Journal of Ethnic Foods

ORIGINAL ARTICLE Open Access

"If there's no dill, the taste isn't right!" A comparison of food plant knowledge between Polish and German descendants in the context of an imagined culinary community in Brazil

Rafaela H. Ludwinsky[1,2*], Amanda E. Cavalhieri[1], Monika Kujawska[3], Nivaldo Peroni[1,2] and Natalia Hanazaki[1,2]

Abstract

Food is a cultural marker investigated by several fields of knowledge. The ecological approach to food plants used in human societies can give us insights into food biodiversity and its connection to cultural identity. In our work, we investigate plant knowledge as part of an imagined culinary community among Polish and German descendants in Santa Catarina, Brazil. We interviewed Polish and German descendants and used an ecological analytical approach to discuss patterns of known plants mediated by culture. One hundred years after immigration, we found that ethnic food-centered memories remain. Polish and German descendants share most resources cited, while the difference between plants' use lies in the ethnic memories and food preparation. There is a tendency to acculturate ingredients and tastes by immigrants descendants, using native species to recreate dishes. This scenario, which joins native plants' knowledge and ethnic memories, provides an excellent opportunity to maintain local biocultural diversity in urbanized environments.

Keywords: Urban ecosystems, Immigration, Cross-cultural ethnobiology, Beta diversity, Atlantic forest

Introduction

Food can act as a cultural marker of identity, while food patterns undergo social, political, and ecological changes [1–3]. Because eating is a social activity, it links people to their cultural heritage through affective memory of dishes and specific ingredients [4]. Such memories and knowledge of dishes and ingredients result from cultural, social, and ecological interactions that change over time and are transmitted over generations, forming part of Traditional Ecological Knowledge, or TEK [5, 6]. When people move from their homeplaces to other regions, their food reflects a sense of place and adapts the immigrants' TEK to a new socio-ecological environment [7, 8]. Researchers from different parts of the world have documented these adaptations of migrants' TEK to the use of medicinal and food plants. Examples of such work include studies by Pirker et al. [9], Kujawska and Pieroni [10], and Ceuterick and Vandebroek [11]. These studies have provided a critical foundation for an understanding of food as experienced in various migratory, environmental, and identity contexts.

In the south of Brazil, European immigrants arrived *en masse* between the late nineteenth and early twentieth

*Correspondence: rafaela.hbio@gmail.com
[1]Laboratory of Human Ecology and Ethnobotany, Department of Ecology and Zoology, Federal University of Santa Catarina, Florianópolis, Santa Catarina, Brazil
[2]Department of Ecology and Zoology, Ecology Post-graduate Program, Federal University of Santa Catarina, Florianópolis, Santa Catarina, Brazil
Full list of author information is available at the end of the article

centuries as a result of a governmental policy to "whiten" the population [12]. These waves of immigration were comprised largely of Germans, Italians, and Poles. The immigrants who arrived in Brazil had a variety of customary practices and work experiences depending on their region of origin. In São Bento do Sul, Santa Catarina state, immigrants arrived from East Prussia, Austria, Bavaria, Bohemia, and Galicia. Those from Galicia, a region of the Austro-Hungarian Empire that now comprises southeastern Poland and western Ukraine, were most frequently engaged in agriculture and livestock rearing, as well as in the exploitation of natural resources such as wood and yerba mate (*Ilex paraguariensis* A.St.-Hil.) in unsettled areas [13]. Meanwhile, immigrants from West Prussia would often work in skilled trades such as tailors, carpenters, and shoemakers [13].

Over time, immigrant settlements transformed into urban centers, changing the lifestyles of their inhabitants. Processes such as urbanization, sedentary life, growing consumption of processed foods, and the disappearance of traditional rural occupations affected the TEK of immigrants and their descendants [14–17]. Urbanization influences the diversity of species available. Shifts in livelihoods towards less rural occupations tend to reduce the diversity of cultivated species and opportunities for an affordable and healthy diet, a phenomenon known as a food desert [18].

We propose an ecological analytical approach to address changes caused by urbanization and livelihoods among the descendants of immigrants and compare the knowledge of food plants between Polish and German descendants in southern Brazil. Such a theme is still little explored in the study area. Our approach focuses on dissimilarities in the composition of known food species between groups of immigrants or the beta diversity of known plants [19, 20]. Beta diversity shows the differences between the richness[1] of two sets of plants. It allows for the investigation of patterns in known plants when a group with a lower richness (fewer species) is nested as a subset of a group with higher species richness [21]. The beta diversity approach can give insights to discuss patterns of known plants mediated by culture. Those patterns can reflect local factors, such as deforestation and transformation of habitats, occupational demand changes, and global forces, such as translocal agri-food and value chains [22].

We assume that Polish and German descendants in Brazil have a different ethnic memory related to the immigrants' farming (rural) and craft/trade (urban) experiences, and that is reflected in descendants' cuisine. The objectives of this study were twofold: (1) to compare the plants cited with traditional, indistinct, or mixed uses in the migrant descendants' cuisines and (2) to investigate the beta diversity (diversity between groups) of food plants known between Polish and German descendants. During their settlement in Brazil, Polish immigrants occupied mostly rural areas while Germans occupied mostly urban ones. Polish immigrants worked mostly as farmers and depended economically on the commerce of food plants in urban food fairs, in which most of the buyers were German immigrants settled in the urban area. Thus, we hypothesize that Polish descendants would know more species (both native and non-native species) than German descendants. Over time, descendants of German immigrants moved throughout the territory independently of their original settlement, concentrating in urbanized areas. We therefore expect a dissimilarity of knowledge about plants between the two groups of descendants. In our second hypothesis, we expect to find a nested pattern of the richness of plant knowledge, with the German descendants' knowledge representing a subset of knowledge of the Polish descendants. Because German descendants would not depend primarily on small-scale agriculture, they complemented their diet with food mostly from farmers, who were primarily Polish descendants. Finally, we assume that knowledge and memories are passed down to descendants' generations. However, TEK responds to various factors such as political, economic, ecological, and cultural forces—including the interaction of different ethnic groups [23–25]. Therefore, we expect to find, on average, a report of mixed knowledge of food plants in immigrants' ethnic cuisines, perhaps showing a mixture of traditional ingredients and those acquired in the new country in both ethnic groups.

Methods

Study location

We conducted the ethnographic and ethnobotanical field study in the municipality of São Bento do Sul, on the northern plateau of Santa Catarina state, southern Brazil (Fig. 1). Immigration to São Bento do Sul was mostly composed of immigrants of Germanic and Polish origin, who predominantly arrived during the "Brazilian fever" (1880–1910) immigration wave [26–28]. Local historians believe that most Poles and Germans immigrated from the provinces of Galicia and Bohemia in the former Austro-Hungarian Empire (1864–1918) [13, 28]. Today, of the 84,507 inhabitants of the municipality, about 70% have Polish roots, and about 90% have German ancestry[2]. The study area also comprises groups of Italian, Ukrainian, and Portuguese descent [29]. In the municipality, 95% of the people live in urban areas and 5% in rural settlements. Less than 0.05% of the population was self-declared indigenous [29].

[1] Richness is an ecological term that stands for a number of species

[2] Survey according to cultural entities and municipal secretariats of each municipality.

Fig. 1 Location of São Bento do Sul, the municipality where sampling was conducted

Data collection

We selected 30 collaborators of each ethnicity through a systematic sampling using data from the historical archives from original immigrational settlements (see Additional file 1), followed by snowball sampling according to the following criteria: (a) age 18 years or older, (b) identified herself/himself as Polish or German descendant, (c) living in the area for at least ten years, and (d) agreed to participate in this research. We interviewed the collaborators using a semi-structured protocol after obtaining prior informed consent between January 2017 and January 2018.

We collected data on age, gender, knowledge of the immigrant language, and each collaborator's life history through the interviews. We asked each collaborator to freely list the plants they knew and used, and we asked about the purposes of uses for each plant. Whenever possible, we recorded the names of plants in Polish and German and information on traditional dishes. None of the plants collected raised doubts concerning their identification, largely consisting of common species such as kale (*Brassica oleracea* L.), lettuce (*Lactuca sativa* L.), and apple (*Malus communis* Desf.). Plant collections damaged by various actions, such as transport damage and attack by fungi and insects, were scanned and used for identification. Thus, no voucher specimens were taken. The first author conducted taxonomic identification through detailed photos and scans of the specimens, and the identification was confirmed by with specialists from the FLOR herbarium of the Federal University of Santa Catarina. To ensure the credibility of identification, photos were compared with a biological database for plants in the study area [30]. The nomenclature was checked with The Plant List [31]. The REFLORA database [32] was used to check the origin of the plants (native or non-native). Native species are considered those which are native to Brazil, including naturalized species. Additionally, the first author recorded qualitative notes in a field diary.

Analyses

Listed plants were a *posteriori* categorized as traditional, indistinct, or mixed, based on additional questions about the culinary uses of each plant. We considered plants with traditional use to be non-native plants used in traditional dishes and recipes. Mixed-use plants include those which are native to Brazil and ones that were present in the region prior to the arrival of German and Polish immigrants, which were subsequently adapted in the traditional immigrant dishes. For example, we included non-native Brazilian species such as banana (*Musa paradisiaca* L.) in this category since it is considered by the interviewees to be native and part of Brazilian identity. Plants with indistinct use are those which have not been associated with traditional cuisine. A traditional immigrant dish was considered to be one that interviewees identified as being passed down between generations (family memories).

We used descriptive statistics to analyze data from the interviews and tested means of the cited plants between descendant groups with the Student's t-test. To test dissimilarities and nestedness, we partitioned beta diversity using the *vegan* [33] and *betapart* [34] packages in the R platform [35] using a presence/absence Jaccard matrix. Since we aimed to evaluate the differences in participants' knowledge of plants, we used dissimilarity to highlight rare plants, which we define as those with only one or two mentions. We tested differences in average of dissimilarity in the beta diversity of species cited between descendant group with an analysis of variance with 5%

significance level (ANOVA). To test the averages between traditional, indistinct, and mixed-use food groups, we used the Kruskal-Wallis test.

Results

We interviewed 18 female and 12 male Polish descendants and 23 female and seven male German descendants. The interviewees' age varied from 18 to 90 years, with an average age of 61 years for Polish descendants and 64 years for German descendants. All interviewees were Portuguese speakers. German descendants use their mother tongue at higher frequencies than Polish descendants. Some 70% of German descendants know a little of the German language and use a few words on a daily basis. About 20% of Polish descendants know a little of the Polish language but hardly use it. However, some Polish descendants knew both languages (Polish and German) since they had engaged in trade with German descendants: "[...] if we wanted to sell our products we needed to communicate. Therefore, we learned the names [in German] of the most important things [...] (74yrs, male, Polish descendant)".

We recorded 153 folk plant names from which we identified 146 botanical species from 54 botanical families (the full list of recorded plants can be seen in more detail in Additional file 2). The most representative families, in terms of the number of species, were Rosaceae (12 species), Myrtaceae (11 species), and Lamiaceae (9 species). Polish descendants mentioned 105 edible plants, while German descendants listed 113 edible plant species, with no difference in the average number of plants cited by either ethnicity (t-test, p=0.2253). Forty-two percent of the plants were common to both groups (Fig. 2). We found no differences in the beta diversity of species cited between descendant groups (ANOVA F = 3.5484, p = 0.06462), nor did we find any nestedness pattern between the two descendant groups (ANOVA F = 2.6531, p = 0.1088).

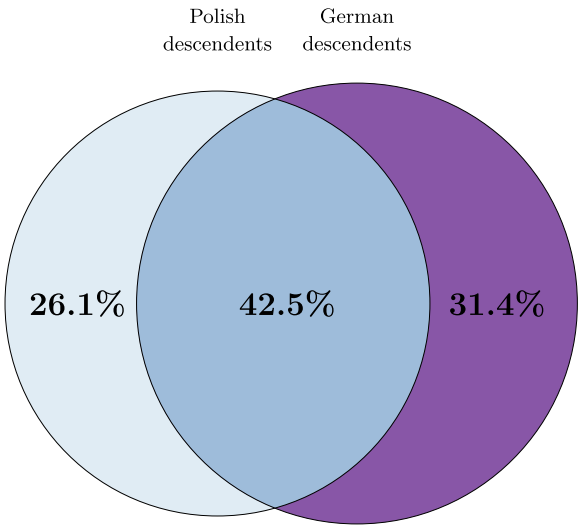

Fig. 2 Exclusive and shared plants cited by interviewees in São Bento do Sul, Brazil (30 Polish descendants and 30 German descendants)

Most of the documented plants (80%) are non-native species and still in use in daily cuisine: about 83% for Polish descendants and 71% for German descendants. The top two most commonly cited plants were *Brassica oleraceae* L. (Polish descendants: 21 citations—70%; Germans descendants: 18 citations—60%) and *Ipomoea batatas* (L.) Lam. (Polish descendants: 20 citations—66%; German descendants: 11 citations—36%), as seen in Fig. 3.

We noted that annual ethnic festivities such as *Polski Festyn* (Polish festivity) and *Schlachtfest* (German slaughter festival or meat festival) occur in the study area. In these festivities, people can taste the local cuisine apart from home and family context, including traditional, mixed, and indistinct plants. On average, the plants differed with respect to their uses between traditional (50%), mixed (30%), and indistinct (92%) (Kruskal-Wallis chi-squared = 10.747, df = 2, *p*-value = 0.0046). The names of some of the plants and their preparations are in Table 1. For example, among the traditional plants, dill (*Anethum graveolens* L.) is a common spice in Polish descendants' cuisine. Interviewees identified *pierogi* as another traditional Polish recipe, which uses potatoes (*Solanum tuberosum* L.) and the preparation of which had remained unchanged since the time of immigration. Some traditional ingredients were mentioned as having been forgotten, either because they are no longer cultivated or because they are not available in markets. These include buckwheat (*Fagopyrum esculentum* Moench), also called *tatarka* by Polish descendants. It was mentioned as an ingredient used in the past and cooked as a porridge or as part of the filling for *haluske* (stuffed cabbage, also known as *gołąbki*). Fruits such as peach (*Prunus persica* (L.) Batsch), apple (*Malus domestica* Borkh.), and pears (*Pyrus communis* L.) are associated with dessert foods like jams. Among the German descendants, these fruits are also consumed in cold soups. German descendants identified their traditional cuisine as including kohlrabi (B. oleracea) and common sorrel (*Rumex acetosa* L.), mostly picked fresh from the garden and eaten raw or added to hot soups.

Both groups of descendants mentioned the traditional consumption of cabbage (*B. oleracea*) and sour cucumber (*Cucumis sativus* L.), as well as wheat and rye as being closely linked to cultural expressions. Although the resources themselves are the same, the ways of preparation can change among the groups, as is the case for sour cabbage or sauerkraut. Mostly known as *chucrute* by both groups of descendants, sour cabbage is prepared by German descendants with only grated cabbage and salt, then left to ferment. The recipe of sour cabbage is linked to the

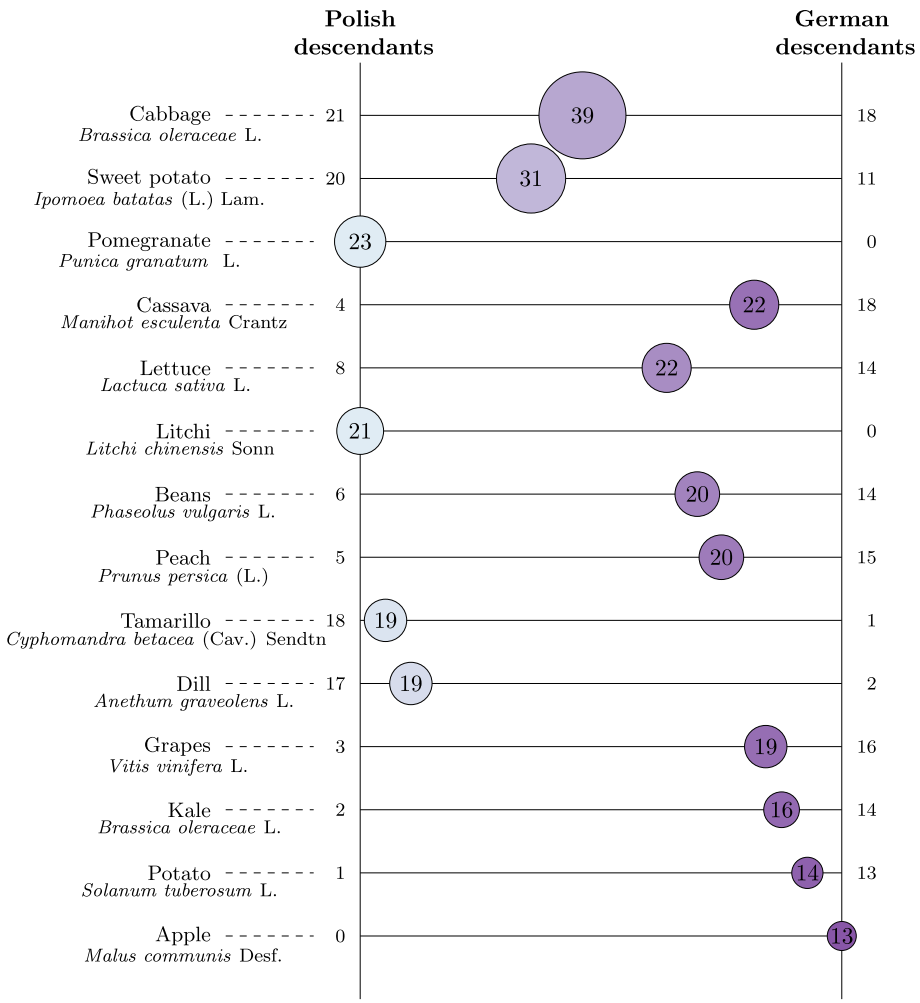

Fig. 3 Plant citations for each group of descendants (blue=Polish descendants; purple=German descendants; darker tones reflect a stronger association with each group). The numbers on the left are the number of times the Polish descendants mentioned the plant, and the numbers on the right correspond to mentions by German descendants. The numbers inside the circles are the total number of citations of each plant. The size of the circle is proportional to the percentage of all mentions represented by each plant

German descendants' idea of their heritage. Some Polish descendants mentioned the same preparation, but added grape leaves and sometimes pieces of bread to help in fermenting. Both descendant groups cited the use of wooden or clay barrels in the past to store cabbage while fermenting (Fig. 4). Cucumbers were also fermented in these barrels. However, preparations of sour cucumbers always involved dill among Polish descendants. Some plants were referred solely by their traditional names (in German or Polish), and others were mentioned in Portuguese as well.

German descendants often mention mixed-use plants with expressions like "this is not traditional, but we use it", as is the case for banana (*M. paradisiaca*) used in a traditional sweet known as *cuca* or *cuque* (a type of cake). The same occurs with the use of sweet potatoes (*I. batatas*), generally used in pork dishes. "[...] Sweet potatoes are not German, they are indigenous, but we use them, our parents planted and taught us to eat [...]" (50yrs, female, German descendant). Both groups of descendants mentioned the use of yams (*Colocasia esculenta* (L.) Schott, *Dioscorea bulbifera* L., and *Xanthosoma* sp.) in the preparation of bread and kneaded together with the wheat dough.

Plants of indistinct use include native plants such as the Araucaria pine tree (*Araucaria angustifolia* (Bertol.) Kuntze), native cherry tree (*Eugenia involucrata* DC.), and Brazilian staple foods, such as rice (*Oryza sativa* L.), beans (*Phaseolus vulgaris* L.), cassava (*Manihot esculenta* Crantz), and lettuce (*Lactuca sativa* L.). Although plants for indistinct uses were not mentioned as part of traditional recipes, some of their traditional names were remembered during interviews, such as the case for *piąkse* (pine nut from *A. angustifolia*). For Polish descendants, some of the most cited plants appear in the group of

Table 1 Examples of traditional plants mentioned by German and Polish descendants, and their associated uses and memories

Botanical family	Species	Local names	Uses and memories
Amaranthaceae	*Beta vulgaris* L.	Beterraba—Pt *Rotebette**—Gd	Canned beets—Pd, Gd; Sweet and sour salads—Gd; Soups—Pd
Apiaceae	*Anethum graveolens* L.	Endro - Pt *Koper* - Pd	The main ingredient of canned vegetables and sour cucumber—Pd "If there is no Koper [referring to the dill used in sour cucumber seasoning], the taste isn't right; something's missing." (63 years old, female, Pd)
Brassicaceae	*Armoracia rusticana* P.Gaertn., B.Mey. & Scherb.	Raíz forte—Pt; *Crem**—Gd, Pd; *Chrzan*, *quichan**—Pd	The root is grated and canned. It is used as a side dish, accompanying recipes made with fatty meats, mainly pork.
	Brassica oleracea L.	Repolho—Pt	Fresh or canned sour cabbage (chucrute)—Gd, Pd
		Couve rabano—Pt; *Colorabe*—Gd	Fresh or added in vegetable soups—Gd
Convolvulaceae	*Ipomoea batatas* (L.) Lam.	Batata doce—Pt; *Bataten**—Gd	Side dish, accompanying recipes made with pork—Gd
Fabaceae	*Phaseolus vulgaris* L.	Feijão—Pt; *Vasola**—Pd	Bean stew "The beans came to replace the *tatarka*, and my mother planted a lot of *tatarka*. I didn't even get to know it [referring to *tatarka*] [...] then the beans came, and we consumed it a lot." (73 years old, female, Pd)
Lamiaceae	*Salvia officinalis* L.	Sálvia—Pt; *Szalwia*—Pd	For flavoring broths, sauces, and meats—Pd
Polygonaceae	*Fagopyrum esculentum* Moench	Trigo sarraceno—Pt; *Tatarka**—Pd	Porridge, cooked side dish, haluski filling—Pd
	Rheum rhabarbarum L.	Ruibarbo—Pt; *Rababa**—Gd	Toppings for sweets, especially *cuque*—Gd
Rosaceae	*Prunus persica* (L.) Batsch	Pêssego—Pt *Fêse*—Gd	Pies, jellies, candied fruits, cold soups - Gd
	Malus domestica Borkh.	Maçã—Pt; Apfel—Gd	Pies, jellies, candied fruits, cold soups—Gd
Rubiaceae	*Coffea arabica* L.	Café—Pt; *Kawa*—Pd *Kaffe*—Gd	Memories associated with rainy days, when families roasted and ground coffee at home—Pd, Gd; "What I liked the most about coffee was the flowers, and when people roasted it [...], the roasted coffee smell would travel far." (63 years old, female, Gd)

Pt Brazilian portuguese language, *Gd* German descendant, and *Pd* Polish descendant. Local names as known by the descendants of each ethnicity are marked with "*"

indistinct use, such as pomegranate (*Punica granatum* L.) and litchi (*Litchi chinensis* Sonn.). Pomegranate was cited as a medicinal food and was consumed in natura, as juices and syrup. However, litchi was consumed only in natura, and its use seems to be recent according to residents (less than five years).

Discussion

We found that almost 50% of edible plants were mentioned by both groups of descendants. German descendants cited a greater number of total species than Polish descendants did. Therefore, we have not corroborated our first hypothesis, of Polish descendants having a greater knowledge of plants than Germans due to a history of agricultural practice. We also did not observe dissimilarities in their knowledge. Over generations, as we can see, descendants of Polish and German migrants tend to incorporate local ingredients with greater frequency or substitute traditional ingredients with what is available in the host country [36]. In a study on the adaptation of traditional cuisine by German immigrants in the southern Brazilian state of Rio Grande do Sul, Friendrich and Witter [37] argued that foodways are restructured according to the continuity of traditional food. Thus, recreations of traditional dishes occur with ingredients produced in the new territory.

As there is no difference (in terms of the number of plants mentioned) of plant knowledge, we also reject the second hypothesis of the knowledge of the German descendants being nested within Polish descendants' knowledge. Since there is a low variation of plants mentioned among the descendants, a large part of these species is non-native species in Brazil (80%). Among Polish and German descendants in Santa Catarina, the botanical families of Rosaceae and Lamiaceae make up the largest numbers of non-native species in Brazil. These

(a) (b)

Fig. 4 a Homemade sour cucumbers, a recipe of Polish descendants with grape leaves and dill. **b** Clay barrel used in the past by German descendants for sour cabbage

botanical families are linked with the introduction of commercial species, with uses generally characterized as traditional and mixed uses [38]. Myrtaceae is one of the most representative botanical families in ethnobotanical studies and floristic surveys in Brazil due to the vast richness of species and its prominence in the Atlantic Forest, with many species bearing edible fruits [39, 40]. In a study on the distribution of plant knowledge conducted in a community of German descent in the same phytogeographic region as our study area, Poderoso et al. [41] present the most commonly cited food plants, which featured a high occurrence of Rosaceae and Myrtaceae. We found that our results are consistent with those of earlier studies, including [41].

Most plants had indistinct uses among Polish and German descendants, meaning that they were not associated with a traditional recipe. This disconnection between ingredients and foods of indistinct origin highlights the patterns of acculturation in eating practices. Although ethnic memories exist and are associated with indistinct plant resources, such as the traditional names given for these plants, the loss of memories about food preparation practices is notable. This memory loss has been reported in the literature: the most recent generations tend to know less and forget traditional knowledge about plants as their livelihoods change, which can favor a distancing from ancestral memories [24, 42]. Still, it is worth noting that for both groups, 30% of the plants mentioned have mixed-use, while 50% compose traditional recipes. Thus, although the vast majority of resources are of indistinct use, there are plants and food preparations that are alive through time, as is the case for sweet potato and cabbage, the latter of which may be even considered a marker of identity for both groups of descendants in the realm of edible plants.

Food-centered memory [43] seems not to be directly related to preserving the language from the country of origin in the daily lives of the descendants of German and Polish migrants. Although German descendants have preserved their language much better than their Polish counterparts, food proves to be a friendly symbol of identity for younger generations despite a lack of interest in the immigrant language [44]. Among both descendant groups, we observe the use of a similar number of food plants as well as a similar number of plant names mentioned in their mother tongues and a similar proportion of traditional uses (50%) of plants. These findings should be considered in future studies focused on the relationship between food plants and language in the migratory context.

On the other hand, the fact that German descendants use similar or even a slightly higher number of food plants than Polish descendants may be connected to their access to rural food sold at town fairs and imported food in town markets from other parts of Brazil. Perhaps the access to a greater number of food sources and less self-subsistence than Polish descendants has contributed to the diversified food ingredients employed in their cuisine. Finally, German migrants who settled in urban areas from the very beginning had a longer trajectory in organizing festivities arranged around food and identity. For the same reasons, they could influence the popularization of *chucrute* instead of *Kapusta kiszona* (Polish equivalent) on a regional level (see [45]). We suggest that ethnic food memories are kept alive in a communitarian way. Actions in communities, such as the festivities and the availability of resources through local farmers' markets, contribute to the maintenance of culinary memories.

Conclusion

When people move between countries, it takes time to stabilize their learning process about the place, local customs, and local biodiversity. Although livelihoods have changed, and immigrants' descendants tend to acculturate

ingredients and tastes, ethnic memories are still a potent connector with food. The ethnic memories associated with the food among Polish and German descendants are not strictly related to different sets of plant species used but rather in food preparation memories. Immigrant food knowledge and memories are commonly associated with many non-native plants in the host country. The challenge in multicultural societies lies in valuing native plants and local knowledge while also maintaining knowledge that may be close to disappearing. When we place the plant knowledge in urbanized environments, as is the case in the study area, incorporating knowledge of native plants associated with ethnic names and memories—though limited—provides an excellent opportunity to maintain local biocultural diversity.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s42779-021-00083-7.

Additional file 1: Flowchart illustrating the sampling of collaborators interviewed combining data from historical archives and snowball methods.

Additional file 2: Plants recorded and identified during Free list. NA stands for Non-Available, such as plants not available for identification because they are not present in Brazil, lack photograph detail, or because the material collected was damaged.

Acknowledgements

We thank all collaborators interviewed for the time and patience in sharing their personal stories and plant knowledge. We thank I. Seidel, M. Cabral, H. Souza, and F. Moraes for helping in the field work.

Funding

This work was supported by Brazilian Federal Agency for the Support and Evaluation of Graduate Education (CAPES) through the Ph.D scholarship awarded to RHL—Finance Code 001, by Brazilian Council for Scientific and Technological Development (CNPq) through the research productivity grant awarded to NH (309613/2015-9 and 304515/2019-1) and NP (306801/2019-1), and the undergraduate scientific research grant awarded to AEC.

Authors' contributions

RHL, AEC, and NH designed the study; RHL and AEC conducted the fieldwork. RHL conducted the statistical analyses. All authors contributed to the writing and revision of the manuscript. All authors read and approved the final version of the manuscript.

Availability of data and materials

Interview data, consent forms, and legal authorizations for interviews and plans collection are stored at the Laboratory of Human Ecology and Ethnobotany, Federal University of Santa Catarina, Brazil. Data generated or analyzed during this study are available upon request to the first author.

Declarations

Ethics approval and consent to participate

This project was approved by the Ethics Committee of the State University of Santa Catarina (protocol number 58283316.0.0000.0121), and the participation of the collaborators was conditional on the acceptance of the term of prior informed consent. This study was also approved by the Brazilian System of Authorization and Information on Biodiversity (protocol number 63758) and registered at the National System of Genetic Heritage and Associated Traditional Knowledge (protocol A8129ED).

Consent for publication

Collaborators were informed that results would be presented in a scientific article and gave their approval.

Competing interests

The authors declare that they have no competing interests.

Author details

[1]Laboratory of Human Ecology and Ethnobotany, Department of Ecology and Zoology, Federal University of Santa Catarina, Florianópolis, Santa Catarina, Brazil. [2]Department of Ecology and Zoology, Ecology Post-graduate Program, Federal University of Santa Catarina, Florianópolis, Santa Catarina, Brazil. [3]University of Łódź, Institute of Ethnology and Cultural Anthropology, Łódź, Poland.

Received: 12 March 2021 Accepted: 8 June 2021
Published online: 29 June 2021

References

1. Anderson EN. Everyone eats: understanding food and culture. New York: NYU Press; 2005.
2. Happel CAC. You are what you eat: Food as expression of social identity and intergroup relations in the colonial andes. Cincinnati Romance Rev. 2012;33:75–193.
3. Emmez BC. Plants and foods as identity markers: an ethnographic analysis on the case of the (Y)Ezidis from Batman (Turkey). J Ethn Foods. 2020;7:. https://doi.org/10.1186/s42779-019-0038-y.
4. Lupton D. Food, memory and meaning: the symbolic and social nature of food events. Sociol Rev. 1994;42(4):. https://doi.org/10.1111/j.1467-954x.1994.tb00105.x.
5. Berkes F. Sacred Ecology: Traditional Ecological Knowledge and Resource Management. Philadelphia: Taylor & Francis; 1999. https://books.google.com.br/books?id=5b8RAgZtxxIC.
6. Berkes F, Colding J, Folke C. Rediscovery of traditional ecological knowledge as adaptive management. Ecologycal Appl. 2000;10:1251–62.
7. Parasecoli F. Food, identity, and cultural reproduction in immigrant communities. Soc Res. 2014;81:. https://doi.org/10.1353/sor.2014.0015.
8. Fontefrancesco M, Barstow C, Grazioli F, Lyons H, Mattalia G, Marino M, McKay AE, Sõukand R, P. C, Pieroni A. Keeping or changing? two different cultural adaptation strategies in the domestic use of home country food plant and herbal ingredients among Albanian and Moroccan migrants in Northwestern Italy. Ethnobiol Ethnomedicine. 2019;15(11). https://doi.org/10.1186/s13002-019-0290-7.
9. Pirker H, Haselmair R, Kuhn E, Schunko C, Vogl CR. Transformation of traditional knowledge of medicinal plants: the case of Tyroleans (Austria) who migrated to Australia, Brazil and Peru. J Ethnobiol Ethnomedicine. 2012;44:1–25.
10. Kujawska M, Pieroni A. Plants used as food and medicine by polish migrants in Misiones, Argentina. Ecol Food Nutr. 2015;54:1–25.
11. Ceuterick M, Vandebroek I. Identity in a medicine cabinet: Discursive positions of Andean migrants towards their use of herbal remedies in the United Kingdom. Soc Sci Med. 2017;177:43–51.
12. Santos SA. Historical roots of the "whitening" of Brazil. Lat Am Perspect. 2002;29:61–82.
13. Ficker C. São Bento do Sul: Subsídios Para Sua História. Joinville: Impressora Ipiranga; 1973.
14. Hawkes C. Uneven dietary development: linking the polices and progress of globalization with the nutrition transition, obesity and diet-related chronic diseases. Glob Health. 2006;2:1–18.
15. Pieroni A, Quave CL, Giusti ME, Papp N. "We are Italians!": The hybrid ethnobotany of a Venetian diaspora in Eastern Romania. J Human Ecol. 2012;40:435–51. https://doi.org/10.1007/s10745-012-9493-4.
16. Soga M, Gaston KJ. Extinction of experience: The loss of human-nature interactions. Front Ecol Environ. 2016;14(2):94–101.
17. Turreira-García N, Vilkamaa AM, Byg A, Theilade I. Diversity, knowledge, and use of leafy vegetables in Northern Thailand – maintenance and transmission of ethnobotanical knowledge during urbanization. Nat Hist Bull Siam Soc. 2017;62:85–105.
18. Cummins S, Macintyre S. "Food deserts" –evidence and assumption in health policy making. Educ Debate. 2002;325:436–8.

19. Jurasinski G, Retzer V, Beierkuhnlein C. Inventory, differentiation, and proportional diversity: a consistent terminology for quantifying species diversity. Oecologia. 2008. https://doi.org/10.1007/s00442-008-1190-z.
20. Baselga A. Partitioning the turnover and nestedness components of beta diversity. Glob Ecol Biogeogr. 2010;19:134–43.
21. Jost L, DeVries P, Walla T, Greeney H, Chao A, Ricotta C. Partitioning diversity for conservation analyses. Divers Distrib. 2010;16:65–76.
22. Cámara-Leret R, Fortuna MA, Bascompte J. Indigenous knowledge networks in the face of global change. Proc Natl Acad Sci. 2019;116: 9913–18.
23. Łuczaj L, Pieroni A, Tardío J, Pardo-de-Santayana M, Sõukand R, Svanberg I, Kalle R. Wild food plant use in 21st century europe: the disappearance of old traditions and the search for new cuisines involving wild edibles. Acta Soc Botanicorum Pol. 2012;81(4):359–70.
24. Medeiros PM, Soldati GT, Alencar NL, Vandebroek I, Pieroni A, Hanazaki N, de Albuquerque UP. The use of medicinal plants by migrant people: Adaptation, maintenance, and replacement. Evid Based Complement Alternat Med. 2012;2012:1–11.
25. Vlková M, Kubátová E, Šlechta P, Polesný Z. Traditional use of plants by the disappearing Czech diaspora in Romanian Banat. Sci Agric Bohem. 2015;46:49–56. https://doi.org/10.1515/sab-2015-0016.
26. Pietraszek B. The Poles in Brazil 1889–1910. Pol Am Stud. 1974;31(2):5–19.
27. Rodycz WC. Os Imigrantes Poloneses da Colônia Lucena – Itaiópolis: Se Um Marreco Pisar No Gelo Ele Quebra. Porto Alegre: Rodycz&Ordakowski; 2011.
28. Fendrich H. Quem eram os alemães de São Bento? 2017. https://saobentonopassado.wordpress.com/2017/09/24/quem-eram-os-alemaes-de-sao-bento. Accessed 17 April 2020.
29. IBGE. Santa Catarina, São Bento - Síntese das Informações. 2010. https://cidades.ibge.gov.br/brasil/sc/sao-bento-do-sul/panorama. Accessed 10 June 2020.
30. Schwirkowski P. Flora de São Bento do Sul - SC. https://sites.google.com/site/florasbs/resultados-do-projeto. Accessed 02 Jan 2020.
31. ThePlantList. The Plant List (2013). Version 1.1. 2013. http://theplantlist.org/. Accessed 05 Jan 2020.
32. REFLORA. Jardim Botânico do Rio de Janeiro. http://floradobrasil.jbrj.gov.br/. Accessed 05 Jan 2020.
33. Oksanen JF, Blanchet G, Friendly M, Kindt R, Legendre P, McGlinn D, Minchin PR, O'Hara RB, Simpson GL, Solymos P, Stevens MHH, Szoecs E, Wagner. H. vegan: Community Ecology Package. R package version 2.5-3. 2018. https://CRAN.R-project.org/package=vegan.
34. Baselga A, Orme CDL. betapart: an R package for the study of beta diversity. Methods Ecol Evol. 2012;3:808–12.
35. R Development Core Team. A Language and Environment for Statistical Computing. Vienna: R Foundation for Statistical Computing; 2018. R Foundation for Statistical Computing. ISBN 3-900051-07-0. http://www.R-project.org.
36. Kittler PG, Sucher K, Nahikian-Nelms M. Food and Culture, 7th edn. Boston: Cengage Learning; 2016.
37. Friendrich FH, Witter NA. Adaptação da culinária dos imigrantes alemães (Rio Grande do Sul: 1850-1930. Disciplinarum Scientia. 2012;13:1–15.
38. Bennett BC, Prance GT. Introduced plants in the indigenous pharmacopoeia of Northern South America. Econ Bot. 2000;54:90–102.
39. Cruz AVM, Kaplan MAC. Uso medicinal de espécies das famílias Myrtaceae e Melastomataceae no Brasil. Floresta e Ambiente. 2004;11(1):47–52.
40. Silva TA, Mazine FF. A família Myrtaceae na Floresta Nacional de Ipanema, Iperó, São Paulo, Brasil. Rodriguésia. 2016;67:. https://doi.org/10.1590/2175-7860201667110.
41. Poderoso AR, Hanazaki N, Dunaiski JA. How is local knowledge about plants distributed among residents near a protected area? Ethnobiology Conserv. 2012;1. https://doi.org/10.15451/ec2012-8-1.8-1-26.
42. Aswani S, Lemahieu A, Sauer WHH. Global trends of local ecological knowledge and future implications. PLoS ONE. 2018. https://doi.org/10.1371/journal.pone.0195440.
43. Holtzman JD. Food and memory. Ann Rev Anthropol. 2006. https://doi.org/10.1146/annurev.anthro.35.081705.123220.
44. Teleginski MN. Comeres, memórias e práticas: A transmissão da culinária polonesa entre descendentes de imigrantes no Centro-Sul do Paraná. In: Paulo A-S, editor. Anais Eletrônicos do XXII Encontro Estadual de História da ANPUH-SP. Santos: ANPUH-São Paulo; 2014.
45. Kuhn E, Haselmair R, Pirker H, Vog CR. The role of ethnic tourism in the food knowledge tradition of Tyrolean migrants in Treze Tílias, SC, Brazil. J Ethnobiol Ethnomedicine. 2018;14(26). https://doi.org/10.1186/s13002-018-0224-9.

Publisher's Note