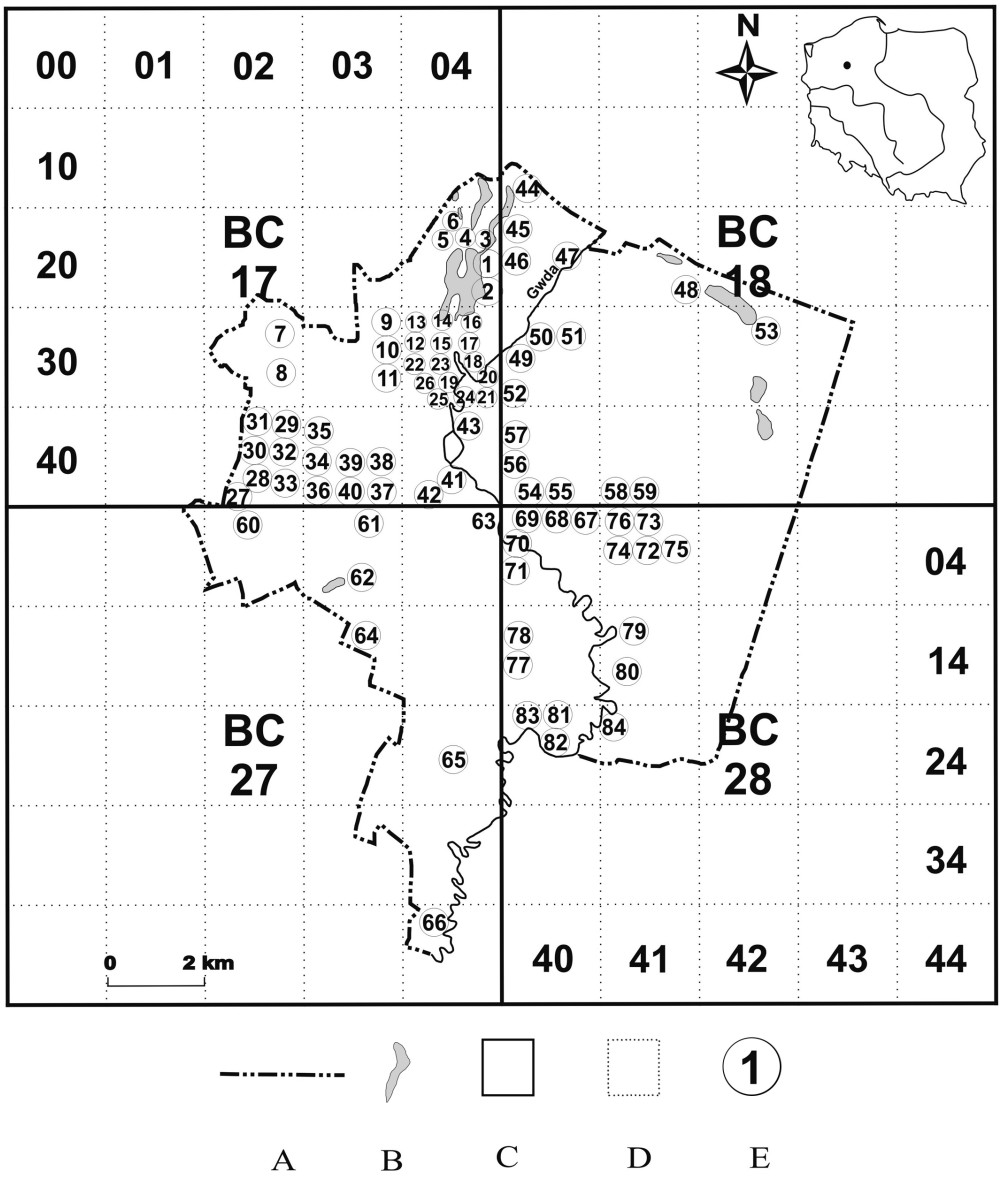

Fig. 1. Location of *Crataegus* localities in the study area against the background of the ATPOL grid square system
Explanations: A – city border, B – water bodies, C – ATPOL 10 × 10 km squares, D – ATPOL 2 × 2 km squares (stands), E – localities of *Crataegus* species (see Appendix 1)

Piła is situated in the South Pomeranian Lake District macroregion (Pojezierze Południowopomorskie) and the Gwda River Valley mezoregion (Kondracki 2001). It is located in the BC17, BC18, BC27 and BC28 squares of ATPOL (Zając 1978).

The average annual air temperature varies between 7.5-7.8^{0}C, while annual average precipitation fluctuates from 525-550 mm (Koźmiński & Michalska 2001; Farat 2004). The average duration of snow cover in the Piła region ranges from 48-58 days (Bednorz 2001). The vegetation period is long and lasts 220 days (Kondracki 1967).

The town is divided by the Gwda river valley. The look of contemporary Piła is the result of people's long-time interference with local landscape. Green areas situated in Piła cover a significant part of the town and include: parks, park-like facilities, numerous flower beds, sound barriers, alamedas, woodlots and cemetery green spots. Human interference in the 'green shape' of Piła is strongly visible. Only the tiny spots of natural vegetation are left, mainly on poor sites, neither available nor accessible for further settlement or potential cultivation.

3. Material and methods

Floristic material was collected in the years 2014-2015, within the town limits, following the method based on ATPOL 10 × 10 km squares. Each of the squares was divided into 25 smaller ones (2 × 2 km), according to ATPOL instructions (Zając 1978). Each

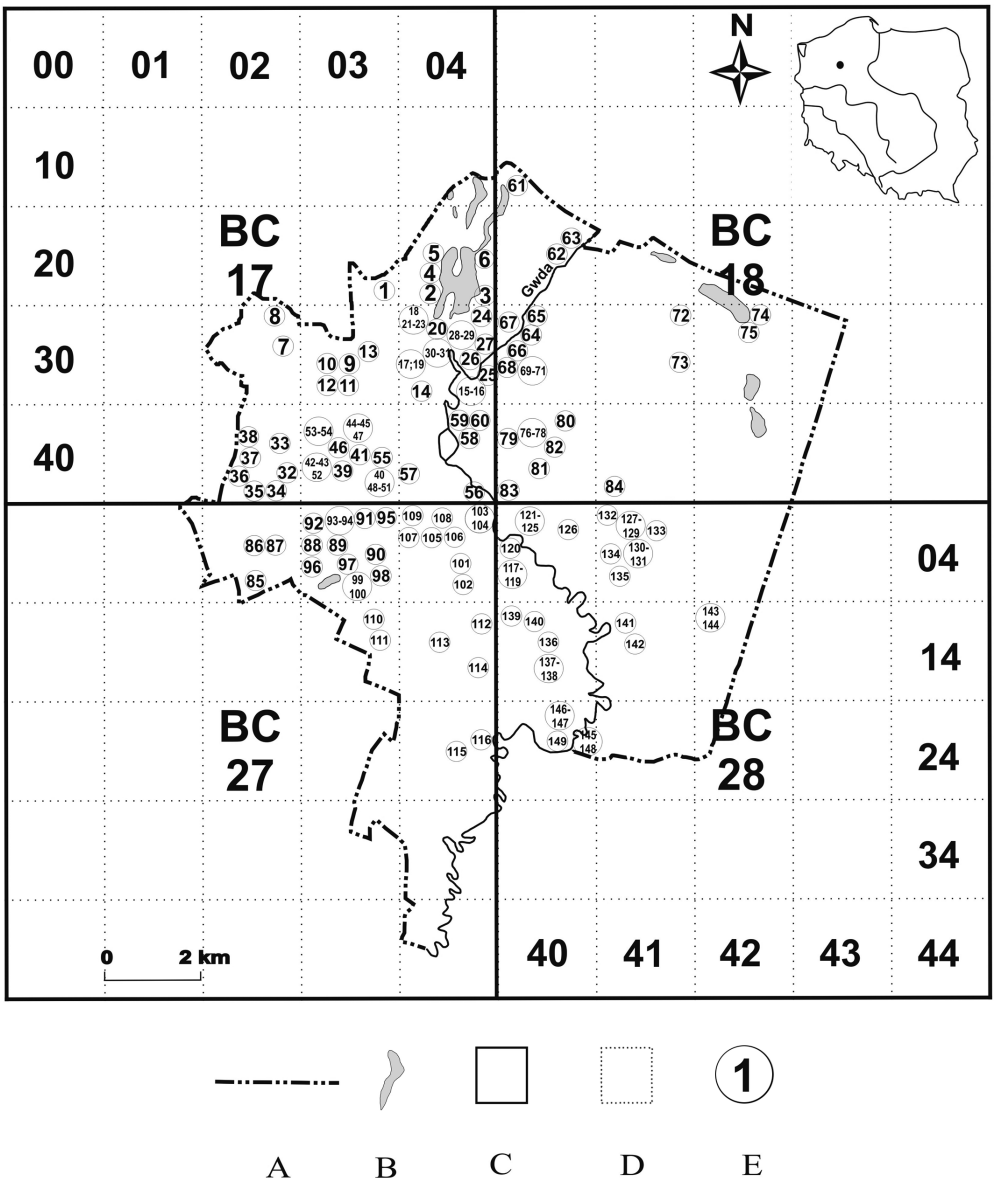

Fig. 2. Location of *Rosa* localities in the study area against the background of the ATPOL grid square system
Explanations: A – city borders, B – water bodies, C – ATPOL 10 × 10 km squares, D – ATPOL 2 × 2 km squares (stands), E – localities of *Rosa* species (see Appendix 2)

of the 39 squares (4 km^2) was treated as a single stand (Figs. 1-2, Appendices 1-2).

All herbarium materials were deposited in the Herbarium of the University School of Physical Education, Gorzów Wielkopolski (Poland). Data from literature were also included. Taxonomic approach and nomenclature were based on the works of Popek (1996), Zieliński (1985, 1987), Henker (2000) and Christensen (1992, 1997). Geographical elements for each species follow Popek (2007) and Zając & Zając (2009). For alien species (anthropophytes), their native ranges are given.

The frequency of taxa occurrence was defined on the basis of the number of stands: 5-9 – rare species, 10-15 – not very frequent, 16-20 – quite frequent, 21-25 – frequent, 26-30 – very frequent, >30 – common.

4. Results

The list of species from the *Crataegus* and *Rosa* genera growing in the explored area contained 19 taxa: 6 species of hawthorns (*Crataegus* L.) belonging to *Erianthae* and *Crataegus* subseries (including 3 nothospecies) and 13 taxa of roses (*Rosa* L.) belonging to the sections: *Rosa* (2 species), *Caninae* DC. em. H. Christ (10 taxa) and *Synstylae* DC. (1 species), among them – 9 native species (including 2 nothospecies, 1 hybrid form) and 3 anthropophytes. It is worth mentioning that the following 12 taxa were new for the flora of Piła: *Crataegus rhipidophylla, C. ×macrocarpa, C. ×subsphaericea, C. ×media* 'Rubra Plena', *Rosa majalis, R. villosa, R. rubiginosa, R. ×subcollina* also the antropophytes:

R. glauca, R. rugosa, R. multiflora and the interspecific hybrid *Rosa canina* × *R. rubiginosa*.

List of species

Abbreviations and symbols used in the list of species: geographical elements, Asia – Asian element, CE – European-temperate sub-element, CE: a-ne – Alpine-northern-European distributional type, CE: ce-g – European-temperate montane group, M – Mediterranean element, ES – Euro-Siberian sub-element, IR – Irano-Turanian element; e – eastern, n – northern, w – western; sa – extension in the beginning of diagnosis to the Atlantic region of Europe

Genus *Crataegus* L.

Ser. *Crataegus*

Subser. *Erianthae*

***Crataegus laevigata* (Poiret) DC.**

A very rare species, reported by Leda (2001a) from BC17 and BC18 ATPOL squares.

The species widespread in the territory of Poland, most frequent in the northern and south-western part of the country (Christensen1992; Leda 2001a). CE-M(n).

Subser. *Crataegus*

Crataegus rhipidophylla* Gand. var. *rhipidophylla

New for the study area, very rare, reported from one locality (37).

Crataegus rhipidophylla Gand. var. *rhipidophylla* is widespread in the territory of Poland, except for the north-east part of the country. Fairly numerous in the Carpathian Mountains and in the Krakowsko-Częstochowska Upland (Jurassic Rock Upland) (Christensen 1992; Sołtys-Lelek 2011, 2012; Oklejewicz & Vončina 2012; Oklejewicz *et al.* 2013, 2014, 2015). CE-M(e)-IR(w).

Crataegus monogyna* Jacq. var. *monogyna

A very frequent species – 66 localities (1, 2, 3, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 26, 27, 28, 29, 31, 32, 34, 36, 35, 41, 42, 43, 44, 45, 46, 47, 48, 49, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 79, 81, 82, 83) from 26 stands. Formerly reported from BC17, BC18, BC27 and BC28 (Leda 2001b).

The only variety occurring in Poland (Christensen 1992), very common in the whole territory (Christensen 1992; Leda 2001b; Barabasz-Krasny & Sołtys-Lelek 2011; Sołtys-Lelek 2011, 2012; Oklejewicz & Vončina 2012; Oklejewicz *et al.* 2013, 2015). sa-CE-M-IR(w).

***Crataegus* ×*macrocarpa* Hegetschw.** [*C. laevigata* (Poiret) DC. × *C. rhipidophylla* Gand.]

New for the study area, a very rare hybrid, reported from four localities, occurs in two varieties.

The taxon found in the localities situated mainly in the west, north, south and south-east outskirts of Poland (Christensen 1992; Sołtys-Lelek 2011, 2012; Oklejewicz & Vončina 2012; Oklejewicz *et al.* 2013, 2014, 2015). CE.

- *Crataegus* ×*macrocarpa* Hegetschw. nothovar. *macrocarpa* [*C. laevigata* (Poiret) DC. × *C. rhipidophylla* Gand. var. *rhipidophylla*]. Syn.: *C.* ×*macrocarpa* var. *curvisepaloides* Hrabetová-Uhrová

  A very rare variety, reported from three localities (21, 33, 80) and three stands.

  The taxon found mainly in the western regions of Poland, sporadic in north and south Poland (Christensen 1992; Sołtys-Lelek 2011, 2012).

- *Crataegus* ×*macrocarpa* Hegetschw. nothovar. *calycina* (Peterm.) Kerguélen [*C. laevigata* (Poiret) DC. × *C. rhipidophylla* Gand. var. *ronnigeri* (K. Malý) Janjić] Syn.: *Crataegus* ×*macrocarpa* Hegetschw. nothovar. *hadensis* (Hrabetová-Uhrová) Christensen, *C. calycina* Petermann, *C. calciphila* Hrabetová-Uhrová

  A very rare variety, 1 record (61) from BC2703.

  Reported only from the south and middle-west parts of Poland (Christensen 1992; Sołtys-Lelek 2011).

***Crataegus* ×*subsphaericea* Gand**. [*C. monogyna* Jacq. × *C. rhipidophylla* Gand.]

New for the study area, a rare hybrid reported from 7 localities, occurs in two varieties.

The taxon reported mainly from the north and north-west Poland, also from the Carpathian and Holy Cross Mountains (Karpaty, Góry Świętokrzyskie). Incidentally reported from single, sporadic localities (Christensen 1992; Barabasz-Krasny & Sołtys-Lelek 2011; Sołtys-Lelek 2011, 2012; Oklejewicz & Vončina 2012; Oklejewicz *et al.* 2013, 2014, 2015). CE-M(e)-IR(w).

- *Crataegus* ×*subsphaericea* Gand. nothovar. *subsphaericea* [*C. monogyna* Jacq. × *C. rhipidophylla* Gand. var. *rhipidophylla*]

  A rare variety, 10 localities (4, 6, 22, 23, 24, 25, 39,50, 78, 84) from 6 stands (Fig. 3).

  The variety reported mainly from the north and north-west regions of Poland, incidentally, from east and south outskirts of the country (Christensen 1992; Sołtys-Lelek 2011, 2012).

- *Crataegus* ×*subsphaericea* Gand. nothovar. *domicensis* (Hrabetová-Uhrová) Christensen [*C. monogyna* Jacq. × *C. rhipidophylla* Gand. var. *ronnigeri* (K. Malý) Janjić]

  A very rare variety, 1 locality (30) from a stand in BC1742. (Fig. 4).

  The variety reported only from the middle and west parts of Poland (Christensen 1992).

***Crataegus* ×*media* Bechst.** 'Rubra Plena' [*Crataegus laevigata* (Poiret) DC. × *Crataegus monogyna* Jacq.]

New for the study area, anthropophyte, the variety cultivated in towns or the leftover after former gardens – 2 localities (38, 40) from one stand.

The double-flowered decorative variety, often cultivated, distributed in the whole territory of Poland (Seneta 1994). CE-M.

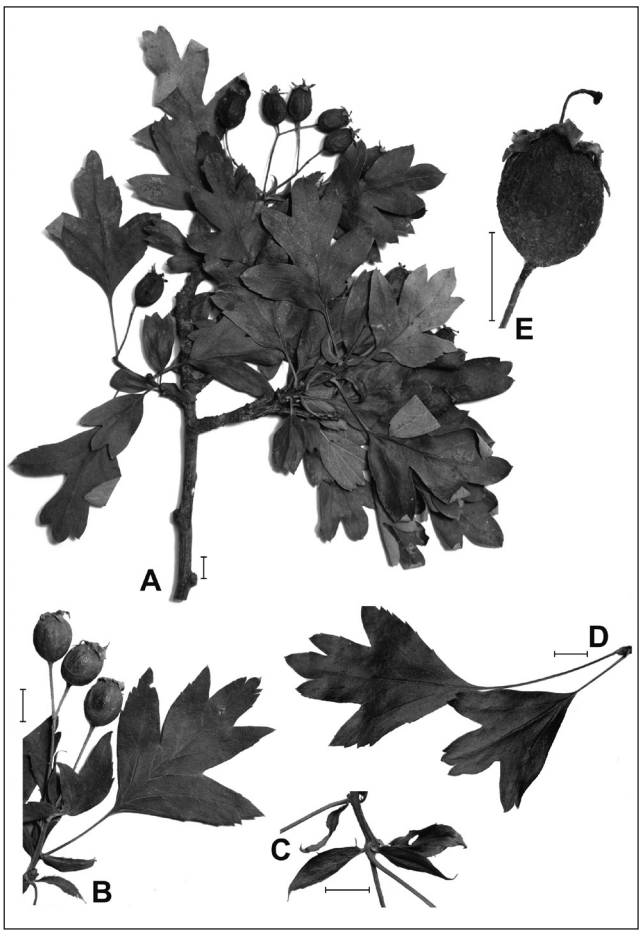

Fig. 3. *Crataegus* ×*subsphaericea* Gand. nothovar. *subsphaericea* Explanations: A – fragment of a shoot, B – leaf of a flowering short shoot, C – stipule of a leaf of a flowering short shoot, D – leaves of a short shoot, E – fruit. Solid bar = 1 cm

Genus *Rosa* L.

I. Sect. *Rosa* (= sect. *Cinnamomeae* DC.)

Rosa rugosa Thunb.

New for the study area, anthropophyte, not very frequent, 18 localities (3, 11, 25, 32, 36, 39, 42, 43, 55, 81, 88, 102, 107, 126, 128, 140, 141, 145) from 13 stands.

The species (Far East origin) grows in the whole territory of Poland, in both natural and cultivated habitats (Zieliński 1987), mostly common in south and south-west Poland and Kielce region (Zając & Zając 2001; Gutkowska & Niedźwiecka 2014; Marciniuk *et al.* 2015). Asia.

Rosa majalis Herrm. var. *majalis*

New for the study area, very rare, 2 localities (45, 105) in two stands, a cultivated specimen running wild.

The species and variety are known from a few localities scattered in the whole Poland, beyond the range limits (Zieliński 1981b; Popek 1996, 2002; Zieliński & Popek 2001a; Gutkowska & Niedźwiecka 2014). ES(w, n).

II. Sect. *Caninae* DC. emend. H. Christ.

Rosa glauca Pourr. var. *glauca*. [Syn.: *R. rubrifolia* Vill.]

New for the study area, anthropophyte, very rare, 1 locality (125), a cultivated specimen running wild.

Frequently cultivated in the area of whole Poland, no wild specimens reported so far. The closest natural locality found in the Tatry Bielskie Mountains (Zieliński 1987; Popek 2002). CE: ce-g.

Fig. 4. *Crataegus* ×*subsphaericea* Gand. nothovar. *domicensis* (Hrabetová-Uhrová) Christensen (photo by W. Gruszka, Piła, Wypoczynkowa str., 2015)

Rosa dumalis Bechst. [Syn.: *R. afzeliana* Fr., *R. glauca* Vill, *R. caesia* Sm., *R. coriifolia* Fr.]

Not very frequent species, in the Lake Rudnickie area, earlier reported by Frase (1935) as *Rosa glauca* Vill. var *complicata* Christ. and *R. coriifolia* Fries. var. typica Christ. Currently found four varieties in 14 stands.

Growing in the whole territory, mainly the lowland and foothill parts of Poland (Zieliński 1981c; Zieliński & Popek 2001b; Popek 2002; Gutkowska & Niedźwiecka 2014). CE-M(n).

- var. *afzeliana* (Fr.) Boulenger
  A very rare variety, 4 localities (64, 66, 74, 124) in 3 stands.
  A common variety growing in the whole territory of Poland (Popek 1996).
- var. *dumalis*
  Not a very frequent variety, 14 localities (2, 12, 15, 19, 21, 23, 47, 53, 71, 89, 92, 123, 133, 134) in 8 stands.
  Very common in the whole country (Popek 1996).
- var. *coriifolia* (Fr.) Boulenger
  Rare variety, 8 localities (30, 46, 62, 82, 95, 112, 114, 144) in 7 stands. The record 82 also concerns *Rosa dumalis* Bechst. var. *coriifolia* (Fr.) Boulenger for. *tristis* (A. Kerner) Popek
  Very common variety in Poland (Popek 1996).
- var. *caesia* (Sm.) Boulenger
  A very rare variety, 3 localities (48, 93, 109) in 3 stands.
  Not frequent variety in Poland (Popek 1996).

Rosa villosa L. **var. *villosa***

New for the study area, very rare, 1 locality (139) – a specimen collected from the cemetery hedge. The original habitat – unknown (Fig. 5).

Through Poland runs the southern limit of the species range . The only wild form of the species grows in the south west part of Poland (Zieliński 1981a; Zieliński & Popek 2001c). The only variety in Poland was reported by Popek 1996. CE-M.

Rosa sherardii Davies

Rare, two varieties reported from 7 stands.

Frequent in Poland. Very common in the lowland and foothill parts of the country (Zieliński 1981d; Popek 1996; Zieliński & Popek 2001d; Gutkowska & Niedźwiecka 2014). CE:a-ne.

- var. *sherardii*
  Rare, 6 localities (49, 77, 120, 138, 142, 147) in 6 stands.
  The widespread variety in the whole Poland (Popek 1996).
- var. *collivaga* (Cottet) Boulenger
  Very rare, 1 locality (130).
  The species grows in west and north parts of Poland. Its southern occurrence was reported only from the Pieniny

Fig. 5. *Rosa villosa* L. (photo by W. Gruszka, Piła, municipal cemetery, 2015)

Mountains and Kraków-Częstochowa Upland (Popek 1996; Sołtys-Lelek 2011). The species formerly reported by Zieliński (1981a), ATPOL BC17 (Popek 2002).

Rosa rubiginosa L.

New for the study area, two varieties of not very frequent species, reported from 10 stands.

Frequent in the whole Poland. Very common in lowlands, foothills and the South Polish Uplands (Kaczmarek 1972; Popek 2002; Gutkowska & Niedźwiecka 2014). sa-CE-M(n).

- var. *umbellata* (Leers) Dumort.
  Rare, 12 localities (5, 40, 51, 68, 73, 76, 85, 94, 119, 121, 129, 131) in 9 stands.
  Distributed in the whole Poland, a very common variety (Popek 1996).

- var. *jenensis* (M. Schulze) H. Christ.
  Very rare, 1 locality (111).
  On the scale of Poland, the variety recorded only in the Szczecin area and Skotniki Małe in the Nida River valley (Holzfuss 1924; Sołtys-Lelek 2012).

Rosa inodora Fr. var. *inodora*

The variety named *R. inodora* Schwertschl var. *genuina* Schwertschl. found close to the Lake Rudnickie, reported by Enderlein (1938), Not verified since then.

Through Poland runs the northeastern limit of the species range. It occurs mainly in lowlands and the South Polish Uplands. The species and variety common (Kaczmarek 1973; Popek 2002). CE (w).

Rosa canina L.

A frequent species, formerly reported by Abromeit *et al.* (1898-1940) as *R. dumetorum* Thuill. Later, reported by Zieliński (1981e) from BC17, BC18 and BC28 (Popek 2002). Currently found five varieties in 23 stands.

Very common in the whole territory of Poland (Zieliński & Popek 2001e; Popek 2002; Gutkowska & Niedźwiecka 2014). sa-CE-M-IR.

- var. *canina*
  Very rare, 2 localities (91, 101) in 2 stands.
  A rare variety in Poland (Popek 1996).

- var. *andegavensis* (Bastard.) Desp.
  Very rare, 3 localities (27, 37, 137) in 3 stands.
  A very rare variety, reported only from the Wielkopolska Lowland, Sudeckie Foothills and Wysoczyzna Płocka (Popek 1996).

- var. *dumalis* Baker
  Quite frequent, 37 localities (1, 4, 6, 7, 9, 10, 14, 17, 18, 22, 24, 26, 31, 33, 38, 41, 44, 52, 54, 56, 57, 58, 59, 72, 75, 78, 79, 80, 86, 90, 98, 104, 106, 113, 117, 132, 149) in 18 stands. The variety formerly reported by Abromeit *et al.* (1898-1940).
  A common variety in Poland (Popek 1996).

- var. *deseglisei* (Boreau) Crépin (Fig. 6).
  Very rare, 2 localities (60, 108) in 2 stands.
  A rare variety, reported from the South Polish Uplands, Niecka Nidziańska, Beskid Śląski Mountains and Szczecińska Upland (Popek 1996; Sołtys-Lelek 2012).

- var. *corymbifera* (Borkh.) Boulenger
  Very rare, 3 localities (50, 69, 146) in 3 stands.
  Very common (Popek 1996).

Rosa ×subcanina (H. Christ) R. Keller

Quite frequent, 26 localities (8, 16, 20, 29, 34, 35, 61, 63, 65, 67, 84, 87, 96, 97, 99, 100, 103, 110, 115, 116, 122, 127, 135, 136, 143, 148) in 17 stands. Reported earlier from the Lake Rudnickie locality (Frase 1935).

The form of hybrid origin, no hairy leaves, reported by Henker (2000) in the range of species. Its distribution in Poland requires further studies. CE-M(n).

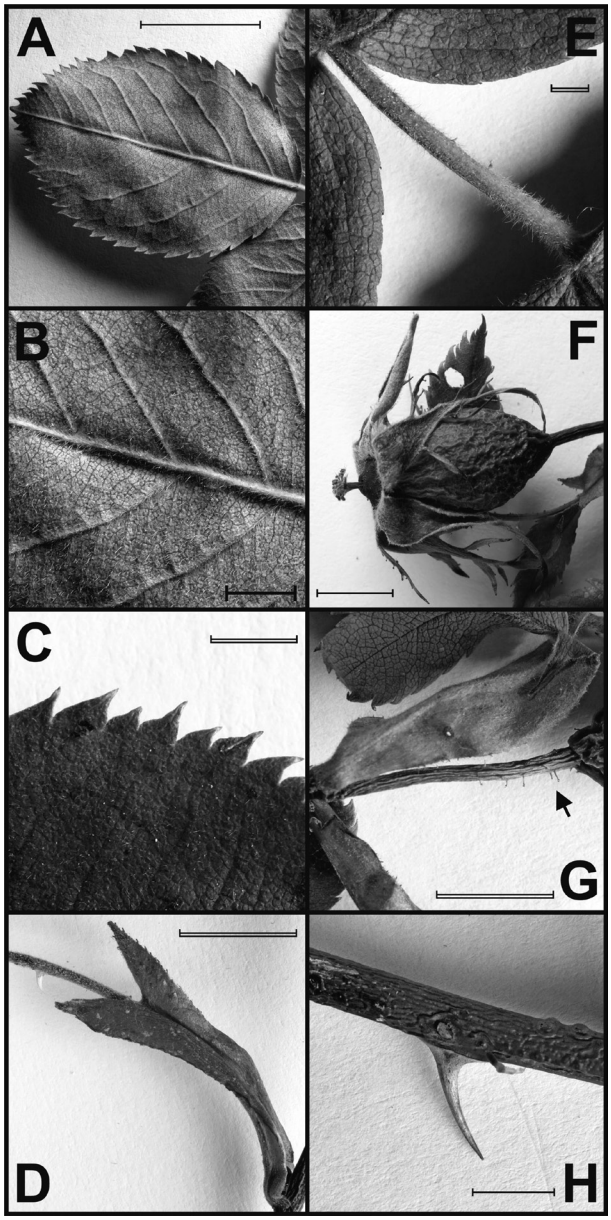

Fig. 6. *Rosa canina* L. var. *deseglisei* (Boreau) Crépin
Explanations: A – leaflet, B – part of a leaf (underside), C – margin of leaflet, D – stipule, E – part of leaf axis, F – fruit, G – glandular pedicel, H – prickle. Solid bar = 1 cm. Double bar = 0.5 cm

Rosa ×subcollina (H. Christ) R. Keller

New for the study area, a very rare taxon, 2 localities (28, 118) in 2 stands.

The form of hybrid origin, hairy leaves, reported by Henker (2000) in the range of species. Its distribution in Poland requires further studies. CE-M(n).

Rosa canina L. × ***R. rubiginosa*** L.

New for the study area, very rare, 2 localities (70, 83) in 2 stands.

An interspecific hybrid, the distribution unknown. sa-CE-M(n).

III. Sect. *Synstylae* DC.

Rosa multiflora Thunb.

New for the study area, anthropophyte, very rare, 1 locality (13), close to a gravel path. The specimen may come from the local private gardens.

Specimens grow in the whole territory of Poland as escapes from cultivated areas, gardens (decorative plant) and parks (Zieliński 1987; Pacyna 2004; Gutkowska & Niedźwiecka 2014; Wolanin 2014). Asia.

5. Discussion

The studies provided additional records concerning the number of species stands in Piła, which helped to prepare a more precise description of their frequency and distribution in the examined area. The examples confirming the above comprised: *Rosa sherardii* or, very common in the entire country, *R. canina* and *R. dumalis*, formerly obtained from single habitats only (Abromeit 1898-1940; Zieliński 1981c, 1981d). The acquired records confirmed poor recognition of the subject in the studied area.

The frequency of rose and hawthorn occurrence in the studied area ranged from 1 to 26 stands. There were found 10 very rare taxa (max. 4 stands only): *Crataegus rhipidophylla*, *Rosa villosa* and antropophytes: *R. glauca*, *R. multiflora* (1 stand for each), *C. ×media*, *C. laevigata* (reported by literature), *R. majalis*, *R.×subcollina* (2 stands for each), *C. ×macrocarpa* (4 stands) and the intersection hybrid *R. canina* × *R. rubiginosa* (2 stands). The most frequent species were: *C. monogyna* (26 stands), *R. canina* (23 stands) and *R. dumalis* (14 stands). These taxa are also the most common wild growing rose and hawthorn species in Poland.

Field studies revealed also the hybrid form of *R. canina* and *R. dumalis*. The occurrence of a specimen slightly different from typical *R. dumalis* was also reported. Some scientists (Henker 2000) consider them as hybrids (*R. dumalis* × *R. canina*) and treat them as individual, separate taxa: *R. ×subcanina* – with no hairy leaves, and *R. ×subcollina* – with hairy leaves. According to other authors (Zieliński 1985, 1987), the above-mentioned specimens are morphological extremes of *R. dumalis* forms, related to typical, com-

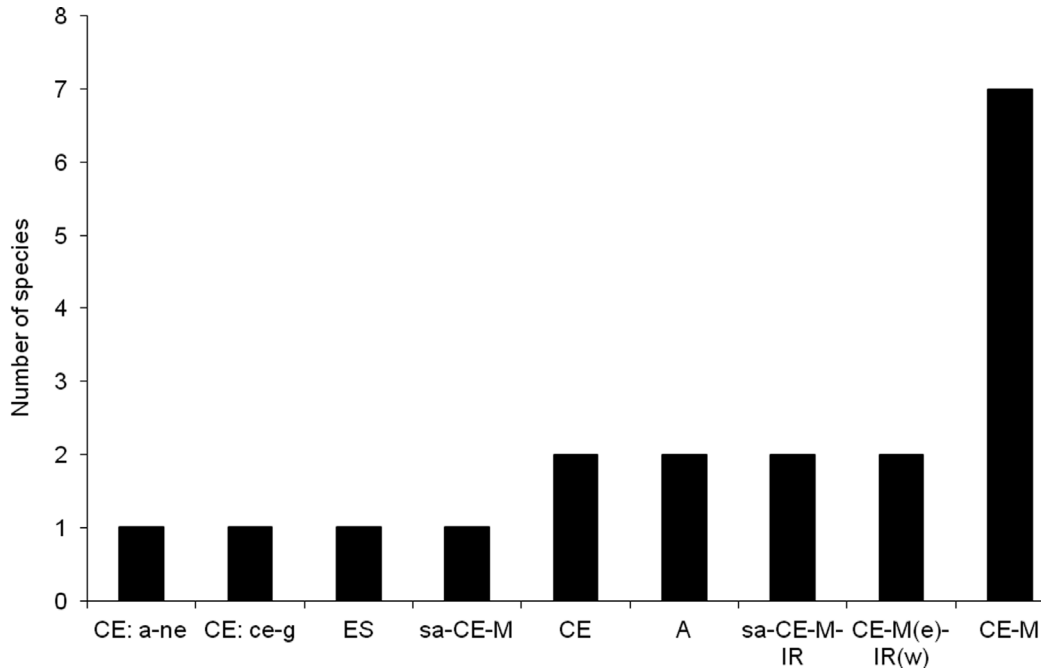

Fig. 7. Geographical elements and subelements of roses and hawthorns occurring in the study area (according to: Popek 2002, 2007; Zając & Zając 2009)

Explanations: A – Asian element, CE – European-temperate sub-element, CE: a-ne – Alpine-northern-European distributional type, CE: ce-g – European-temperate montane group, ES – Euro-Siberian sub-element, IR – Irano-Turanian element, M – Mediterranean element, e – eastern, w – western; sa – extension in the beginning of diagnosis to the Atlantic region of Europe

mon representatives. This paper follows the approach of Henker (2000).

The highest diversity was found among *R. canina* (5 varieties) and *R. dumalis* (4 varieties). The *R. canina* varieties include, among others: *R. canina* var. *canina* with single serrated leaves, *R. canina* var. *andegavensis* with glandular pedicles and no hairy leaves and *R. canina* var. *deseglisei* with glandular pedicles and hairy leaves. The rare varieties of *R. canina* in Poland (Popek 1996) deserve further attention (Fig. 6). So far, in Poland, *R. canina* var. *andegavensis* was only reported from the Wielkopolska Lowland, Sudety Foothills and Wysoczyzna Płocka, while *R. canina* var. *deseglisei* was observed in Szczecin, Silesian-Kraków Uplands, Nida Basin and Silesian Beskids (Popek 1996; Sołtys-Lelek 2011, 2012).

R. rubiginosa var. *jenensis*, with glandular pedicles, fruit and sepals is an absolute rarity in the Piła area, formerly found in the Szczecin region (Holzfuss 1924) and Solec Basin (Sołtys-Lelek 2012) in Poland. Generally, it is considered a very rare variety in the central and southern parts of Europe (Klášterský 1932). Non-glandular leaves and pedicles of rare *R. sherardii* var. *collivaga* were reported so far from western and northern parts of Poland (Kłodzko, Wałbrzych, Chojnów, Zielona Góra and Szczecin areas) and south of the country: The Pieniny Mountains, and Krakowsko-Częstochowska Upland (Jurassic Rock Upland) (Popek & Szeląg 1993; Popek 1996; Sołtys-Lelek 2011) belong to more interesting ones.

C. ×*subsphaericea* nothovar. *domicensis* – with erect or erect to spreading sepals (Fig. 4) – belongs to the most interesting taxa among hawthorns. So far, it was reported from central and eastern Poland only (Morawica and Lublin region: Helenów and Ciecierzyn), also, from the Polish Carpathian Mts. (Christensen 1992; Oklejewicz *et al.* 2014).

Nothovar. *macrocarpa* and nothovar. *calycina* – two nothovarieties of *C.* ×*macrocarpa* – the nothospecies found in the examined area also deserve more attention; so far they were reported only from the western, southern and eastern outskirts of Poland (Christensen 1992; Oklejewicz & Vončina 2012; Sołtys-Lelek 2011, 2012; Oklejewicz *et al.* 2013, 2014, 2015). There are no sufficient records concerning the distribution of this taxon in Poland, yet.

Among the above-mentioned taxa dominate the species distributed in the European territories with temperate and Mediterranean climate (Fig. 7).

The studied species belong to the floristic elements of Piła and occur in specific conditions, depending on urban infrastructure. They often grow in towns spontaneously, as a result of natural succession, or are cultivated by people as a part of urban greenery. Considering their decorative value, the following specimens were planted in the investigated area: *R. glauca, R. villosa, R. multiflora* and cultivated, remarkably beautiful *C.* ×*media* 'Rubra Plena'. Most roses and hawthorns species originate from wasteland habitats; however, a quite

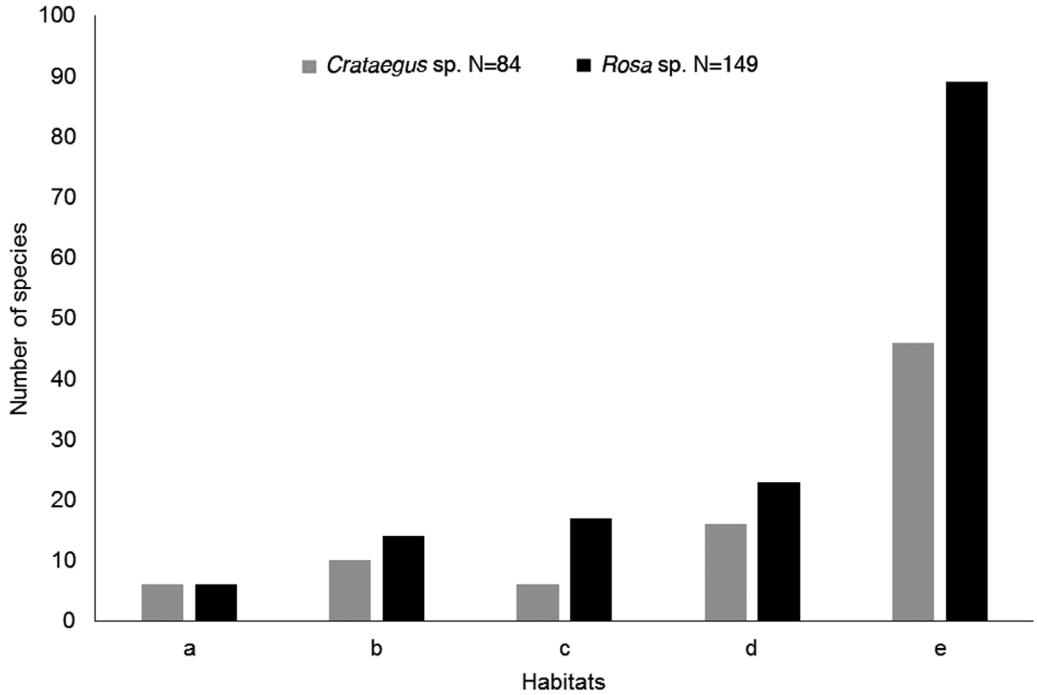

Fig. 8. Habitats of species in the study area
Explanations: a – forest areas, b – forest edges , c – green areas within the city borders, d – roadsides, e – wastelands

large number of taxa was also reported from roadsides (Fig. 8). *R. canina* and *R. dumalis* – two most common species appearing in Poland, as well as *R. rubiginosa* were found in the above-mentioned habitats. *R. glauca* and *R.* ×*subcollina* were the only taxa occurring in the wasteland habitats situated in the examined territory. *Rosa majalis* and *R. villosa* were found only in the urban green areas. *C. monogyna* was found in all studied stands. *C.* ×*subsphaericea* was also present in all habitats besides the forests margins.

Altogether, five out of six native hawthorn species growing in Poland and over half of native rose species were observed in the examined area. The obtained results provide evidence that despite the relatively limited size of explored territory, the final effects may be spectacular. Unexpectedly, the significant number of species of the studied genera were identified within the boundaries of the town of Piła. It is very important to point out that numerous taxa found in the above-mentioned area were recorded for the first time.

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Appendix 1. Coordinates of localities of *Crataegus* species

Stand: BC1724
Localities
1. 53°11'13.35"N; 16°44'58.64"E
2. 53°11'4.51"N; 16°45'1.08"E
3. 53°11'17.43"N; 16°44'45.65"E
4. 53°11'17.53"N; 16°44'45.22"E
5. 53°11'17.45"N; 16°44'24.66"E
6. 53°11'21.30"N; 16°44'36.55"E
Stand: BC1732
7. 53°10'30.53"N; 16°41'23.35"E
8. 53°9'42.33"N; 16°41'13.47"E
Stand: BC1733
9. 53°10'42.89"N; 16°43'55.61"E
10. 53°9'59.88"N; 16°43'20.76"E
11. 53°10'0.83"N; 16°43'21.63"E
Stand: BC1734
12. 53°10'26.24"N; 16°43'36.73"E
13. 53°10'33.53"N; 16°43'50.86"E
14. 53°10'33.55"N; 16°44'32.45"E
15. 53°10'36.16"N; 16°43'48.89"E
16. 53°11'14.84"N; 16°45'7.55"E
17. 53°10'45.90"N; 16°44'48.04"E
18. 53°10'19.19"N; 16°45'10.47"E
19. 53°10'3.51"N; 16°45'1.57"E
20. 53°10'0.44"N; 16°44'57.61"E
21. 53°10'1.33"N; 16°44'41.66"E
22. 53°10'31.18"N; 16°43'30.22"E
23. 53°10'34.16"N; 16°44'47.66"E
24. 53°9'59.80"N; 16°44'39.68"E
25. 53°9'49.56"N; 16°44'26.90"E
26. 53°10'6.34"N; 16°44'47.20"E
Stand: BC1742
27. 53°8'38.86"N; 16°41'11.39"E
28. 53°8'42.65"N; 16°41'12.32"E
29. 53°9'16.06"N; 16°41'32.22"E
30. 53°8'58.92"N; 16°40'49.53"E
31. 53°9'2.77"N; 16°40'53.19"E
32. 53°9'5.64"N; 16°41'18.34"E
33. 53°9'5.64"N; 16°41'18.34"E
Stand: BC1743
34. 53°9'22.71"N; 16°43'19.37"E
35. 53°9'22.89"N; 16°43'19.43"E
36. 53°9'4.13"N; 16°42'39.82"E
37. 53°8'42.10"N; 16°43'18.12"E
38. 53°8'47.61"N; 16°43'17.23"E
39. 53°8'53.32"N; 16°43'13.05"E
40. 53°9'2.85"N' 16°41'51.23"E
Stand: BC1744
41. 53°8'49.54"N; 16°44'47.70"E
42. 53°8'38.47"N; 16°43'32.98"E
43. 53°9'23.37"N; 16°44'30.73"E
Stand: BC1810
44. 53°11'55.54"N; 16°45'22.73"E
Stand: BC1820
45. 53°11'28.54"N; 16°45'13.67"E
46. 53°11'11.21"N; 16°46'14.26"E
47. 53°11'22.27"N; 16°46'35.30"E
Stand: BC1821
48. 53°11'1.07"N; 16°48'24.14"E
Stand: BC1830
49. 53°10'15.49"N; 16°45'19.66"E
50. 53°10'32.26"N; 16°45'45.47"E
51. 53°10'32.26"N; 16°45'45.47"E
52. 53°10'12.21"N;16°45'16.14"E
Stand: BC1832
53. 53°10'31.75"N; 16°49'46.42"E
Stand: BC1840
54. 53°8'52.24"N; 16°45'56.43"E
55. 53°8'55.87"N; 16°46'31.07"E
56. 53°9'29.49"N; 16°45'33.21"E
57. 53°9'27.20"N; 16°45'33.89"E
Stand: BC1841
58. 53°8'52.36"N; 16°47'9.40"E
59. 53°8'50.39"N; 16°47'28.64"E
Stand: BC2702
60. 53°8'5.45"N; 16°41'40.86"E
Stand: BC2703
61. 53°8'30.33"N; 16°42'38.54"E
62. 53°8'5.59"N; 16°43'18.68"E
Stand: BC2704
63. 53°8'22.33"N; 16°45'14.29"E
Stand: BC2713
64. 53°7'15.22"N; 16°43'7.75"E
Stand: BC2724
65. 53°6'0.66"N; 16°44'18.39"E
Stand: BC2744
66. 53°4'16.34"N; 16°44'46.39"E
Stand: BC2800
67. 53°8'23.36"N; 116°46'21.43"E
68. 53°8'22.75"N; 16°46'10.66"E
69. 53°8'23.20"N; 16°46'6.92"E
70. 53°8'21.87"N; 16°45'59.77"E
71. 53°8'13.67"N; 16°45'40.35"E
Stand: BC2801
72. 53°8'8.57"N; 16°47'42.74"E
73. 53°8'39.68"N; 16°47'35.47"E
74. 53°8'1.40"N; 16°47'42.23"E
75. 53°8'4.93"N; 16°48'17.59"E
76. 53°8'38.40"N; 16°47'14.58"E
Stand: BC2810
77. 53°6'48.04"N; 16°46'31.45"E
78. 53°7'26.11"N; 16°46'21.50"E
Stand: BC2811
79. 53°7'21.26"N; 16°47'22.20"E
80. 53°6'24.27"N; 16°47'20.68"E
Stand: BC2820
81. 53°6'20.24"N; 16°46'28.89"E
82. 53°6'9.67"N; 16°46'27.15"E
Stand: BC2830
83. 53°6'18.79"N, 16°46'15.09"E
Stand: BC2821
84. 53°6'15.20"N; 16°46'42.28"E

Appendix 2. Coordinates of localities of *Rosa* species

Stand: BC1723
Locality
1. 53°10'53.11"N; 16°43'44.31"E
Stand: BC1724
2. 53°11'9.37"N; 16°43'48.48"E
3. 53°10'46.01"N; 16°44'47.99"E
4. 53°10'59.46"N; 16°44'4.89"E
5. 53°10'59.46"N; 16°44'4.89"E
6. 53°11'16.64"N; 16°45'1.62"E
Stand: BC1732
7. 53°10'24.19"N; 16°41'22.92"E
8. 53°9'50.85"N; 16°41'12.05"E
Stand: BC1733
9. 53°10'3.44"N; 16°43'9.18"E
10. 53°9'56.42"N; 16°43'4.14"E
11. 53°9'48.56"N; 16°43'2.17"E
12. 53°9'49.31"N; 16°42'55.69"E
13. 53°10'4.13"N; 16°43'22.93"E
Stand: BC1734
14. 53°9'47.61"N; 16°43'39.80"E
15. 53°9'56.71"N; 16°44'49.35"E
16. 53°10'0.30"N; 16°44'39.98"E
17. 53°10'23.25"N; 16°43'40.54"E
18. 53°10'31.27"N; 16°43'30.14"E
19. 53°10'32.35"N; 16°43'47.29"E
20. 53°10'33.55"N; 16°44'32.45"E
21. 53°10'35.24"N; 16°43'32.74"E
22. 53°10'38.16"N; 16°43'57.24"E
23. 53°10'38.16"N; 16°43'57.24"E
24. 53°10'46.09"N; 16°45'13.32"E
25. 53°10'1.39"N; 16°45'0.03"E
26. 53°10'16.64"N; 16°44'42.87"E
27. 53°10'19.19"N; 16°45'10.47"E
28. 53°10'36.43"N; 16°44'48.85"E
29. 53°10'36.43"N; 16°44'48.85"E
30. 53°10'43.62"N; 16°43'37.34"E
31. 53°10'30.16"N; 16°44'8.35"E
Stand: BC1742
32. 53°8'50.06"N; 16°41'34.12"E
33. 53°9'16.41"N; 16°41'31.68"E
34. 53°8'36.32"N; 16°41'2.79"E
35. 53°8'39.53"N; 16°41'11.40"E
36. 53°9'0.58"N; 16°41'20.90"E
37. 53°9'18.33"N; 16°41'1.77"E
38. 53°9'21.51"N; 16°40'48.80"E
Stand: BC1743
39. 53°8'36.73"N; 16°41'53.22"E
40. 53°8'44.86"N; 16°43'17.61"E
41. 53°8'48.99"N; 16°42'33.57"E
42. 53°8'49.35"N; 16°41'47.34"E
43. 53°9'1.22"N; 16°41'54.10"E
44. 53°9'4.07"N; 16°42'54.81"E
45. 53°9'4.23"N; 16°42'42.42"E
46. 53°9'4.91"N; 16°42'2.13"E
47. 53°9'7.12"N; 16°42'36.41"E
48. 53°8'38.95"N; 16°43'19.03"E
49. 53°8'38.95"N; 16°43'19.03"E
50. 53°8'41.74"N; 16°43'18.78"E
51. 53°8'42.15"N; 16°43'21.38"E
52. 53°8'50.18"N' 16°42'2.85"E
53. 53°9'10.46"N; 16°41'47.09"E
54. 53°9'10.46"N; 16°41'47.09"E
55. 53°8'51.44"N; 16°43'24.15"E
Stand: BC1744
56. 53°8'40.21"N, 16°45'4.60"E
57. 53°8'56.01"N; 16°43'36.12"E
58. 53°9'18.76"N; 16°44'35.48"E
59. 53°9'42.27"N; 16°44'22.67"E
60. 53°9'25.78"N; 16°44'32.82"E
Stand: BC1810
61. 53°11'53.62"N; 16°45'25.21"E
Stand: BC1820
62. 53°11'1.39"N; 16°46'5.60"E
63. 53°11'7.21"N; 16°46'7.66"E
Stand: BC1830
64. 53°10'26.91"N; 16°45'47.45"E
65. 53°10'18.21"N; 16°45'24.24"E
66. 53°10'21.51"N; 16°45'37.13"E
67. 53°10'28.90"N; 16°45'30.30"E
68. 53°10'32.16"N; 16°45'46.57"E
69. 53°9'56.61"N; 16°45'33.77"E
70. 53°9'57.36"N; 16°45'32.10"E
71. 53°9'57.36"N; 16°45'32.10"E
Stand: BC1831
72. 53°11'0.59"N; 16°48'24.18"E
73. 53°10'10.84"N; 16°48'27.39"E
Stand: BC1832
74. 53°10'37.19"N; 16°49'47.59"E
75. 53°10'35.63"N; 16°49'44.88"E
Stand: BC1840
76. 53°9'26.39"N; 16°45'34.66"E
77. 53°9'27.50"N; 16°45'34.06"E
78. 53°8'3.68"N; 16°42'26.98"E
79. 53°9'22.90"N; 16°45'25.56"E
80. 53°9'39.76"N; 16°46'32.63"E
81. 53°9'13.77"N; 16°46'11.98"E
82. 53°9'38.37"N; 16°46'31.57"E
83. 53°8'52.20"N; 16°45'51.98"E
Stand: BC1841
84. 53°8'57.58"N; 16°47'29.17"E
Stand: BC2702
85. 53°7'37.03"N; 16°40'53.78"E
86. 53°7'55.49"N; 16°41'5.04"E
87. 53°7'55.49"N; 16°41'5.04"E
Stand: BC2703
88. 53°8'30.89"N; 16°42'6.11"E
89. 53°8'31.49"N; 16°42'7.55"E
90. 53°8'12.17"N; 16°43'2.72"E
91. 53°8'25.24"N; 16°42'47.85"E
92. 53°8'32.29"N; 16°42'41.63"E
93. 53°8'33.46"N; 16°42'43.42"E
94. 53°8'33.46"N; 16°42'43.42"E
95. 53°8'37.00"N; 16°43'22.76"E
96. 53°7'58.63"N;16°42'1.49"E

97. 53°8'11.45"N; 16°42'14.02"E
98. 53°8'6.81"N; 16°42'18.30"E
99. 53°8'3.68"N; 16°42'26.98"E
100. 53°8'9.05"N; 16°42'15.56"E
Stand: BC2704
101. 53°8'0.08"N; 16°44'46.59"E
102. 53°7'52.62"N; 16°44'53.99"E
103. 53° 8'22.25"N; 16°45'10.07"E
104. 53°8'21.95"N; 16°45'14.07"E
105. 53°8'31.04"N; 16°44'26.04"E
106. 53°8'31.27"N; 16°44'29.58"E
107. 53°8'31.31"N; 16°44'23.57"E
108. 53°8'32.48"N; 16°44'32.94"E
109. 53°8'29.84"N; 16°43'45.64"E
Stand: BC2713
110. 53°7'23.65"N; 16°43'11.32"E
111. 53°7'17.19"N; 16°43'15.03"E
Stand: BC2714
113. 53°8'31.40"N; 16°44'26.14"E
113. 53°7'29.38"N; 16°43'53.45"E
114. 53°6'52.27"N; 16°45'3.26"E
Stand: BC2724
115. 53°5'42.97"N; 16°44'40.82"E
116. 53°5'55.84"N; 16°45'3.60"E
Stand: BC2800
117. 53°7'39.00"N; 16°45'34.05"E
118. 53°7'42.14"N; 16°45'37.74"E
119. 53°7'42.14"N; 16°45'37.74"E
120. 53°8'13.77"N; 16°45'26.55"E
121. 53°8'19.14"N; 16°46'25.69"E
122. 53°8'28.57"N; 16°45'45.26"E
123. 53°8'19.80"N; 16°46'17.00"E
124. 53°8'26.63"N; 16°45'58.40"E
125. 53°8'31.30"N; 16°45'44.33"E
126. 53°7'40.79"N; 16°46'58.65"E
Stand: BC2801
127. 53°8'36.37"N; 6°47'40.29"E
128. 53°8'36.37"N; 16°47'37.24"E
129. 53°8'35.02"N; 16°47'46.49"E
130. 53°7'54.42"N; 16°48'2.22"E
131. 53°7'55.59"N; 16°47'59.31"E
132. 53°8'40.09"N; 16°47'15.79"E
133. 53°8'7.34"N, 16°48'12.02"E
134. 53°8'8.04"N; 16°47'41.14"E
135. 53°8'28.83"N; 16°47'11.67"E
Stand: BC2810
136. 53°6'54.25"N; 16°46'31.63"E
137. 53°6'44.88"N; 16°46'32.99"E
138. 53°6'44.88"N; 16°46'32.99"E
139. 53°7'30.64"N; 16°45'42.87"E
140. 53°7'33.43"N; 16°46'21.53"E
Stand: BC2811
141. 53°6'58.30"N; 16°47'28.67"E
142. 53°7'18.33"N; 16°47'32.93"E
Stand: BC2812
143. 53°7'19.86"N; 16°49'15.23"E
144. 53°7'21.94"N; 16°49'9.89"E
Stand: BC2820
145. 53°6'14.80"N; 16°46'54.15"E
146. 53°6'19.31"N; 16°46'27.55"E
147. 53°6'20.27"N; 16°46'17.74"E
148. 53°6'16.90"N; 16°46'58.66"E
149. 53°6'13.47"N; 16°46'32.20"