

Knowledge transmission patterns at the border: Ethnobotany of Hutsuls living in the Carpathian Mountains of Bukovina (SW Ukraine and NE Romania)

Giulia Mattalia (✉ giulia.mattalia@unive.it)

Università Ca' Foscari <https://orcid.org/0000-0002-1947-7007>

Nataliya Stryamets

Università Ca' Foscari Dipartimento di Scienze Ambientali Informatica e Statistica

Andrea Pieroni

Università degli Studi di Scienze Gastronomiche

Renata Sõukand

Università Ca' Foscari Dipartimento di Scienze Ambientali Informatica e Statistica

Research

Keywords: Biocultural diversity, Ecological Knowledge, LEK, Minority groups, TEK, Wild food plants, Wild medicinal plants

Posted Date: April 27th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-24160/v1>

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Version of Record: A version of this preprint was published on July 10th, 2020. See the published version at <https://doi.org/10.1186/s13002-020-00391-3>.

Abstract

Background

Cross-border research is a novel and important tool for detecting variability of ecological knowledge. This is especially evident in regions recently divided and annexed to different political regimes. Therefore, we conducted a study among Hutsuls, a cultural and linguistic minority group living in Northern and Southern Bukovina (Ukraine and Romania, respectively). Indeed, in the 1940s a border was created: Northern Bukovina was annexed by the USSR while Southern Bukovina remained part of the Kingdom of Romania. In this research, we aim to document uses of plants for food and medicinal preparations, discussing the different dynamics of Local Ecological Knowledge (LEK) transmission among Hutsuls living in Ukraine and Romania.

Methods

Field research was conducted using convenience and snowball sampling techniques to recruit 31 Hutsuls in Ukraine and 30 in Romania for participation in semi-structured interviews regarding the use of plants for medicinal and food preparation purposes and the sources of such knowledge.

Results

The interviews revealed that, despite a common cultural and linguistic background, ethnobotanical knowledge transmission occurs in different ways on each side of the border. Family is a primary source of ethnobotanical knowledge transmission on both sides of the border; however, in Romania knowledge from other sources is very limited, whereas in Ukraine interviewees reported several other sources including books, magazines, newspapers, the Internet and television. Indeed, this is especially evident when analysing the wild plants used for medicinal purposes as we found 53 taxa that were common to both, 47 used only in Ukraine and 11 used only in Romania. Indeed, while Romanian Hutsuls used almost exclusively locally available plants, Ukrainian Hutsuls often reported novel plants such as *Aloe vera*, *Aronia melanocarpa*, and *Elaeagnus rhamnoides*. Knowledge related to these plants was transferred by sources of knowledge other than oral transmission among members of the same family. Therefore, this may imply hybridization of the local body of knowledge with foreign elements originating in the Soviet context which has enriched the corpus of ethnobotanical knowledge held by Ukrainian Hutsuls.

Conclusions

While ethnobotanical knowledge among Romanian Hutsuls is mainly traditional and vertically transmitted, among Ukrainian Hutsuls there is a considerable proportion of LEK that is transmitted from other (written and visual) sources of knowledge. This cross-border research reveals that despite a

common cultural background, socio-political scenarios have impacted Hutsul ethnobotanical knowledge and its transmission patterns.

Background

The current global changes demand thorough analysis of not only ecological knowledge *per se*, but also how such knowledge is produced, shared and used [1]. Indeed, ecological knowledge is a valuable system, which can significantly contribute to a better understanding of the current socio-economic and environmental changes occurring all over the world [2, 3]. These bodies of knowledge are seriously endangered by urbanization and the increasing adoption of new modes of life disconnected from local ecosystem dynamics and resources [4]. In addition, a widespread tendency of formal education (e.g. literature) to downplay local resources and knowledge has been observed [5], thus leading to knowledge homogenization and standardization [6, 7].

Ethnobotanical knowledge can be considered as part of Local Ecological Knowledge (LEK) and it can be, but not necessarily is, regarded as traditional. Indeed, LEK “concerns the interplay among organisms and between organisms and their environment. LEK may be a mix of scientific and practical knowledge; it is site-specific and often involves a belief component” [8]. Berkes [9] defined Traditional Ecological Knowledge (TEK) as “a cumulative body of knowledge and beliefs, handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment.” As observed by Olsson and Folke [8], the specific characteristics of TEK lie in its “historical and cultural continuity of resource use”.

These two definitions of ecological knowledge are not in opposition, but rather, as largely accepted by the majority of ethnobiology scholars, both TEK and LEK define a complex and heterogeneous body of folk knowledge, practices, and beliefs related to the natural environment. However, solely for the instructive aim of a better understanding of the different “nature” of these bodies of knowledge in the current context, in this article we adopt the term TEK when referring to a system in which knowledge and practices are mainly orally transmitted (e.g. pre-industrial contexts), while we use the term LEK to refer to a system in which the borders between written (or in other words “standardized”) and oral forms of knowing nature and practicing this knowledge are more blurred.

Van den Boog et al. [10 and references within] discussed and categorized the dynamics of LEK transmission into vertical (between generations within the family), horizontal (between people of the same generation) and oblique (between generations not belonging to the same family). The evolving dynamics of ethnobotanical knowledge transmission have been found to be affected by not only exposure to a market economy [11, 12], but also socio-economic changes [13] and political circumstances [7].

Hutsuls are an ethnic group living in the Carpathian Mountains of Ukraine and to a lesser extent Romania. These communities have been recently studied from an ethnographic perspective [14, 15] as well as an ethnobotanical one [6, 16].

Over the last few years, cross-border ethnobotany has received increasing attention from scholars [16, 17, 18] as it is an excellent tool for exploring the effects of different social and political contexts on LEK. In this study, we examine culturally homogenous Hutsul communities living in similar mountain landscapes, yet separated by a border created in the 1940s when Northern Bukovina was annexed by the Soviet Union and Southern Bukovina remained part of the Kingdom of Romania. The aim of this study, therefore, is to document and discuss the different dynamics of LEK transmission among Hutsuls living in Ukraine and Romania and to explore whether the different social, political, and economic conditions that developed after border creation have affected these dynamics.

Methods

Study area and historical background

The interviews were conducted in Bukovina, a region of Eastern Europe characterized by an extensive forested area especially in proximity to the Carpathian Mountains. This region belonged to the Hapsburg Empire for over 140 years until 1918, when it became part of the new Kingdom of Romania. In 1940, the Ribbentrop Molotov Pact split this region into two parts: Northern Bukovina was annexed by the USSR and thus a new border was created. After a few years of uncertain borders, in 1944 Southern Bukovina was assigned to Romania, and since 2007 it has been a member of the European Union, whereas Northern Bukovina, after the collapse of the Soviet Union in 1991, became part of independent Ukraine. While Northern Bukovina underwent a process of homogenization and centralization promoted by the USSR, Southern Bukovina was not heavily affected by Romanian collectivization policies due to its limited economic interest.

Over one century ago, Bukovina was a multicultural and multi-religious mosaic composed of Romanians, Ukrainians, Jews, Armenians, Roma people, Hungarian Székelys, Russian Old Believers (Lipovans), Germans (mainly clerks), Slovaks, Poles, and Tatars [19, 20].

Currently only a small portion of such cultural diversity is maintained, as linguistic and ethnic minorities have undergone a process of homogenization [21]. Among these minorities are Hutsuls who live in the Carpathian Mountains of the Suceava district of Romania and the Cernivtci, Ivano-Frankiv'sk and Zakarpatska provinces of Ukraine. Hutsuls speak a local language which they themselves consider to include elements of Ukrainian, Polish, German and Hungarian [14]. In Romania, children are taught both in Romanian and Ukrainian in school, while at home they mainly speak the Hutsul language. In Ukraine, they attend school in Ukrainian and use Hutsul for informal conversations. The main economic activities of both Romanian and Ukrainian Hutsuls are small-scale mixed farming and non-wood forest product exploitation. All interviewed Hutsuls belonged to the Orthodox Church.

The climate of the area is classified as Dfb, a humid continental climate, without a dry season and with warm summers. Annual precipitation is around 775 mm, which is mainly concentrated in June and July. The coldest month is January when average temperature is -5.5 °C and the warmest is July at 16 °C.

Sampling and interviews

Sixty-one Hutsul informants were interviewed in Romanian and Ukrainian Bukovina between June 2018 and July 2019. Thirty in-depth interviews were gathered in the municipalities of Brodina, Ulma and Izvoarele Sucevei, in the district of Suceava, Northern Romania, while thirty-one interviews were conducted in the districts of Putyla (main villages in which interviews were conducted include Kyselytsi, Shepit, Serhii, Foshky, Parkulyna, Ryzha) and Vyzhnytsia (Dolishnii Shepit) in the province of Cernivtsi, Southern Ukraine. Altitude of the villages ranges from 600 to 1000 m a.s.l.

Informants were conveniently selected (we interviewed people walking on the street, working in their gardens or talking in cafes) and when possible we used the snowball method. We strictly followed the ethical guidelines prescribed by the International Society of Ethnobiology (ISE, 2006) and the study protocol was approved by the Ethical Committee of Ca' Foscari University of Venice.

We used semi-structured interviews to obtain qualitative and quantitative data regarding the use of plants for culinary and medicinal purposes (starting with culinary use). Specifically, we asked interviewees what plants they harvest, for what purpose, and how they prepare them. In addition, we asked informants the source of such knowledge, i.e. from whom or where did they learn it. In some cases, we deemed it useful to draw a timeline indicating when each informant started using each plant. When possible, we harvested the mentioned plants together with the interviewees in order to collect and identify voucher specimens. Voucher specimens collected in Ukraine are stored in the "Roztochya" Nature Reserve (Ukraine) bearing codes NB001-NB259, while those collected in Romania are stored in the Herbarium of Ca' Foscari University of Venice (Italy) bearing codes SB001-SB094. Voucher specimens were identified using the "The Plant List" [22] and "Flora Europaea" [23]. Plant families were classified according to Stevens [24]. Interviews were held in Romanian or Ukrainian according to the preference of the interviewees. In Romania, many interviewees answered using a mixture of Romanian, Ukrainian or the Hutsul language, while in Ukraine they tended to stick to Ukrainian.

Data Analysis

Gathered data on the use of plants for various purposes were entered into an Excel spreadsheet. We structured emic categories into detailed use-reports (DUR), where each interviewee mentioned a specific use (e.g. abdominal pain) of a plant part (e.g. aerial parts or roots) for a specific preparation (e.g. tea or infused in alcohol). The spreadsheet included informant code, language of the interview, plant parts used, scientific name, family assignment, local name (Ukrainian and Hutsul names were transliterated using the system adopted by the Cabinet of Ministers of Ukraine [25]), mode of preparation, time of use (always, in the past, recently abandoned, recently adopted), medicinal use, food use, source of knowledge, and comments. In addition, for medicinal uses, we related ICD-11 medicinal categories [26] to reported emic categories (e.g. good for the stomach) for better comparison. In addition to the ICD-11 categories, we included a general health category including mainly "general symptoms" and some unspecified emic categories.

We considered only wild and semi-wild plants for food purposes, while we also included cultivated plants for medicinal purposes.

To compare Romanian and Ukrainian Hutsuls, we calculated the Jaccard Similarity Index (JI) following the methodology of González-Tejero et al. [27]:

$$JI = (C / (A + B - C)) \times 100$$

where A is the number of species in sample A, B is the number of species in sample B and C is the number of species common to both A and B. An index value close to 100 indicates that the two groups are very similar, while a value close to 0 indicates that they are very different.

In order to calculate the proportion of each knowledge transmission strategy we assigned a total of 1 point to each source of knowledge indicated by the interviewee. Therefore, if the interviewee reported one use, we assigned a value of 1; two uses, we assigned 0.5 to each; three uses, 0.33 to each; and four uses, 0.25 to each. Later, we summed these values in the emic categories mentioned by the interviewees on both sides of the border.

Results And Discussion

We recorded a total of 118 food and medicinal plants from 107 genera and 53 families. The most well represented families were Asteraceae, Rosaceae and Lamiaceae. Among Hutsuls of Northern Bukovina we recorded 107 taxa, while there were 72 taxa among Hutsuls of Southern Bukovina, and 60 taxa common to both. The most used plants were *Vaccinium myrtillus*, *Rubus idaeus* and *Urtica dioica*. These were the most used in both Northern and Southern Bukovina and thus we can confirm their importance as Hutsul cultural markers as previously suggested by Sõukand and Pieroni [16].

Food taxa

The interviewed Hutsuls reported a total of 47 taxa used for food preparations (Table 1). Twenty-six taxa were found on both sides of the border, 8 taxa were reported only in Romania and 13 only in Ukraine. When considering only the plants mentioned by at least 10% of the interviewees (3), Romanian Hutsuls mentioned 12 taxa, Ukrainians 7 taxa and 15 were common to both. The most common taxa correspond to those most used overall (*Vaccinium myrtillus*, *Rubus idaeus* and *Urtica dioica*), although among Romanian Hutsuls *Fagus sylvatica* was also very common as its wood was used for smoking pork meat, which is one of the most traditional Hutsul preparations, as well as to flavour soups. *Rumex acetosa* was very often reported by Ukrainian Hutsuls (but never by Romanian Hutsuls) as an ingredient for soups. The most common food purpose was recreational tea, a preparation used for 30 taxa. Tea was widely reported in Northern Bukovina where 23 taxa were mentioned, of which 13 were shared with Southern Bukovina, for a total of 81 DUR. In addition, 6 taxa were reported only among Hutsuls in Southern Bukovina for a total of 19 taxa and 65 DUR. In line with Sõukand et al. [28], the main represented families

for recreational teas were Rosaceae followed by Asteraceae and Lamiaceae. Another common preparation was jam which predominated in Romania (82 DUR) and included 8 taxa, 5 of which were common to both communities (*Fragaria vesca*; *Rubus caesius*; *Rubus idaeus*; *Vaccinium myrtillus*; *Vaccinium vitis-idaea*). Among the taxa used for jams exclusively prepared by Romanian Hutsuls, we found the young sprouts of *Picea abies*, which are harvested in June and can also be used for making medicinal syrup, and the petals of *Rosa rugosa* and *Rosa centifolia*, which are used for jams and teas almost exclusively by Romanian Hutsuls. In addition, the flowers of *Taraxacum officinale* were also used for the preparation of jam in Southern Bukovina. Another common use of wild and semi-cultivated food plants was seasoning, and in particular *Thymus* spp. and *Armoracia rusticana* which were used in both communities. Actually, *Armoracia rusticana* was reported by Ukrainian Hutsuls for “квашення” (kvashennya) and fermenting, including but not limited to “pickled cucumbers”, a typical recipe common in Romania under the name of “muraturi”. For this preparation, Hutsuls from both communities reported the use of *Armoracia rusticana* roots (in Ukraine leaves were also reported) and *Quercus* spp. (young branches in Romania and leaves in Ukraine), and *Carum carvi* only in Ukraine. Many other cultivated plants (cucumbers, carrots, garlic, cabbage, cauliflower, as well as mushrooms in some cases) were added to this preparation, which is later fermented. Another peculiar mode of preparation reported in Ukraine is “Квас (kvas)”, a drink made from fermented grain and low in alcohol content. Birch sap was also reported as an ingredient for kvas. Such a drink is often flavoured with berries and fruits, including *Aronia melanocarpa*, *Sorbus* spp. and *Vaccinium vitis-idea* which were mentioned by interviewees.

On both sides of the border, berries were often prepared as compote, which consists of boiling fruits (in this case *Fragaria vesca*, *Rubus idaeus*, *Rubus caesius*, *Vaccinium myrtillus*, *Vaccinium vitis-idaea*) in abundant water and later removing them to drink the flavoured liquid. It was often reported as a preserve for winter time.

Freezing as a conservation method was mentioned only by one person in Romania (for *Vaccinium myrtillus*), while it was more often reported in Ukraine for other berries (*Rubus idaeus*, *Fragaria vesca* and *Vaccinium vitis-idaea*).

Figure 3a. Proportional Venn diagram of food taxa mentioned in Northern and Southern Bukovina; JI=55.

Figure 3b. Proportional Venn diagram of food taxa mentioned by at least three interviewees in Northern and Southern Bukovina; JI=44.

Medicinal taxa

We recorded 111 plant taxa used for medicinal purposes (Table 2). Specifically, 64 taxa were used among Romanian Hutsuls while 100 were used among Ukrainian Hutsuls, with 53 taxa shared in common. This disparity was also reflected in the number of DURs: 840 in Northern Bukovina and 585 in Southern Bukovina (-30%). This trend was also reported by Sõukand and Pieroni [16].

Figure 4a. Proportional Venn diagram of medicinal taxa mentioned in Northern and Southern Bukovina; JI=49.

Figure 4b. Proportional Venn diagram of medicinal taxa mentioned by at least three interviewees in Northern and Southern Bukovina; JI=48.

The most common medicinal taxon was the same in both communities, namely *Vaccinium myrtillus* (78 DUR among Ukrainian Hutsuls and 45 DUR among Romanian Hutsuls). In Northern Bukovina, it was followed by *Rubus idaeus* (46 DUR), *Urtica dioica* (32 DUR), *Plantago major* (31 DUR) and *Vaccinium vitis-idea* (27 DUR). In Southern Bukovina, it was followed by *Urtica dioica* (35 DUR), *Hypericum* spp. (33 DUR), *Tilia* spp. (32 DUR), and *Rubus idaeus* (27 DUR). Half of the reported medicinal DURs on both sides of the border are for cultivated plants, while wild species represent 24% and 31% of the reported taxa in Northern and Southern Bukovina, respectively.

Figure 5. Distribution of medicinal DUR per category.

Romanian Hutsuls particularly mentioned medicinal taxa for treating the respiratory system, the digestive system and for general health. In the first two cases, they reported more DURs than did Ukrainian Hutsuls. In Northern Bukovina, the first three medicinal categories reported by Hutsul interviewees were general health, the respiratory system and the digestive system.

Following the higher number of medicinal DUR among Ukrainian Hutsuls, they exceeded Romanian Hutsuls in all medicinal categories apart from those of the auditory, digestive and respiratory systems. Interestingly, cancer (neoplasm category, four taxa) was only mentioned in Ukraine, whereas in Romania two people reported a remedy for cancer using *Helleborus foetidus*, but then added that they do not to use it as it is very dangerous.

We recorded a total of 128 emic medicinal categories which were nearly equally distributed: 42 were reported by both communities, 41 among Romanian Hutsuls and 45 among Ukrainian Hutsuls.

Only 10 medicinal DURs used by at least 10% of each community were found on both sides of the border. Three DURs were included in the digestive category and specifically considered as good for the stomach: tea made from the seeds of *Carum carvi* (used by one fifth of the interviewees), dried aerial parts of *Hypericum perforatum* and any preparation of *Vaccinium myrtillus*. Two musculoskeletal remedies include compresses of the leaves of *Arctium lappa* and the flowers of *Arnica montana* infused in alcohol, locally applied to treat joint pain. The aerial parts of *Rubus idaeus* are prepared as tea to reduce fever, while the aerial parts of *Urtica dioica* are boiled and used to wash the hair (for strong and shiny hair). More than 30% of both communities consider *Thymus* spp. as a remedy for cough. Finally, the fresh leaves of *Plantago major* are locally applied to warts and the young sprouts of *Urtica dioica* are considered beneficial for cleansing the blood.

Knowledge transmission

We recorded eight sources of knowledge among both Romanian and Ukrainian Hutsuls. Three categories differ between the two groups: friends, professors and a local healer (in the past) were mentioned in Southern Bukovina, while television, the Internet and newspapers were mentioned in Northern Bukovina. When analysing these data in the framework of the abovementioned Van den Boog [10] study, we observed that in 45% of cases Romanian Hutsuls transferred their knowledge vertically (from parents, grandparents and great-grandparents), 42% obliquely (via the elderly of the village), and 4% horizontally (through friends and neighbours), while 4% received knowledge from specialists (local healers and professors) and written sources (books) accounted for 2%. Among the books, one elderly interviewee mentioned Maria Treben's [29] bestseller (for the preparation of *Primula* tea), but most of the Romanian Hutsuls said they did not have time for reading as there was always a lot of work in maintaining their small-scale farms. Moreover, all the Romanian people who mentioned books as a source of knowledge added that they would never have trusted this information as such, but they had a solid base of knowledge derived from oral sources and they have just added some information to it (for instance, they did not know a specific plant was useful for something, but they were already using it or part of it).

Figure 6a. Ecological knowledge transmission strategies among Romanian Hutsuls. Figure 6b. Ecological knowledge transmission categories among Romanian Hutsuls grouped per strategy.

Among the Ukrainian Hutsuls, we recorded nearly the same proportion of vertical ecological knowledge transmission from parents and grandparents (48%), as well as the same amount of horizontal transmission from neighbours and oblique transmission from local elderly individuals (11%). We also observed that 15% of knowledge was obtained from written sources including books and newspapers ("I read in the newspaper that a bath with *Chelidonium majus* and *Matricaria chamomilla* helps with allergies", explained a woman born in 1969), 6% from the Internet and 2% from television.

Comparing the two communities, we can observe that the elderly, and thus oblique LEK transmission, play a minor role among Ukrainian Hutsuls, while neighbours have a more important role ("Come to my neighbour, she knows everything", advised an old woman born in 1928). Also, in Ukraine, no one reported having learnt from specialists, while mass media such as the Internet and television accounted for 8%, which added to the 15% from books and newspapers totals 23%, whereas this value is only 12% among Romanians.

Figure 7a. Ecological knowledge transmission strategies among Ukrainian Hutsuls. Figure 7b. Ecological knowledge transmission categories among Ukrainian Hutsuls grouped per strategy.

Moreover, while only one book was mentioned [28] and another one was presented during interviews in Southern Bukovina [30], Ukrainian Hutsuls reported 16 books in both Ukrainian and Russian published between 1979 and 2016 (Table 3).

Popular books about medicinal plants in Northern Bukovina (Ukraine)

Books on medicinal plants were very popular in Ukraine and could be grouped based on the period of their publication. The first period of mass publication of books on wild medicine began in the 1970s. At that time, most of the books had an official reviewer controlled by Moscow, as a rule a doctor or professor of medicine. The popularity of herbal medicinal books can be seen by the number of editions; for example, Dr. Karhut's "Medicine around us" was republished in 1975, 1978 and 1979. Hammerman and co-authors published the text book "Medical plants or plant-helpers" in 1978 and then again in 1979 for biological specialties and medical schools, which was adopted by the Ministry of Education of the USSR.

Table 3. Details of the books reported during interviews in Northern Bukovina, Ukraine.

The second period started at the beginning of the 1990s when there were no longer censors, and therefore a boom of book publications took place; and indeed out of the 16 books mentioned during our interviews, 11 are from this period. Besides books, respondents named a variety of newspapers that specialized in recipes of wild and domesticated taxa for medicinal purposes. We recorded 8 different newspapers and magazines named by interviewees, e.g. "Alphabet of health", "Health advice", "Good doctor", and "Granny". These magazines were very cheap and promoted by the state postal service. Those publications included recipes from medical doctors as well as from people that "treated themselves" with specific remedies.

Different attitudes towards written and visual sources among Hutsuls on the two sides of the border

We observed a different attitude towards written sources between the two communities. While in Romania books were somehow perceived as unnecessary, not completely useful (as *the elderly know more*) and not to be trusted (as *the elderly know better*), in Ukraine they were a real source of pride. "We are very knowledgeable people, we go to libraries", claimed a woman (born in 1966). Indeed, in Ukraine during the Soviet era, education and books were important ways of showing off, as boasted by a Hutsul woman (born in 1948): "I have an expensive book! (the medicinal plants book)". This is because books were very rare and hard to get during Soviet times [31]. Therefore, the large number of books shown during our interviews may be due to informants' pride of being able to show that they are knowledgeable people who have the economic power to buy books and can acquire "high" knowledge (compared to the lesser importance of oral knowledge). Specifically, books regarding medicinal uses of plants were propagandized and it was a popular topic in schools and universities. In addition, phytotherapeutic knowledge was especially sought-after because the Soviet medical system relied heavily on herbal medicine, e.g. a special course on herbal medicine was offered at all medical universities of Soviet Ukraine [32,33]. Indeed, this positive attitude towards "official" and written sources has been observed in other post-Soviet countries and confirms that book knowledge is considered especially trustworthy in these contexts [34].

Another difference between Ukrainian and Romanian Hutsuls is that neighbours are an important source of knowledge among the former, while a similar role is played by the elderly among the latter. Although it may simply be a phenomenon related to semantics (elderly individuals can also be neighbours), there may be more older and knowledgeable people in Romania, as in Ukraine a particular generation was deported to Siberia and never returned, or if individuals did return they did not live long [35] or were killed during WWII and the time of repressions [36].

Different perspectives on Hutsul ecological knowledge transmission patterns on both sides of the border

Our overall data reveals that LEK among Romanian and Ukrainian Hutsuls is transferred using different transmission patterns and sources. Indeed, among Romanians, the main rule seemed to be the experiential “uite, asta-i buna sau nu-i buna (look, this is good, this is not)” learnt from parents or the elderly of the village, as an 85-year-old Hutsul man reported. This attitude is clearly encompassed by the definition of traditional knowledge, as it is transmitted orally in the local language and characterized by ubiquitous dissemination. The other sources of knowledge accounted for only 6% in total.

Among Ukrainian Hutsuls, there is a larger proportion of knowledge that comes from other sources (23%). However, even though magazines and pamphlets were found to be an important source of knowledge in several post-Soviet countries [37,38], the Internet and television were not found to influence medicinal plant knowledge in other areas of Ukraine [39].

Socio-political factors affecting LEK in Northern Bukovina (Ukraine)

The reasons for the different knowledge transmission strategies may be found in the distinct social and political environments which the “new” border created. In Northern Bukovina, Hutsuls were part of a centripetal system that delivered services and information equally to every part of the USSR.

The educational system promoted by the Soviet Union significantly impacted the Hutsul way of thinking and living [40]. All across Ukraine, this was implemented through both the mandatory teaching of the Russian language, which was required for any prestigious job [41], and the promotion of “rural clubs”, which proposed new forms of political education such as mobile libraries and cinemas in order to reach people in even very remote villages [41]. This kind of policy aimed to prevent the expression of local (Hutsul) identity by fostering the assimilation of Soviet culture in the Ukrainian territory [42]. Among others, the Soviet regime targeted the expression of Hutsul identity and many traditions and rituals were banned. For instance, wearing Hutsul clothing and singing traditional songs were not allowed [43]. The traditional (religious) calendar was altered and only events devoid of any identitarian features were maintained [43].

The social landscape of Ukrainian Hutsuls abruptly changed in the 1940s when, concomitantly with border creation, drastic depopulation and the collectivization of farms and arable land occurred [44]. Indeed, despite the meagre amount of arable land in the Carpathian valleys, many collective farms were established there, and in the area of Putyla as well (“There were collective farms and it was hard to live. I have been working since I was 14”, mentioned an elderly individual). Several interviewees reported that there were important wool factories, which benefitted from the large number of sheep present in this area of the Carpathians, in addition to the centralized management of the forest and the promotion of rural clubs (“Can you believe there was a cinema here?”, asserted a middle-aged male informant).

Socio-political factors affecting LEK in Southern Bukovina (Romania)

In Southern Bukovina, beginning in the 1960s, the Romanian government promoted rural systematization (“sistemizarea”) in order to foster the reconciliation of differences between urban and rural settlements [45]. However, in the following decade the government recognised the difficulty of rural systematization in the Carpathians, its limited economic potential and the existence of various difficulties, which were sociological, geographical and ethnographical in nature. Therefore, in the 1980s when the main priority turned to agriculture, the project of rural systematization in the Carpathian Mountains was definitively abandoned [45]. In support of this thesis, some local interviewees reported not having experienced the collective farms (otherwise widespread in Romania), due to the limited agricultural productivity of the area. Moreover, local interviewees claimed that livestock and game used to belong to the State, but due to the vastness of the area, the harshness of the steep terrain and communication difficulties, there was not much control in the mountains where Hutsuls live. Therefore, the peripheral location of the area with regard to Romania, as well as its lying along the border and its ethnolinguistic peculiarity prevented this area from being subjected to the centralization policies implemented throughout most of the country (in fact, Romanian Hutsuls reported that only between the 1960s and 1989 were the local forests managed by the central government). As a consequence, ethnobotanical knowledge among Romanian Hutsuls was mainly maintained through vertical transmission (as other sources of knowledge were not widely available).

The effects of these different socio-political contexts on medicinal LEK

Therefore, the creation of the border and the consequent socio-political contexts unevenly affected the LEK of Romanian and Ukrainian Hutsuls, despite a common ethnolinguistic background, very similar environmental conditions and the peripherality of these areas in their respective geopolitical contexts. Indeed, in Romania the area in which Hutsuls live was considered remote and of limited economic interest and as a result left behind in the implementation of the “sistemizarea”. In Ukraine, the centripetal power of Moscow was stronger and thus eliminated the concept of peripherality. The reforms

were indeed implemented with the same intensity throughout Soviet territory, and the Russian language and collective farms were imposed.

The different success of the policies of the Soviet and Romanian regimes, therefore, differently affected Hutsul LEK. While Romanian Hutsul LEK appears to have been somehow “frozen/static” during the twentieth century, as they were not systematically affected by centralization policies or other factors, Ukrainian Hutsuls were strongly influenced by the new language (Russian) which served as a vector for new (and sometimes technical) knowledge, including the transmission of plant knowledge especially through books and newspapers. Therefore, in addition to vertical knowledge transmission among Ukrainian Hutsuls, we found that other sources of knowledge played an important role. As described in Table 4, these two kinds of LEK sources differ especially with regard to geographical range: while TEK is strictly situational and local and may vary from village to village, other sources may have a wider geographical range, thus encompassing some elements foreign to the community but common to other contexts.

Table 4. Characteristics of knowledge sources among Bukovinian Hutsuls.

Different pathways of medicinal LEK in Northern and Southern Bukovina

Our analysis highlights different trends for food and medicinal LEK among Ukrainian and Romanian Hutsuls. While food uses were quantitatively and qualitatively comparable, about 30% more medicinal uses were reported among Ukrainian Hutsuls. We consider that this might be due to the low availability of physicians and long distances in the sparsely inhabited Hutsul valleys (despite official statistics reporting 3.51 physicians per 1000 inhabitants in Ukraine versus 1.47 in Romania in 1980, [46]), as well as the unavailability of synthetic drugs in health centres.

The higher number of medicinal plants may also be a reaction to Soviet policies which promoted allopathic medicines, discouraging traditional plant-based medicines [37]; for example, a middle-aged Ukrainian woman fiercely claimed “My mother is 77 years old and has never used a single pill in her life”, and also another woman who stated “Listen to what is said about medicinal plants so that you do not get sick and do not have to take pills. We drink teas made from Carpathian herbs”. This phenomenon may have been fostered by the severe economic crisis which affected Ukraine after the collapse of the Soviet Union. Indeed, we observed that during this period, medicinal plants were highly promoted by mass media and books; out of the 16 books Ukrainian Hutsuls showed us, 11 were published in this period (1990s).

In the Romania of Ceaușescu, “everyone had the right to be hospitalized”, agreed a middle-age couple; however, a younger male interviewee (born in 1974) also reported that “at that time (when I was child) there were no doctors, no roads, but there were people who knew plants”, which was confirmed by an older Hutsul woman (born in 1927) who stated “when I arrived here (from Ukrainian Bukovina, after border creation), I learnt everything from a local healer and my neighbour. All I knew at the time I came

here was the plants we had to harvest for the army during school hours. Among them I remember arnica". Therefore, it follows that medicinal knowledge in Romania was to some extent ubiquitous, although some local healers held more (maybe also literary) knowledge and were considered reference points within the Hutsul community.

We could not obtain the source of knowledge for each plant, but we can identify some pan-Soviet elements which were not found on the Romanian side of the border. Indeed, we can observe some of the consequences of the reforms implemented in the Soviet era such as the cultivation of *Panax ginseng*, *Ginkgo biloba*, *Aloe vera*, *Aronia melanocarpa* and *Elaeagnus rhamnoides* and their medicinal uses. Specifically, *Aronia melanocarpa* gained popularity in the late 1940s when the Soviet Union started large-scale cultivations for the production of juices and jams. However, it was also used as herbal medicine, especially as an antihypertensive and anti-atherosclerotic, in several countries of Eastern Europe including Ukraine [47]. Another example of LEK of pan-Soviet origin is the use of *Elaeagnus rhamnoides*, whose industry, just as with *Aronia melanocarpa*, grew in the 1940s. Its oil was reported in the Russian Pharmacopeia as an anti-inflammatory [48].

As observed by Fedorak [49], despite several changes Bukovina has faced since Austro-Hungarian times, Hutsuls have fiercely strived to maintain their culture, which has been possible, in part, to their scattered dwellings and the remoteness of the mountains. However, the creation of the border resulted in different socio-political circumstances which affected Hutsul LEK in different ways on each side of the border.

Finally, more and more people have resorted to frequenting pharmacies, probably also fostered by globalization and increased economic means (especially among Romanian Hutsuls, who are now European Union citizens). This trend was observed among both Romanian and Ukrainian Hutsuls who often answer to our questions "now everyone goes to the pharmacy".

Conclusions

We found a total of 118 food and medicinal plants from 107 genera and 53 families. Among Hutsuls of Northern Bukovina we recorded 107 taxa, while there were 72 taxa among Hutsuls of Southern Bukovina. The most used plants were the same in both communities: *Vaccinium myrtillus*, *Rubus idaeus* and *Urtica dioica*.

Despite a common cultural and linguistic background, the ethnobotanical knowledge transmission occurs in different ways on each side of the border. Family is a primary source of ethnobotanical knowledge transmission on both sides of the border; however, in Romania knowledge from other sources is very limited, whereas in Ukraine interviewees reported several other sources including books, magazines, newspapers, the Internet and television. Indeed, this is especially evident when analysing the wild plants used for medicinal purposes. While recorded food uses are comparable in the two Hutsul communities, our overall data show a disparity regarding the medicinal use of plant taxa. Ukrainian Hutsuls reported around 30% more plants and taxa than Romania Hutsuls. The latter group mentioned almost exclusively locally available plants, whereas the former group reported some plants not

mentioned by Romanians such as *Aloe vera*, *Maclura pomifera*, and *Aronia melanocarpa*. Knowledge regarding these plants was probably not transferred vertically, within the same family, but by other sources of knowledge such as books, newspapers, magazines and possibly radio, as a consequence of the policies implemented during the Soviet era, including the widespread promotion of Russian language and culture, as well as allopathic drugs. Therefore, this may imply hybridization of the local body of knowledge with foreign elements originating in the Soviet context which has enriched the corpus of ethnobotanical knowledge held by Ukrainian Hutsuls.

Further research should specifically address the plant taxa recently introduced in the body of LEK of Ukrainian Hutsuls in order to understand how such knowledge was conveyed and absorbed by Hutsul mountain communities.

Abbreviations

Jl

Jaccard Index

LEK

Local Ecological Knowledge

TEK

Traditional Ecological Knowledge

Declarations

- Ethics approval and consent to participate

We strictly followed the ethical guidelines prescribed by the International Society of Ethnobiology (ISE, 2006).

- Consent for publication

Not applicable

- Availability of data and materials

All data are available in this publication.

- Competing interests

The authors declare not to have any competing interests.

- Funding

This project received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement No 714874)

- Authors' contributions

RS designed the study, GM and NS conducted the fieldwork, GM analysed the data and drafted the manuscript with major contributions from all the authors. NS performed a first analysis of the food uses and drafted the section regarding Ukrainian book sources and its table. All authors read and approved the final manuscript.

- Acknowledgements

We are very grateful to all the Hutsuls who kindly shared their knowledge and practices with us. We thank Angela and Mişu for their kind assistance in the field.

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Tables

Please see the supplementary files section to view the tables.

Figures



Figure 1

Bukovinian Carpathian landscape, Lupcina, Ulma; July 2019; Photo by N. Stryamets.



Figure 2

Maps of the study area.

Figure 3a Proportional Venn diagram of food taxa mentioned in Northern and Southern Bukovina. JI=55

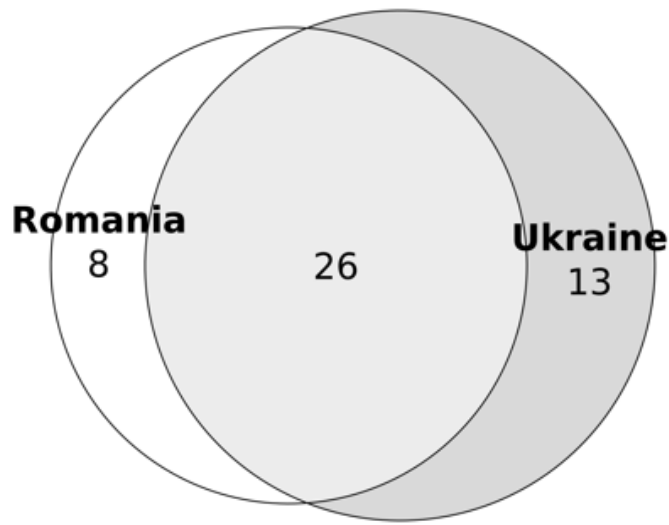


Figure 3b Proportional Venn diagram of food taxa mentioned by at least three interviewees in Northern and Southern Bukovina. JI=44.

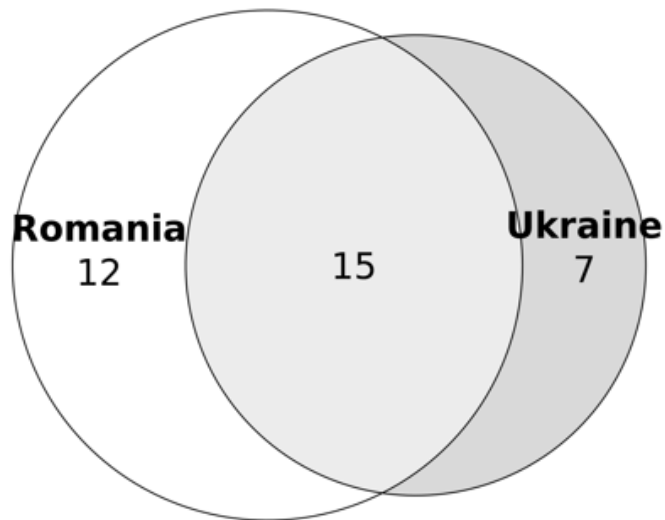


Figure 3

Figure 3a. Proportional Venn diagram of food taxa mentioned in Northern and Southern Bukovina; JI=55.
Figure 3b. Proportional Venn diagram of food taxa mentioned by at least three interviewees in Northern and Southern Bukovina; JI=44.

Figure 4a Proportional Venn diagram of medicinal taxa mentioned in Northern and Southern Bukovina. JI=48

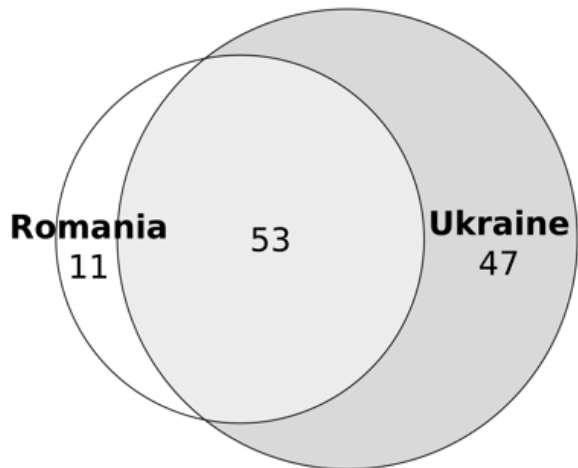


Figure 4b Proportional Venn diagram of medicinal taxa mentioned by at least three interviewees in Northern and Southern Bukovina. JI=49.

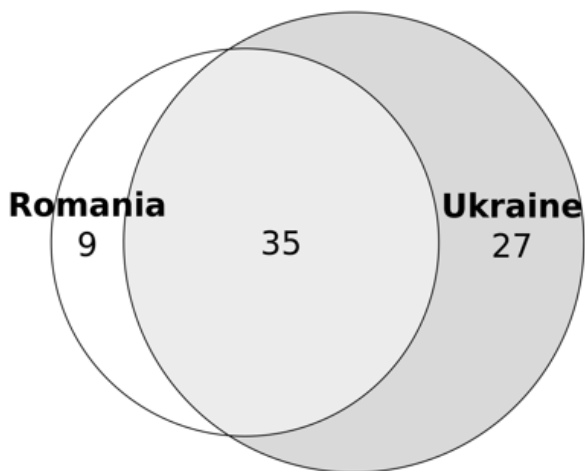


Figure 4

Figure 4a. Proportional Venn diagram of medicinal taxa mentioned in Northern and Southern Bukovina; JI=49. Figure 4b. Proportional Venn diagram of medicinal taxa mentioned by at least three interviewees in Northern and Southern Bukovina; JI=48.

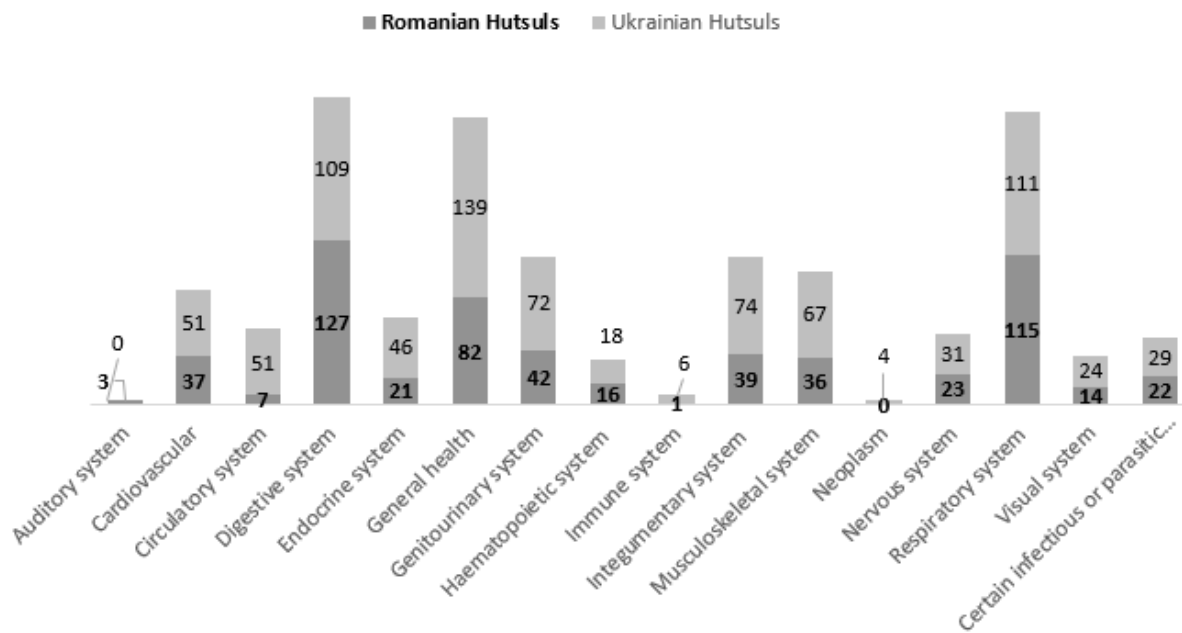


Figure 5 Distribution of medicinal DUR per category

Figure 5

Distribution of medicinal DUR per category.

Fig 6a Ecological knowledge transmission strategies among Romanian Hutsuls

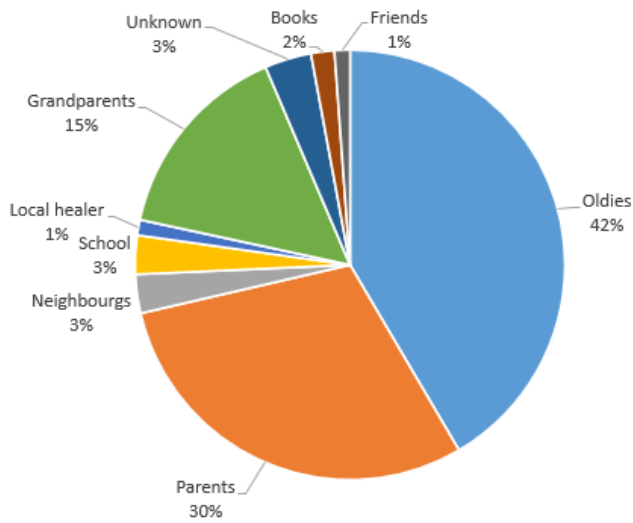


Fig 6b Ecological knowledge transmission strategies among Romanian Hutsuls grouped per strategy

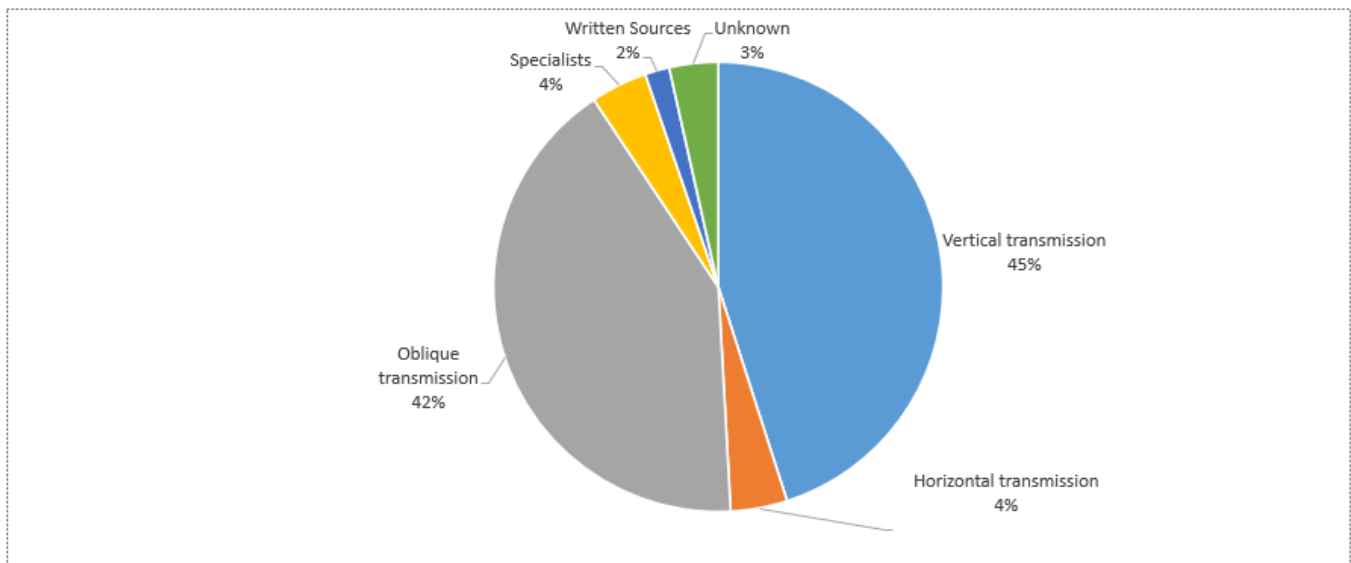


Figure 6

Figure 6a. Ecological knowledge transmission strategies among Romanian Hutsuls. Figure 6b. Ecological knowledge transmission categories among Romanian Hutsuls grouped per strategy.

Fig 7a Ecological knowledge transmission strategies among Ukrainian Hutsuls

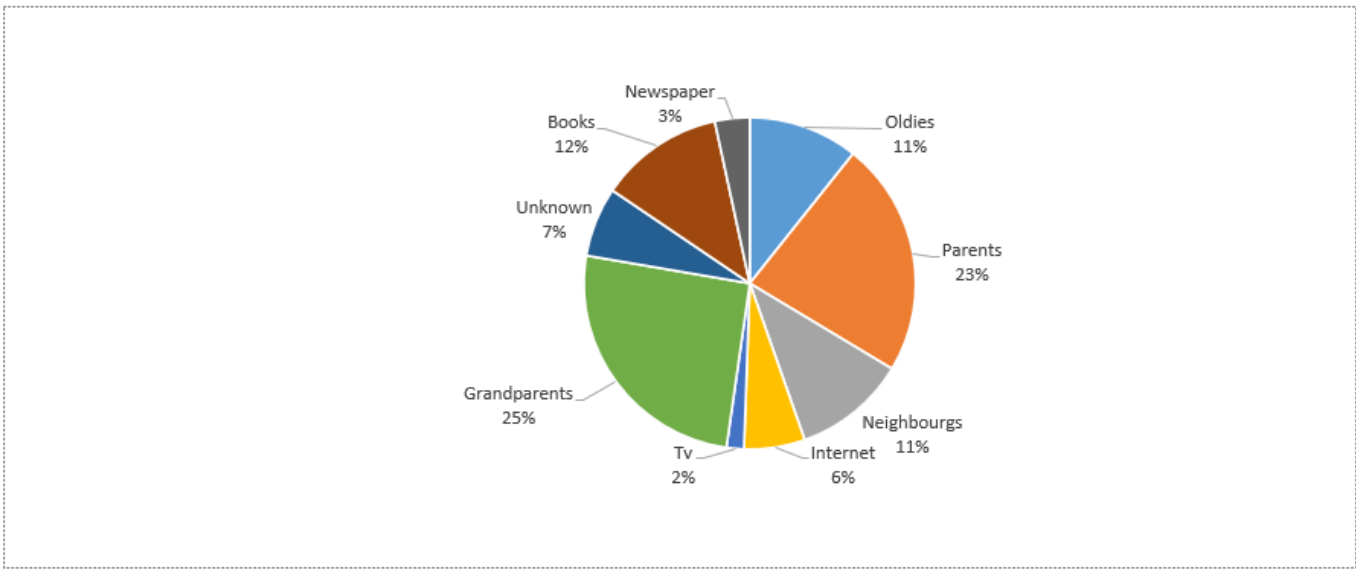


Fig 7b Ecological knowledge transmission strategies among Ukrainian Hutsuls grouped per strategy

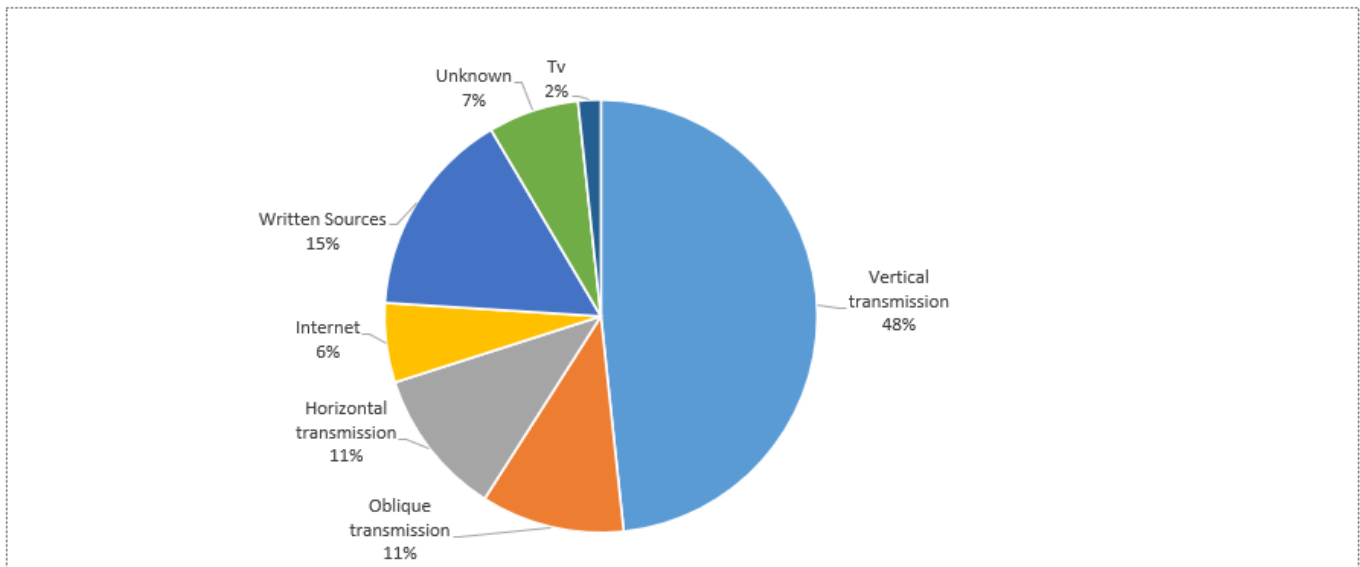


Figure 7

Figure 7a. Ecological knowledge transmission strategies among Ukrainian Hutsuls. Figure 7b. Ecological knowledge transmission categories among Ukrainian Hutsuls grouped per strategy.

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