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Current and remembered past uses of wild food plants in Saaremaa, Estonia: changes in the context of unlearning debt

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Abstract: It is widely agreed that in industrialized Europe knowledge on the use of wild food plants shows a decreasing trend with few instances of valorization. We employed a folk history approach in order to understand the changes that have occurred in the use of wild food plants within the lifetime of the older generation living on Saaremaa Island. Comparing current and remembered past uses and evaluating temporal encounters, afforded the understanding that, while the general picture of the use of wild food plants seems diverse and promising (89 plant taxa used, median 20 taxa used per person, Informant Consensus Index of 0.9), only 36% of uses have been practiced throughout life. Another third (34%) of uses existed as a childhood memory, which also encompassed taxa useful during times of food shortage and 20% of the uses recorded were recently abandoned. The uses of wild food plants acquired later in life, at some point during adulthood (4%) or recently (6%), were few in number, rather temporal in nature and affected by fashion trends. To understand the temporal changes in the use of wild food plants and to identify the reasons causing those changes, it may be important for future researchers to document the exact time of the actual use. To ensure the survival of food-security related knowledge, during times of relative food abundance, it is important to ensure the continuity of the use of wild food plants on the family level, by educating children through their participation in making food from wild plants.

Keywords: ethnobotany; food security; food shortage; wild food plants; childhood memories; folk history

Introduction

In the light of global ecological changes, the Earth is reaching or has already exceeded many of the limits of its planetary boundaries (Rockström et al. 2009), which may lead to sudden and unexpected ecological and/or social crisis. Moreover, recent political and socio-economic changes in the areas bordering the European Union (such as armed conflicts in Syria and Ukraine) may, in the case of future escalation, create the need for more localized food supplies. The availability and knowledge of the use of local wild food resources may then be of crucial importance (Redžić 2010a, b). Although wild food plant resources are often seen as a supplement, or diversifier, to the food supply, the loss of knowledge of and habit of their use threatens to create hardship during interruptions in globalized food supply chains, as there is always a certain amount of knowledge required for managing, gathering and using wild food resources. Mere knowledge, however, does

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not correlate to actual use, especially if the community does not depend on the plants in everyday life (Reyes-García et al. 2005).

Stryamets et al. (2015) link the use of wild food plants to socio-economic development of the area, illustrating this with case studies from Ukraine and Russia where wild food plants are still widely used domestically and to generate additional income, while in Sweden they are used modestly and mainly for recreational purposes. Indeed, in historically less economically developed Post-Socialist parts of Europe the use of wild food plants is well documented in some locations, for example in Croatia (Dolina and Łuczaj 2014), among Ukrainian minorities in Romania (Łuczaj et al. 2015), in Kosovo (Mustafa et al. 2015) and in Dagestan, where giving away wild vegetables is also regarded as a sign of care, respect and local identity (Kaliszewska and Kołodziejska-Degórska 2015). However, semi-qualitative studies conducted in ethnobotanically rich and interesting regions usually focus on the plants people have used through their lifetime, neglecting the changes that have occurred within the lifetime of the interviewees.

Traditional ecological knowledge in Europe has been constantly changing, as some bits of it are continually abandoned and new ones generated (Hernández-Morcillo et al. 2014). As the use of wild food plants is also a part of TEK, the same applies: historical sources provide different use records from the results of current ethnobotanical investigations, as has been demonstrated by recent field studies in Belarus (Łuczaj et al. 2013) and northern Apulia, SE Italy (Biscotti and Pieroni 2015) as well as the results obtained by questioning people with advanced botanical education in Estonia (Kalle and Sõukand 2013). Yet the use of wild food plants has also shown considerable resilience to change in isolated minority communities, such as among Albanians of the upper Reka Valley in Western Macedonia (Pieroni et al. 2013) and Waldensians in valleys of the Western Alps in NW Italy (Bellia and Pieroni 2015). Some authors have found that the use of wild food plant in Western Europe is rather poor, for example in Sicily (Italy) (Licata et al. 2016), while others state that in the Basque Country (Spain) "a wide range of plants are known and many still used" (Alarcón et al. 2015). A large-scale study conducted in Mediterranean Europe reported a generalized, although uneven, trend of decrease in the gathering and consumption of wild food plants, whereas two factors (high cultural appreciation and recreational activities associated with gathering) have maintained the popularity of some wild food plants (Reyes-García et al. 2015). Furthermore, Serrasoles et al. (2016) developed some of the above mentioned field-studies into an investigation of the popular explanation of the reasons for using wild food plants, concluding that socio-cultural factors are more prominent determinants of the consumption trend; they also conclude that of the three different paths the consumption of wild food plants can follow (abandonment, maintenance and valorization) only the first two were present, with a high prevalence of abandonment in all three research sites.

Estonia, once one of the republics of the Soviet Union, is now considered a high income level country according to the World Bank. Hence the influence of rapid change in the economic situation at the country level could be reflected in the use of plants. To address the question of changes in the knowledge on the use of wild food plants in Estonia, we selected a relatively isolated location, Saaremaa Island. Local inhabitants of Saaremaa, like the majority of Estonians, perceive themselves as people "close to nature" and this vision has been supported by many popular authors since the end of the 19th century. Yet, for modern Saaremaa, a relatively good availability of food

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and healthcare has been a reality for more than 60 years, during which time food crises have been rare and mild. The generation that provided for the family during the last major crisis (around WWII) is already deceased, taking along the adult perspective on the need-specific use of wild food plants. Those representatives of the elder population, who are still alive, were children then, and so they have only memories of consuming wild food plants during food shortages. On the other hand, particularly in the last 20 years, numerous popular books and television programs have been trying to re-build and promote the use of wild food plants, regularly introducing new taxa or ways of use. Hence, there have been conditions allowing for the observance of all three paths of use of wild food plants (e.g. abandonment, maintenance and valorization).

Saaremaa is also notable as it is the only region in Estonia with localized data on the use of wild food plants from the beginning of the 19th century (Luce 1823); namely that published by the German doctor Johann Wilhelm Ludwig von Luce (1756–1842), who worked in Saaremaa first as a pastor and then as a doctor. His research was the first of its kind in Europe and is considered one of the pioneer works in ethnobotany (Pardo-de-Santayana et al. 2015). Alongside the uses he collected on Oesel Island (Saremaa), his book also contains recommendations, possible loans from the contemporary literature of his time and taxa not belonging to Estonian flora and the sources for the claimed plant uses are not always clear (Sõukand and Kalle 2016a, b). Given the above and the fact that the work of Luce is temporally too distant for the objectives of our research, we will not compare it with the results of the present study.

The aim of this contribution was a) to document remembered past and current use of wild food plants in Saaremaa among the older generation; and b) to understand the temporal dimension of changes and to assess different paths in the use of wild food plants within the lifetime of one generation. We expected that wild food plants are still widely used and appreciated. Our primary hypothesis was that there has been some erosion in the use of famine food, balanced with valorization of newly promoted "fancy" wild plants. This research contributes to the documentation and analysis of the use of wild food plants in present-day Europe. This is the first regional field-work based study on the consumption of wild food plants in modern Estonia.

Definition of the research domain

The concept of wild plants used in this article is based on the internationally agreed upon ethnobotanical perception and refers primarily to plants growing without deliberate cultivation or those able to reproduce without human intervention (Cruz-Garcia and Price 2011, 2014; Łuczaj et al. 2012; Menendez-Baceta et al. 2012), remaining within the confines of the perceptions of the wild food plants modern Estonians had in their childhood (Sõukand and Kalle 2015). In scope this concept covers native and naturalized species not cultivated for food including cultivars provided if the plant parts that are not usually eaten are used for food (such as the leaves of *Prunus cerasus* L.), and plants which are cultivated for non-food purposes (like *Syringa vulgaris* L.). Some of the species growing in the wild as well as in cultivated settings (for example, *Armoracia rusticana* P.Gaertn., B.Mey. & Scherb. and *Ribes nigrum* L.) are also included, given that they have run wild or are gathered from non-cultivated settings or abandoned gardens. In the context of this article the term "food" includes, in addition to hot and cold meals, fermented foods, condiments, occasional

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snacking, the making of recreational teas (e.g. herbal beverages prepared as infusions or decoctions and consumed in a food context without folk medical indications *sensu* Sõukand et al 2013) and the smoking of meat and fish.

Data and methods

Research site

Saaremaa is the fourth largest island in the Baltic Sea and the largest island in Estonia (2,673 km^2), having a coastline of 1200 km (Sooväli et al 2003). About half of the roughly 30,000 inhabitants live in its urban center, Kuressaare; the mean population density is 12 people per km^2 (Kull et al. 2007). People tend to inhabit small towns or village centers, and while there are still some stand-alone farms, many of them function as a second (holiday) home. Hence, the population density outside of towns and areas bordering with towns may even be as low as 2.3 people per km^2 (Eesti Statistika 2016).

With its mild maritime climate and wide variety of soils and habitat types, Saaremaa hosts about 80% of the native plant species found in Estonia: 1200 vascular plant species, 10% of which are rare and protected. Mixed (dominantly conifer) forest with rich plant communities covers over 40% of the territory of the island. Within the last 25 years the ecological situation of Saaremaa has undergone considerable changes. In 1990 Saaremaa was 63% forested, with characteristic coniferous forests, while the share of arable land reaches further from the coast than in the other regions of Estonia (Mander 1994). Wooden meadows and alvars, abandoned as pastures since the 1990s, have been overgrown with grass, but are now slowly being cleared and mowed again, supported by different nature conservation schemes. Wooded meadows on Saaremaa are now dominated by hazel (*Corylus avellana* L.) and birch (*Betula* spp.), followed by aspen (*Populus tremula* L.) and ash (*Fraxinus excelsior* L.) (Garbarino and Bergmeier 2014).

Data collection

The collection of the data on wild food plants was part of our wider ethnobotanical and ethnomedicinal field study, conducted on the island of Saaremaa in June-August 2014. Interviewees were approached on a random basis, as we were trying to cover diverse rural locations on Saaremaa Island. In some cases local elderly people were suggested by the people encountered in villages, as a considerable proportion of people living in Saaremaa during summer were vacationists originating from the mainland. The initial idea of the study was to find people who had lived all their life in the same place and had been involved in farming activities, but this task proved to be literally impossible, due to various influences of the Soviet system and its later decay. Before and after WWII the local farming system (where families owned and took care of the land) was destroyed, many wealthy landowners were sent to Siberia and lands as well as animals were collectivized into collective farms and the island underwent rapid industrialization (Sooväli et al. 2003; Palang 2010). People who continued to live in the countryside were obliged to work for collective farms and their children strived to get an education; after the fall of the Soviet regime, the lands were returned to their previous owners or their inheritors, collective farms were disintegrated and the people working there were left unemployed – precipitating the next wave of migration to towns and the mainland (Palang 2010). Although each individual has a different life-story, the people interviewed during the study could be roughly divided into three groups,

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represented equally in the interviewee sample: 1) former collective farm workers who now manage their own small farms or are retired; 2) those who spent their childhood in Saaremaa, later received a higher education (agronomy, forestry, bookkeeping), then worked for a period in towns or other parts of Saaremaa (one interviewee had even lived on the mainland for a short time) and now have returned to spend their retirement mainly on their parent's property; and 3) (now retired) local intellectuals (teachers, medical assistant) and clerks. One fifth of the interviewees have moved within the borders of Saaremaa, primarily because of marriage or work. The origin and present parish of residency of the respondents is shown in Figure 1.

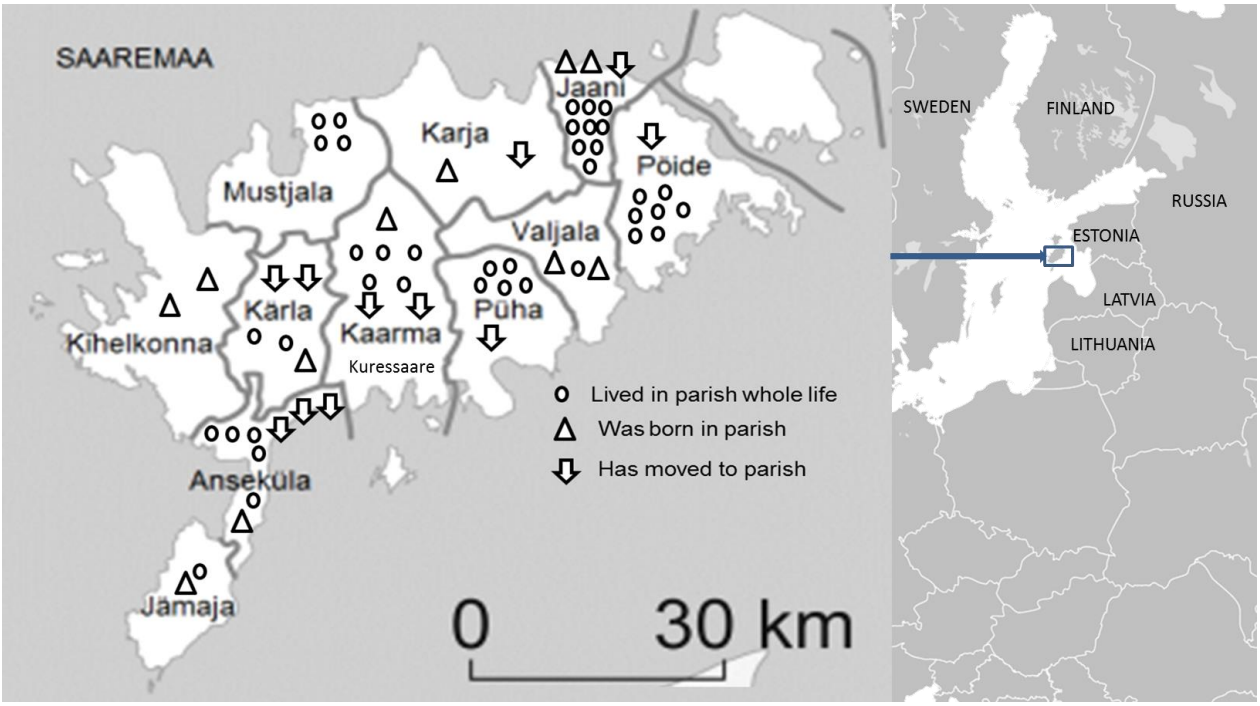

Fig. 1 Map of Saaremaa showing its location within Europe and territorial distribution of interviewees. Relocated people are depicted twice: showing their parish of origin as well as present residence. Here and thereafter the number of interviewees is 50.

For this segment of research, 48 face-to-face semi-structured interviews were carried out in 25 villages with 50 people older than 60 years of age, of which 42% were male and 58% were female. Respondents were born between 1928 and 1952. Only rural local residents who had spent their childhood and now lived permanently on Saaremaa Island in countryside settings were considered for this study. To obtain diachronic information, the folk history method (reconstruction of historical events through the memory of common people, sensu Hudson 1966) was employed: people were asked to recall the use of plants they had used themselves or observed their parents using throughout their entire life, indicating exactly when the specific use was encountered for the first or the last time. Interviews lasting from 0.5 to 2.5 hours were conducted mainly in people's homes or garden terraces with later walks in the gardens and surrounding meadows and forests, if

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this was possible. Three interviews were also conducted in a temporary nursing home in Kuressaare. Whenever possible, voice-recording was used with the interviewee's permission; in all cases field notes were also taken. The purpose of the study was explained and prior informed consent was obtained from all interviewees, adhering to the Code of Ethics of the International Society of Ethnobiology (ISE 2008). The interviews were transcribed either from the voice recordings or in a few cases from the field note-books. The voice-recorded interviews as well as the transcripts and notebooks are stored at the Scientific Archive of the Estonian Folklore Institute (EFISA RR1-56) located in the Estonian Literary Museum.

Voucher specimens were collected on site or during field walks with the interviewees, dried and identified by the first author using the flora identification key for Estonia and later reviewed by Toomas Kukk (Curator of the Estonian University of Life Sciences herbarium). Plant vouchers are deposited at the Estonian University of Life Sciences herbarium (TAA), assigned herbarium numbers within the range TAA0118553-0119824, and also bearing numbers ETBOT1-149.

Whenever it was not possible to collect voucher specimens (e. g. plant did not grow there any more, person had moved), the identification was made based on the folk botanical name and precise description of the plant. In a few cases, when taxa were not differentiated on the species level among interviewees, it was identified on the genus level, even if voucher specimens for some representatives of the genus were collected (for example *Hypericum*, *Allium*, *Rumex* and *Rosa*). This practice was followed as there is no guarantee that interviewees, at some point in their lives, did not collect representatives of other species belonging to the same genus.

Taxonomic identification, botanical nomenclature, and family assignments followed the Flora Europaea (Tutin et al. 1964), The Plant List database (2013), and the Angiosperm Phylogeny Group IV (Stevens 2015).

Data analysis

Digitalized responses were entered into a Microsoft Excel spread sheet. Use Reports (UR, Tardio and Pardo de Santayana 2008) referring to the use of wild food plants were structured according to food-use category (snack, jam, juice, wine, etc.) as well as part of the plant used, and the frequency of detailed use (DUR, Kalle and Sõukand 2013) was calculated separately from URs. Following the recommendation given in several recent publications (Łuczaj and Kujawska 2012; Menendez-Baceta et al. 2012), uses mentioned by one respondent were also included. Informant consensus factor (F_{IC} [Trotter and Logan 1986]) was calculated for the whole group of wild food plants as well as for different use categories. Finally, the reliability criterion (Johns et al. 1990) was also calculated. Influence of the age of the interviewees on of the number of used plants and DURs was assessed by calculating R^2 in Microsoft Excel (Figure 2).

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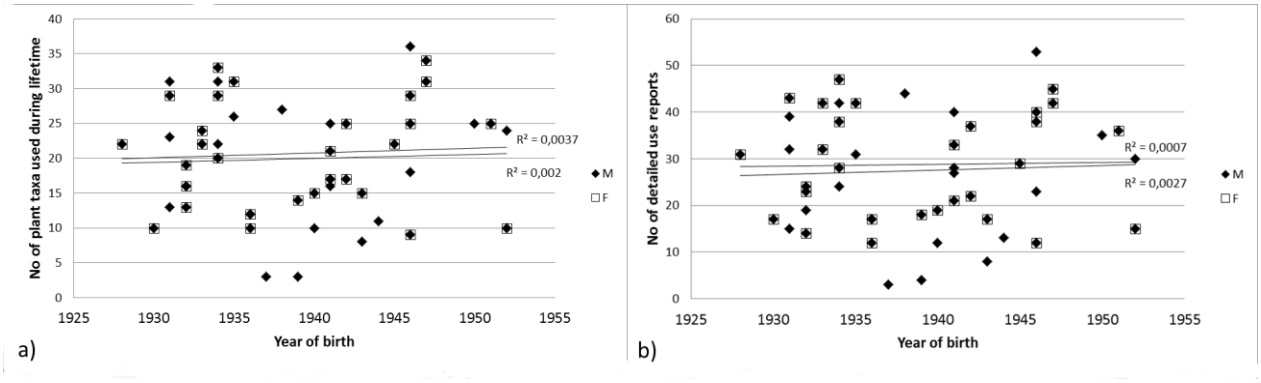

Fig. 2 Distribution of a) the number of taxa used throughout life and b) the number of DURs according to the year of birth of the interviewees.

Temporal domains: While in their study Serrasoles et al. (2016) assessed the abandonment of wild food plants based on a selected number of taxa and by dividing the uses into two categories (used within the last 12 months and used in the past), the structure of our field study allowed us to determine a greater number of temporal domains. Based on the distribution of the time of use reported by the interviewees, the DURs were divided into five temporal domains:

1) "Throughout life" – indicating that the use had continued since the childhood until the moment of interview. This domain also contained DURs reflecting very recent cessation of use (within the last two- to three years) due to either bad weather or bad harvest, but also temporal health condition not allowing for harvesting.
2) "Childhood" refers to DURs that were recalled as the ones experienced during the childhood of the interviewees, where the use did not continue through to later periods of life.
3) "Recently abandoned" outlined the uses experienced by the interviewees throughout their childhood and adulthood, but not in the last 5–20 years.
4) "Only now" refers to very recently (within the last 20 years) adopted uses, mainly related to the conscious promotion of the consumption of wild food plants in the media.
5) "Adulthood" refers to uses picked up at some point in adulthood, which either continued to present or only tried once or twice.

For every taxon the proportion of uses in different temporal domains was calculated (Table 1).

Where appropriate, qualitative comparison with the data on the historical use of wild food plants in Estonia (including, but not explicitly emphasizing Saaremaa) was conducted, relying on our previous publications (Kalle and Sõukand 2012, 2013; Svanberg et al. 2012).

Results

Overall quantification without temporal differentiation

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Altogether 89 vascular plant taxa belonging to 33 families were used for food. Those uses were mentioned in 989 URs (1371 DURs) (Table 1). Of these 89 taxa, eight were identified to the genus level. The most well-represented family was Rosaceae (22 taxa), followed by Asteraceae (6 taxa), and Lamiaceae, Betulaceae and Ericaceae, 5 taxa each). The Rosaceae was also the most prevalent based on the sum of all use records for all taxa (295) and the diversity of uses (425). It was followed by Ericaceae (114/202 - total URs/DURs respectively), Betulaceae (81/92), Grossulariaceae (60/68), and Apiaceae (45/77).

Sixty one taxa (68.5%) met reliability criteria by having been mentioned by at least three independent informants. Informant consensus factor for the used taxa (F_{IC}=0.91) was quite close to the maximum value (which is 1), indicating relatively high agreement among respondents on the usefulness of selected wild food taxa. Within specific food-use categories high F_{IC} was observed for fermented (0.95), fresh use, jam and beer (all 0.9), recreational tea/coffee and condiment (0.85), while the least agreed upon food uses were making juice (0.59), smoking meat or fish (0.65), and preparing soup and wine (both 0.67).

The average number of reported plants was 19.9 (median 20) and the average DUR was 27.4 (median 28). The maximum number of plants reported was 36, with a DUR of 53; both the smallest number of plants used and the lowest DUR value was three. There was no statistically significant difference in the number of plants listed or the number of detailed use reports based on the age and sex of the interviewees (Figure 2).

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Table 1. Used wild food plants

Family	Species	Local name	UR	DUR	Intensity of use	Plant parts	Use	Proportion of use				
								wl	ch	nr	ru	ad
Adoxaceae	*Sambucus nigra* L. (ETBOT20)	must leeder	1	1	few times	fruits	only tasted				1	
	Viburnum opulus L. (ETBOT104)	lodjapuu, õispuu, leivamari	7	7	seasonally	fruits	additive to bread, snacks		0.9	0.1		
Amaranthaceae	*Chenopodium suecicum* Murr (ETBOT113)	malts	1	1	seasonally	aerial parts	additive to meat soup			1		
Amaryllidaceae	*Allium schoenoprasum* L. (ETBOT6)	murulauk	6	7	seasonally	leaves	salad, snacks, with bread and butter	0.4			0.6	
	Allium scorodoprasum L.	porrulauk, metslauk	3	4	seasonally	leaves	salad, snacks		0.33		0.66	
	Allium spp.	lauk, looduslik küüslauk	3	3	seasonally	leaves	salad, snacks, flavoured butter	0.65	0.35			
	Allium ursinum L. (ETBOT60)	karulauk	6	7	seasonally	leaves	salad, snacks, flavoured butter	0.3			0.7	
Apiaceae	*Aegopodium podagraria* L.	naat	8	8	few times	leaves	salad, cutlets, soups, snacks		0.35		0.65	
	Carum carvi L. (ETBOT133)	köömned, köömled	37	69	constantly	seeds	spice for a variety of foods like bread, beets, lamb, fresh stewed cabbage, fresh and stewed sauerkraut, moonshine, white sausages, snacks, tea	0.52	0.35	0.12		0.01
Asteraceae	*Achillea millefolium* L. (ETBOT92)	raudrohi, raudreia	7	7	occasionally	aerial parts, inflorescences	tea		0.29	0.29	0.42	
	Cichorium intybus L. (ETBOT52)	sigur	5	5	constantly	roots	coffee		0.8	0.2		
	Matricaria chamomilla L. (ETBOT129)	(põld)kummel, kommel,	6	6	occasionally	flowers, aerial parts	tea	0.17	0.66		0.17	

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	Sonchus oleraceus (L.) L.?	piimohakas	1	1	few times	aerial parts	tasted			1		
	Taraxacum campylodes G.E.Haglund	võilill	9	13	seasonally	leaves, flowers, aerial parts, stems	snacks, salad, coffee	0.38		0.62		
	Tragopogon pratensis L. (ETBOT77)	did not had name, plant properly described	1	1	few times	buds, stems	snacks		1			
Berberidaceae	*Berberis vulgaris* L. (ETBOT56)	paberits, paaburitsud, paburitskad, kukerpuu, barbariss	16	33	seasonally	fruits, leaves	snacks, juice, jam, wine, spice for lactofermented cucumbers	0.18	0.45	0.27	0.1	
Betulaceae	*Alnus glutinosa* (L.) Gaertn. (ETBOT54)	must lepp	2	2	occasionally	wood	smoking meat	0.5			0.5	
	Alnus incana (L.) Moench	hall lepp	1	1	occasionally	wood	smoking meat				1	
	Alnus spp.	lepp	11	11	occasionally	wood, cambium, catkins	smoking meat, snacks	0.64	0.18	0.18		
	Betula spp.	kask	31	47	seasonally	sap	drink (fresh and fermented), water for tea, beer-like drinks	0.47	0.28	0.23		0.02
	Corylus avellana L. (ETBOT114)	pähkel, sarapuu, pähklipuu, metsapähklid	36	37	seasonally	nuts	snacks, dessert ingredient	0.51	0.27	0.22		
Boraginaceae	*Anchusa officinalis* L. (ETBOT10)	imi, imikas	2	2	seasonally	nectar	snacks		0.5	0.5		
Brassicaceae	*Armoracia rusticana* P.Gaertn., B.Mey. & Scherb. (ETBOT59)	mädarõigas	23	29	seasonally	roots, leaves	spice for fermented cucumbers, additive to food, salad	0.76	0.13	0.07		0.04
	Crambe maritima L.	merekapsas, merikapsas	6	7	seasonally	leaves, stems	snacks, in place of cabbage in foods, salads, soups, stews		0.13	0.29	0.29	0.29

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Cannabaceae	*Humulus lupulus* L. (ETBOT37)	humal	3	4	occasionally	cones	additive to beer, tea		0.75			0.25
Caprifoliaceae	*Valeriana officinalis* L. (ETBOT22)	palderjan	1	1	occasionally	aerial parts	tea			1		
Cupressaceae	*Juniperus communis* L. (ETBOT82)	kadakas	35	61	occasionally	cones, twigs	snacks, tea, spice for foods, additive to bread, beer, beer-like drinks, smoking meat and fish	0.21	0.25	0.36	0.14	0.05
Cyperaceae	*Schoenoplectus tabernaemontani* (C.C.Gmel.) Palla (ETBOT131)	kõrkjad, rädi	3	3	occasionally	stalks	snacks		1			
Ericaceae	*Arctostaphylos uva-ursi* (L.) Spreng. (ETBOT62)	leesikad	1	1	occasionally	fruits	snacks			1		
	Vaccinium myrtillus L. (ETBOT28)	mustikad	42	78	constantly	fruits	snacks, (raw) jam, kissel, dessert, additive to bread	0.42	0.28	0.15	0.09	0.05
	Vaccinium oxycoccos L. (ETBOT1389	jõhvikad, kuremarjad	27	44	constantly	fruits	snacks, foods (kissel, desserts), juice, additive to sauerkraut	0.35	0.1	0.4		0.15
	Vaccinium uliginosum L. (ETBOT143)	sinikad, (h)allikad	6	7	occasionally	fruits	snacks, jam	0.14	0.29	0.57		
	Vaccinium vitis-idaea L. (ETBOT141)	pohl(ad)	38	72	constantly	fruits, leaves	snacks, jam, additive to sauerkraut	0.55	0.2	0.21		0.04
Fabaceae	*Trifolium pratense* L.	(suur) punane ristik	3	3	few times	inflorescences	snacks, nectar		0.66	0.33		
	Trifolium repens L. (ETBOT96)	valge ristik	4	4	few times	inflorescences	snacks, nectar, tea		0.5	0.25	0.25	
	Trifolium spp.	ristik(hein)	3	3	few times	flowers, leaves	snacks, nectar		0.66	0.33		
Fagaceae	*Quercus robur* L. (ETBOT45)	tamm	9	10	seasonally	acorns, bark, leaves	coffee, snacks, additive to fermented cucumbers, spice for moonshine	0.1	0.5	0.4		

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Grossulariaceae	*Ribes alpinum* L. (ETBOT112)	mage sõstar, imal sõstr, maalmaks, imalmaks, punased metsasõstrad, mage punane sõstar, imal marjapuu	24	24	seasonally	fruits	snacks	0.13	0.79	0.08		
	Ribes nigrum L. (ETBOT125)	must sõstar	31	39	seasonally	leaves, fruits, twigs	additive to lactofermented cucumbers, tea, snacks, jam	0.67	0.2	0.08	0.05	
	Ribes uva-crispa L.	tikker	5	5	seasonally	fruits	snacks		0.6	0.4		
Hypericaceae	*Hypericum perforatum* L. (ETBOT115)	kollase õiega	1	1	occasionally	aerial parts	additive to Christmas sausage			1		
	Hypericum spp.	naistepuna	9	9	occasionally	aerial parts	tea	0.12	0.11	0.33	0.22	0.22
Lamiaceae	*Lamium album* L. (ETBOT66)	emanõges	4	4	occasionally	nectar	snacks	0.25	0.5	0.25		
	Mentha × *piperita* L.	piparmünt	2	2	occasionally	aerial parts	tea	0.5			0.5	
	Mentha arvensis L.	põldmünt	1	1	seasonally	aerial parts	spice for white sausages	1				
	Origanum vulgare L. (ETBOT107)	pune, vorstirohi, origano, tüümian	15	22	constantly	aerial parts	spice for food (white and blood sausage, meat), spice for beer-like drinks, tea	0.64	0.23	0.13		
	Thymus serpyllum L.(ETBOT130)	timmijaan, (nõmme)liivatee, liivanõmmetee, liivarohi, tüümian	15	16	constantly	aerial parts, inflorescences	tea, spice for a variety of foods	0.44	0.25	0.06	0.25	
Malvaceae	*Tilia cordata* Mill. (ETBOT13)	pärn	23	23	constantly	inflorescences	tea	0.65	0.13	0.04	0.13	0.04
Myricaceae	*Myrica gale* L.	pors	6	6	occasionally	cones	additive to beer		0.66	0.33		
Oleaceae	*Syringa vulgaris* L.	sirel	10	10	seasonally	flowers, juice	snacks "for luck", drink	0.3	0.6	0.1		

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Oxalidaceae	*Oxalis acetosella* L. (ETBOT139)	jänesekapsas	17	20	seasonally	leaves, flowers	snacks	0.1	0.85	0.05		
Papaveraceae	*Papaver somniferum* L.	moon	2	2	occasionally	seeds	additive to home-baked rolls			0.5	0.5	
Pinaceae	*Larix* spp.	lehis	2	2	few times	shoots, resin	snacks		0.5	0.5		
	Picea abies (L.) H.Karst. (ETBOT74)	kuusk	4	5	seasonally	young shoots	snacks, juice		0.4	0.6		
	Pinus sylvestris L. (ETBOT48)	mänd	6	7	seasonally	young shoots, cones, needles	snacks, juice, smoking meat and fish, tea	0.14	0.29	0.43	0.14	
Poaceae	*Phragmites australis* (Cav.) Trin. ex Steud. (ETBOT19	roog	1	1	few times	tip of the root	snacks		1			
	Poaceae	kõrred, rohukõrred, rohi	2	2	occasionally	stalks	snacks		1			
Polygonaceae	*Persicaria lapathifolia* (L.) Delarbre (ETBOT71)	liigendrohi	1	3	seasonally	roots	additive to meat, potatoes and meat jelly		1			
	Persicaria maculosa Gray (ETBOT70)	liigendrohi	1	3	seasonally	roots	additive to meat, potatoes and meat jelly		1			
	Rumex spp. [*R. acetosa* L. (ETBOT116)]	(hapu)oblikas	35	45	seasonally	leaves, stems	snacks, soup	0.09	0.85	0.04	0.02	
Primulaceae	*Primula veris* L. (ETBOT76)	nurmenukk, kääkaatsed, käokaats, kukepüks	27	42	seasonally	flowers, leaves, stems	snacks, tea, salad	0.64	0.19		0.14	0.03
Rhamnaceae	*Frangula alnus* Mill. (ETBOT4)	paakspuu	5	5	few times	fruits	snacks		0.6	0.2		0.2
Rosaceae	*Alchemilla* sp. (ETBOT21)	kortsleht	1	1	occasionally	leaves	tea				1	
	Crataegus spp. (ETBOT14)	viirpuu, tünrpuu	4	7	seasonally	fruits, flowers	snacks, tea		1			
	Filipendula ulmaria (L.) Maxim. (ETBOT111)	angervaks	1	1	occasionally	inflorescences	tea	1				
	Fragaria ×ananassa Duchesne	aedmaasikas, kodumaasikas	1	1	occasionally	sepals	tea			1		

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	Fragaria moschata (Duchesne) Duchesne (ETBOT117)	teine maasikas	1	1	seasonally	fruits	snacks				1	
	Fragaria vesca L. (ETBOT75)	(mets)maasikad	40	59	seasonally	fruits, aerial parts, flowers	snacks, jam, tea, additive to foods	0.34	0.42	0.21	0.03	
	Fragaria viridis Duchesne	muulukad, muulikad	21	21	seasonally	fruits	snacks	0.24	0.62	0.14		
	Malus domestica Borkh. (ETBOT43)	koduõunapuu, aed-õunapuu, pärisõunapuu, metsistunud õunapuu	21	39	constantly	fruits, leaves, wood	snacks, jam, juice, wine, tea, smoking of meat and fish	0.59	0.28	0.07	0.03	0.03
	Malus domestica x *M. sylvestris*	poolikud(õunad), metsõunad, paradiisipuu, segaõunad	3	4	seasonally	fruits	snacks, juice	0.25	0.75			
	Malus sylvestris (L.) Mill.	metsõunapuu, maaõun	19	19	seasonally	fruits	snacks (frozen)	0.05	0.79	0.16		
	Prunus cerasus L. (ETBOT30)	kirss	13	13	seasonally	leaves, twigs, resin	additive to lactofermented cucumbers and aronia syrup, smoking of fish, snacks	0.62	0.23	0.15		
	Prunus domestica subsp. *insititia* (L.) Bonnier & Layens (ETBOT25)	kreek, kreegipuu	11	14	seasonally	fruits, resin	snacks, jam	0.29	0.29	0.29	0.13	
	Prunus padus L. (ETBOT121)	toomingas	23	23	few times	fruits, flowers	snacks, tea	0.04	0.88	0.04	0.04	
	Pyrus communis L.	metspirnipuu	1	1	occasionally	fruits	snacks			1		
	Pyrus pyraster (L.) Burgsd. (ETBOT58)	metsik pirnipuu	1	1	occasionally	fruits	compote				1	
	Rosa spp. [incl. Rosa subcanina (H.Christ) Vuk. (ETBOT106), *Rosa vosagiaca* Desp.	kibuvits, kibusk	16	19	seasonally	fruits	snacks, tea, jam	0.42	0.26	0.21	0.11	

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	(ETBOT98), *Rosa caesia* Sm. (ETBOT61)											
	Rubus caesius L. (ETBOT110)	põldmari	33	68	constantly	fruits, twigs	snack, jam, juice, kissel, wine, tea	0.49	0.19	0.19	0.06	0.07
	Rubus chamaemorus L.	(mäda)murakas, kuremari	8	12	constantly	fruits	snacks, jam, juice	0.33		0.25		0.25
	Rubus idaeus L. (ETBOT109)	(mets)vaarikas, vaarmari	22	40	constantly	fruits, twigs, leaves	snacks, jam, tea, juice	0.45	0.18	0.1	0.1	0.17
	Rubus saxatilis L. (ETBOT88)	(linnu)liimukad, lillukad, linnumari	5	5	seasonally	fruits	snacks	0.2	0.6	0.2		
	Sorbus aucuparia L. (ETBOT105)	pihla(kas)	41	65	seasonally	fruits, cambium	snacks (frozen), tasted (fresh), jam, wine, compote	0.2	0.37	0.03	0.37	0.03
	Sorbus intermedia (Ehrh.) Pers. (ETBOT122)	pooppuu	9	11	seasonally	fruits	snacks, additive to bread		0.73	0.27		
Salicaceae	*Populus tremula* L.	haab, haavapuu	2	2	occasionally	juice, wood	drink, smoking meat			0.5	0.5	
	Salix spp.	paju	1	1	few times	cambium	tasted		1			
Sapindaceae	*Acer platanoides* L. (ETBOT83)	vaher	22	27	seasonally	sap	drink (fresh and fermented)	0.48	0.22	0.22		008
Urticaceae	*Urtica dioica* L. (ETBOT17)	nõges, kõrvenõges	15	16	seasonally	aerial parts, leaves	tea, smoking meat and fish, soup	0.13	0.12	0.5	0.19	0.06
	Urtica urens L. (ETBOT51)	raudnõges	1	1	seasonally	aerial parts	tea			1		

Abbreviations: UR – Use Reports, n = 50; DUR – Detailed Use Reports. Proportion of use: wl – whole life, ch – only childhood, nr – used throughout life, but not recently, ru – recent use, ad – used at some point in adulthood

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The continuation of the availability of wild food resources was ensured by using predominantly fruits (51% of DUR), but also leaves (13%), seeds and nuts (8%), flowers (7%), sap and aerial parts (both 5%). Although a wide variety of foods are made from wild food plants, about half of the consumption reports refer to the use of fresh plants without any preparation (mainly snacking in the wild) (49%) and an additional third of the uses is divided between three specific food-use categories (tea/coffee (15%), jams (10%) and condiments (9%)), leaving only 17% of DURs for the remaining food-use categories.

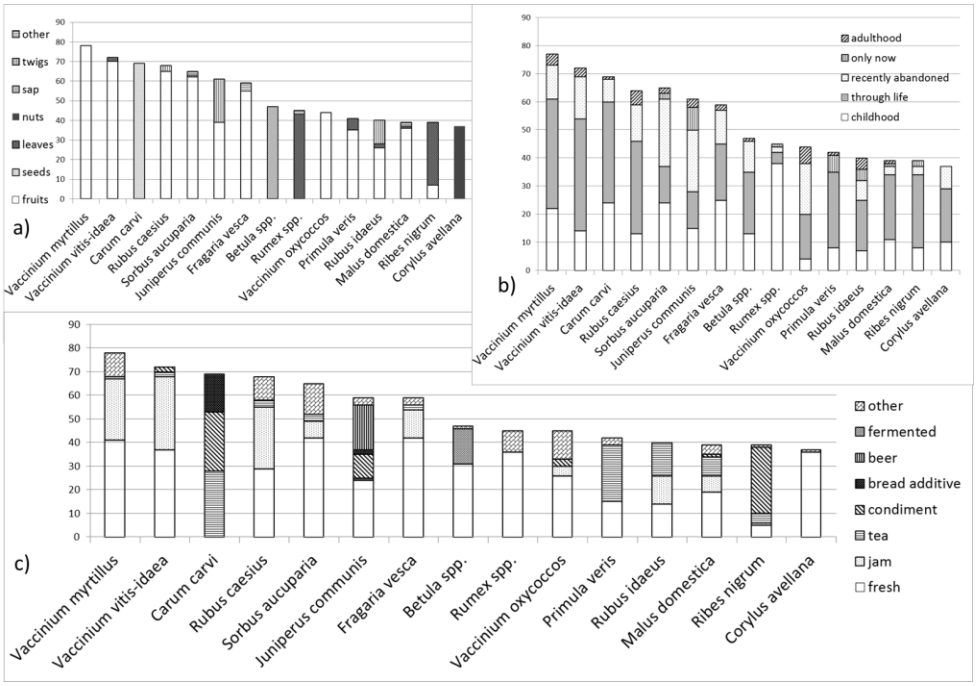

Fig. 3 Use report proportions for a) used plant parts, b) period of life when plant was used, and c) various foods used for the 13 most diversely utilized taxa.

In scope, the 15 most used taxa (utilized by over 50% of the interviewees) provided 59% of all DURs (Figure 3). Among them were herbaceous plants (*Vaccinium oxycoccos* L., *Fragaria vesca* L., *Carum carvi* L.) as well as semi shrubs (*Vaccinium myrtillus* L., *Vaccinium vitis-idaea* L.), and some trees and shrubs (*Sorbus aucuparia* L:, *Corylus avellana, Juniperus communis L.*, *Rubus caesius* L. *Ribes nigrum* L.), all well known for their fruits. This list also includes two green herbaceous taxa, namely *Rumex* spp. (in all cases *R. acetosa* L., but in some cases probably other *Rumex* species as well) which is used mainly as a childhood snack and *Primula veris* L. used for making recreational tea. The genus *Betula* ranked among the top of the list due to the diverse use of its sap (fresh and fermented). Of these taxa all but three (*Rumex acetosa, Corylus avellana* and *Betula* spp.) exhibited a wide variety of food uses. The use intensity of many of the most popular taxa during different temporal domains followed the general trend of temporal distribution of all DURs, although the pattern is not always equally shared. For example, recent adoption was documented in a few of the most popular taxa, yet *Juniperus communis* has a rather high percentage of recently adopted uses. Also one taxon (*Rumex acetosa*) exhibited remarkable dominance in the "childhood" domain.

Temporal distribution of used taxa and food made

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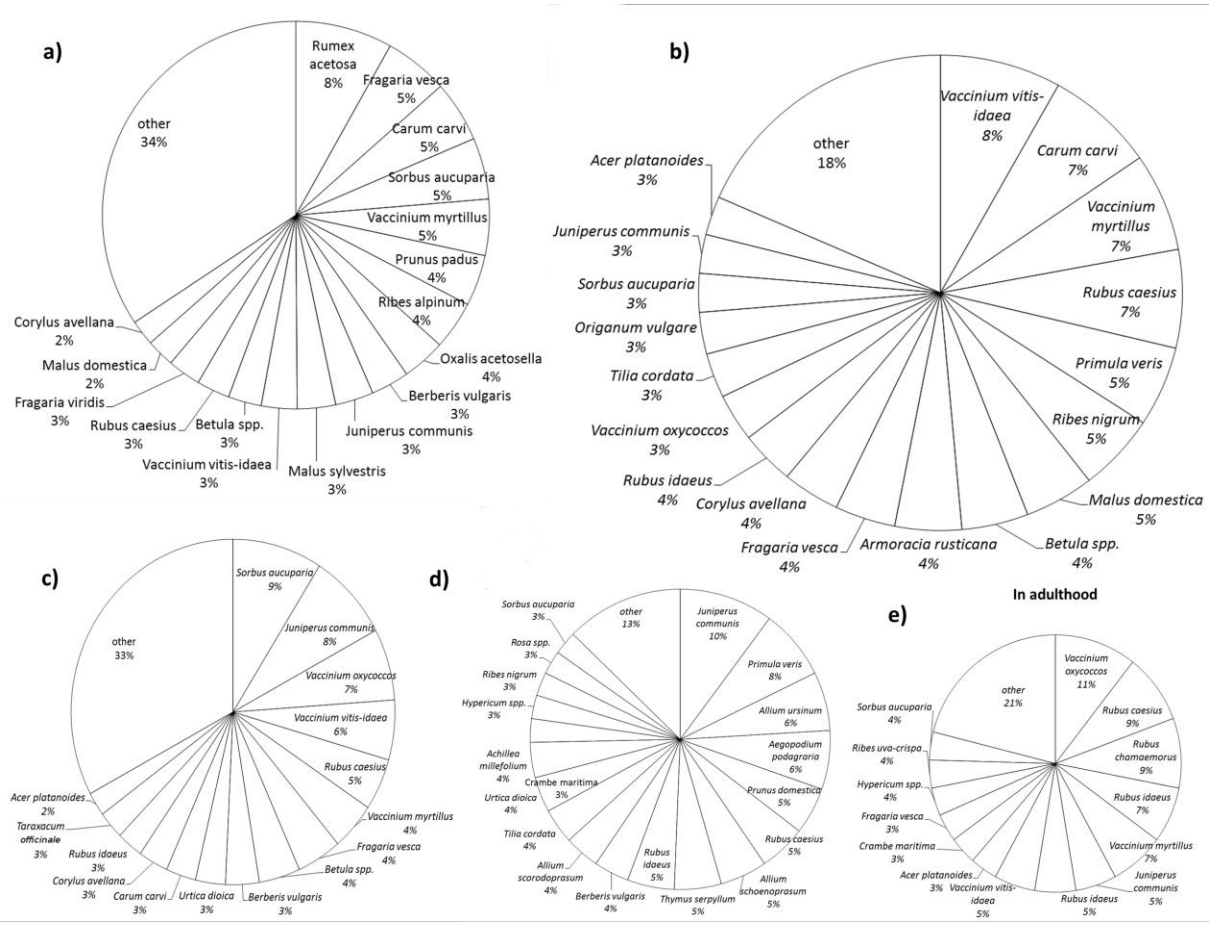

Fig. 4 Most popular plants in different temporal domains (based on % of DURs): a) childhood, b) throughout life, c) recently abandoned, d) only now, and e) adulthood.

The division of DURs between four temporal domains is rather unequal. Three temporal domains cover 90% of all DURs: 36% of all DURs refer to the use of plants practiced throughout the lifetime of the interviewee, while 34% of DURs refers to uses encountered only during childhood and 20% of DURs have been abandoned recently. The remaining 10% of uses have been acquired recently ("only now"), or used at some point in adulthood. Further analysis reveals that even if each temporal domain has its own "favorites," on a general scale the pattern remains quite similar (Figure 4). The same applies to the food made from wild plants (Figure 5).

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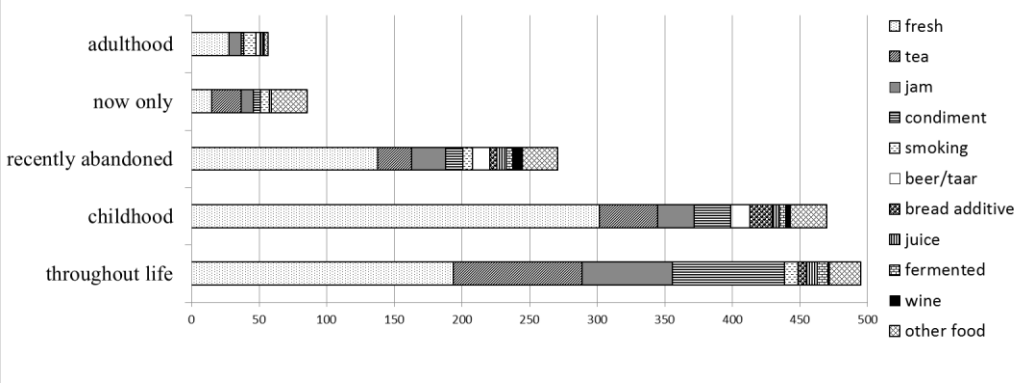

Fig. 5 Most popular foods made from wild plants in different temporal domains.

The domain "throughout life" is dominated by forest fruits, mainly *Vaccinium* species, used as snacks, but also widely as jams, as well as plants used as condiments or for making recreational tea (*Carum carvi, Origanum vulgare* L., *Tilia cordata* Mill., *Armoracia rusticana*), and sap trees (*Betula* spp. and *Acer platanoides* L.). The lowest proportion of "other taxa" in this domain exhibit fairly well-established and even use of the specific taxa. Those 18 taxa (outlined in Figure 4b) could probably be considered the core basis for the sustainability of the use of the wild food plants in Saaremaa.

However, the fact that a taxon has been used throughout life does not imply that the way it has been prepared or where it has been obtained has remained the same over time. Many people described the changes in jam making (from sugar-free preservation, to oversweet preserves in the 1980s when sugar was cheap and in abundance, and finally to modern day moderately sweet raw jams). One 68 year old woman, who grew up in a quite wealthy family, described the way cranberry jam was preserved in her childhood: "*Cranberry jam was the only jam then, I don't know why they did not do anything else; one end of a growler was cut away and it was full of cranberry jam boiled with pumpkin, we did not add sugar then."* Other transitory changes outlined were (temporary) purchases from markets (especially fruits), and also pharmacies (plants for making recreational tea). In addition, a few older interviewees referred to the fact that the needed forest fruits are picked by the younger generation – all they need to do is to cook.

The "childhood" domain (Figure 4a) was dominated by common green snacks for children like *Rumex acetosa* and *Oxalis acetosella* L. as well as (fleshy) fruits of trees, shrubs, semi-shrubs and herbaceous plants; accordingly, snacks constituted almost two thirds of all the foods in the "childhood" domain (Figure 5). A large proportion of the "other taxa" section in this domain (34% covering 51 taxa, 21 of which had at least 2 DUR) indicates quite diverse taxa encountered in "childhood" for some of the interviewees. Snacks for children are abandoned mainly due to leaving their parents' home or a change of childhood paths and daily work activities.

Here, however, we need to differentiate the abandoning of snacks (which may still also bear information on the edibility of the species) from the abandoning of other food uses that can contribute to food security in times of hardship. More alarming is ceasing to continue making food from wild food plants (such as bread filled with fruits or soups and desserts), i.e. specific uses routinely prepared by their parents, were not carried over to their own families. For example, one 68 year old woman, who came from a poor family with many children, described an unsuccessful attempt to incorporate one of her "delicious" childhood foods into the modern menu of her family: "*The cutlets made with goatweed [Aegopodium podagraria* L.*] were so green and so tasty, at least at that time*

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[of my childhood]. When I told my children about them, they tried to bake them, but they did not like it – there is no need for such a food now".

The use of the fruits of *Sorbus intermedia*, rarely mentioned already at childhood of the interviewees (i.e. not highlighted among the most massively abandoned taxa, yet mentioned by few interviewees), is an example of the transformation and later disappearance of a famine food: the fruits were historically added to bread dough to increase its volume (Kalle and Sõukand 2012), later eaten as a delicacy by children (Kalle and Sõukand 2013) and now finally abandoned (Table 1). An eighty-three year old woman described the fruit-bread her mother used to make: "*Fresh fruits were mixed with the leftovers of bread dough and these round cakes were baked. They were made for immediate consumption and not preserved for a longer period such as regular bread*." Another example of a lost childhood food/drink, as well as taxon, is the use of chicory for making grain coffee. An eighty year old woman recalled: "*Grain coffee consisted of wheat, beans and chicory, one could grow it themselves, but we also collected it in the wild. It was very tasty coffee; we roasted and milled it. They sold similar coffee in the shops too, but I don't know if they do so any more.*"

Two other taxa strongly stand out from the childhood snack-front: *Carum carvi* – probably due to its wide variety of uses as a condiment and recreational tea, but also as a result of its perceived disappearance from the present landscape: "*Caraway grew everywhere, now we cannot find it any more*" was a quite common saying. The other one is *Betula* spp., mostly represented in this temporal domain through the abandoned use of fermented sap – a traditional drink widely used until the middle of the 20th century, but lately rejected due to greater availability of commercial soft drinks and a variety of juices (Svanberg et al. 2012). An 82 year old woman recalled from her childhood: "*[When I was a child] we were poor cottagers. Across the field there were four or five birch trees we used for tapping; sap was brought with buckets. It was poured on the spent drain, leftover from beer-making and left to ferment. We drank this the whole summer, every year."* In addition to caraway, other taxa used as condiments have been abandoned. One of them, *Origanum vulgare*, which was traditionally widely used for seasoning blood- or white sausages (Kalle and Sõukand 2012), has been abandoned due to the disappearance of the tradition of making such sausages at home. A seventy-eight year old woman described this along with the statement that she did not even have the chance to gather the plant in the wild: "*For Christmas time we were making white sausages: it was grain porridge, which was seasoned with fried meat, salt and sausage herb [Origanum vulgare* – identified based on local name, application and the description of the "powder"*]. I don't know how the sausage herb itself looked, it was collected from the wild, and I saw it at home only in powdered form."*

Reasons for the recent abandonment were age-related reduced mobility (for forest berries which require active picking in distant places) or the need for a reduced workload (no longer tapping trees for sap), the recent disappearance of the species from the habitats known by the interviewees throughout their lives (such as *Fragaria vesca* or *Carum carvi*), or a change in taste preferences (sour fruits like *Sorbus aucuparia* or *Berberis vulgaris* L. do not taste good any more). Although this domain may not directly signify the abandoning of specific uses, as the interviewees may have had ample time to teach the skills to the next generation, it presents a kind of warning, that this practical knowledge may be endangered.

The smallest temporal domain (4% of all DURs) is constituted by the taxa whose use was learned at some point in adulthood. It mainly contains plants that grew far from the childhood home of the interviewees, and were encountered after they either moved to another place, or acquired vehicles to access the locations in which the plants grow (the majority of forest berries in Figure 4e), whereas the pattern of the distribution of food categories follows the major trend, missing out only wine and recreational teas. The domain "only now" (6% of all DURs)

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is dominated by one-time trials and influences from popular journals and television programs, sometimes mediated by the younger generation: experimenting with condiments (*Juniperus communis*) or making salads (*Primula veris*, *Aegopodium podagraria*, *Allium* spp.), soups (*Urtica dioica* L.) and recreational teas. Insignificant in terms of proportion, the last two temporal domains provide a quite powerful message: they show that the majority of uses (90% in total) derive from a person's childhood and a small proportion of wild food plant uses are acquired later in life. Moreover, the small number (44) of taxa contributing to both domains (16 of these were mentioned by one person) shows selective acceptance of new taxa into one's diet, regardless of the fact that during the adulthood of interviewees there have been periods characterized by monotonous diets and/or difficulties in acquiring food from retail shops (at the beginning of the 1990s). However exceptional or inspiring some of these uses seem, the majority of them remain in the repertoire for a short time or are just one-time trials. This does not provide a solid foundation for developing long-lasting traditions.

Discussion

The dominance of the Rosaceae family is well correlated with the historical data on all of Estonia (Kalle and Sõukand 2012). The great importance of species from Rosaceae family as wild food plants has also been observed in other European regions (Pardo-de-Santayana et al. 2007; Ghirardini et al. 2007; Menendez-Baceta et al. 2012). The mean number of used taxa per interviewee was more than twice as large, for example, as the value recently obtained among Ukrainians living in Romania, on average 7.7 species without fungi (Łuczaj et al. 2015) However, the present results correspond well with our recent research results concerning specialists with advanced botanical education (based on an unassisted questionnaire and encompassing people with a greater interest in using plants) in which an average of 20.7 species and a median of 20 species was recorded (Kalle and Sõukand 2013). The number also correlates well with the results obtained by Dolina and Łuczaj (2014) for knowledgeable informants in Croatia (average: 19 species, median: 16.3 species). Given that we were approaching all elderly local residents without searching for particularly knowledgeable individuals, the results obtained can be considered high in an Eastern-European context. However, from the perspective of the temporal distribution of uses, the results do not seem so promising, as only 36% of all uses continued throughout life.

Although the folk history method used for this study may be considered incomplete and fragmentary, as it relies on a person's memory and may not be fully trustworthy, it remains the only means of adding diachronic comparison, especially in regions where recent proper historical ethnobotanical studies have not been conducted. In fact, qualitative ethnobotanical research is already at least in part a kind of folk oral history, as it reflects the views of the people on present and past uses and does not measure exact daily quantities consumed.

Recent studies indicate that the use of wild plants for food has been, compared to medicinal use, more homogenous and equable within two different groups sharing the same ecological niche (Quave and Pieroni 2015) or one group divided by state borders (Sõukand and Pieroni 2016). The argument proposed in the first publication that wild food plants may have represented emergency foods in the past, was also considered valid for the second one. Yet the same reason (being an emergency food), or more precisely, the absence of such a need for longer periods of time, may induce large-scale erosion of the respective practice, knowledge, and later memory of that knowledge.

The situation recorded in Saaremaa can be compared to extinction debt (sensu Tilman et al. 1994), a phenomenon known in ecology which states that some species in a plant community (in our case specific knowledge within a human community) are doomed to extinction due to changing environmental conditions (in our case mainly socio-economic and cultural conditions), but the actual extinction event has not yet occurred due to the slow intrinsic

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dynamics of populations (Helm et al. 2009). As with ecological phenomenon, where the loss of species diversity is seemingly delayed due to some "store" of resources (seeds), the loss of knowledge diversity may be less evident mainly due to the vitality of childhood memories of the older generations. However, in the case of the practical use of plants it is not the living organism, but rather the knowledge that is being lost. Therefore we propose a term that could potentially be used to describe the observed phenomenon of "hidden" erosion of the use of wild food plants:

unlearning debt – indicates that specific knowledge on the practical use of local ecological resources, while still in the active memory of older generations, is considered to be forgotten because it is not practiced nor transferred to younger generations any more. Even more critical for the survival of practical knowledge of the use of wild food plants is the absence of a supportive mechanism for making such food in Saaremaa, as according to our observations:

a) Only a few domestic animals are now kept (meaning home-made sausages are rarely made).

b) Although the habit of making home-made bread is slowly returning via the younger generation, the taste experimentation is oriented towards exotic, not local taxa.

c) It is easier to buy a few bottles of beer or a few kilograms of sauerkraut than to brew or make large quantities of these.

d) Tree saps are no longer fermented, as a variety of soft drinks can be easily bought.

e) If the garden is full of cultivated fruits, there is no need to collect wild ones (unless for the taste).

Abandonment, however, was not all-embracing and not oriented towards any specific taxa or group of taxa, as there still were reservoirs of knowledge (people/families that have practiced throughout their entire lives the majority of wild food plant uses they encountered in childhood). Yet, it may not be sufficient to ensure the critical mass needed for securing long-lasting preservation of knowledge on the use of wild food plants. We suggest that for maintaining critical mass for the sustainable use of wild food plants, the use must be well justified and need-related – in times of food shortage it was expressed through the need for nutrients and diversification of the diet. Now, when there is an abundance of food it could be expressed through the need for the diversification of tastes and microelements, supported by respective educational programs. The fact that (although moderate) valorization existed indicates that people are ready at least to try new tastes, adopting suggestions provided by different media sources.

Conclusions

The purpose of this work was to document the present and remembered past uses of wild food plants in Saaremaa, to evaluate the temporal scale of their use within a lifetime of one generation, and to try to interpret those changes. The results of the work afforded the understanding that, while the general picture of the use of wild food plants seems diverse, quite a considerable proportion of uses were remembered from childhood and are no longer practiced. Second, the uses of wild food plants which are acquired later, at some point during a person's adulthood or recently, are few in number, rather temporal in nature and affected by fashion trends, not the practical need for nutritive food. Hence, although all three possible paths of wild food consumption are present, the most dominant one is abandonment, followed by moderate maintenance and very minimal valorization. To ensure the survival of food security knowledge, in the times of relative food abundance, it is important to ensure the continuity of the use of wild food plants on the family level, by educating children through their participation in making food from wild plants. To avoid the underestimation of the erosion of knowledge it may be quite important for future

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researchers to identify and analyse the temporal scale of the actual use of wild food plants. Moreover, future quantitative and qualitative comparative studies are needed to better understand and explain the phenomenon of unlearning debt in the context of Estonia and more widely in Europe.

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