Ethnobiology of Georgia

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Preface

My full-time dedication to ethnobiology started in 2012, since when it has never failed to fascinate me. Ethnobiology is a relatively young science with many blank areas still in its landscape, which is, perhaps, good motivation to write a synthetic text aimed at bridging the existing gaps. At this stage, however, an exhaustive representation of materials relevant to the ethnobiology of Georgia would be an insurmountable task for one author. My goal, rather, is to provide students and researchers with an introduction to my country's ethnobiology. This book, therefore, is about the key traditions that have developed over a long history of interactions between humans and nature in Georgia, as documented by modern ethnobiologists.

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Chapter 1. A brief introduction to ethnobiology

The subject matter of ethnobiology

Ethnobiology exhibits specific features which make this science easily distinguishable from others. First of all, it is an interdisciplinary science in the fullest sense of this word. It transcends both natural and social sciences as the methods of study combine mathematics, statistics, physics, chemistry, biology, geography, anthropology, sociology and ethnography (Figure 1.1.). This fusion of natural and social sciences is based on the fundamental tenet of ethnobiology: nature and culture are inseparable. Ethnobiology considers humans and their culture to be intrinsic parts of nature, so that culture and nature interact and transform each other. Accordingly, this book is based on the most common and widely used definition of ethnobiology, as given by the Society of Ethnobiology[1]: "ethnobiology is a scientific study of dynamic relationships among people, biota and environment". Let me specify the meaning of 'biota' and 'environment'. "Biota" refers to all living beings (animals, plants, fungi, soil organisms) that inhabit a particular territory (region, habitat, landscape, any geographical unit) for a given geological or historical period; "environment" usually refers to physical and chemical conditions such as climate characteristics and soil properties, although, in some special cases, it may include living beings too.

Ethnobiology is conveniently divided into three major sub-disciplines: ethnobotany, ethnozoology and ethnoecology (Figure 1.2). It is self-evident that ethnobotany and ethnozoology deal mainly with plants and animals, respectively. Ethnoecology, however, might need further explanation. It refers to the scientific study of the ways different groups of people living in different environments deal with the ecosystems around them, i,e, the specific interactions between nature and the local population. It is also strongly linked to the concept of traditional knowledge, which cements ethnobotany, ethnozoology and ethnoecology into one discipline. The World Intellectual Property Organisation (WIPO) defines traditional knowledge as 'knowledge, know-how, skills and

[1] https://ethnobiology.org

practices that are developed, sustained and passed on from generation to generation within a community, often forming part of its cultural or spiritual identity'[2]. Knowledge about animals, plants, ecosystems and their uses make up a substantial part of this traditional knowledge which we can call "ethnobiological knowledge", a term that I will use in this book.

Historically, ethnobotany, ethnozoology and ethnoecology have been regarded as separate/discrete/distinct disciplines, but nowadays they are united under the one discipline of ethnobiology.

The unity of humans and nature

The fundamental principle of ethnobiology that human societies and their natural environment are not to be studied separately from one other has a solid empirical basis: the human species cannot long survive if separated from nature (Figure 1.3). However, there is no lack of attempts to achieve autonomy from our natural ecosystems in the exploration and even colonisation of uninhabitable areas, such as space and the ocean depths. Perhaps submarine boats come the closest, as reported in the Guinness World Records, "The longest submerged and unsupported patrol made public is 111 days (57,085 km 30,804 nautical miles) by HM Submarine Warspite (Cdr J. G. F. Cooke RN) in the South Atlantic from 25 November 1982 to 15 March 1983"[3]. This might not be the limit, but even if any submarine could stay submerged with its crew for more than one year, it would be still a limited autonomy. After each such mission, boats need to be repaired, the crew rehabilitated and supplies replenished. And this limited autonomy requires sophisticated solutions to a plethora of problems in order to maintain a habitable environment under the sea (Figure 1.4).

Similarly, limited autonomy is achieved in space stations, very complex engineering structures (Figure 1.5) with a sophisticated life support system (Figure 1.6). The autonomy achieved by the International Space Station is not a full one, since it requires regular replenishment of supplies from Earth. Crew members also rotate regularly and must join a rehabilitation programme after their missions.

[2] https://www.wipo.int/tk/en/tk/

[3] https://www.guinnessworldrecords.com/world-records/submarine-patrol-longest

Also worth mentioning are the experiments carried out at Biosphere 2, a large-scale and long-term scientific mega-project, which aims at constructing artificial, isolated but entirely autonomous ecosystems (Figures 1.7 and 1.8). The name 'Biosphere 2' implies that the global ecological system of Earth naturally inhabited by humans represents the first biosphere (Biosphere 1), while all major natural habitats reconstructed and enclosed in the buildings of this project represent the second biosphere. Constructed between 1987 and 1991, it is the largest closed ecosystem ever created (Bahr 2009). Since 2011 it has belonged to the University of Arizona.

Biosphere 2 was designed to explore ecological interactions that could also support human life; along with artificially reconstructed habitats were shelters for humans and areas for agriculture (Nelson et al. 1993). The two experiments conducted in Biosphere 2, the first from 1991 to 1993, and the second from March to September 1994 failed to achieve full autonomy. The problems of the first experiment were insufficiently produced food and oxygen, die-back of many animal and plant species and a proliferation of pests accidentally brought in, most notably cockroaches). The second was more successful in providing sufficient food and oxygen (Marino et al. 1999), but it resulted in severe psychological problems among the participants and, more significantly, a power struggle over the direction of the project that led to its premature closure (Nelson 2018). These experiments led to considerably improved knowledge about ecosystems, but also a perception that, if a full autonomy were to be achieved, it might only be through careful and accurate copying and reconstruction of natural ecological systems. This brings us back to the reiteration of the vital importance of nature to humans, the main principle of ethnobiology.

Other concepts relevant to ethnobiology

This vital link between nature and humans is also emphasised in the comparable theory of socio-ecological systems (Redman et al. 2004), which originates from complexity theory but includes typical societal problems such as land use, equity and human well-being, resource fluxes, resilience, economic and ecological sustainability (Ostrom 2009; Turner 2014). In contrast, although ethnobiology deals with these questions too, its primary concern is the study of the value and importance of traditional knowledge to our culture. There are other differences as well: socio-

ecologists emphasise a quantitative approach and concentrate on establishing the facts about resource flows, econometric indices, biogeochemical cycles and agricultural productivity. Such data can be useful to ethnobiologists too, but their approach is much wider as they also take into account qualitative data, descriptions, narratives, legends, rituals, fossils and archaeological artefacts. They routinely use statistical models for analysing their data, but more as tools, rarely as part of theory. By contrast, the models of socio-ecological systems are often essential parts of the theory used for building hypotheses and producing quantifiable predictions. Ethnobiology also differs in its approach to human societies. Socio-ecological models can be verified in relatively isolated societies that have depended over long periods on local natural resources (see Netting 1981; Redman et al. 2004), whilst ignoring the traditions preserved in other parts of the population. The ethnobiological approach is wider: even though the focus is on isolated traditional and small-scale societies who live at low densities in small groups and subsist by traditional farming and herding, it recognizes that the traditions evolved in these societies are still with us: "the world of yesterday wasn't erased and replaced by a new world of today: much of yesterday is still with us" (Diamond 2013, p.8). This is especially true of Georgia, where many traditions still play an important part of both the culture and economy. In fact, up to 42% of Georgia's population live in rural areas (Geostat 2018), where many traditions (Bussmann et al. 2017) are now of importance to cultural tourism (Tevzadze and Kikvidze 2016). The widespread use of transhumance along with the considerable resources offered by communal forests, grasslands and water bodies to the villages of the highlands (Kemkes 2015) demonstrate the continued traditional management of agriculture.

A key concept of ethnobiology is that of ecosystem services: these recognize the importance of the many and varied benefits that humans gain from the natural environment and ecosystems (e.g., Díaz et al. 2015). These services are divided into four categories: (1) Supporting services, which include nutrient recycling, primary production, soil formation – the most basic functions that make other services possible; (2) Provisioning services which deliver all kinds of food, construction materials, fuel, water, medicinal plants and energy; (3) Regulating services such as pollination of fruit trees and crops, climate regulation, waste decomposition, clean water and air; (4) Cultural services including the arts, identity symbols, recreation and sports, science and education. The first three categories are relatively readily quantifiable and are often used in economic and ecological models

(Daniel et al. 2012). However, the cultural services included in the fourth category have been criticised by one of the experts: "Pivotal cultural values of nature cannot be integrated into the ecosystem services framework" (Kirchhoff 2012): the proposed models do not take into account the values of symbolic landscapes and the charisma of geographic features, which are not derived from ecosystem functions but from a subjective perception of cultural identity. The answer was a call for developing models that would explicitly include cultural services (Daniel et al. 2012). My aim is not in resolving this dispute; I will only note that the knowledge systems such as scientific ecological knowledge and traditional ecological knowledge (including ethnobiological knowledge) are clearly derived from ecosystem properties and therefore, represent an important cultural asset to ethnobiology.

Georgia: biodiversity hotspot

Georgia sits between the latitudes of 41°N and 44°N, and longitudes of 40° and 47°E. Its area of ca. 70000 km² is located between the Greater and Lesser Caucasus mountains, exactly on the crossroads of Eastern Europe and West Asia (Figure 1.9). It is bounded to the west by the Black Sea, to the north and north-east by the Russian Federation, to the south by Turkey and Armenia, and to the southeast by Azerbaijan. Georgia's terrain is complex with very diverse landscape types: plains, valleys, gorges, mountains, canyons, plateaus and foothills (Figure 1.9). The climate is also very diverse and ranges from humid, warm temperate in western lowlands to hot and dry continental in south-eastern lowlands, moderate on the foothills and cold at high elevations. The details of this climate are discussed in Chapter 4. Here I will only mention that the geomorphologic and climatic diversity characteristic for Georgia supports virtually all vegetation types that are found in any temperate climate (Nakhutsrishvili 2012).

Georgia belongs to the Caucasus region, which is a biodiversity hotspot as recognised by international conservation organisations such as the World Wide Fund for Nature (WWF [4]) and the International Union for nature Conservation (IUCN[5]). The checklist of vascular plants of Georgia

[4] https://wwf.panda.org/knowledge_hub/where_we_work/black_sea_basin/caucasus/projects/english/

[5] https://www.iucn.org/content/curious-case-caucasus

contains 6,350 species (2.3% of the world's flora, Gagnidze 2002) and the particularly specious genera are: *Campanula* L. (Campanulaceae), *Silene* L. (Caryophyaceae), *Veronica* L. (Scrophulariaceae), and *Heracleum* L. (Apiaceae) (Schatz et al. 2009). It is estimated that the country harbours between 10 and 15 thousand animal species (1% of the world's fauna) (Tarkhnishvili 2016). This biodiversity is distributed across discernible altitudinal zones (the overview is based again on the National Biodiversity Strategy and Action Plan 2014-2020 of Georgia 2014)[6]. Western and eastern Georgia, however, differ quite markedly: there are no semi-arid and arid forestless habitats at low altitudes in the western part, since forests grow from the coastline itself to cover foothills and mountain slopes (Figure 1.10).

Georgia has a remarkable ethnic and cultural diversity (Fearon 2003). Even the name "Georgia" has an interesting etymology from an ethnobiological point of view. There are three hypotheses about its origin (Mikaberidze 2015). The first was suggested by the thirteenth-century French theologian and historian, Jacques de Vitry, who thought it derived from St George, a very popular saint among Georgians. He is depicted as a mounted warrior and is thought by many scholars to be transformed into a warrior deity of the highlanders whose major symbol is the horse (Kikvidze 1976, p. 230). The second hypothesis was put forward in the seventeenth century by the French traveller and author, Jean Chardin, who suggested that "Georgia" is derived from the Ancient Greek γεωργός, which means 'worker on the land', 'farmer': implying that Georgians were skilled farmers. The final and most plausible one is based on linguistic analyses. "Georgia" probably takes its origin from the Persian word "gurğ" or "gurğān", which later migrated to other languages: variations such as "La Géorgie" and "Georgien" in western Europe, "Gruzia" in eastern Europe and "Gurjistan" in western Asian languages. "Gorgan" in Old Persian referred to wolves in general but also to a locality close to the Caspian Sea, "the Land of Wolves". It should also be noted that Vakhtang Gorgasali, a very prominent king of Iberia (kingdom of Eastern Georgia), was strongly associated with wolves: the name "Gorgasali" means "wolfhead" in Old Persian (Kakabadze 1994). Wolves are prominent in Georgian folklore and stories.

Today, Georgian traditional communities can be found not only within modern Georgia, but

[6] http://www.nplg.gov.ge/gsdl//cgi-bin/library.exe?e=d-00000-00---off-0civil2--00-1----0-10-0---0---0prompt-10---4-------0-1l--10-ka-50---20-about---00-3-1-00-0-0-01-1-0utfZz-8-00&a=d&c=civil2&cl=CL1.7&d=HASH01a5fd55fa6ceae318a2e0f4.6

also in Anatolia, in localities adjacent to Georgia and further to the west, along the southern coast of the Black Sea. Small communities live in central Iran, in Fereydunshahr County near Isfahan, where they were forcibly dislocated from eastern Georgia by Persian invaders in the 17th and 18th centuries (Mikaberidze 2015). The remarkable feature of Georgian traditional communities is their use of Georgian languages. These and other Iberian languages spoken in the Caucasus are remarkably conservative and make a point of retaining archaic grammatical forms (Gamkrelidze and Ivanov, 1995; Pagel et al. 2013).

Therefore, the rich ethno-culture combined with high biological diversity makes the study of ethnobiology in Georgia particularly appealing.

Methods in ethnobiology

Improving and developing methods for ethnobiological studies is an exciting field of research in its own right and there is available literature on this topic (e.g., Albuquerque et al. 2014; McClatchey 2012; Bussmann et al. 2018). Based on these publications, I will give a brief overview of the subject.

Ethnobiologists typically combine many methods in their research, aiming at exact qualitative and quantitative description of ecosystems and their human communities. This description includes geographical location, landforms, climate, soils, habitat types (forest, grasslands, streams, etc., mostly based on vegetation type) and dominant plants and animals (often important biological resources). Sometimes a given ecosystem is already thoroughly described in previous studies and there are sufficient data in the existing literature. However, often this is not the case and ethnobiologists have to conduct field studies using appropriate geographical, ecological, climatological and edaphological methods. The task can include assessments of changes brought about by prolonged human use of an ecosystem; in this case palaeobiological and palaeontological methods will also be used. Similarly, a human community under study must be described exactly: is the entire community approached, or a specific target group (elders, healers, youngsters, women, hunters)? What is their ethnic identity, cultural background and history? This data can be available in the literature, but more often than not, the data on demography, social and economic development is not current, and this typically becomes a part of ethnobiological fieldwork. If the research includes the history of a given community, archaeological methods can be involved too.

Almost invariably, interviews and the use of questionnaires form the major part of ethnobiological fieldwork. The most frequently employed techniques are free listing and semi-structured questionnaires. A detailed introduction of ethnographic and sociological methods is beyond the scope of this book. However, the interested reader can find detailed information in publications cited above (Albuquerque et al. 2014; McClatchey 2012) as well as in the current ethnobiological literature (e.g., Bussmann et al. 2018). I will only note that free listing and semi-structured questionnaires in particular allow for a good balance between the ease of recording a large amount of data and quantification and tabulation for further statistical analysis.

These methods inevitably produce multiple variables that require statistical analyses. Therefore, along with the usual descriptive and analytical statistical tests, multivariate analysis is widely used in ethnobiology. Multivariate analyses such as Principal Component Analysis (PCA) is commonly used in sociology, ethnography and anthropology. However, ethnobiologists need to combine data on ecosystems (ecological, botanical, zoological) with sociological data (demography, levels of knowledge, the use of biological resources). Consequently they use the methods developed for linking environmental and biological data designed for analysing ecosystems and biological diversity such as Canonical Correspondence Analysis (CCA) and non-Metric Dimensional Scaling (nMDS). These allow for examining how the services and biological resources of a given ecosystem of local residents depend on climate, ecosystems, geography, culture and history. Again, the interested reader can find further details in the current ecological and ethnobiological literature cited above.

Finally, the methods specific to ethnobiology concern the assessment of the cultural value of the documented new knowledge as related to ecosystem services and biological resources, and the ways in which these services and resources are used (Zenderland et al. 2020). There are various indices developed and I will briefly overview the most popular.

The Use Value (*UV*) is used to demonstrate the relative importance of plants known locally. It is calculated by the following formula (Vitalini et al. 2013):

$$UV = (U_1 + U_2 + \ldots + U_i + \ldots + U_N) / N$$

where U_i is the number of uses mentioned by an informant i, and N is the total number of informants

interviewed.

The Family Use Value (*FUV*) is used to identify the significance of plant families (mostly used by ethnobotanists). It is calculated by the following formula (Cadena-González et al. 2013):

$$FUV = UV_s / N$$

where UV_s is the use value of species belonging to the same family an N_s= the total number of species present in a given family.

The Relative Frequency of Citation (*RFC*) is used to demonstrate the local importance of each species. It is calculated by the following formula (Vitalini et al. 2013):

$$RFC = FC / N$$

where *FC* is the number of informants mentioning the use of the species; *N* is the total number of informants interviewed.

The fidelity level (*FL*) is used to determine the most ideal species used in the treatment of a specific ailment (Musa et al. 2011). It is calculated by the following formula (Nawash et al. 2013):

$$FL\ (\%) = (N_p / N) * 100$$

where N_p is the number of informants who reported the use of a given species to treat an illness; *N* is the total number of informants interviewed.

The Informant Consensus Factor (ICF) is used to measure the agreement between informants about the use of plants for specific use categories. It is calculated by the following formula (Heinrich et al. 1998):

$$ICF = (N_{ur} - N_t) / (N_{ur}-1)$$

where N_{ur} is the number of use reports for a particular ailment category; N_t is the number of plants

mentioned for the treatment of this particular ailment category. The ICF ranges from zero to one, a value which is close to one indicates a high intra-cultural consensus (most informants use the same species for the treatment of the same illnesses) and a value close to zero indicates a high variation in the use of species (informants disagree over which species use in the treatment within a category of illness) (Heinrich et al. 1998).

The relative importance (RI) is used to measure the versatile use and the true value of plants, and is calculated by the following formula (Yaseen et al. 2015):

$$RI = (PP + AC)*100/2$$

where *PP* stands for pharmacological properties, which indicate relative use reports calculated by dividing the number of use reports (*UR*) attributed to a species by the maximum number of use reports attributed to the most important species (the species with the highest number of use reports); *AC* stands for ailments treated, which indicates the relative body systems treated. AC is calculated by dividing the number of body systems treated by a given species by the maximum number of ailment categories treated by the species that are used most widely.

The cultural importance index (*CI*) is used to assess the importance of each species and is calculated by the following formula (Pardo-de-Santayana et al. 2007):

$$CI = UR_1 + UR_2 + \ldots + UR_i + \ldots + UR_N) / N$$

where UR_i is the number of use reports of species for different use category (*i*, varying from only one use to the total number of uses); *N* is the total number of informants interviewed.

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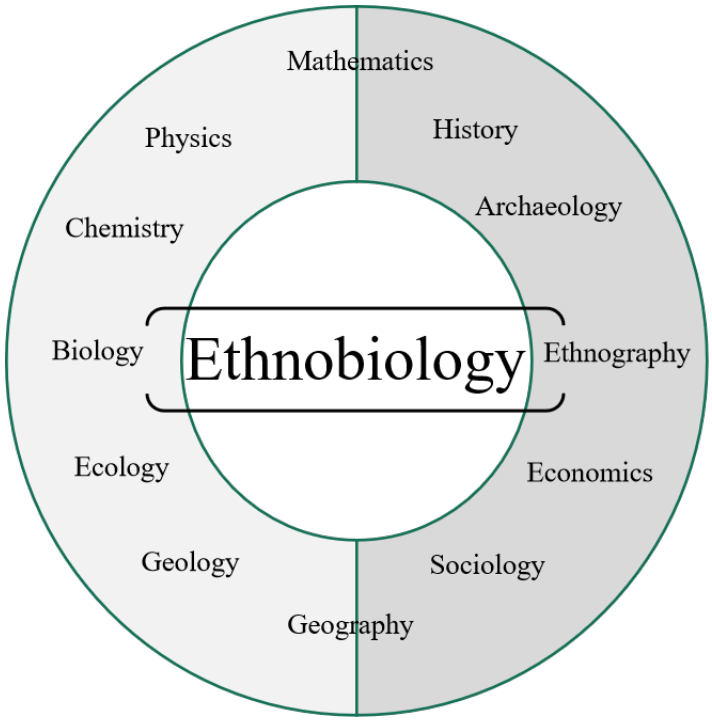

Figure 1.1. The interdisciplinary character of ethnobiology is depicted as being a bridge for exchange of knowledge between the natural and social sciences.

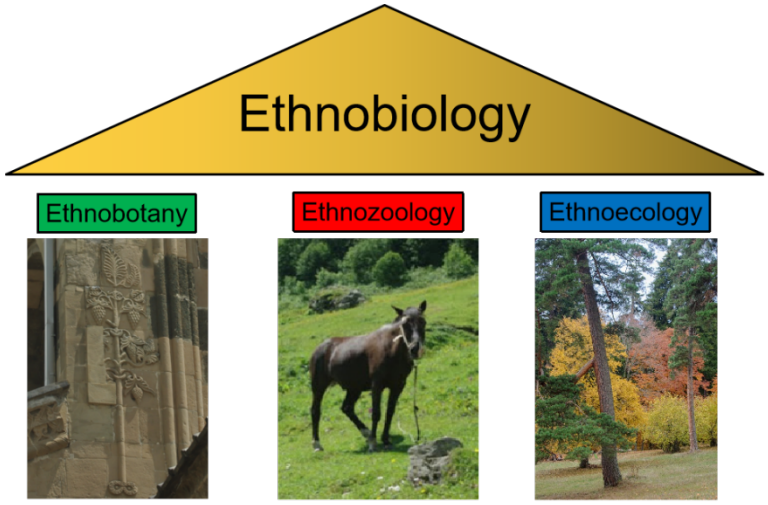

Figure 1.2. The three major sub-disciplines of ethnobiology. The grapevine is of vital importance to the economy of Georgia and pervades its culture; the horse continues to be part of traditional landscapes, especially in the highlands; the silvopastoral landscape is still prevalent in Georgia: the forest floor is used as hay meadows and pastures, while the understorey and overstorey are sources of timber, wild fruits, edible and medicinal plants.

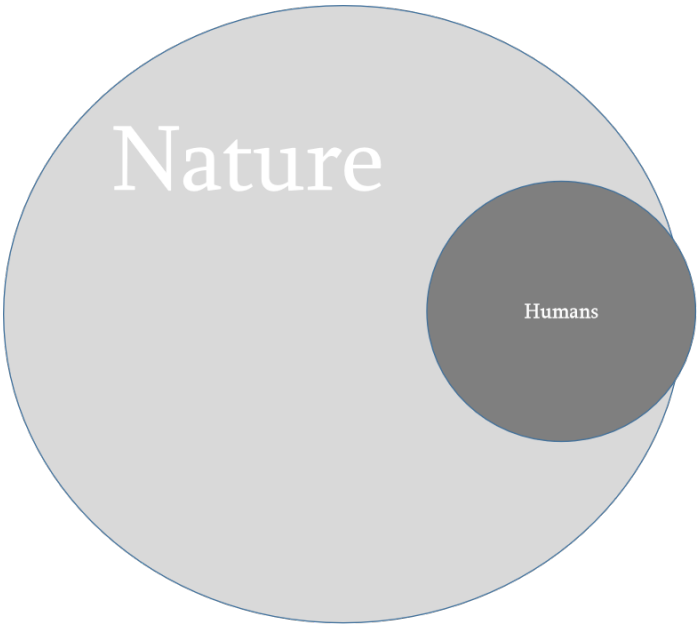

Figure 1.3. The idea that humans are inseparable from nature is expressed by a small circle embedded into a larger one. However, the small circle only extends but very little out of the larger one, showing that our attempts to reach a certain autonomy from nature are, in fact, very limited.

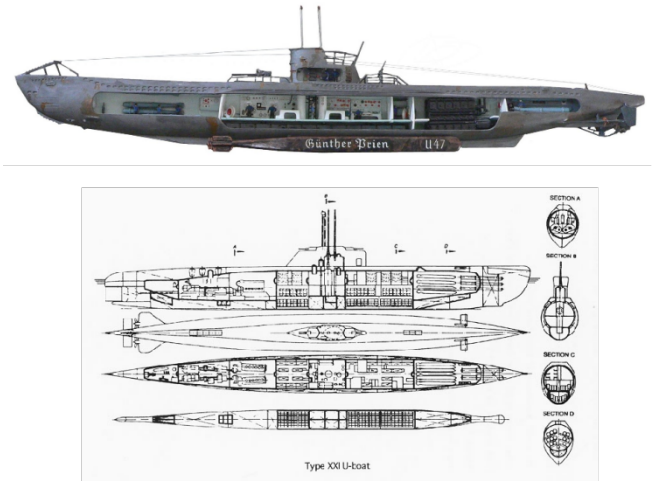

Figure 1.4. WWII German submarine boat designs. Modern boats powered by atomic energy are far more sophisticated. (https://commons.wikimedia.org/w/index.php?curid=3181781).

Upper panel: A model of Günther Prien's U-47, German WWII Type VII diesel-electric hunter (https://commons.wikimedia.org/w/index.php?curid=64316);

Lower panel: Type XXI U-boat, late World War II, with pressure hull almost fully enclosed inside the light hull (https://commons.wikimedia.org/w/index.php?curid=3181781)

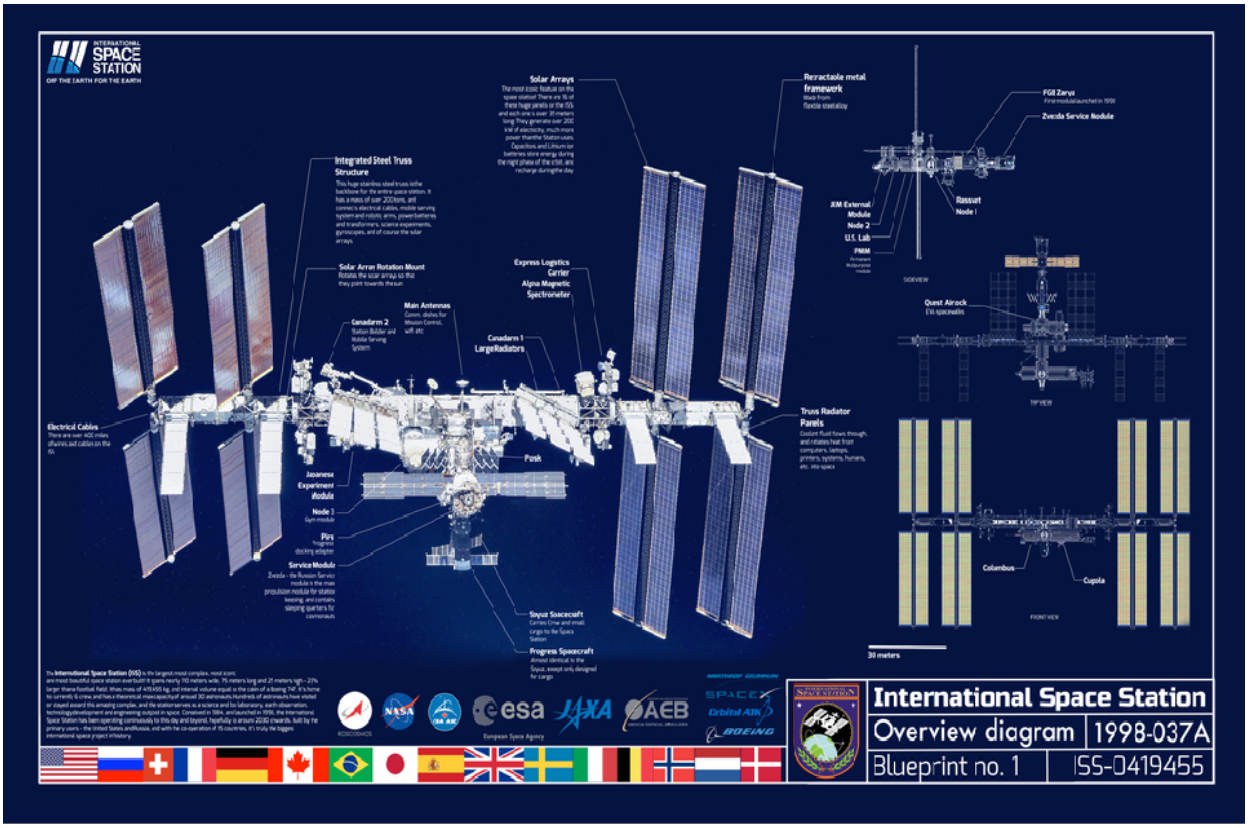

Figure 1.5. The International Space Station: a complex structure that maintains habitable conditions for astronauts by using regular supplies received from Earth. Technical blueprint of components: Daniel Molybdenum/NASA/Roscosmos, with the help of John Chryslar and others. (https://commons.wikimedia.org/w/index.php?curid=78163724)

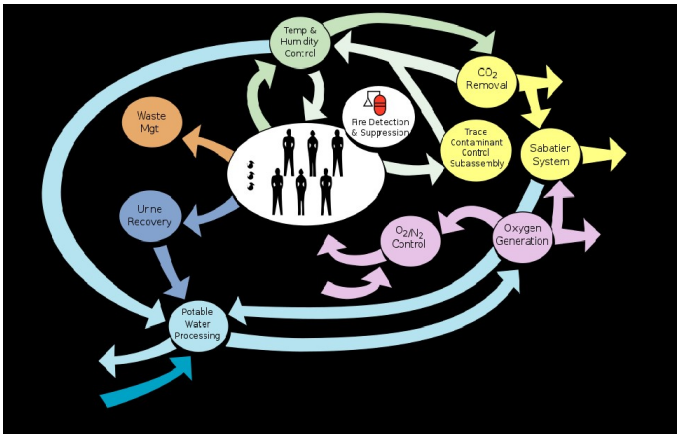

Figure 1.6. The life support system of the International Space Station. Interactions between the components of the ISS Environmental Control and Life Support System (ECLSS). (https://commons.wikimedia.org/w/index.php?curid=5445106)

Figure 1.7. Biosphere 2: buildings in the campus of Arizona University (https://commons.wikimedia.org/w/index.php?curid=16883643

Figure 1.8. An interior of Biosphere 2: an artificial forest. (https://commons.wikimedia.org/w/index.php?curid=38250883)

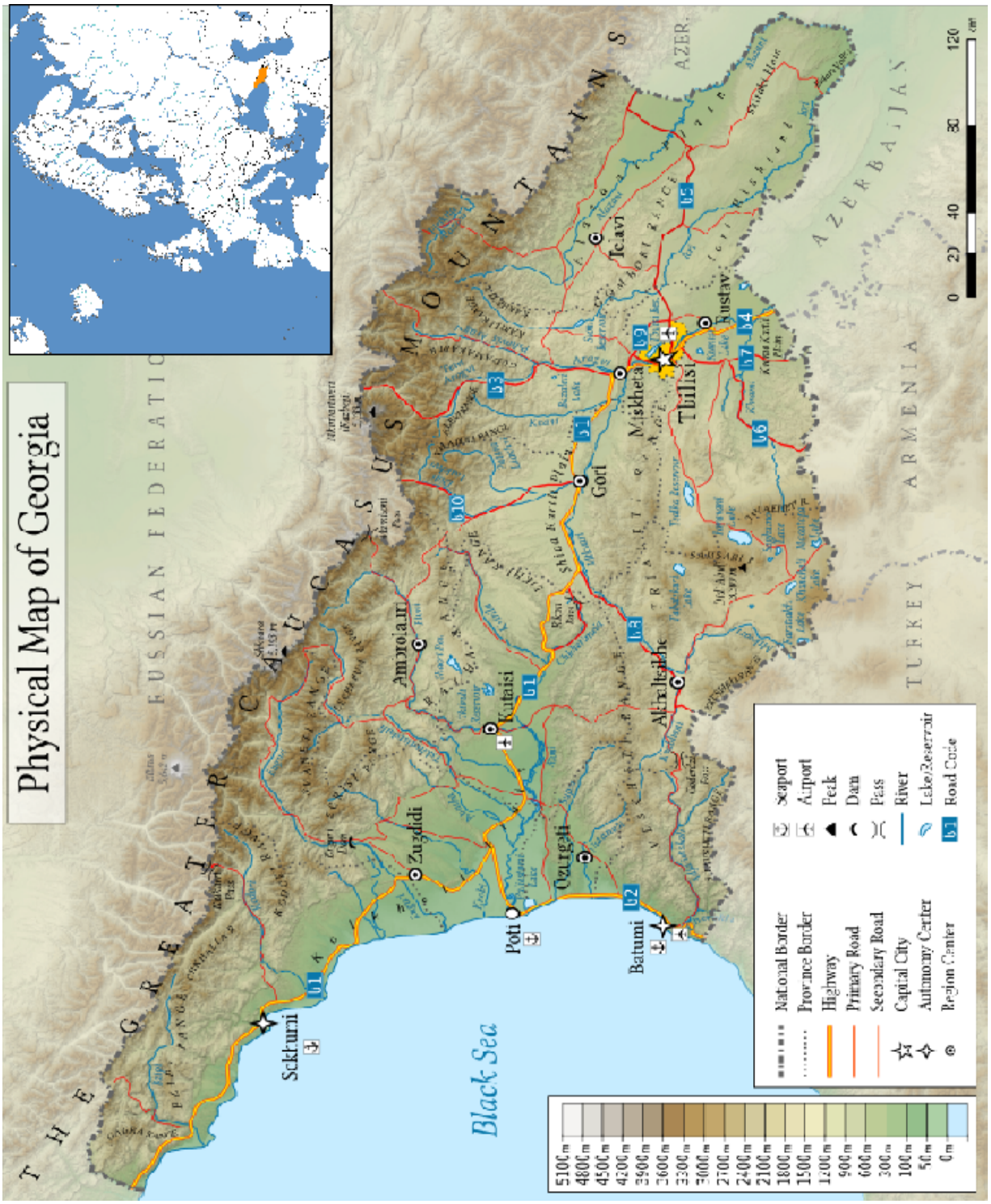

Figure 1.9. Physical map of Georgia (https://commons.wikimedia.org/w/index.php?curid=65618377) Location of Georgia: it is oriented from north-east to south-east, exactly between Asia and Europe. (https://images.app.goo.gl/EGBXE9qfLmXXyfRv6)

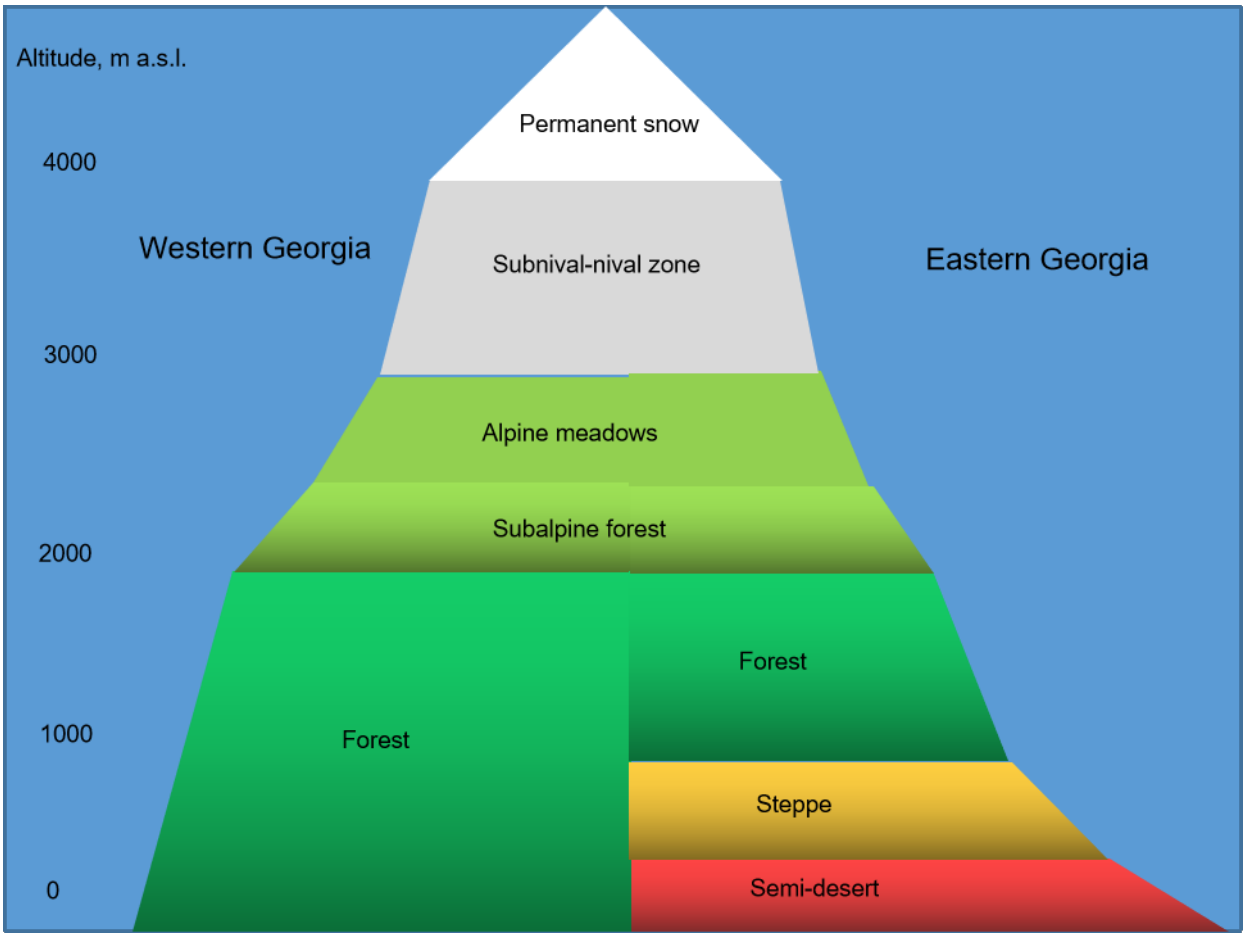

Figure 1.11. Altitudinal zones of Georgia. Western Georgia with four major zones: forests (0 to 1900 m a.s.l.), subalpine (1900-2500 m), alpine tundra (2500 to 3000 m) and alpine desert 3000-4000 m). Eastern Georgia with six major zones: semi-deserts (150 to 300m), steppes and steppe-forests (300 to 600 m), forests (600 to 1900 m), subalpine (1900 to 2500 m), alpine tundra (2500 to 3000 m) and alpine desert (3000 to 4000 m). Above 4000m the peaks of the Great Caucasus are covered with permanent snow.

Chapter 2. Ethnobotany of Georgia

A historical introduction

Plants have a special place in biology: they are so-called autotrophic organisms that use the energy of the sun and inorganic substances for growing. This gain in mass is called "primary production" implying that the new plant mass can be used as food by other organisms. These are herbivores (plant eating animals), who in are in turn consumed by predators. When plants, herbivores and predators die, they are consumed by scavengers and all organic remains end up in the soil where numerous destructor organisms break them down into inorganic substances to be recycled by plants again. This is a very simplified scheme of an ecological cycle, but I hope it demonstrates the fundamental role that plants play in ecosystems, from which traditional societies extract resources essential for their economy. Therefore, I will begin introducing Georgia's ethnobiology from ethnobotany.

The use of plants by humans coincides with the beginnings of human societies: the first hunter and gatherer bands. Indeed, up to 70% of the diet of these societies are provided by plants (Zihlman and Tanner 1978). The oldest documented in Georgia were bands of *Homo erectus*, who left behind evidence of having consumed a variety of plant species, among them hackberry (*Celtis* sp.) and joint-pine (*Ephedra* sp.) (Allué et al. 2015, Kikvidze in press). In the Caucasus, consumption of the hackberry is ethnobotanically documented in modern times (Grossheim 1952, p.20).

The next important evidence regarding the use of plants comes from the Upper Stone Age (Upper Paleolithic) and was left behind by the first bands of *Homo sapiens* in Georgia: spun, dyed, and knotted fibres of flax (*Linum usitatissimum*), the oldest of which were dated to 35,000-34,000 Before Present (BP) (Kvavadze et al. 2009). From the same epoch, these hunter and gatherer bands used an array of edible and medicinal plants: fruits, shoots, leaves, seeds and bulbs. In total 32 species of putative medicinal plants have been identified (Martkoplishvili and Kvavadze 2015; Martkoplishvili 2017, p.101-04):

- bellflower (*Campanula* sp.)
- bindweed (*Convolvulus* sp.)
- birch (*Betula* sp.)

- brown knapweed (*Centaurea jacea*)
- cannabis (*Cannabis sativa*)
- Caucasian rhododendron (*Rhododendron caucasicum*)
- clover (*Trifolium* sp.)
- comfrey (*Symphytum* sp.)
- common knotweed (*Polygonum aviculare*)
- cornflower (*Centaurea cyanus*)
- echium (*Echium amoenum*)
- ephedra (*Ephedra* sp.)
- hogweed (*Heracleum* sp.)
- lime (*Tilia* sp.)
- mallow (*Malva*)
- mountain-ash (*Sorbus* sp.)
- pine (*Pinus* sp.)
- plumeless thistle (*Carduus* sp.)
- ribwort plantain (*Plantago lanceolata*)
- rock rose (*Cistus* sp.)
- willow (*Salix*)
- yarrow (*Achillea millefolium*)

The same studies also found evidence that early *Homo sapiens* stored plants for food in their caves (Martkoplishvili 2017, p.101-02): mostly nuts and wild cereals. These edible plants included:

- acorns (*Quercus petraea*)
- beech nuts (*Fagus orientalis*)
- sea buckthorn berries (*Hippophae rhamnoides*)
- chestnuts (*Castanea sativa*)
- Cornelian cherry (*Cornus mas*)
- dog rose (*Rosa canina*)
- hazelnut (*Corylus avelana*)
- mountain-ash (*Fraxinus* sp.)

- walnut (*Juglans regia*)
- wild grape (*Vitis vinifera*)

There were also remains of wild cereals, mallows, plantains, plumeless thistles, lime leaves and ferns.

The advent of agriculture in the Neolithic Age clearly changed things: while hunters and gatherers could collect only those edible and otherwise utilisable plants that grew in their near habitat, farmers could cultivate domesticated plants. Archaeological excavations in south-eastern Georgia (Kvemo Kartli) have yielded remains of an array of field plants, mostly cereals and pulses (Hamon 2008; Chataigner et al. 2014; Sagona 2017):

Varieties of wheat:

- club wheat *T. compactum*
- common wheat *Triticum aestivum* or *T. vulgare*
- durum *T. turgidum* subs. *durum*
- einkorn *T. monococcum* subs. *aegilopoides*
- emmer *T. dicoccum*
- makha *T. aestivum* subs. *macha*
- Persian wheat *T. turgidum subs. carthlicum*)
- shot wheat *T. aestivum* subs. *sphaerococcum*
- spelt *T. spelta*

Other cereals:

- barley (*Hordeum vulgare*)
- millet (*Panicum miliaceum, Setaria italica*)
- oats (*Avena sativa*);
- sorghum (*Sorghum bicolor*)

Pulses:

- common pea (*Pisum sativum*).
- lentils (*Lens culinaria*)

Local wild plants nevertheless remained important to agrarian communities as a source of wood, medicine and additional food. Pollen of 56 plants has been identified from the archaeological sites of the Neolithic Age (Martkoplishvili 2017).

In the Bronze Age, one variety of wheat, namely the hexaploid form of *Triticum aestivum,* was the most cultivated cereal, along with emmer wheat *T. dicoccum*, while other cereals and pulses played a minor role (Messager et al. 2015). Interestingly, remains of weeds typical for cereal production were also found (Kakhiani et al. 2012; Kvavadze et al. 2015):

- campion (*Silene* sp.)
- cleaver (*Galium aparine* and/or *spurium*)
- common knotweed (*Polygonum aviculare*)
- common nettle (*Urtica dioica*).
- field gromwell (*Buglossoides arvensis*)
- goosefoot (*Chenopodium album* and *C. hybridum,* most common)
- henbane (*Hyoscyamus niger*)
- black bindweed (*Fallopia convolvulus*)
- knotweed (*Polygonum* sp.)
- poppy (*Papaver* sp.)
- ryegrass (*Lolium* sp.)
- sorrel (*Rumex* sp.)
- spurge (*Euphorbia* sp. and *E. helioscopa*)

In the Bronze Age, flax (*Linum usitatissimum*) became indispensable as a source of fibre: 95% of all tissues, cloth, ropes and woven baskets were made of flax, while wool left almost a non-existent trace (Kvavadze et al. 2010). Also, a rich plant material was documented in the settlements and barrows of the Middle Bronze Age: oak logs used for walls and carts, woodwork including caskets and baskets for medicinal plants (Kvavadze et al. 2013; 2015; Messager et al. 2015). Pollen spectra and charcoal remains showed the presence of forest species:

- alder (*Alnus* sp.)
- beech (*Fagus* sp.)
- chestnut (*Castanea sativa*)
- fir (*Abies* sp.)
- hazelnuts (*Corylus* sp.).
- holly (*Ilex acquifolia*)

- hornbeam (*Carpinus orientalis*)
- oak (*Quercus macranthera*)
- pine (*Pinus* sp.)
- sea-buckthorn (*Hippophae* sp.)
- spruce (*Picea* sp.)
- yew (*Taxus baccata*)

Grapevines were represented both by wild (*Vitis vinifera sylvestris*) and probably domestic (*V. vinifera vinifera*) varieties. Fig (*Ficus carica*) was also documented in the form of fossilised fruit and seeds (Kvavadze et al. 2015).

During Classical Antiquity, when the ties between Georgia, Ancient Greece and the Roman Empire were particularly strong, the famous figure of the Georgian (Colchian) princess Medea emerged: a main character in various literary and historical works, described in the legend of Jason and the Golden Fleece (Shengelia 2018). The princess was famous for her beauty and wisdom, but to ethnobiologists she is most notable from the ethnobotanical point of view: she was unrivalled in her knowledge of plants and their medicinal uses. The Ancient Greek tradition ascribes her with exercising magical powers with her herbs and potions. Some scholars suggest that the term "medicine" takes its origin from the name of this Colchian princess (Shengelia 2018).

During the Middle Ages, the special interest in plants is evidenced by the regular publishing of karabadini (probably derived from the Ancient Greek 'Grafidion' γραφιδιον), reference handbooks for practising physicians in which the knowledge and use of medicinal plants formed a major part. The oldest and best known karabadini was published in the 11th century under the title *Usts'oro Karabadini*, that can be translated as *Peerless Handbook*; the author's surname is Kananeli, the forename is not known. The most recent karabadini was published in the 19th century by Petre Klapitonishvili.

The 20th century was a benchmark in ethnobotanical research in Georgia with the publication of Makashvili's *Botanical Dictionary*. The first edition was published in 1949, the second and revised editions in 1961 and 1991. Today this is still the most cited reference book in ethnobotanical studies of Georgia.

After 2010, a group of ethnobotanists published studies that cover a large part of Georgia (Bussmann et al. 2014; 2016abc; 2017abcd; 2018b; 2020ab, see also Bussmann 2017 and publications herein). Largely based on these works, I discuss below first the domestic plants grown in gardens, yards and fields, and then the wild plants most commonly used in traditional households.

Domestic plants most commonly cultivated in traditional gardens and fields

The grapevine (*Vitis vinifera* L. ვაზი, ყურძენი, ვენახი vazi, q'urdzeni, venakhi) is clearly the most valuable plant to the Georgian economy: according to the National Wine Agency of Georgia[7], 86 million bottles (0.75 l) of wine were exported from Georgia in 2019 to 53 countries of the world, reaching a value of US$ 220 million which constitutes ca. 6.1% of the country's total exports (export volume data are taken from CIA Factbook)[8]. The grapevine is no less important as cultural currency, as the representations of it pervades the traditional culture of Georgia. The symbol of the grapevine that I chose to represent ethnobotany in the previous chapter (Figure 1.2) is typical of the decoration almost invariably found on architectural monuments (in this case, the cathedral monastery of Svetitskhoveli in Mtskheta, built in 12th century). It is also said to have played a role in the conversion of Iberia (East Georgian Kingdom) to Christianity. According to traditional accounts, St Nina of Cappadocia was sent to convert Georgia by the Virgin Mary who gave her a cross made of grapevine twigs which St Nina bound together with her own hair. In another version, St Nina made the cross after entering Georgia on her way to the capital city of Mtskheta. She was able to baptise and persuade Queen Nana and King Mirian of Iberia to abandon Zoroastrianism and declare Christianity an official religion in 330 AD (Rapp Jr. 2014). Oral traditions (which I have heard many times, although I could not verify them with any written text) even affirms that the cross made of dry twigs revived and produced green leaves in the hands of the saint, and this miracle also

[7] http://georgianwine.gov.ge/

[8] https://www.imf.org/external/pubs/ft/weo/2019/02/weodata/weorept.aspx?pr.x=57&pr.y=8&sy=2017&ey=2021&scsm=1&ssd=1&sort=country&ds=.&br=1&c=915&s=NGDPD%2CPPPGDP%2CNGDPDPC%2CPPPPC%2CPCPIPCH&grp=0&a=

facilitated the conversion of Georgians to Christianity. The cross became a holy relic and at present is preserved in Sioni Cathedral in Tbilisi and serves as a major symbol (recognisable by the slightly drooped horizontal arms) of the Georgian Orthodox Church.

Georgia is classic wheat country (Pruidze et al. 2016). Local landraces of wheat (*Triticum* sp. ხორბალი khorbali) are very diverse, and eight of them are registered as varieties endemic to Georgia. All four taxonomic groups of domestic wheat described in modern nomenclature (GRIN taxonomy for plants, Wiersema, 1994; for wheat see Fuller and Lucas 2014) are represented by these traditional landraces:

1. spelt (*T. aestivum* L.) group represented by მახა (makha);
2. einkorn (*T. monococcum* L.) group represented by გვაწა ზანდური (gvats'a zanduri);
3. emmer (*T. turgidum* L.) group represented by დიკა (dik'a);
4. Timofeev wheat (*T. timopheevii* (Zhuk.)) group represented by ზანდური (zanduri).

An interesting detail of the ethnobotanical profile of Georgia is that rye and especially cephalaria (*Cephalaria syriaca* (L.) Schrad. ex Roem. and Schult.) were common weeds in wheat fields, but traditional farmers did not attempt to weed then out or separate their seeds from the harvest. Rather, this mixture was welcomed, as it gave the bread a softness and a distinctive aroma. *Cephalaria* seeds also gave the bread a bluish colour and it was referred to as "makhobela bread" after the Georgian name of cephalaria: "makhobela" (მახობელა) (Pruidze et al. 2016).

While wheat dominated the fields of lowland Georgia, barley (*Hordeum sativum* L.) was known from ancient times for making the "bread of the highlands". Apart from being a staple food, it also had a special cultural value in the brewing of beer for ritual celebrations. Highlanders often referred to barley as "barley-gold" (ქერი-ოქრო, keri-okro) to emphasise the status in which this cereal was held. There are many local varieties and landraces of barley registered in Georgia, adapted to local climatic and soil conditions (Pruidze et al. 2016).

Other cereals, in order of importance, are as follows:

- rye (*Secale cereale* L.), ch'vavi (ჭვავი) in Georgian, cultivated in the highlands of western Georgia.

- foxtail millet (*Setaria italica* (L.) P. Beauvois; synonym *Panicum italicum*), g'omi (ღომი) in Georgian. Before the introduction of maize, foxtail millet was the staple food in the western lowlands of Georgia.
- proso millet (*Panicum miliaceum* L.), pet'vi (ფეტვი) in Georgian. Proso millet has been cultivated in Georgia from ancient times, but became more common in western Georgia, both in the highlands and lowlands. It is less productive, but less demanding of weather and soil; farmers cultivated proso millet on less fertile lands as an auxiliary crop. Cheese bread made of proso millet flour is still used in ancient rituals in the western highlands, in Svaneti.
- Indian barnyard millet (*Echinochloa frumentacea* Link), urishi (ურიში) in Georgian, mostly grows in the western Georgia lowlands as an auxiliary crop and is often used for medicinal purposes.
- wild foxtail millet (*Setaria mocharica* (Alef.) Menabde and Ericzjan), kvrima (ქვრიმა) in Georgian. An auxiliary crop of relatively low quality, it could be grown on poor soils, is drought resistant and was traditionally grown throughout Georgia.

Pulses represent another important grain plant with many local land races and varieties. However, both their use and diversity have been reduced after the introduction of Mexican varieties of bean. Below I list the major traditional pulses common in traditional Georgian households.

- Pea (*Pisum sativum* L.), barda ბარდა in Georgian, was the most common pulse consumed in Georgia before the introduction of common beans, and is still found in gardens.
- Broad bean (*Vicia faba* L.) tsertsvi ცერცვი in Georgian, is another common pulse grown everywhere in Georgia in the past and still occasionally cultivated.
- Lentil (*Lens culinaris* Medik), osp'i ოსპი in Georgian. Lentils were common in the highlands and occasionally are still cultivated in south-eastern Georgia (Samtskhe-Javakheti).
- Chickpea (*Cicer arietinum* L.), mukhudo მუხუდო in Georgian. Once very common everywhere in Georgia and valued for its nutritional properties, it is now very reduced and has in part been replaced by the soya bean.
- Grass pea (*Lathyrus sativus* L.) tsulisp'ira ცულისპირა in Georgian. Mostly grown in western highlands (Racha), it is used for seed rotation and also as an auxiliary crop in gardens and vineyards.

- Adzuki bean [*Vigna angularis* (Willd.) Ohwi and H. Ohashi] sak'adrisa საკადრისა in Georgian. It was and still is cultivated mostly in the western lowlands, competes with the common bean and is regarded for its good taste and ease of digestion.
- Cowpea [*Vigna unguiculata* (L.) Walp.] dzadza ძაძა in Georgian, was cultivated almost everywhere in the lowlands, but was strongly reduced after the introduction of the common bean.
- Lupin (*Lupinus albus* L.) khanch'k'ola ხანჭკოლა in Georgian, is mostly grown in the western lowlands and used in seed rotation to return fertility to the soil.
- Bitter vetch [*Vicia ervilia* (L.) Wild.], ugrekheli უგრეხელი in Georgian, was common in the eastern Georgia lowlands and, like the lupin, was mostly used in seed rotation.
- Blue fenugreek [*Trigonella cerulea* (L.) ser.], ulumbo ულუმბო in Georgian. I am not sure whether I should include this among the pulses, but the powder of dried blue fenugreek seeds is used as a spice and is highly characteristic of Georgian traditional cuisine. It is grown nowadays as much as it was in the past and is used in various popular sauces and dishes. Without blue fenugreek an ethnobotanical profile of Georgia would not be complete.

I also include flax as a plant ethnobotanically characteristic of Georgia – as already mentioned, flax fibre was used as early as the Upper Stone Age and then through subsequent ages. Flax (seli სელი in Georgian) was cultivated throughout the country: varieties of pale flax (*Linum bienne* Mill.) in western Georgia and common flax *Linum usitatissimum* L. in eastern Georgia (Pruidze et al. 2016). It was grown both for its fibres and its oil, which was used for food as well as medicinal purposes (Chitaia 1970; Molodini 1985). Cannabis (*Cannabis sativa*) was cultivated with the same purposes (oil and fibre, Rukhadze 1972). The seeds were eaten after being dry roasted in a pan. There are no records of the use of these plants for their narcotic properties. Nevertheless, in the Soviet era, the growing of flax and cannabis was forbidden, and nowadays it is almost impossible to find these plants growing in traditional communities.

As already mentioned, since 2010 a group of ethnobotanists led by Rainer Bussmann has been conducting systematic fieldwork in various parts of Georgia. An intensive database is already taking shape, which by 2020 includes over 15000 entries. The most frequently occurring species have been included in "Ethnobotany of the Caucasus" (Bussmann et al. 2017); the wild plants that I have

selected for the ethnobotanical profile of Georgia are based on this book – overall, around 100 species (an exact number is not easy to give as more than one species is included in some entries because of taxonomic similarity or the similar use of these plants). Furthermore, these species are grouped according to their primary uses – for food (including infusions and smoking), for medicinal purposes for construction, making furniture, tools – where timber is used, and (4) as a dye.

Wild plants used primarily as food

This category includes all types of food (salads, pickles, pies, sauces, infusions). All parts of the plant are used: fruits, young shoots and leaves, roots and bulbs, etc. References are also provided cited from the electronic version of Bussmann (ed.) 2017[9].

- agasyllis [*Agasyllis latifolia* (M. Bieb.) Boiss.], dutsi (დუცი) in Georgian, endemic (Batsatsashvili K. et al. 2016. *Agasyllis latifolia* (M. Bieb.) Boiss. Apiaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- amaranth (*Amaranthus retroflexus* L.), jijlaq'a (ჯიჯლაყა) in Georgian (Batsatsashvili K. et al. 2016. *Amaranthus retroflexus* L. Amaranthaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- asparagus (*Asparagus officinalis* L., *A. verticillatus* L.), sat'atsuri (სატაცური) in Georgian (Fayvush G. et al. 2016. *Asparagus officinalis* L., *Asparagus verticillatus* L. Asparagaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- barberry (*Berberis vulgaris* L.), kots'akhurii (კოწახური) in Georgian (Batsatsashvili K. et al. 2016. *Berberis vulgaris* L. Berberidaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- bastard cabbage [*Rapistrum rugosum* (L.) All.], bolok'a (ბოლოკა) in Georgian (Batsatsashvili K. et al. 2016. *Rapistrum rugosum* (L.) All. Brassicaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- bearberry (*Vaccinium arctostaphylos* L.), mag'ali motsvi (მაღალი მოცვი) in Georgian (Batsatsashvili K. et al. 2016. *Vaccinium arctostaphylos* L. Ericaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)

[9] https://link.springer.com/referencework/10.1007/978-3-319-50009-6

- blackthorn (*Prunus spinosa* L.), k'vrinchkhi (კვრინჩხი) in Georgian (Batsatsashvili K. et al. 2016. *Prunus spinosa* L. Rosaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- bladdernut (*Staphylea colchica* Steven., *S. pinnata* L.), jonjoli (ჯონჯოლი) in Georgian (Batsatsashvili K. et al. 2016. *Staphylea colchica* Steven., *Staphylea pinnata* L. Staphyleaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- carraway (*Carum carvi* L. *C. caucasicum* Boiss.), k'vliavi (კვლიავი) in Georgian (Mehdiyeva N. et al. 2016. *Carum carvi* L., *Carum caucasicum* Boiss. Apiaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- Caucasian pear (*Pyrus caucasica* Fed.), p'ant'a (პანტა) in Georgian (Batsatsashvili K. et al. 2016. *Pyrus caucasica* Fed. Rosaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- cherry plum (*Prunus divaricata* Ledeb.), t'q'emali (ტყემალი) in Georgian (Batsatsashvili K. et al. 2016. *Prunus divaricata* Ledeb. Rosaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- chickweed [*Stellaria media* (L.) Vill.)] zhunzhruk'i (ჟუნჟრუკი) in Georgian (Batsatsashvili K. et al. 2016. *Stellaria media* (L.) Vill. Caryophyllaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- chicory (*Cichorium intybus* L.), vardk'ach'ach'a (ვარკაჭაჭა) in Georgian (Mehdiyeva N. et al. 2016. *Cichorium intybus* L.Asteraceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- Cornelian cherry (*Cornus mas* L.), shindi (შინდი) in Georgian (Batsatsashvili K. et al. 2016. *Cornus mas* L. Cornaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- creeping thistle [*Cirsium arvense* (L.) Scop.], nari (ნარი) in Georgian (Batsatsashvili K. et al. 2016. *Cirsium arvense* (L.) Scop. Asteraceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- currant (*Ribes alpinum* L., *R. orientale* Desf., *R. petraeum* Wulfen, *R. uva-crispa* L.), motskhari (მოცხარი) in Georgian (Batsatsashvili K. et al. 2016. *Ribes alpinum* L. *Ribes orientale* Desf.

Ribes petraeum Wulfen *Ribes uva-crispa* L. Grossulariaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)

- danewort (*Sambucus ebulus* L.), ants'li (ანწლი) in Georgian (Batsatsashvili K. et al. 2016. *Sambucus ebulus* L. Adoxaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- dock (*Rumex acetosa* L., *R. acetosella* L., *R. confertus* Willd., *R. conglomeratus* Murray, R. *crispus* L., R. *tuberosus* L.), g'olo (ღოლო) in Georgian (Batsatsashvili K. et al. 2016. *Rumex acetosa* L., *Rumex acetosella* L., *Rumex confertus* Willd., *Rumex conglomeratus* Murray, *Rumex crispus* L., *Rumex tuberosus* L., Polygonaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- elder (*Sambucus nigra* L.), didgula (დიდგულა) in Georgian (Batsatsashvili K. et al. 2016. *Sambucus nigra* L. Adoxaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- field pansy (*Viola arvensis* L., *V. odorata* L.), ia ia (ია ია) in Georgian (Mehdiyeva N. et al. 2016. *Viola arvensis* L., *Viola odorata* L. Violaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- goosefoot (*Chenopodium album* L., *Ch. foliosum* L.), natsarkatama (ნაცარქათამა) in Georgian (Batsatsashvili K. et al. 2016. *Chenopodium album* L., *Chenopodium foliosum* L. Amaranthaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- grapevine (*Vitis vinifera sylvestris* C. C. Gmel.), veluri vazi (ველური ვაზი) in Georgian (Mehdiyeva N., Alizade V., Paniagua Zambrana N.Y., Bussmann R.W. 2016. *Vitis sylvestris* C. C. Gmel. Vitaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- hazelnut (*Corylus avellana* L., *C. colurna* L.), tkhili (თხილი) in Georgian (Batsatsashvili K. et al. 2016. *Corylus avellana* L., *Corylus colurna* L. Betulaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- hogweed (*Heracleum asperum* M. B. Fl. *H. leskovii* A. Grossh.), diq'i (დიყი) in Georgian (Batsatsashvili K. et al. 2016. *Heracleum asperum* M. B. Fl. *Heracleum leskovii* A. Grossh.

Apiaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)

- knotweed (*Polygonum alpinum* All., *P. aviculare* L., *P. carneum* C. Koch *P. hydropiper* L.), mat'it'ela (მატიტელა) in Georgian (Batsatsashvili K. et al. 2016. *Polygonum alpinum* All., *Polygonum aviculare* L. *Polygonum carneum* C. Koch, *Polygonum hydropiper* L. Polygonaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- liquorice (*Glycyrrhiza glabra* L.), dzirt'k'bila (ძირტკბილა) in Georgian (Mehdiyeva N. et al. 2016. *Glycyrrhiza glabra* L. Fabaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- mallow (*Malva neglecta* Wallr., *M. sylvestris* L.), balba (ბალბა) in Georgian (Batsatsashvili K. et al. 2016. *Malva neglecta* Wallr., *Malva sylvestris* L. Malvaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- medlar (*Mespilus germanica* L.), zg'mart'li (ზღმარტლი) in Georgian (Batsatsashvili K. et al. 2016. *Mespilus germanica* L. Rosaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- milky bellflower (*Campanula lactiflora* M. Bieb.), k'enk'esha (კენკეშა) in Georgian (Batsatsashvili K. et al. 2016. *Campanula lactiflora* M. Bieb. Campanulaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- mint (*Mentha aquatica* L. *M. longifolia* L., *M. pulegium* L.), p'it'na (პიტნა) in Georgian (Batsatsashvili K. et al. 2016. *Mentha aquatica* L., *Mentha longifolia* L., *Mentha pulegium* L. Lamiaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- moon carrot (*Seseli transcaucasicum* Pimenov and Sdobnina), sasuka (სასუქა) in Georgian (Batsatsashvili K. et al. 2016. *Seseli transcaucasicum* Pimenov & Sdobnina Apiaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- peavine (*Lathyrus roseus* Steven), arjak'eli (არჯაკელი) in Georgian (Batsatsashvili K. et al. 2016. *Lathyrus roseus* Steven Fabaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)

- persimmon (*Diospyros lotus* L.), khurma (ხურმა) in Georgian (Mehdiyeva N. et al. 2016. *Diospyros lotus* L. Ebenaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- purslane (*Portulaca oleracea* L.), danduri (დანდური) in Georgian (Batsatsashvili K. et al. 2016. *Portulaca oleracea* L. Portulacaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- rowan (*Sorbus aucuparia* L., *S. torminalis* (L.) Crantz), tsirtseli (ცირცელი) in Georgian (Batsatsashvili K. et al. 2016. *Sorbus aucuparia* L., *Sorbus torminalis* (L.) Crantz Rosaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- saltbush (*Atriplex hortensis* L., *A. tatarica* L.), tatabo (თათაბო) in Georgian (Mehdiyeva N. et al. 2016. *Atriplex hortensis* L., *Atriplex tatarica* L. Amaranthaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- savory (*Satureja laxiflora* C. Koch, *S. spicigera* (K. Koch) Boiss.), onch'o (ონჭო) in Georgian (Batsatsashvili K. et al. 2016. *Satureja laxiflora* C. Koch, *Satureja spicigera* (K. Koch) Boiss. Lamiaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- sickleweed (*Falcaria vulgaris* Bernh.), k'oprchkhila (კოფრჩხილა) in Georgian (Batsatsashvili K. et al. 2016. *Falcaria vulgaris* Bernh. Apiaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- *smilax* (Smilax excelsa L.), ek'alg'ich'i (ეკალღიჭი) in Georgian (Batsatsashvili K. et al. 2016. *Smilax excelsa* L. Smilacaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- stinging nettle (*Urtica dioica* L.), ch'inch'ari (ჭინჭარი) in Georgian (Batsatsashvili K. et al. 2016. *Urtica dioica* L. Urticaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- thyme (*Thymus caucasicus* Willd. ex Benth., *T. collinus* M. Bieb., *T. kotschyanus* Boiss. and Hohen.), begkondara (ბეგქონდარა) in Georgian (Batsatsashvili K. et al. 2016. *Thymus caucasicus* Willd. ex Benth., *Thymus collinus* M. Bieb., *Thymus kotschyanus* Boiss. & Hohen.

Lamiaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)

- walnut (*Juglans regia* L.), k'ak'ali (კაკალი) in Georgian (Batsatsashvili K. et al. 2016. *Juglans regia* L. Juglandaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- white nettle (*Lamium album* L.), ch'inch'ris deda (ჭინჭრის დედა) in Georgian (Batsatsashvili K. et al. 2016. *Lamium album* L. Lamiaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- wild garlic (*Allium paradoxum* (M. Bieb.) G. Don., *A. ursinum* L., *A. victorialis* L.), g'andzili (ღანძილი) in Georgian (Fayvush G. et al. 2016. *Allium paradoxum* (M. Bieb.) G. Don, *Allium ursinum* L. *Allium victorialis* L. Amaryllidaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham).

Most of the above plants (except for berries, other fruits and nuts) are used while young in spring and early summer to prepare pkhali, (or mkhali as often called in eastern Georgia) an original dish characteristic of Georgia. Generally, pkhali consists of plants that are boiled, chopped and mixed with various spices, and it can be prepared from any edible plants including wild ones. Some varieties of pkhali are known as delicacies (e.g., made of smilax, nettle, sorrel) and some are made from vegetable garden weeds (amaranth, goosefoot, nettle, purselane). The forests in western Georgia abound in edible plants, and traditional communities collect young leaves and shoots as they appear in spring. After being boiled and chopped, the plant mass is spiced with ground walnuts, vinegar, onions, garlic and herbs (mostly coriander, parsley, dill and fennel). More or less the same plants are used in eastern Georgia, but they are prepared differently: after the boiling and chopping process, the mass is fried in butter or oil together with onions and eggs. Wild spring plants are especially important in the highlands, more so in eastern Georgia as after a long winter, when highlanders crave fresh greens. They collect all the edible plants as they appear and use them fresh or in mkhali (Jikia 1991); often they are just dipped raw in milk, whey, sour cream or other liquid dairy product and eaten. Milk and its products can be used for mixing the boiled plants as well. Pkhali can be made of a single or a mixture of several plant species: for example mallow is added to pkhali to make it moister. Some plants can be toxic in great quantities, such as species of buttercup and the leaves of

potatoes and tomatoes. But if picked young, thoroughly boiled and mixed with safe plants, they are not dangerous. Another delicacy characteristic of Georgian traditional cuisine is pickles made with the young shoots of bladdernut, asparagus and wild garlic.

Wild plants used primarily for medicinal purposes

These plants are mostly represented by perennial herbs and a few ferns; any part of these plants can be used for preparing infusions, ointments or decoctions, although leaves are mainly used.

- agrimony (*Agrimonia eupatoria* L.), birk'ava (ბირკავა) in Georgian (Mehdiyeva N. et al. 2016. *Agrimonia eupatoria* L. Rosaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- black nightshade (*Solanum nigrum* L.), dzag'lq'urdzena (ძაღლყურძენა) in Georgian (Batsatsashvili K. et al. 2016. *Solanum nigrum* L. Solanaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- buckthorn (*Hippophae rhamnoides* L.), katsvi (ქაცვი) in Georgian (Mehdiyeva N. et al. 2016. *Hippophae rhamnoides* L. Elaeagnaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- poet's laurel, butchers's broom [*Danae racemosa* (L.) Moench, *Ruscus hyrcanus* Woron., *R. hypnophyllum* L.], tagvisara (თაგვისარა) in Georgian (Mehdiyeva N. et al. 2016. *Danae racemosa* (L.) Moench, *Ruscus hyrcanus* Woron., *Ruscus hypnophyllum* L. Asparagaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- butterbur [*Petasites albus* (L.) Gaertn., *P. fominii* Bordz., *P. hybridus* (L.) G. Gaertn., B. Mey. and Scherb.], buera (ბუერა) in Georgian, *P. fominii* is endemic (Batsatsashvili K. et al. 2016. *Petasites albus* (L.) Gaertn, *Petasites fominii* Bordz., *Petasites hybridus* (L.) G. Gaertn., B. Mey. & Scherb. Asteraceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- catchfly [*Oberna lacera* (Steven) Ikonn., *O. wallichiana* (Klotzsch) Ikonn.], kotana (ქოთანა) in Georgian (Batsatsashvili K. et al. 2016. *Oberna lacera* (Steven) Ikonn. *Oberna wallichiana* (Klotzsch) Ikonn. Caryophyllaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)

- Caucasian comfrey (*Symphytum caucasicum* M. Bieb.), lashkara (ლაშქარა) in Georgian (Batsatsashvili K. et al. 2016. *Symphytum caucasicum* M. Bieb.Boraginaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- Caucasian stonecrop I LOOKED THIS UP AND IT SAID Phedimus Spurius[*Sedum caucasicum* (Grossh.) Boriss., *S. spurium* M. Bieb.], k'ldisduma (კლდისდუმა) in Georgian (Batsatsashvili K. et al. 2016. *Sedum caucasicum* (Grossh.) Boriss., *Sedum spurium* M. Bieb. Crassulaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- Caucasian houseleek, hen and chicks (*Sempervivum caucasicum* Rupr., *S. annae* Gurgenidze), k'ldiskhortsa (კლდისხორცა) in Georgian (Batsatsashvili K. et al. 2016. *Sempervivum caucasicum* Rupr., *Sempervivum annae* Gurgenidze Crassulaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- crested gentian (*Gentiana septemfida* Pall.), nag'vela (ნაღველა) in Georgian (Batsatsashvili K. et al. 2016. *Gentiana septemfida* Pall. Gentianaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- cyclamen (*Cyclamen elegans* Boiss.et Buhse, *C. vernum* Sweet), q'ochivarda (ყოჩივარდა) in Georgian (Mehdiyeva N. et al. 2016. *Cyclamen elegans* Boiss.et Buhse *Cyclamen vernum* Sweet Primulaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- daphne (*Daphne mezereum* L.), majag'veri (მაჯაღვერი) in Georgian (Mehdiyeva N. et al. 2016. *Daphne mezereum* L. Thymelaeaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- dog rose (*Rosa canina* L., *R. iberica* Stev., *R. villosa* L.), ask'ili (ასკილი) in Georgian (Batsatsashvili K.G. et al. 2016. *Rosa canina* L. *Rosa iberica* Stev., *Rosa villosa* L. Rosaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- echium (*Echium maculatum* L.), dzirts'itela (ძირწითელა) in Georgian (Batsatsashvili K. et al. 2016. *Echium maculatum* L. Boraginaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)

- elecampane (*Inula helenium* L.), k'ulmukho (კულმუხო) in Georgian (Batsatsashvili K. et al. 2016. *Inula helenium* L. Asteraceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- fritillary (*Fritillaria collina* Adams), g'vina (ღვინა) in Georgian (Batsatsashvili K. et al. 2016. *Fritillaria collina* Adams. Liliaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- gooseberry (*Physalis alkekengi* L.), ont'k'opa (ონტკოფა) in Georgian (Fayvush G. et al. 2016. *Physalis alkekengi* L. Solanaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- greater celandine (*Chelidonium majus* L.), krist'esiskhla (ქრისტესისხლა) in Georgian (Batsatsashvili K. et al. 2016. *Chelidonium majus* L. Papaveraceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- hawthorn (*Crataegus curvisepala* Lindm., C. pentagyna Waldst.), k'uneli (კუნელი) in Georgian (Batsatsashvili K. et al. 2016. *Crataegus curvisepala* Lindm. Crataegus pentagyna Waldst. Rosaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- helichrysum [*Helichrysum rubicundum* (K. Koch) Bornm], nego (ნეგო) in Georgian (Fayvush G. et al. 2016. *Helichrysum rubicundum* (K. Koch) Bornm. Asteraceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- juniper (*Juniperus communis* L., *J. sabina* L.), g'via (ღვია) in Georgian (Batsatsashvili K. et al. 2016. *Juniperus communis* L. *Juniperus sabina* L. Cupressaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- lesser calamint [*Clinopodium nepeta* (L.) Kuntze], mtis p'it'na (მთის პიტნა) in Georgian (Mehdiyeva N., Alizade V., Zambrana N.Y.P., Bussmann R.W. 2016. *Clinopodium nepeta* (L.) Kuntze Lamiaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- maidenhair spleenwort (*Asplenium trichomanes* L.), mamasts'ara (მამასწარა) in Georgian (Mehdiyeva N. et al. 2016. *Asplenium trichomanes* L. Aspleniaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)

- male fern [*Dryopteris filix-mas* (L.) Schott], chaduna (ჩადუნა) in Georgian (Batsatsashvili K. et al. 2016. *Dryopteris filix-mas* (L.) Schott Dryopteridaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- meadowsweet [*Filipendula ulmaria* (L.) Maxim.], kapura (ქაფურა) in Georgian (Mehdiyeva N. et al. 2016. *Filipendula ulmaria* (L.) Maxim. Rosaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- ostrich fern [*Matteuccia struthiopteris* (L.) Todd.], shavi gvimra (შავი გვიმრა) in Georgian (Batsatsashvili K. et al. 2016. *Matteuccia struthiopteris* (L.) Todd. Onocleaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- plantain (*Plantago mayor* L., *P. media* L, *P. lanceolata* L.), mravaldzarg'va (მრავალძარღვა) in Georgian (Bussmann et al. 2017c)
- primrose (*Primula macrocalyx* Bunge, *P. woronowii* Losinsk.), purisula (ფურისულა) in Georgian (Batsatsashvili K. et al. 2016. *Primula macrocalyx* Bunge, *Primula woronowii* Losinsk. Primulaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- pyrethrum [*Pyrethrum parthenifolium* Willd., *P. roseum* (Adams) M. Bieb.], gvirila (გვირილა) in Georgian (Mehdiyeva N. et al. 2016. *Pyrethrum parthenifolium* Willd., *Pyrethrum roseum* (Adams) M. Bieb. Rosaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- rhododendron (*Rhododendron caucasicum* Pall.), dek'a (დეკა) in Georgian (Batsatsashvili K. et al. 2016. *Rhododendron caucasicum* Pall. Ericaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- Solomon's seal (*Polygonatum glaberrimum* C. Koch., *P. orientale* Desf.), svint'ri (სვინტრი) in Georgian (Fayvush G. et al. 2016. *Polygonatum glaberrimum* C. Koch. *Polygonatum orientale* Desf. Asparagaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- wayfaring tree (*Viburnum lantana* L), uzani (უზანი) in Georgian (Batsatsashvili K. et al. 2016. *Viburnum lantana* L. Adoxaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)

- wormwood (*Artemisia annua* L., *A. fragrans* Willd.), avshani (ავშანი) in Georgian (Batsatsashvili K. et al. 2016. *Artemisia annua* L., *Artemisia fragrans* Willd. Asteraceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)

The list of medicinal plants could be much longer given the vast literature in Georgian on this subject. However, elaboration on these would take me far away from the task of this book, as this is a separate and large topic (e.g., see Pirpilashvili 1970; 1989). Indeed, some sources estimate that ca. 700 species of the flora of Georgia are used for medicinal purposes and, out of these plants, 200 are recognised by official pharmacopoeia of Georgia (Pruidze et al. 2016); among endemic plant taxa of Georgia, 43 have medicinal properties (Miller et al. 2005).

Wild woody plants valued primarily for their timber

Most of these trees are typical of the forests in Georgia. Beech dominates nearly 50% of the forested area. Other Fagaceae trees (oak, chestnut) are also common. They are used in building work and the making of tools (handles of axes, hoes, etc.), utensils, containers, chests, furniture.

- beech (*Fagus orientalis* Lipsky), ts'ipeli (წიფელი) in Georgian (Batsatsashvili K. et al. 2016. *Fagus orientalis* Lipsky Fagaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- birch [*Betula pubescens* var. *litwinowii* (Doluch.) Ashburner and Mc. All.], arq'i (არყი) in Georgian (Batsatsashvili K. et al. 2016. *Betula pubescens* var. *litwinowii* (Doluch.) Ashburner & Mc. All. Betulaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- chestnut (*Castanea sativa* Mill.), ts'abli (წაბლი) in Georgian (Mehdiyeva N. et al. 2016. *Castanea sativa* Mill. Fagaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- fir [*Abies nordmanniana* (Steven) Spach.], soch'i (სოჭი) in Georgian (Batsatsashvili K. et al. 2016. *Abies nordmanniana* (Steven) Spach Pinaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)

- hackberry (*Celtis caucasica* Willd.), ak'ak'i (აკაკი) in Georgian (Batsatsashvili K. et al. 2016. *Celtis caucasica* Willd. Cannabaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- hornbeam (*Carpinus caucasica* Grossh.), rtskhila (რცხილა) in Georgian (Batsatsashvili K. et al. 2016. *Carpinus caucasica* Grossh. Betulaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- lime (*Tilia begoniifolia* Steven.), tsatskhvi (ცაცხვი) in Georgian (Batsatsashvili K. et al. 2016. *Tilia begoniifolia* Steven Malvaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- maple (*Acer laetum* C. A. Mey, *A. platanoides* L., *A. pseudoplatanus* L., *A. velutinum* Boiss.), nek'erchkhali (ნეკერჩხალი) in Georgian (Mehdiyeva N. et al. 2016. *Acer laetum* C. A. Mey, *Acer platanoides* L., *Acer pseudoplatanus* L., *Acer velutinum* Boiss. Sapindaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- oak (*Quercus iberica* Steven ex M. Bieb.), mukha (მუხა) in Georgian (Batsatsashvili K. et al. 2016. *Quercus iberica* Steven ex M. Bieb. Fagaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- pine (*Pinus kochiana* Klotzsch ex K. Koch), pich'vi (ფიჭვი) in Georgian (Batsatsashvili K. et al. 2016. *Pinus kochiana* Klotzsch ex K. Koch Pinaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- spruce [*Picea orientalis* (L.) Peterm.], nadzvi (ნაძვი) in Georgian (Batsatsashvili K. et al. 2016. *Picea orientalis* (L.) Peterm. Pinaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)
- yew (*Taxus baccata* L.), urtkheli (ურთხელი) in Georgian (Mehdiyeva N. et al. 2016. *Taxus baccata* L. Taxaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)

The most valued timber for building wooden houses is chestnut on account of its durability in the damp climate of western Georgia. For posts and beams, oak is the most valued. Hornbeam is used in toolmaking. Yew has become rare, but its timber is valued for any type of work. Of the conifers, spruce and fir are the preferred timber for shingle roofs as they resist rain well. Hackberry is used

when a hardwood is needed. Pine is very common in the highlands and is mostly used for firewood and temporary constructions.

Wild plants used as dye

There is a single plant species in this category:

- madder (*Rubia tinctorium* L.), endro (ენდრო) in Georgian (Batsatsashvili K. et al. 2016. *Rubia tinctorium* L. Rubiaceae. In: Bussmann R. (eds.), Ethnobotany of the Caucasus. European Ethnobotany. Springer, Cham)

This does not mean that this is the only plant used to obtain colours (Molodini 1971). In fact, most of the plants listed above have multiple uses. For example, walnut is listed in the group of food plants as it is highly prized in Georgian traditional cuisine, but the young fruits are routinely used to obtain a brown dye and the timber is valued in furniture making. Lime is listed among the timber plants, but an infusion of its leaves is a very popular remedy against cold and flu. Likewise, oak is known for its strong timber, but also for its bark which is used to make a black dye. Along with its exceptionally hard timber, the fruits of the hackberry can be used as food. Madder root is at present mostly used for painting Easter eggs red, but in past it was also used to dye knitting wool. However, madder has also medicinal properties, as noted in Culpepper's herbal[10].

Analysis and synthesis of collected data

Intensive ethnobotanical fieldwork has produced a large amount of standardised data, which could be analysed statistically as described in Chapter 1 (section 'Methods in Ethnobiology'). Here I will only describe the 'big picture' that emerged from these analyses; technical details can be found in publications cited above (Bussmann et al. 2016abc; 2017abcd; 2018b; 2020ab). As it appears, regional differences in the traditional use of plants in Georgia basically depend on two factors: the location of either eastern or western Georgia and the altitude above the sea level (Figure 2.1). Over 80% of plants are used traditionally across all Georgia, and the regional differences are marked by plants that are not common everywhere. Therefore, I will only give one or two examples of such 'marker' plants

[10] http://www.bibliomania.com/2/1/66/113/frameset.html

which in my opinion are the most salient. I also will reference the domains on the map of historical regions of Georgia (Figure 2.2).

The most important plant in the highlands of Georgia was, in the past, barley (Figure 2.1, top), which at present has been almost entirely replaced by potatoes (Zemo Svaneti, Adjara, Khevi, Tusheti, Pshavi, Khevsureti, Mtiuleti, Ertso-TianeTi, Gudamakari, Fig. 2.2). In the western lowlands (Guria, Imereti, Samegrelo, Abkhazia, Lower Svaneti, Lechkhumi, Fig. 2.2) the major grain was millet, now replaced by maize (Figure 2.1, left). Wheat (Figure 2.1, right) is the main crop in the eastern lowlands (Kakheti, Hereti, Shida Kartli, Kvemo Kartli, Zemo Kartli). The most important plant in the lowlands, both western and eastern, is the grapevine, along with various fruit trees such as apple, pear, cherry, apricot, peach, quince, plum, cherry plum, walnut and hazelnut (Figure 2.1, centre below). These fruits are often used to make fruit spirits (araq'i), a tradition that I will discuss in the next section. There are also some ethnobotanical differences between the western and eastern highlands which are shown here by the most common spices: blue fenugreek in the western (Zemo Svaneti) and thyme in the eastern (Khevi, Khevsureti, Tusheti) highlands (Figure 2.1 centre left and right). Plants typical for all Georgia are those used for pkhali, as well as, in the past, flax (Figure 2.1. overlap of all three circles, centre).

The tradition of alcohol distillation from fruit (araq'i)

In this section I would like to describe my own observations recorded through almost a decade of ethnobotanical explorations in the countryside of practically all the regions of Georgia. In late autumn, when everything worth harvesting is safely gathered in, Georgian farmers roll out their stills and arrange improvised distilleries in their barns or gardens (Figure 2.3). In fact, the vineyards and orchards of Georgia produce a considerable surplus of fruit that cannot be consumed or absorbed by the markets. This provides excellent material for distilling a drink with a high alcohol content, that goes by the name in Georgia of araq'i (არაყი). The most common material for producing araq'i is grape pomace, the residue after grape pressing. Its Georgian name is ch'ach'a (ჭაჭა), which is often used as a name of the beverage too. This word has become so common that some farmers use it to refer to any home-distilled spirit even if it is not made of ch'ach'a. In the major wine-making region of Georgia, Kakheti, it is difficult to find any home-made araq'i other than ch'ach'a. In other regions,

however, different fruits can be prominent too. In fact, araq'i can be distilled from any fruit. Sometimes the fruits are mixed, resulting in "fruit araq'i", which is often considered a cheap substitute of the high quality spirits.

Araq'i is not just a drink. Farmers usually claim that it has medicinal properties, especially for skin care, and some is distilled primarily for medicinal use. One such is made from the cherry plum. The content of alcohol is about 70%, which is close to the commercially available pharmaceutical-grade ethanol solutions. Another araq'i used almost exclusively for its medicinal properties is produced from danewort berries, and is believed to cure stomach aches and digestive disorders very effectively. Highly valued araq'i is made from pear, the best one from the wild pear. Worth mentioning also is araq'i made from ch'anch'uri (a variety of plum), renowned for its good taste.

There are other araq'is valued for their pleasant taste or high content of alcohol, such as those distilled from mulberries, persimmons and figs, but these are rare nowadays. Herbs are rarely added. High quality araq'i will retain the aroma and the taste of the fruit used over an entire year; it is rarely kept longer. Sometimes, the fibrous inside membranes of walnuts are added to araq'i to improve its taste and colour as it removes the taste of fusel oils and adds dryness.

Distilling spirits from grape pomace and various fruits is a common tradition throughout all Georgia, and only at very high altitudes where there is a shortage of fruit is araq'i distilled from grain.

The traditional home garden in Georgia

Home gardens are very popular in Georgia and traditionally there is little variation in the herbs and vegetables that are grown. Normally, gardens are divided into sections for vegetables, herbs, cereals and pulses. The largest section is devoted to the staple food plants, such as maize, beans or potatoes, but occasionally there are other cereals and pulses too:

- barley *Hordeum vulgare* L. Poaceae ქერი (keri)
- beans *Phaseolus sativus* L. Fabaceae ლობიო (lobio)
- chickpea *Cicer arietinum* L. Fabaceae მუხუდო (mukhudo)
- emmer *Triticum dicoccum* Schrank ex Schübl. Poaceae ასლი (asli)
- lentils *Lens cornicularis* L. Fabaceae ოსპი (ospi)
- maize *Zea mays* L. Poaceae სიმინდი (simindi)
- pea *Pisum sativum* L. Fabaceae ბარდა (barda)

- potato *Solanum tuberosum* L. Solanaceae კარტოფილი (kartopili)
- rye *Secale cereale* L. Poaceae ჭვავი (tch'vavi)
- soya beans *Glycine max* (L.) Merr. Fabaceae სოია (soia)
- sunflower *Helianthus annuus* L. Asteraceae მზესუმზირა (mzesumzira)
- vetch *Vicia faba* L. Fabaceae ცერცვი (tsertsvi)
- wheat *Triticum aestivum* L. Poaceae ხორბალი (khorbali)

Vegetables also occupy a large section of home gardens. Typically these are as follows:

- aubergine *Solanum melogena* L. Solanaceae ბადრიჯანი (badrijani)
- beets *Beta vulgaris L.* Chenopodium album L. Amaranthaceae ჭარხალი (ch'arkhali)
- peppers *Capsicum annuum* L. Solanaceae ბულგარული წიწაკა (bulgaruli ts'ts'ak'a)
- broccoli *Brassica oleracea* L. *Broccoli* Brassicaceae ბროკოლი (brok'oli)
- cabbage *Brassica oleracea* L. Brassicaceae კომბოსტო (k'ombost'o)
- carrot *Daucus carota* L. ssp. *sativus* Apiaceae სტაფილო (st'apilo)
- cauliflower *Brassica oleracea* L. var. *botrytus* Brassicaceae ყვავილოვანი კომბოსტო (q'avilovani k'ombost'o)
- chili pepper *Capsicum annuum* L. Solanaceae წიწაკა (ts'ts'ak'a)
- courgette *Cucurbita pepo* L. Zucchini Cucurbitaceae ცუკინი (tsuk'ini)
- cucumber *Cucumis sativus* L. Cucurbitaceae კიტრი (k'it'ri)
- garlic *Allium sativum* L. Amaryllidaceae ნიორი (niori)
- horseradish *Armoracia rusticana* G. Gaertn., B. Mey. & Scherb. Brassicaceae პირშუშხა (pirshushkha)
- Jerusalem artichoke *Helianthus tuberosus* L. Asteraceae მიწავაშლა (mits'avashla)
- kohlrabi *Brassica oleracea* L. var. *gongylodes* Brassicaceae კოლრაბი (k'olrabi)
- leek *Allium porrum* L. Amaryllidaceae პრასი (p'rasi)
- lettuce *Lactuca sativa* L. Asteraceae სალათა (salata)
- marrow *Cucurbita pepo* L. var. *giromontia* Cucurbitaceae ყაბაყი (q'abaq'i)
- onion *Allium cepa* L. Amaryllidaceae ხახვი (khakhvi)
- pattipan squash *Cucurbita pepo* L. var. *patisson* Cucurbitaceae პატისონი (p'at'isoni)

- radish *Raphanus sativus* L. var. *major* Brassicaceae ბოლოკი (bolok'i)
- rapini *Brassica rapa* L. subsp. *rapifera* Metzger Brassicaceae თალგამურა (talgamura)
- rocket *Eruca sativa* Mill. Asteraceae რუკულა (ruk'ula)
- spinach *Spinaca oleracea* L. Amaranthaceae ისპანახი (isp'anakhi)
- squash *Cucurbita pepo* L. Cucurbitaceae გოგრა (gogra)
- tomato *Lycopersicum esculentum* L. Solanaceae პომიდორი (p'omidori)
- turnip *Brassica rapa* var. *rapa* L. Brassicaceae თალგამი (talgami)
- Welsh onion *Allium fistulosum* L. Amaryllidaceae ჭლაკვი (ch'lak'vi).

All these plants are domestic, although sometimes wild garlic can be found, replanted from the forest:

- wild garlic *Allium victorialis* L. Amaryllidaceae ღანძილი (g'andzili)

Georgian home gardens contain a variety of herbs:

- basil *Ocimum basilicum* L. Lamiaceae რეჰანი (rehani)
- blue fenugreek *Trigonella caerulea* (L.) Ser. Fabaceae ულუმბო (ulumbo)
- celery *Apium graveolens* L. Apiaceae ნიახური (niaxuri)
- coriander *Coriandrum sativum* L. Apiaceae ქინძი (kindzi)
- dill *Anethum graveolens* L. Apiaceae კამა (k'ama)
- fennel *Foeniculum vulgare* Mill. Apiaceae ცერეცო (tseretso)
- land cress *Lepidium sativum* L. Brassicaceae წიწმატი (ts'its'mat'i)
- marigold *Tagetes patula* L. Asteraceae ყვითელი ყვავილი (q'viteli q'vavili)
- mint *Mentha x piperita* L. Lamiaceae ბაღის პიტნა (bag'is p'it'na)
- mustard *Sinapis arvensis* L. Brassicaceae მდოგვი (mdogvi)
- parsley *Petroselinum crispum* (Mill.) Fuss. Apiaceae ოხრახუში (okhrakhushi)
- penny royal *Mentha pulegium* L. Lamiaceae ომბალო (ombalo)
- savory *Satureja hortensis* L. Lamiaceae ქონდარი (kondari)
- tarragon *Artemisia dracunculus* L. Asteraceae ტარხუნა (tarkhuna)

Fruit trees usually occupy the corners and edges of the garden. These are:

- alucha plum *Prunus vachuschtii* Bregadze Rosaceae ალუჩა (alucha)

- apple *Malus domestica* L. Rosaceae ვაშლი (vashli)
- apricot *Prunus armeniaca* Lam. Rosaceae გარგარი (gargari)
- bay *Laurus nobilis* L. Lauraceae დაფნა (dapna)Cherry *Prunus avium* (L.) L. Rosaceae ბალი (bali)
- cherry plum *Prunus cerasifera* Rosaceae ტყემალი (tq'emali)
- damson *Prunus insititia* L. Rosaceae ღოღნოშო (g'og'nosho)
- fig *Ficus carica* L. Moraceae ლეღვი (leg'vi)Lemon *Citrus limon* (L.) Burm. f. Rutaceae ლიმონი (limoni)
- medlar *Mespilus germanica* L. Rosaceae ზღმარტლი (zg'mart'li)
- mulberry *Morus alba* L. Moraceae თუთა (tuta)
- pear *Pyrus communis* L. Rosaceae მსხალი (mskhali)
- persimmon *Diospyros sp.* Ebenaceae ხურმა (khurma)
- plum *Prunus x domestica* L. Rosaceae ქლიავი (kliavi)
- quince *Cydonia oblonga* L. Rosaceae კომში (komshi)
- sour cherry *Prunus cerasus* L. Rosaceae ალუბალი (alubali)

To this list I shall add the grapevine as well as trees replanted from the forest, which often form part of home gardens:

- bladdernut *Staphylea colchica* Steven Staphyleaceae ჯონჯოლი (jonjoli)
- Cornelian plum *Cornus mas* L. Cornaceae შინდი (shindi)
- grapevine *Vitis vinifera* L. Vitaceae ვაზი (vazi)
- walnut *Juglans regia* L. Juglandaceae კაკალი k'ak'ali
- wild apple *Malus orientalis* Uglizk. Rosaceae მაჟალო (mazhalo)

In Adjara and Guria, old gardens often have cherry laurel *Prunus laurocerasus* L. Rosaceae წყავი (ts'q'avi).

Berries also can be found in the traditional garden, to which I add watermelons (botanically their fruits are berries).

- raspberry *Rubus idaeus* L. Rosaceae ჟოლო (zholo)
- strawberry *Fragaria vesca* L. Rosaceae მარწყვი (marts'q'vi)
- wild strawberry *Fragaria virginiana* Mill. Rosaceae ხენდრო (khendro)

- watermelon *Citrullus lanatus* (Thunb.) Matsum. & Nakai var. *lanatus* Cucurbitaceae საზამთრო (sazamtro)

On occasions, mushrooms pop up in the gardens, most commonly:

- horse mushroom *Agaricus arvensis* Schaeff. Agariceae ქამა (kama)
- pearl oyster mushroom *Pleurotus ostreatus* (Jacq. ex Fr.) P. Kumm Pleurotaceae კალმახა (k'almakha)

Finally, there are weeds, which, if edible, are left to grow in the garden:

- amaranth *Amaranthus retroflexus* L. Amaranthaceae ჯიჯლაყა (jijlaq'a)
- goosefoot *Chenopodium album* L. Amaranthaceae ნაცარქათამა (natsarkatama)
- salsify *Tragopogon* sp. Asteraceae ფამფარა (pampara)
- purslane *Portulaca oleracea* L. დანდური (danduri)

Pkhali made from these weeds makes a substantial addition to everyday diet in early spring.

Smoking and snuff

In the remote villages of the eastern Georgian highlands it is common to find tobacco growing in the garden or in small improvised plantations (Bussmann et al. 2014):

- strong tobacco *Nicotiana rustica* L. Solanaceae წეკო ts'eko
- common tobacco *Nicotiana tabacum* L. Solanaceae თამბაქო tambako

It is grown almost exclusively for home use which includes smoking and taking snuff. Snuff is very characteristic of Khevsureti, the highland province of eastern Georgia. The cultivation of tobacco is not difficult: it is sown in early spring and one month after germination the top bud is pinched out regularly (once a week) in order to promote the growth of the side shoots. Tobacco does not like competition, so it requires to be well weeded. The leaves are harvested four or five times per growing season and then sun-dried for one day, wrapped in a blanket or carpet for three days to keep them warm and to allow for fermentation. It is then spread indoors or in a shaded place for around two weeks, after which the tobacco is ready to be smoked. Snuff is made in exactly same way but ground finer. Traditionally, no other ingredient (flavour or spice) is added.

Nowadays smokers prefer rolling their own cigarettes to pipe smoking. If there is a shortage of cigarette papers, thin coils are peeled from the bark of lime trees (*Tilia dasystyla* Steven, tsatskhvi ცაცხვი). If there is a tobacco shortage, smokers use elecampane (*Inula helenium* L. კულმუხო k'ulmukho) leaves, but this is rarely done now.

Snuff is inhaled through the nose. Interestingly, traditional snuff-takers were women, while men were the smokers. Highland ethics disapprove of women smoking, but tolerate snuff taking. At present this division is blurred: it is easy to find both women smokers and men taking snuff.

Here I end my overview of the ethnobotanical profile of Georgia. The material is far richer and more extensive than I could present in this book, but fortunately for interested readers, this topic is duly elaborated in other publications, notably in the monograph "Ethnobotany of the Caucasus" (Bussmann 2017).

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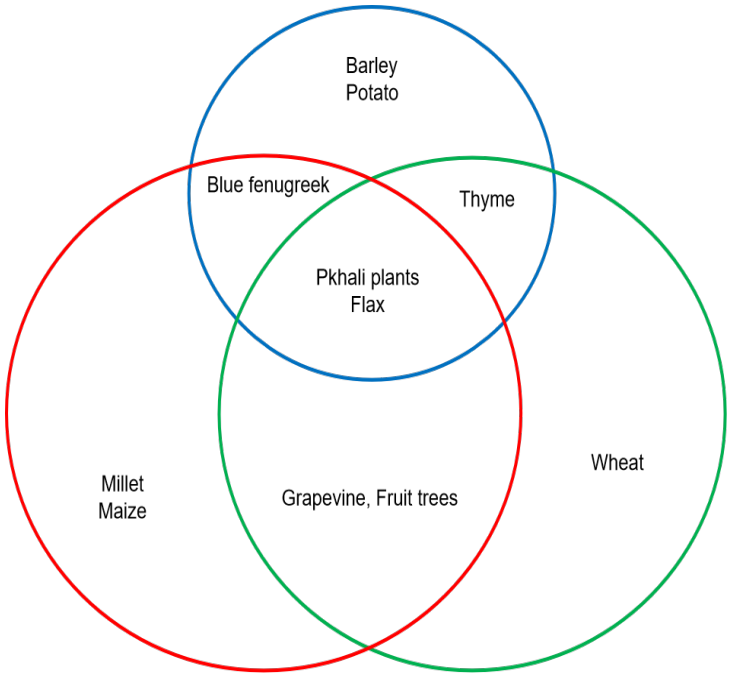

Figure 2.1. Synthesis of the results obtained through the ethnobotanical fieldwork in 2012-2019 seasons. The plants and their uses are depicted by overlapping circles to show three major domains: the western lowlands (green circle), the eastern lowlands (red circle) and the highlands (blue circle). The examples of plants specific to each domain are written in the non-overlapped area, plants shared by all domains are shown in the overlapped area.

Figure 2.2. Historical provinces of Georgia (By Accipite7 - Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=76697020)

Figure 2.3. A traditional device for alcohol distillation in Kakheti, Georgia (https://commons.wikimedia.org/w/index.php?curid=4462903)

Chapter 3. Ethnozoology of Georgia

A historical introduction

The major source of protein for early humans in Georgia was provided by animals, either by hunting, fishing or scavenging. Hunter and gatherer bands of *Homo erectus* left behind a good deal of evidence of hunting through the concentration of deer bones wherever they settled (Vekua and Lortkipanidze 1998). Neanderthals, who replaced *Homo erectus* and were living in Georgia during the Great Ice Age, were remarkably skilful hunters, using caves in the mountains from which to hunt the Caucasian tur (*Capra caucasica*) during its periods of migration (Adler and Bar-Oz 2009). Ca. 40,000 years ago, Neanderthals were replaced by anatomically modern humans (*Homo sapiens*) who appropriated these caves, and conducted more effective campaigns, as besides the Caucasian tur, considerable remains of aurochs (*Bos primigenius*) and steppe bison (*Bison priscus*) (Bar-Oz et al., 2002; 2004; Adler et al. 2006) have been found; these large ungulates made up over 40% of all animal remains. The hunting habits of *Homo sapiens* changed over time, as by the Middle Stone Age, evidence of pigs (wild boar *Sus scrofa*) and brown bears (*Ursus arctos*) (Meshveliani et al. 2007; Bar-Oz et al. 2009) has been found.

Agriculture strongly changed the relationship with animals in the Neolithic Age, since domestic animals could provide a guaranteed supply of meat, and, as a consequence, hunting began to lose its relative importance to the economy. The same archaeological excavations that documented the first domestic plants also revealed remains of domestic animals. The first agrarians in Georgia raised sheep, goats, cows and pigs. To these four species we can also add dogs, which had been domesticated even earlier by the hunters and gatherers (Frantz et al. 2016). These communities husbanded the same animals until the introduction of the domestic horse ca. 4,000 years ago (Pitskhelauri 1973), which produced notable shifts in lifestyles and led to transhumant herding and the colonisation of Georgia's highlands (Kikvidze in press). At the same time, the economic importance of hunting continued to decline until the present time when it has become merely a sport. At present, sheep, goats, cows and pigs remain the major domestic animals, even though over time there have been other important introductions from other countries and continents such as the water buffalo, donkey, chicken and turkey.

Bees also have a long history in Georgia: honey jars as old as 8,000-6,000 years have been discovered at the archaeological sites of the first agrarian communities (Martkoplishvili 2017). Since then, bee keeping has always been an important activity, although traditional apiaries have been replaced by industrially made hives (Robakidze 1960). Today, honey production in Georgia is about 4,000 tonnes per year. The five major honey types are: acacia (in fact, the false acacia *Robinia pseudoacacia*), spring blossom, alpine, lime and chestnut honey (the latter two are mostly harvested in western Georgia). Dedicated beekeepers practise transhumance (moving the apiary seasonally: highlands in spring and summer, lowlands in autumn and winter) and harvest honey twice a year in late spring and late summer. The current trend is towards environmentally friendly products and this is reflected in traditional methods of beekeeping, in particular, excluding artificial wax and integrating apiaries into organic farms, which derive benefit from the pollinating services of the bees (Khositashvili et al. 2019).

Another domestic insect of economic importance was the silkworm. Sericulture in Georgia developed in the Middle Ages and, by the 19th century had become an important branch of the economy, mainly carried out in traditional communities (Lekashvili et al. 2018). The State Museum of Silk was established in Tbilisi in 1887 and includes worldwide exhibits as well as local ones[11]. Unfortunately, since the nineteenth century, silk production has declined strongly and during my fieldwork I was able to see silk worms at work on only one occasion (the village of Magaro, Sighnaghi Municipality). This was a family-run, non-profit project and involved up to 20 other enthusiasts from nearby villages.

Traditional animal husbandry is still practised in Georgia and in the next sections I will discuss the relationships of humans with both wild and domestic animals. It should be noted that ethnozoological studies in Georgia have failed to produce many publications, so as a result, most of the descriptions and discussions in this chapter are based on my own observations and to a lesser extent, on data from sources such as the *Georgian Soviet Encyclopaedia*, web-sites supported by the Ministry of Agriculture of Georgia and bulletins from other government agencies related to animals (conservation, hunting regulations, local races of domestic animals).

[11] https://en.unesco.org/silkroad/content/state-silk-museum;

https://www.apollo-magazine.com/state-silk-museum-tbilisi/

After hunting, fishing proved to be another major source of protein historically in Georgia, especially for the communities that settled near the sea or close to large rivers. Evidence of fishing tackle has been documented from the Neolithic Age (Varoutsikos 2015); Georgian (Colchian) fishing boats were noted by Ancient Greek authors such as Strabo (Beradze 1981); noble families kept special serf-fishers (Javakhishvili 1951) during the Middle Ages; the richness of fish resources in Georgia was mentioned by the 18th-century geographer and historian Vakhushti Bagrationi (1973); the lists of the 19th-century Tax Office in Tbilisi mention highly valued fish such as sturgeon, salmon and other fresh fish being sold in the markets (Javakhishvili 1951).

Domestic fauna of Georgia

The domestic fauna kept in traditional households of Georgia is essentially the same as in the rest of Europe. We see mostly the same animals that were and still are found over all Europe to this day. Below is a list of common domestic animals.

Mammals

- cat *Felis catus* Linnaeus კატა kat'a
- cattle (cow, bull) *Bos taurus* Linnaeus საქონელი (ძროხა, ხარი) sakoneli (dzrokha, khari)
- dog *Canis lupus familiaris* Linnaeus ძაღლი dzag'li
- donkey *Equus africanus asinus* Linnaeus სახედარი sakhedari
- goat *Capra aegagrus hircus* Linnaeus თხა tkha
- horse *Equus ferus caballus* Linnaeus ცხენი tskheni
- pig *Sus scrofa domesticus* Erxleben ღორი g'ori
- sheep *Ovis aries* Linnaeus ცხვარი tskhvari
- water buffalo *Bubalus bubalus* Linnaeus კამეჩი k'amechi

Birds:

- chicken *Gallus gallus domesticus* Linnaeus ქათამი katami
- goose *Anser anser domesticus* Linnaeus ბატი bat'i
- duck *Anas platyrhynchos domesticus* Linnaeus იხვი ikhvi.
- guineafowl *Numida mellagris galleata* Longchamps ციცარი tsitsari.
- turkey *Meleagris gallopavo* Linnaeus ინდაური indauri

Insects

- bee *Apis melifera* Linnaeus ფუტკარი put'k'ari
- silk moth *Bombyx mori* თუთის აბრეშუმხვევია tutis abreshumkhvevia

In comparison with neighbouring Middle East countries, both the absence of camels and the presence of pigs is notable. In fact, pigs constitute an important segment of Georgia's domestic market (Kukielka et al. 2017; Beltrán-Alcrudo et al. 2018). As with other European countries, the tradition of painted Easter eggs is very strong in Georgian culture. Any egg can be painted, but hens' eggs are the most popular. Young children often compete to see whose Easter egg is harder by hitting two eggs together. The owner of the cracked egg is the loser and has to hand over his egg to the winner. Guineafowl eggs have harder shells than those of hens and other birds, and so these are especially valued among boys. One can occasionally see singing birds — canaries, nightingales — kept in the cages, but in general this is not a common custom.

There are regional differences in the use of domestic animals and their products, which I will discuss later in this chapter (the last section "Synthesis: ethnozoological profile of Georgia").

Hunting traditions in Georgia

The main connection of humans to wild animals at present in Georgia is hunting, either by organised shooting parties or by traditional methods, both regulated by Georgian Law. Hunting is a popular sport in Georgia and the introduction of stricter laws and regulations has not always been welcomed, especially by traditional hunters. A clear example of this is a very negative attitude towards the establishment of large national parks where hunting is widely forbidden. In particular, my graduate student David Kunchulia studied the attitudes in local villages surrounding the Kolkheti (Colchis) National Park, mostly in the Lanchkhuti Municipality. In his Master thesis (Kunchulia 2019), he interviewed the locals to find that the increase in the number of predators (predominantly the wolf) was perceptible for over 10% of respondents, while 45% thought that the increase was very strong (Figure 17 in Kunchulia 2019). Further, many respondents (55%) felt that the increase of predators and attacks on livestock was a consequence of the ban on the hunting of these animals. There were even conspiracy theories circulating that the predators were brought from somewhere else outside

Georgia (17% of respondents affirmed this, Figure 22 in Kunchulia 2019). The most radical of these theories was offered by two respondents (almost 4% of the interviewed participants), which stated that wolves were transferred from the sea to the Park using U.S. Navy helicopters. Interestingly, none of the respondents had witnessed the alleged transfer themselves, but cited eyewitnesses from other villages. For more credibility, they added that they were unusual wolves, of larger size and with reddish coats. These conspiracy theories are suggestive of many thoughts, among them that the Park's administration should improve their public relations. At the same time, the documented negative attitudes towards strict hunting rules are indicative of a conflict between humans and wildlife. I will address this problem further in the section "Human-wolf conflict". Here, I would like to discuss ancient traditions.

These are best preserved in the highlands of Racha, Svaneti, Khevi, Khevsureti, Pshavi and Tusheti. There were many pre-Christian local deities — patrons of wild animals who have been gradually absorbed into Christianity; most of the deities have merged with the cult of St George (Tuite 2006). One of the most prominent figures among these deities and still worshipped by traditional hunters in Svaneti and adjacent Samegrelo is Dali or Dael, the Goddess of the Hunt (in Samegrelo called T'q'ashi Mapa ტყაში მაფა, the Queen of Animals). Associated with Dali is Ochopintre, a deity who is merely a shepherd of wild animals and who ardently desires to marry Dali, but is thwarted at every turn. Dali is a goddess of dazzling beauty with long golden plaits, sky-blue eyes and pearly white skin who watches over and protects wild animals from the summits of mountains. She sometimes shapeshifts into her favourite animals (mostly deer) when she carries special markings so that she is easily distinguished from the rest of herd. Hunters are forbidden even to aim at animals with such marks, an action considered the gravest misconduct and punishable with death. However, Dali can help hunters who respect her main rule: do not hunt more than you need. Real traditional rules could be even stricter: in Racha, hunters were not permitted to kill more than three animals on each hunting trip. Traditions also regulated when and where hunting was allowed, and any misconduct was severely punished by the village with public condemnation and fines. After the number of animals killed reached 1000, a hunter would bury his shotgun and give up hunting for good (Robakidze 1941).

Organised hunting parties, by contrast, are regulated by strict legislation, which is largely based

on conservation priorities (Kopaliani and Gurielidze 2009). The attitude of any given society towards its natural environment can be judged by the systems in place to protect it. Georgia has a fast-developing system of protected areas that gives an idea of the cultural value of nature in general and animals in particular. I note this in connection with animals because, as usual, the flagship or cornerstone species of the protected areas is always the animals. The Protected Area Profile for Georgia from the World Database of Protected Areas (UNEP-WCMC 2019) informs us that the total area of Georgia's protected areas is 511,123 hectares, which amounts to approximately 8.33 % of the whole country. On February 20, 2014 the government of Georgia approved the Red List of Georgia (Resolution №190). Interestingly, a large part of Georgia's vertebrate fauna can be found on this list (see Appendix 3.1 for mammals and birds). The companies organising hunting parties often describe themselves as 'hunting farms', and information about them can be readily gathered from their web pages or advertisements placed on the well-known Tripadvisor and other internet portals[12]. Controversially, since 2012 these companies are allowed to organise shooting parties for protected animals such as wild boar[13], which is very negatively viewed by green organisations and traditional hunters[14].

Large mammals, naturally, are the most desired game. However, virtually all of them are on the red list and can only be hunted on extraordinary occasions, for example, when they threaten local residents and their property. Among the protected animals are badger (*Meles meles*), bear (*Ursus arctos*), chamois (*Rupicapra rupicapra*), deer (*Cervus elaphus*), fox (*Vulpes vulpes*), gazelle (*Gazella subgutturosa*), hyena (*Hyaena hyaena*), jackal (*Canis aureus*), lynx (*Lynx lynx*), marten (*Martes foina*), otter (*Lutra lutra*), roedeer (*Capreolus capreolus*), Caucasian tur (*Capra caucasica*), wild goat (*Capra aegagrus*), wildboar (*Sus scrofa*) and wolf (*Canis lupus*). Killing a protected animal results in a fine of 10,000 (bear), 13,000 (tur) or15,000 (deer) Georgian lari.

Licences for hunting birds can be obtained by paying 10 Georgian lari to the government, and are issued annually for all. The licence permits the hunting of the following birds: common pochard

[12] https://www.bia.ge/EN/Company/18532?VisitCompanyType=3&ServiceId=2919

https://carsandrooms.ge/hunting-colchic-pheasant/

[13] https://carsandrooms.ge/hunting-on-a-wild-boar/

[14] https://tol.org/client/article/23001-georgia-says-come-kill-our-threatened-species.html

(*Aythya ferina*), common quail (*Coturnix coturnix*), common wood pigeon (*Columba palumbus*), corn crake(*Crex crex*), Eurasian coot (*Fulica atra*), Eurasian teal (*Anas crecca*), Eurasian wigeon (*Anas penelope*), European turtle dove (*Streptopelia turtur*), European woodckock (*Scolopax rusticola*), gadwall (*Anas strepera*), garganey (*Anas querquedula*), great snipe (*Gallinago media*), greater white-fronted goose (*Anser albifrons*), greylag goose (*Anser anser*), jack snipe (*Lymnocryptes minimus*), mallard (*Anas platyrhynchos*), northern pintail (*Anas acuta*), northern shoveler (*Anas clypeata*), rock dove (*Columba livia*), stock dove (*Columba oenas*), tufted duck (*Aythya fuligula*). Killing a bird without a licence results in a fine of between 1000-2000 Georgian lari.

As for traditional hunting, the most charismatic animals for trophy hunting are deer, tur, bear and wild boar. Decorating the walls with the stuffed heads of these animals is normal procedure in hunters' families, where a bear's hide would take pride of place. Hunting in traditional communities is a sacred activity and is imbued with countless myths and legends. Hunters usually perform strict rituals of purification that include three-day fasts and sleeping in a barn before going out on a hunting party (Zurebiani 2015). Below is a text written by Alexander (Lexo) Gavashelishvili from the Institute of Ecology, Ilia State University (29th October 2018). He is a Professor of Ecology and an expert hunter.

Thoughts of a hunter

Lexo Gavashelishvili

I was born and grew up in Kvareli, in a village that was close to the hunting grounds of the Duruji and Bursa valleys. We children followed the example given by our adult neighbours, and we dedicated our leisure to hunting. From when we were small, we hunted with slingshots and improvised homemade shotguns, but after we grew up a bit, our fathers trusted us with real shotguns. My father trusted me with a 12-bore double-barrelled shotgun when I was in my seventh year of school, and after that I never lost his trust. When I was a schoolboy, we had a neighbour Ale Lobzhanidze, a gentleman older than my father. One week before going hunting Ale stopped eating meat and did not sleep with his wife. He slept in a special bed in a barn, cellar, or elsewhere. Ale used to say that this is an old hunting rule in order to reduce the human smell that would scare the game away. From Ale and other hunters of my neighbourhood we learned a lot about hunting, which we later complemented with our own experience. When in senior high school, we went out hunting without any accompanying adults and would sleep out for a week or even longer. When

the ridge of the Great Caucasus range was covered with impassable snow, we hunted in the valleys of the Duruji, Bursa, Chelta and Avani. After the snow was gone, we crossed right over the ridge and hunted mostly in Dagestan. On our side we hunted mainly bear, boar, roe deer and deer, while in Dagestan we hunted Caucasian tur and chamois. Before hunting, we drank wine and araq'i and prayed for a blessing from Dali the Goddess of Hunting, and asked help from Ochopintre the Shepherd of Game. If successful, we skinned the dead animal on the spot, disembowelled it and cut it up, collected wood for the fire and set up camp for the night. Before going to sleep we roasted the meat, and with the first toast we gave thanks to Dali and Ochopintre. The second toast paid tribute to the soul of the dead animal. The third one was dedicated to the commemoration of the people who had passed through those places but were not alive anymore. The rest of the toasts were as usual. We were delighted in hunting in Dagestan because the locals hunted little and there was plenty of game. The head and hide of the trophy was given to the one who actually killed the animal, while the meat was divided equally among all hunters. There was a special rule for cutting and dividing the meat equally, and this required a certain ritual. We cut the meat into as many parts as the number of hunters. Then it was placed more or less equally in a circle and the least experienced or the youngest hunter would stand with his back to us so that he could not see the pieces of meat. Then one of us would point to a piece of meat and ask: "Whose piece is this?". The hunter with his back to us would then give a name and the piece of meat was given to the named person. This was continued till all the pieces were dealt out. The 'naming' hunter could name himself when he wished. In this way, nobody felt offended if somebody got more or better meat than him. If anybody made his first kill, it was the hunter's rule that we drew a cross on his forehead with the blood of the animal.

Bear hunting is distinct from other forms of hunting and manifests itself in numerous different ways, which continued even after the invention of the shotgun.

- Sarejgvela სარეჯგველა (saregveli სარეგველი): a deadfall trap made of logs. There is a saying: "Imeretian gentry do not hesitate to accept an invitation for dinner even if it is served in sarejgvela."[15]
- In Svaneti, the way of hunting the bear was using a "q'virq'v" (ყვირყვ), a kind of snaring loop made out of hazelnut stems and ropes.
- Sakhundari (სახუნდარი): an ambush set up either on a tree or on the ground near the place where the bear would be likely to pass — close to a tree or bush with ripe wild pears, chestnuts, blackberries, water source, dead prey or gala, the path often used by an animal. The bear was killed with a gunshot.
- Following tracks. Hunters find fresh tracks and carefully follow them until they locate the bear's den, then silently approach and shoot the bear. Often hunters use a breed of dog which keeps close by them

[15] Imeretian gentry were famous for being exceptionally proud of their descent even though economically very poor, Z.K.

and does not bark while hunting.

- Den hunting. Hunters find, usually with the help of dogs, the den of the bear where it hibernates. The bear tries to escape and rushes out, when the hunters kill it with spears or guns. Once I killed a bear in his den with a gun myself.
- Sareki სარეკი: a place from where the game is driven to a sakhundari (ambush). Game is flushed out by beaters into a line of standing guns. Hunting dogs are often used as assistants, hence the reason why this type of hunting is called sareki – moving game from one place to another like herding a flock of sheep.

I have already discussed the power of the bow[16]. I will just say it again: as early as 7000 years ago very powerful bows were made from yew, sharp arrowheads from obsidian, and bowstrings from sinew. A bowstring could also be made of flax. The compressive force of such a bow could reach 25-35 kg, which is more than enough to kill a large bear from 20-40 m. In Georgia bows were traditionally made of yew (probably being one of the reasons why in Pshavi and Khevsureti it is a sacred tree), but oak, elm and ash could be used too.

A bear wounded by an arrow, in contrast with a bear wounded by a bullet, would not fall down immediately. The bullet has such energy that the victim is stopped by an overwhelming shock, unlike the arrow which causes no such shock, enabling the animal to run quite a distance away. However, the arrow pierces blood vessels, causing the wounded animal eventually to collapse or bleed to death. Today too, when hunting with a bow and arrow, hunters follow the blood trail left by a wounded animal to find it (here Lexo refers to the modern sport of archery as popularised by Fred Bear[17]). The distance a wounded animal can run in fact depends on how important the damaged blood vessels are to life.

It is thought that the bow and arrow were invented during the transition from the Old to the Middle Stone Age. My own research shows that by the end of Great Ice Age (21000 to 15000 years ago), the South Caucasus bear population was divided into two distinct subpopulations: one from the Lesser Caucasus and the other one from the Greater Caucasus (Murtskhvaladze et al. 2010). Bows and arrows were already in use in all settlements of that era except in Australia and the Ocean Islands. In Switzerland, in a Karst cave, Grotte de Bichon, pieces of broken arrowhead were found in the third vertebra of a bear (Chauvière 2008). In fact, the skeleton was intermingled with bones of a young hunter, and was dated to 14,000 B. P. The reconstruction based on the position of bear and human remains suggests that the hunter wounded the bear

[16] Verbally, during the personal communication with me – the author

[17] http://www.bowhuntershalloffame.com/members/bearfred/index.html

before being killed by the dying animal.

The only breed of dog used for tracking and chasing bears remains in Guria in Georgia, but it can still be found in Lazistan and Tao, in Turkey[18]. It behaves similarly to the laika (Northern Russian and Siberian hunting dog breed, ZK) and fox terrier, combining the character of both breeds. In Guria, this dog is called mek'verne მეკვერნე (meaning a marten-hunting dog) or "chakira" ჩაქირა. To my knowledge, "chakira" is not a Georgian word, but in Turkish this might mean either a hawk or a greyish-blue colour "çakır". In Turkey proper this dog is called "zerdava", which means "marten" in Turkish, Albanian and Croatian, so it seems to be of Balkan origins[19].

The human-wolf conflict

The relationships between humans and nature, unfortunately, can take mutually detrimental forms, situations that are described as "human-wildlife conflicts". Conservation activists see these occurring when human social, economic or cultural life has a negative impact on wildlife and the natural environment (World Wide Fund for Nature 2005). However, human-wildlife conflicts are reciprocal and wildlife can also have negative impacts on human life. The 5th Annual World Parks Congress held in Montreal, 2003, came up with the following, probably the most accepted definition: "Human-wildlife conflict occurs when the needs and behaviour of wildlife impact negatively on the goals of humans or when the goals of humans negatively impact the needs of wildlife" (Madden 2004). These conflicts are worldwide and can take various forms and naturally, Georgia is not exempt from them. A relatively recent case which received publicity in Georgia was the human-wolf conflict (Kikvidze and Tevzadze 2015).

Wolves began to appear in the spotlight in early 2000s, thanks to the efforts of a prominent Georgian ethologist Jason Badridze, who views wolves as an essential part of wildlife, and was alarmed by the fact that wolf population was strongly declining in Georgia. Together with his students, he initiated a campaign for the conservation and reintroduction of wolves to the forests throughout Georgia. Despite the fact that Jason Badridze is a recognised as a world-renowned expert in wolf behaviour, he has published very little, and practically nothing can be found to cite. But he

[18] https://www.youtube.com/watch?v=N25jk9JYqkU#t=59

[19] https://www.youtube.com/watch?v=N25jk9JYqkU#t=59

conducted many interviews, and has spoken widely at conferences and meetings and fortunately, has become well known through the writings of other ethologists (e.g., Steinhart 2011, p. xiii-xiv, 90). Naturally, there were opponents of wolf reintroduction who indicated that an increased number of wolves would damage agriculture, especially the traditional holdings in remote places close to natural habitats. Indeed, reports of the damage from wolf attacks increased considerably in the early 2000s: killing livestock and even attacking humans. The majority of complaints came from the province of Khevi (Kazbegi District) and the lowland communities of western Georgia (Colchis plains), where livestock numbers had increased by an order of magnitude and where wolves found extensive habitats in abandoned tea plantations (western Georgia) or natural thickets of buckthorn (in Khevi, in the valley of the river Terek თერგი, Tergi in Georgian). A group of researchers associated with Jason Badridze, whom I joined in the later stages of data analysis, decided to conduct an ethnozoological study of this problem. Using the methods described in Chapter 1, we reported the following (details can be found in Kikvidze and Tevzadze 2015).

We conducted our study in two regions: the historical province of Khevi, now widely coinciding with the Kazbegi Municipality, and the villages around the town of Lanchkhuti (Guria and adjacent Imereti). The climates of these focal areas differ markedly: a warm temperate maritime climate of the Lanchkhuti villages versus the subalpine climate of the Khevi area. Yet the two regions shared one feature: dramatic changes in their economies after the collapse of the Soviet Union. During the Soviet era, both regions developed specialised agriculture: in the Lanchkhuti district it was growing tangerines and tea for export to Russia and in Khevi it was the export of strawberries and vegetables to Russia. Since the latter had become a corridor for the gas pipeline connecting Russia to Armenia, villagers along this route took advantage of the free gas supply to build gas-heated greenhouses. By 2000, Russia had closed the market for Georgian agricultural goods and the export-oriented economies collapsed. The villagers then switched back to animal husbandry, an activity which they had almost abandoned in previous decades. As a result, cattle numbers increased and, at the time of our research, a farmer in the Lanchkhuti area typically owned 10–15 head of livestock, consisting almost entirely of cows; in Khevi, the number was around 50–100 head of livestock, mostly cows (ca. 80 %) and sheep (up to 15 %). Before this economic conversion, the villagers in both regions had owned only one or two cows. The population of wolves also increased

by natural growth (Kikvidze and Tevzadze 2015). They attacked livestock close to pastures and villages, and damaged mostly the farms that had recently returned to cattle farming, but in the villages with poor roads where cattle farming had remained the main traditional occupation, there were no complaints of wolf attacks. Therefore, in our study we compared traditional households with the newly converted farmers (returnees). The two groups were comparable in age and education, yet respondents from the traditional households reported overwhelmingly less damage from wolves, kept farm dogs and bulls along with cows, showed much less or no fear of wolves and much greater knowledge of wolf habits. In contrast, the returnee farmers perceived a strong increase in damage from wolves, kept small-sized dogs which were in effect merely pets, many of which were lost to wolves, did not keep bulls among their cattle, showed greater fear of wolves and a much poorer knowledge of their habits.

In general, we found that the perceived damage from wolves was strongly associated with a poor knowledge of wolf habits and poor management of livestock. Remarkably, all the owners of farm dogs were those who also kept bulls in the herds. Even though returnee respondents easily appreciated the importance of such dogs for cattle protection, the role of bulls was not so clear to them. In contrast, traditional farmers knew that bulls protect their herds from wolf attacks by preventing the herd from scattering.

We concluded that the documented loss of traditions led to poor management and growth of wolf attacks, a real cause of increased human-wolf conflict in Georgia. In other words, the returnee farmers had lost the old farming traditions and replaced them with apparently common-sense based ones: “Bulls do not give milk, it is expensive keeping a farm dog.” These approaches worked while households kept a small number of cattle, but appeared to be poor practice for large-scale keeping of cattle.

Fishing

At present, fish farms play an increasing part in the fish supply for Georgia’s markets (Rice 2009; Khavtasi et al. 2010). In total, fish farms can potentially supply 10-15% of consumed fish in Georgia. Rainbow trout (*Oncorhynchus mykiss* Wallbaum ცისარტყელა კალმახი tsisart’q’ela k’almakhi) is the most farmed fish, making 61% of all farmed fish (in 2018). Next is mirror carp (*Cyprinus carpio*

carpio Linnaeus, სარკისებრი კობრი, გოჭა sark'isebri k'obri, goch'a) which supplies ca. 18% of farmed fish. Another source of fish is the Black Sea, which, however, is not particularly rich in fish and seafood resources (Gücü et al. 2017) apart from the subspecies of European anchovy (*Engraulis encrasicholus ponticus* Alexandrov ქაფშია kapshia). A popular saltwater fish is the flathead grey mullet (*Mugil cephalus* Linnaeus კეფალი k'epali). Other commercial fish include:[20]

- spiny dogfish (*Squalus acanthias* Linnaeus ქიცვიანი ზვიგენი kitsviani zvigeni).
- thornback ray (*Raja clavata* Linnaeus ქიცვიანი სკაროსი kitsviani sk'arosi)
- common stringray (Dasyatis pastinaca Linnaeus ზღვის კატა zg'vis k'at'a)
- beluga sturgeon (*Huso huso* Linnaeus სვია svia)
- starry sturgeon (*Acipenser stellatus* Pallas ტარაღანა t'arag'ana)
- European sea sturgeon (*Acipenser sturio* Linnaeus ზუთხი zutkhi
- Caspian shad (*Alosa caspia* Eichwald შავზურგა ქაშაყი shavzuga kashaq'i)
- Black Sea sprat (*Clupeonella delicatula* Nordmann ჩვეულებრივი ტიკულა chveulebrivi t'ik'ula)
- European sprat (*Sprattus sprattus* Linnaeus შავი ზღვის ქარსალი shavi zg'vis karsali)
- Black Sea salmon (*Salmo labrax* Pallas შავი ზღვის ორაგული shavi zg'vis oraguli)

Fishing for freshwater fish is a popular sport; species diversity is higher than that of saltwater fish and is listed below (including alien introduced ones):

- asp *Leuciscus aspius* Linneaus ჭერეხი ch'erekhi
- common barbel *Cyprinus barbus* Linnaeus წვერა ts'vera
- bastard sturgeon *Acipenser nudiventris* Lovetsky ფორეჯი poreji
- European bitterling *Rhodeus amarus* Bloch ტაფელა t'apela
- bleak *Alburnus* sp. Rafinesque თაღლითა tag'lit'a
- bream *Abramis brama* Linnaeus კაპარჭინა k'ap'arch'ina
- Bulatmai barbel *Luciobarbus capito* Güldenstädt ჭანარი ch'anari
- carp *Cyprinus carpio* Linnaeus კობრი k'obri

[20] https://sportfishing.ge/forum/index.php?/topic/275-%E1%83%A8%E1%83%90%E1%83%95%E1%83%98-%E1%83%96%E1%83%A6%E1%83%95%E1%83%98%E1%83%A1-%E1%83%A1%E1%83%90%E1%83%A0%E1%83%94%E1%83%AC%E1%83%90%E1%83%9D-%E1%83%97%E1%83%94%E1%83%95%E1%83%96%E1%83%94%E1%83%91%E1%83%98/

- Caucasian gobi *Ponticola constructor* Nordmann ღორჯო g'orjo
- Caucasian scraper *Capoeta capoeta* Güldenstädt ხრამული khramuli
- chub *Squalius cephalus* Linnaeus ქაშაპი kashap'i
- common bleak *Alburnus alburnus* Linneaus თეთრულა tetrula
- Danube bleak *Alburnus chalcoides* Güldenstädt შამაია shamaia
- eel *Anguilla anguilla* Linnaeus გველთევზა gveltevza
- grass carp *Ctenopharyngodon idella* Valenciennes in Cuvier & Valenciennes, 1844 ამური amuri
- gudgeon *Gobio gobio* Linnaeus ციმორი tsimori
- Kura loach *Oxynoemacheilus brandtii* Kessler გოჭალა goch'ala
- lamprey *Lampetra* sp. Linneaus სალამურა salamyra
- mursa *Luciobarbus mursa* Güldenstädt მურწა murts'a
- nase *Cyprinus nasus* Linnaeus ტობი t'obi
- perch *Perca fluviatilis* Linnaeus ქორჭილა korch'ila
- pike *Esox lucius* Linnaeus ქარიყლაპია kariq'lap'ia
- roach *Cyprinus rutilus* Linneaus ნაფოტა napot'a
- sander *Perca lucioperca* Linneaus ფარგა parga
- silver bream *Blicca bjoerkna* Linneaus ბლიკა blik'a
- silver carp *Leuciscus molitrix* Valencienn სქელშუბლა skelshbla
- spined loach *Cobitis taenia* Lennaeus გველანა gvelana
- tench *Tinca tinca* Linneaus ლოქორია lokoria
- trout *Salmo trutta* Linnaeus კალმახი k'almakhi
- vendace *Coregonus albula* Lineeaus ჭაფალა ch'apala
- wels catfish *Silurus glanis* Linnaeus ლოქო loko
- whitefish *Coregonus lavaretus* Linneaus სიგი sigi

Georgia's fish consumption is not high (FAO Fishery Statistical Collections, Consumption of Fish and Fishery Products 2017)[21]. The annual per capita consumption of fish and fish products in Georgia is under 8 kg, while in Europe and Asia it reaches up to 21 and 35 kg per capita, respectively

[21] http://www.fao.org/fishery/statistics/global-consumption/en

(Fisheries and Aquiculture in Georgia, Europe for Georgia, retrieved on Sept. 4, 2020)[22]. The Georgian tradition values fish highly as a delicacy for special occasions but not as a daily food, considering it just a substitute for meat on fast days, which are still observed in traditional communities. As the old saying goes: "Trout is better than any fish, a goat broth is better than trout" (recorded in Guria).

Medicinal use of animals

Healing traditions in Georgia rarely rely on animal products. During our research my colleagues and I encountered only one case of the use of animals: a lady in Racha recommended using cat placenta for curing multiple baby diseases. Obtaining the placenta from a cat who has just given birth is not easy; the owner has to be watchful and 'steal' the placenta from the mother cat before she eats it. After the placenta has been dried, a small piece is then cut up, blended with milk and given to a sick baby. Other uses of animals for healing are trout (the entire fish or just the skin) to heal broken bones (Adjara, healer Khabadze) and the yolk and the white of an egg for the same purpose (Tbilisi, healer Askurava). Healers rarely disclose their methods and the ingredients they use, keeping it all a family secret. Other informal reports included the use of donkey's milk to improve a baby's health. Finally, I witnessed the use of goat's fat being placed on the chest of a patient with bronchial problems. The patient was relieved, but I am not aware if this effect was long standing or not.

Kantsi: the Georgian drinking horn

Interesting from the ethnozoological point of view is the use of the drinking horn. This ancient practice is widespread in western cultures (e.g., Pollington 2011), and in Georgia (Goldstein 2013) the drinking horn takes the shape of a kantsi (ყანწი, more accurate transliteration is q'ants'i; plural: ყანწები q'ants'ebi; Figure 3.1). The difference from other cultures is that in Georgia these horns are still in regular use, and are not merely consigned to museum cases or depicted in paintings on gallery walls. A traditional kantsi is made from the horn of a Caucasian tur, bull, water buffalo or wild goat.

[22] http://eugeorgia.info/en/article/832/tevzchera-da-akvakultura-saqartveloshi-seqtoris-kvleva/

The horns are boiled, the rough parts and outer layer engraved and polished and often decorated with silver or other metallic ornaments. Nowadays, a kantsi can be made from other materials, such as clay and glass, too (Figure 3.2.).

No banquet —supra (Goldstein 2013), a vital constituent of Georgia's cultural identity, is complete without its kantsebi (Ram 2014). At supras, a kantsi is raised for a special toast in honour of the hosts, distinguished guests, on the occasion of a special birthday or anniversary (Figure 3.3). Most often this happens at wedding parties and other notable celebrations, while all regular toasts (which are an inevitable part of the supra) are raised with ordinary glasses.

Synthesis: ethnozoological profile of Georgia

Publications on the ethnozoology of Georgia, as I have previously stated, are few and far between and, to my knowledge, there are no reviews, systematic studies or any organised body of data available that I could use for revealing patterns based on statistical analyses. Therefore, the descriptions and discussions below are based on my own observations and the few references available are provided in the cited literature at the end of this chapter.

Compared to plants, the number of domestic mammal and bird species is much less, but they can be found in any corner of Georgia. Yet, as with plants, there are certain regional differences (Table 1). First of all, cattle form the basis of the traditional subsistence economy of Georgia in all regions, and are of particular importance in the highlands of both eastern and western Georgia. The sharpest regional differences that can be noted are the following: water buffaloes and guinea fowl are not normally found in the highlands and donkeys are (almost) absent in western Georgia, although mules and hinnies are occasionally mentioned in ethnographic and fictional literature. I personally have never come across any donkey in western Georgia. There is also an absence of cats, and pigs in Tusheti, where they are considered unclean.

The dog is a universally popular animal, whether used as a working dog with shepherds and hunters or kept as a pet. Cats, far less popular then dogs, are more commonly found in families in western than in eastern Georgia, the reason for this is unknown. These days there are more horses in the highlands than there are in the lowlands (both in eastern and western Georgia). Goats are more important in western Georgia's lowlands but are spread throughout the country. As they are

browsers, they can damage vegetation in dry countries, but the warm and wet forests of western Georgia regenerate vigorously and can withstand such browsing. In general, cows are more difficult to keep in western Georgia than goats, since they require pastures. Western households usually keep just a single cow. They bring it to a grass opening in the forest to graze and tether it to a peg to stop it from wandering, and in the evening, return to take it back home. Such grazing is often practised in Lechkhumi, for example. The locals call it "chabmit dzoveba" (ჩაბმით ძოვება) which means 'tethered grazing'. Finally, while sheep are one of the most important species in eastern Georgia, pigs are equally so in the western part of the country.

Among domestic birds, chickens are by far the most important and omnipresent, followed by turkeys. At the same time, ducks and geese are more often seen in western Georgia.

Even though the above regional differences are fading away under the homogenising effects of supermarkets, they are still apparent in rural areas. These remarkable differences can have an interesting interpretation and can often be explained by differences in climate caused by the proximity of sea and altitude. I will discuss these in the next chapter dedicated to ethnoecology.

As well as regional variations (Table 3.1, below), there is a variety in the use of these animals. With reference to the consumption of meat and dairy products, beef is most often eaten in eastern Georgia, especially in the highlands, followed by lamb, and pork in the lowlands. Western Georgia favours poultry especially in the lowlands, and pork and goat over lamb.

The traditional farmers of eastern Georgia habitually produce a hard type of cheese made from cows' or sheep's milk. Their western counterparts make suluguni, a type of cheese resembling mozzarella made from cow or buffalo milk. Home-made butter is a common product in eastern Georgian households and clarified butter a trademark of eastern highlanders and found nowhere else in Georgia. In western Georgia there was never any tradition of making of butter and it never formed part of their diet. Nowadays these regional differences are becoming more blurred as eastern Georgians make western-type cheese and western Georgians consume butter; yet ethnographical materials in regional museums show no tools for making butter in western Georgia. Eastern Georgian farmers make matsoni (a local sort of yoghurt), which has now spread to western Georgia. Conversely a whey curd (nadug'i ნადუღი), which is spiced with mint and salt before consumption, was traditionally made in western Georgia but has now become common in eastern Georgia. The

differences are also clear in cured meats. Kupati, a spicy sausage made with either pork or beef, is the only type of sausage in western Georgia, while eastern Georgians commonly eat salted pork and pig backfat instead of sausages. A traditional preserve is salted and sun-dried beef, mostly made in Meskheti, eastern Georgia. Western Georgian highlanders have a tradition of smoked meat, nowadays mostly pork, but smoked poultry is common too. Not to be left out is the very rare speciality of sheep tail fat made by shepherds in the eastern highlands, who salt it and smoke it, but usually refrain from offering it to strangers, believing that it is only they who understand the value of its specific sheep flavour. Indeed, I myself have observed many people turning their noses up at this delicacy. However, it is a tender dish when boiled, albeit too fatty and when used as a filling with garlic in baked aubergines (badrijani dumit ბადრიჯანი დუმით in Georgian) is very tasty.

In general, animals and their uses in Georgia show less pronounced regional differences than plants, yet are similar (Figure 2.1) in that that the main factors of variation are location (east versus west) and elevation (the lowlands versus the lowlands). Naturally, the differences in climate are mainly responsible for regional variations at the basic level: nature and the character of the ecosystem define the available resources for traditional households. Indeed, keeping cattle is easier in eastern Georgia and the highlands, while in western Georgian lowlands, the number of cattle has been reduced. This, as might be expected, is reflected in the use of animal products. Yet nowadays regional differences in traditional cuisine are disappearing as westerners and easterners cook similar dishes, especially in the lowlands. However, eastern highlanders are still proud of their dumplings (khink'ali ხინკალი) and boiled lamb (ხატის წვენი khat'is ts'veni) spiced with local herbs collected in the wild (species of thyme); in Samegrelo people praise their katsari (ქაცარი), a goat kid roasted in a tone (თონე) — a traditional oven resembling a tandoori oven; Imereti is famous for kharcho (ხარჩო, a soup made of beef, rice, cherry plum purée and chopped walnuts), Kakhetians and Kartlians believe that their mtsvadi (mts'vadi მწვადი, skewered barbecue) and khashlama (ხაშლამა, boiled beef with coriander and salt) are the best meat dishes in Georgia; Racha, Lechkhumi, Lashkheti (a part of Lower Svaneti) are famous for their ham and bean pies; Adjarian highlanders are proud of their dairy products. On several occasions, I heard about a legendary dish: "The King's Egg". An egg is placed in a chicken, which is placed in a piglet, which is placed in a lamb; finally the lamb is placed in a cow and sewn up tightly. Then the entire construction is roasted until the cow is

completely charred, then it is discarded and the meat delights inside are distributed among the guests. However, it was only the king who had the right to eat the egg. Let me add that I have never seen such a dish, but have found a very similar description in books dedicated to the cuisine of Soviet peoples, in the sections of Georgian cuisine (e.g., Pokhlebkin 2009). Nevertheless, Georgians are delighted to have such a dish, even if in the form of legend.

Table 3.1. This shows the relative importance of animal species to traditional subsistence agriculture in the different regions of Georgia, according to a five-star scale, no stars meaning complete absence to five stars indicating high frequency.

Animal species	Eastern Georgia		Western Georgia	
	Lowlands	Highlands	Lowlands	Highlands
Cat	★★	★	★★★	★★
Cattle	★★★★	★★★★★	★★★★	★★★★★
Dog	★★★★★	★★★★★	★★★★★	★★★★★
Donkey	★★	★★	-	-
Goat	★★	★	★★★★	★★★★
Horse	★★★	★★★★	★★★	★★★★
Pig	★★★★★	★★★	★★★★★	★★★★
Sheep	★★★★	★★★★★	★	★
Water buffalo	★★★	-	★★★	-
Chicken	★★★★	★★★★	★★★★★	★★★★
Goose	★★	★	★★★	★★
Duck	★★★	★★	★★★★	★★★
Guineafowl	★	-	★	-
Turkey	★★★★	★★★	★★★★★	★★★★

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Appendix 3.1. List of mammal and bird species under protection in Georgia

Mammals

- Bechstein's bat *Myotis bechsteinii* Kuhl გრძელყურა მღამიობი grdzelq'ura mg'amiobi
- brown bear *Ursus arctos* Linnaeus მურა დათვი mura datvi
- Caucasian birch mouse *Sicista caucasica* Vinogradov კავკასიური თაგვანა k'avk'asiuri tagvana
- chamois *Rupicapra rupicapra* Linnaeus. არჩვი archvi
- common bottlenose dolphin *Tursiops truncatus* Montagu აფალინა apalina
- East Caucasian tur *Capra cylindricornis* Blyth დაღესტნური ჯიხვი dag'est'nuri jikhvi
- Eurasian beaver *Castor fiber* Linnaeus თახვი takhvi
- Eurasian harvest mouse *Micromys minutus* Pallas პაწია თაგვი pats'ia tagvi
- Eurasian lynx *Lynx lynx* Linnaeus ფოცხვერი potskhveri
- Eurasian otter *Lutra lutra* Linnaeus ევრაზიული წავი evraziuli ts'avi
- goitered gazelle *Gazella subgutturosa* Güldenstaedt ქურციკი kurtsik'i
- grey dwarf hamster *Cricetulus migratorius* Pallas ნაცრისფერი ზაზუნელა natsrisperi zazunela
- harbour porpoise *Phocoena phocoena* Linnaeus ზღვის ღორი zg'vis g'ori
- Kazbeg birch mouse *Sicista kazbegica* Sokolov Baskevich and Kovalskaya ყაზბეგის თაგვანა q'azbegis tagvana
- Kluchor birch mouse *Sicista kluchorica* Sokolov Kovalskaya and Baskevich ქლუხორის თაგვანა klukhoris tagvana
- leopard *Panthera pardus* Linnaeus ჯიქი jiki
- long-clawed mole vole *Prometheomys schaposchnikovi* Satunin პრომეთეს მემინდვრია p'rometes memindvria
- marbled polecat *Vormela peregusna* Güldensthdt ჭრელტყავა ch'relt'q'ava
- Mediterranean horseshoe bat *Rhinolophus euryale* Blasius სამხრეთული ცხვირნალა samkhretuli tskhvirnala
- Mediterranean monk seal *Monachus monachus* Hermann თეთრმუცელა tetrmutsela
- Mehely's horseshoe bat *Rhinolophus mehelyi* Matschie მეჰელის ცხვირნალა mehelis cxvirnala
- Nehring's blind mole-rat *Nannospalax nehringi* Satunin ბრუცა brutsa
- Pontic bank vole *Clethrionomys glareolus ponticus* Schreber წითური მემინდვრია ts'ituri

memindvria

- red deer *Cervus elaphus* Linnaeus კეთილშობილი ირემი ketilshobili iremi
- jungle cat Schreber ლელიანის კატა lelianis k'at'a
- striped hyena *Hyaena hyaena* Linnaeus ზოლებიანი აფთარი zolebiani aptari
- tiger *Panthera tigris* Linnaeus ვეფხვი vepkhvi
- Tristram's jird *Meriones tristrami* Thomas მცირეაზიური მექვიშია mtsireaziuri meqvishia
- Turkish hamster *Mesocricetus brandti* Nehring ამიერკავკასიური ზაზუნა amierk'avk'asiuri zazuna
- West Caucasian tur *Capra caucasica* Güldenstaedt and Pallas დასავლეთკავკასიური ჯიხვი dasavletk'avk'asiuri jikhvi
- Western barbastelle *Barbastella barbastellus* Schreber ევროპული მაჩქათელა evrop'uli machkatela
- wild goat *Capra aegagrus* Linnaeus ნიამორი niamori

Birds

- barn owl *Tyto alba* Scopoli ბუხრინწა bukhrints'a
- bearded reedling *Panurus biarmicus* Linnaeus ულვაშა წივწივა ulvasha ts'ivts'iva
- bearded vulture *Gypaetus barbatus* Linnaeus ბატკანძერი bat'k'andzeri
- black stork *Ciconia nigra* Linnaeus ყარყატი q'arq'at'i
- boreal owl *Aegolius funereus* Linnaeus ჭოტი ch'ot'i
- Caspian snowcock *Tetraogallus caspius* Gmelin კასპიური შურთხი k'asp'iuri shurtkhi
- Caucasian grouse *Tetrao mlokosiewiczi* Taczanowski კავკასიური როჭო k'avk'asiuri roch'o
- cinereous vulture *Aegypius monachus* Linnaeus სვავი svavi
- common crane *Grus grus* Linnaeus რუხი წერო rukhi ts'ero
- Dalmatian pelican *Pelecanus crispus* Bruch ქოჩორა ვარხვი kochora varkhvi
- Eastern imperial eagle *Aquila heliaca* Savigny ბექობის არწივი bekobis arts'ivi
- Egyptian vulture *Neophron percnopterus* Linnaeus ფასკუნჯი pask'unji
- golden eagle *Aquila chrysaetus* Linnaeus მთის არწივი mtis arts'ivi
- greater spotted eagle *Aquila clanga* Pallas დიდი მყივანი არწივი didi mq'ivani arts'ivi

- great rosefinch *Carpodacus rubicilla* Güldensthdt დიდი კოჭობა didi koch'oba
- great white pelican *Pelecanus onocrotalus* Linnaeus ვარდისფერი ვარხვი vardisperi varkhvi
- Güldenstädt's redstart *Phoenicurus erythrogastrus* Güldenstädt წითელმუცელა ბოლოცეცხლა ts'itelmutsela bolotsetskhla
- lanner falcon *Falco biarmicus* Temminck წითელთავა შავარდენი ts'iteltava shevardeni
- lesser kestrel *Falco naumanni* Fleischer მცირე კირკიტა mtsire k'irk'it'a
- lesser white-fronted goose *Anser erythropus* Linnaeus პატარა ღერღეტი p'at'ara g'erg'et'i
- Levant sparrowhawk *Accipiter brevipes* Severtzov ქორცქვიტა kortskvita
- little bustard *Tetrax tetrax* Linnaeus სარსარაკი sarsarak'i
- long-legged buzzard *Buteo rufinus rufinus* Cretzschmar ველის კაკაჩა velis k'ak'acha
- marbled duck *Marmaronetta angustirostris* Menetries მარმარილოსებრი იხვი marmarilosebri ikhvi
- Radde's accentor *Prunella ocularis* Radde. ჭრელგულა ჭვინტაკა ch'relgula ch'vintak'a
- red-footed falcon *Falco vespertinus* Linnaeus თვალშავი tvalshavi
- red-necked grebe *Podiceps grisegaena* Boddaert მურტალა murt'ala
- ruddy shelduck *Tadorna ferruginea* Pallas წითელი იხვი ts'iteli ikhvi
- saker falcon *Falco cherrug* Gray გავაზი gavazi
- stone curlew *Burhinus oedicnemus* Linnaeus თვალჭყეტია tvalch'q'et'ia
- velvet scoter *Melanitta fusca* Linnaeus გარიელი garieli
- white-headed duck *Oxyura leucocephala* Scopoli თეთრთავა იხვი tetrttava ikhvi
- white stork *Ciconia ciconia* Linnaeus ლაკლაკი lak'lak'i
- white tailed sea-eagle *Haliaeetus albicilla* Linnaeus თეთრკუდა ფსოვი tetrkuda psovi

Figure 2.1. Sculpture of a toastmaster (tamada) holding a drinking horn (kantsi). Copy of the 7th century BC bronze figurine found at the archaeological site of Vani, western Georgia. The sculpture is now situated in the centre of Tbilisi, near the Sioni cathedral. (https://commons.wikimedia.org/w/index.php?curid=31648204)

Figure 3.2. Example of modern kantsebi (https://commons.wikimedia.org/w/index.php?curid=25678360)

Figure 3.3. "A banquet of Bego's friends". Painted in the 1910s by the famous Georgian naïve painter Niko Pirosmani (Pirosmanashvili). The original is kept in the State Museum of Oriental Art in Moscow, Russian Federation (www.pirosmani.org, Public Domain, https://commons.wikimedia.org/w/index.php?curid=4971812).

Chapter 4. Ethnoecology of Georgia

A historical introduction

Ethnoecology differs from its sister sub-disciplines ethnobotany and ethnozoology in a particular way. Most of the ethnobotanical and ethnozoological concepts are as ancient as our civilisation, their origins can be traced back to the Ancient Greek philosophers and scientists Theophrastus (c. 371–287 B.C.E.) and Aristotle (384–322 B.C.E.) who included use by humans in their description of plants and animals. By contrast, the ecological concepts that underpin ethnoecology are much younger. The writings of the founder of biogeography, Alexander von Humboldt, who was writing in the early 19th century (see, e.g. Humboldt and Bonpland 1819), include an exemplary study that contains qualitative but very exact descriptions of the interaction between human societies and nature (Ackerknecht 1955), and this can be considered one of the first modern ethnoecological texts. The basic ecological concepts on the relations between living beings and their environment started to appear as early as the 18th century and the term "ecology" was coined by Ernst Häckel in 1866 in his book *Generelle Morphologie der Organismen*. These concepts gradually entered ethnoecological thinking although the terms "ethnoecology" and "ethnoecological approach" appeared much later, in the mid-1950s, in the works of the American anthropologist Harold Conklin (1954).

A modern definition of ethnoecology can be found on the web page of the International Society of Ethnobiology, where it is stated that it is

> "the study of complex relationships, both past and present, between human societies and their environment. Its uniqueness lies in its explicit emphasis on local peoples' perceptions, knowledge and understandings of their own reality and problems".[23]

I largely comply with this definition and understand ethnoecology as knowledge of the traditions that regulate the reciprocal interaction between human societies and the ecosystems they dwell in. The traditions and rules concerning ecosystems acquire clear meaning in the general and key concepts of modern biogeography, macro-ecology, community ecology and ecosystem theory as they

[23] http://www.ethnobiology.net/ethnoecology/

shed light on the importance of traditional land use, water management and economy styles in relation to the sustainability of traditional subsistence systems.

The history of interactions between humans and their ecosystems in Georgia can be divided into three phases.

The first phase began when anatomically modern humans arrived in Georgia some 40,000 years ago. These humans already brought with them traditions of hunting and gathering; archaeological finds show clearly that, over time, these traditions changed (the previous chapter) and matured into new traditions that were associated with better hunting tools and skills. About 9,000 years ago human lifestyles began to change rapidly owing to the advent of agriculture. Many of the old traditions disappeared, while some of them persisted and blended with the new agricultural methods. In short, this first phase can be associated with the emergence and development of traditions, which carried on until the Late Bronze Age.

This second phase of Georgia's ethnoecological history began 3,000 years ago and can be termed a period of the conservation of mature traditions. Indeed, for the last three millennia, the traditions formed in the Late Bronze have lasted until almost the present day. This is a remarkable persistence and a sign of the strong ability of traditional subsistence systems to adapt to various environments, resist the impacts of climate change and influences from other ethnic cultures.

The present time is the third phase, when traditional subsistence systems are rapidly declining. In the lowlands, new styles of farming are being introduced, based on highly productive commercial breeds of domestic plants and animals to the detriment of traditional, local landraces. These new styles also introduce machinery, fertilisers, pesticides, glasshouses and irrigation pipelines, which replace traditional land use and water management. In the highlands, traditional substance systems have declined owing to the migration of the younger generation and depopulation of the villages.

At present, the only narrow niche where traditional subsistence and its products find profitable application is the hospitality business, where local traditional cuisine, organic food and local festivals attract visitors through organised cultural, educational and ecological tours (Tevzadze and Kikvidze 2016). I must also mention organic farming, which often relies on traditional subsistence technologies. The most notable of these is the resurrection of traditional methods of winemaking, which increasingly feature in marketing. This includes traditional grape vine cultivation methods as

well as ancient fermenting technologies using kvevrebi, the man size clay jars that are buried in the ground (e.g., documentaries aired by the 1st Channel of the Georgian Public Broadcast Service[24]). At any rate, one of the main aims of ethnoecology in Georgia is to preserve the traditional ways of using natural resources and ecosystem services by recording these traditions as accurately as possible. As mentioned above, they are a rapidly disappearing part of our culture, while having a strong potential for various applications in pharmacy, food industry, organic farming.

Climate and landscapes

One of the fundamental principles of ecology states that the properties of a given ecosystem are determined by the climate of a given area; the implication is that climate will also determine how these ecosystems can be sustainably managed. Latitudinally, Georgia is situated within the temperate climate zone. However, the particular geographic setting of this country makes the character of its climate remarkably diverse. The most important determinants of the climate are the Black Sea, to which the country is exposed on its western side, (Figure 1.9) and the ranges of the Greater and Lesser Caucasus mountains. The mass of moist, warm sea air spreads eastwards until it reaches the mountains of the Greater Caucasus to the north, which block it from the cold and dry Arctic and Siberian cyclones coming from the north, and send it further eastwards. Similarly, the Lesser Caucasus Mountains to the south block the hot and dry winds coming from the arid south and east, and direct the air towards the east of the country. However, there are also mountain ranges of generally meridional orientation (Likhi Range, Meskheti Range), that connect the Greater and Lesser Caucasus mountains in central Georgia and these limit further eastward movement of the sea air. As a consequence, the effect of the Black Sea is most substantial in the plains of western Georgia, where the air materialises into a climate characterised by relatively high temperatures and evenly distributed precipitation. This allows for growing tea, oranges, feijoa and other tropical and subtropical fruits. This influence from the Black Sea is much reduced in eastern Georgia and some plains suffer regular summer droughts where trees cannot grow naturally. No farming is possible here without artificial irrigation. However, the mountain foothills and mild slopes occupy large areas in Georgia and here the moderate climate allows farming styles that are usual for temperate zones.

[24] https://www.youtube.com/watch?v=Q7UidSaazDo

Finally, there are high mountains with vast alpine meadows suitable for transhumant herding. For those who appreciate quantitative descriptions, Appendix 4.1. provides technical details of the climate character of Georgia.

Precipitation strongly affects the type of natural vegetation, biological resources and ecosystem services that are available for traditional households. In the eastern lowlands (Kartli, Kakheti, Javakheti) where precipitation is low, forests are either absent or only appear as thin, open woodlands. Consequently, subsistence households have to adapt to a scarcity of forest resources such as timber. This is reflected in the traditional architecture of the so called darbazi type houses first described by Marcus Vitruvius Pollio in 1860. These are stone dwellings half dug in the earth and with low conical rooves made of thick wooden boards placed circularly. Space for domestic animals, utility rooms such as a kitchen and toilet were all under the same roof (Figure 4.1). The lack of precipitation in these lowlands is combined with climate continentality, which means very cold winter nights and very hot summer days. Darbazi architecture therefore serves as protection from these extreme conditions not only for humans but also their domestic animals (Kaldani 1990). At the same time, the presence of cattle indoors on winter nights helps conserve the heat (in summer, cattle are kept outdoors). Instead of timber, dried dung was used as a fuel for heating and cooking.

The situation is contrastingly different in the western lowlands, where precipitation is high and the forests are luxuriant and timber plentiful. Accordingly, traditional households actively use wood for construction (Figure 4.2). Residential buildings, cattle barns, hen houses and sheds for pigs, sheep and goats, kitchens, bathrooms and toilets are all wooden and form separate buildings.

In the highlands, precipitation is moderate and forests can grow to a level as high as 2500 m a.s.l.. However, the challenge here is the cold. The traditional architecture of highlanders, both eastern and western, is characterised by massive, fortified stone houses (Figure 4.3), where domestic animals are kept indoors, as in the eastern lowlands.

In the rest of Georgia, at the altitudes of 500 to 1200 m on the foothills and slopes, the climate is moderate, and forest resources are available. Here the architecture can be a mixture of various styles, most commonly a simple two-stored house with a balcony (Figure 4.4) and ancillary buildings usually stand apart.

As mentioned above, the differences in climate and vegetation types are also important to subsistence styles: I describe them next.

Subsistence types

Subsistence systems depend on climate characteristics, which in turn depend on location. This, and the patterns of variation in climate described above (and Appendix 4.1), help distinguish four major regional subsistence types (summarised in a table below), which also contain subregional variations. This classification is based on irrigation, because the variation of precipitation is the most salient characteristic of climate across Georgia. However, it should be noted that here I will only discuss traditional irrigation systems, that is, systems that could be built by the traditional communities in which skills and knowledge were transferred tacitly down through the generations. These traditional irrigation systems are studied in Georgia ethnographically (see Gegeshidze 1961 for a review), and based on archaeological evidence (e.g., Kikvidze 1963). My descriptions of subsistence traditional types of Georgia are largely taken from these two books.

Location	Eastern Plains	Mid altitudes	Highlands	Western plains
Climate	Warm and dry	Moderate	Cold with moderate precipitation	Warm and wet
Farming	Irrigated	Mixed or rainfed	Rainfed	Drainage
Herding	Steppe pastures and hay meadows	Forest pastures and hay meadows	Alpine pastures subalpine hay meadows	Forest pastures and hay meadows
Major habitats	Steppe, scrub, dry woodlands	Temperate forest	Subalpine forests and alpine meadows	Colchic forests and marshes

The driest part of Georgia is found in the Eastern plains: Kvemo Kartli and Outer Kakheti between the rivers of the Kura and Iori; the Eldari plain, the historical region of Kukheti, Samgori Valley; the environs of Tbilisi: Digomi, Ponichala; the Inner Kartli Plain: the Municipalities of Kaspi, Gori, Kareli and Khashuri (Fig. 4.3). Precipitation is not only scant but its distribution is also very unfavourable for agriculture: rains begin to fall in late autumn and continue only through the winter.

These areas require the most intensive irrigation and the fields need watering from spring until harvest, as no farming is possible without it. In this region, droughts become less severe towards the north (Sagarejo Municipality of Outer Kakheti) and west (Khashuri Municipality of Inner Kartli), where spring rains are frequent and the fields require less watering. Traditional irrigation was possible only close to rivers or slopes with springs. One such easily irrigable area is the valley of the river Debeda, a tributary of the Khrami in the driest part of Kvemo Kartli. It is easy to water adjacent fields with channels from the river, and this type of traditional irrigation has continued here for millennia. Local orchards and fields were famous for their produce and are described in detail by Prince Vakhushti (Bagrationi 1973), who was impressed by the diversity of the harvests. Other small rivers, mostly left-bank tributaries of the River Kura in Inner Kartli are those of the Kaspi and Gori municipalities: the Rivers Darbatana, Darbazula, Kavtura, Khekordzula, Lekhura, Nichbura, Nostura, Tana and many others were used in traditional irrigation. At present, these systems are integrated into modern irrigation systems, and some of them, e.g., Khekordzula, still retain their traditional, primitive design (Kikvidze 1963, p.46-48). Traditional irrigation naturally could not be relied on in all of these regions, in which a very considerable area is composed of dry, waste grasslands, used as pastures. To sum up, the economy of this group of traditional households was based on animal husbandry and irrigated farming. This explains the high consumption of animal products in this region (Chapter 3).

The second group of traditional households can be found throughout Georgia at mid- altitudes: piedmonts, mild slopes and plateaus. Two subgroups can be distinguished: mixed irrigation in the east and rainfed farming in the west. The climate here is moderate, and precipitation can support rainfed wheat fields, whilst vineyards, orchards and gardens are watered in the same way as described above: small channels taken from nearby rivers or drained from the springs of nearby slopes. Households with such mixed irrigation can be found in the Alazani Valley and northern Municipalities of Kakheti (Akhmeta, Gurjaani, Kvareli, Lagodekhi, Sighnaghi, Telavi); the northern part of Inner Kartli (Tskhinvali Region, Mtskheta Municipality); the historical provinces of Meskheti (Municipalities of Abastumani, Akhaltsikhe, Aspindza, Borjomi, Vale) and Javakheti (Akhalkalaki, Tsalka, Ninotminda). Households at mid-altitudes found in the western Georgian regions of Upper Imereti, Lower Racha, Lechkhumi, Lower Svaneti, part of Smagrelo called Lakada (Tsalenjikha and

Chkhorotsku Municipalities), part of Guria (Chokhatauri Municipality), Municipalities of Shuakhevi and Keda in Adjara make a subgroup in which the subsistence system is generally based on rainfed farming. The major natural ecosystem in the entire group is temperate forest. However, the eastern subgroup is somewhat drier and the terrain allows for clearing and maintaining more pastures and hay meadows than its counterpart in the west, where pastures are often limited by riparian forests and smaller clearings. Therefore, in the eastern subgroup animal husbandry is more important than in the western. Farming is based on wheat in the eastern subgroup and on maize (millet in past) in the western. A considerable amount of grain in the eastern subgroup is fed to cattle, while in western mid-altitude households, livestock is kept to a minimum and most of the surplus grain goes to pigs and domestic birds, mainly chickens and turkeys (Chapter 3).

The wettest regions of Georgia are those near the Black Sea coast: the Municipalities of Khelvachauri and Kobuleti and environs of Batumi in Adjara; Municipalities of Ozurgeti and Lanchkhuti in Guria, environs of Poti; Municipalities of Khoni, Samtredia and Vani in Lower Imereti; Municipalities of Abasha, Khobi, Martvili, Senaki, Zugdidi; environs of Sokhumi, Municipalities of Gali, Ochamchire, Gagra, Gudauta and Gulripshi Municipalities in Abkhazia. The climate here gives such a surplus of rainfall that the fields require draining. Traditional farmsteads are built on natural hills or artificial mounds and are surrounded with ditches to let this surplus water drain down to rivers, marshes or the sea. Forests are of the luxuriant Colchic type, with a strong ability to regenerate. Animal husbandry is more important here than in households with rainfed farming in adjacent inland regions because the winters are very mild, vegetation is accordingly vigorous and fodder is available almost all year round. Water buffaloes are prominent here (especially in Samegrelo) providing milk for cheese and other dairy products, whilst sea fisheries play a notable role in some areas, especially the nearby cities of Batumi, Poti and Sokhumi.

The fourth type of households can be found at high altitudes: northern districts of Dusheti and Akhmeta Municipalities in the central Caucasus, Mestia Municipality in Upper Svaneti, Khulo Municipality in Upper Adjara. Farming here is rainfed except for Upper Svaneti. Rainfall is less than at high altitudes of the central Caucasus and the locals build traditional irrigation networks to water hay meadows and fields of potatoes (in the past, proso millet fields). At these altitudes the characteristic ecosystems are alpine meadows and subalpine forests. Animals play a very important

role, whilst arable farming is based on barley, and nowadays potatoes (Chapters 2 and 3). However, alpine pastures can sustain cattle only during the three summer months. In autumn they are kept on valley pastures, and during winter and some of the spring months their diet is almost entirely hay from the meadows. These meadows are established in wide clearings in subalpine forests, haystacks are moved down to the village in autumn, either simply sliding using grass sledges or carts pulled by oxen.

Irrigation is certainly not the only major technology used by traditional households in Georgia. Below I will discuss other important technologies too, among them field rotation, intercropping, hay meadows and deep ploughing.

Intercropping

Intercropping is a farming practice involving two or more crop species, or genotypes growing together and coexisting at the same time on the same field (Brooker et al. 2015; Martin-Guay et al. 2018). This is not a very common agrarian technique worldwide, yet experimental research is conducted quite intensively in various centres (e.g., The Organic Research Centre in Cirencester, UK[25]; Trakya Agricultural Research Institute in Edirne, Turkey[26]; James Hutton Institute in Aberdeen, UK[27]) with a hope that intercropping can achieve a greater yield from a given field: if properly selected, coexisting different plant species with different structures and requirements of soil nutrients can utilise more local resources than a single species. Modern intercropping is considered to have a possible** major part in sustainable intensification of agriculture worldwide, as it could potentially increase world agricultural output by 38% or reduce the need for arable lands by 23% (Martin-Guay et al. 2018). However, sowing mixed seeds of two or more cereal species was very common practice in times as ancient as the New Stone and the Chalcolithic Age (Kikvidze 1963, p.19-20). The purpose of traditional intercropping, though, was not an increase of yield but an insurance against summer droughts. It was widespread in rainfed farming and documented also quite

[25] https://www.organicresearchcentre.com/

[26] https://arastirma.tarimorman.gov.tr/ttae/Sayfalar/EN/Anasayfa.aspx

[27] https://www.hutton.ac.uk/

recently by ethnographers in eastern Georgia (Chitaia 1949; Beriashvili 1973). The usual mixtures were local wheat dik'a (*Triticum turgidum* subspecies *carthlicum*) and barley (*Hordeum sativum*). This certainly gave less harvest than if sown separately, as these two cereals ripen at different times. The loss, however, is traded off for a guarantee that at least a part of harvest will be saved. Barley grows faster and shades the wheat and if there is plenty of spring rain, the barley ripens first and is harvested, while the wheat is foregone. If, however, a summer drought starts early, the barley withers away, while at the same time shading and protecting the wheat which yields grain in the autumn. In other words, a traditional farmer uses intercropping to reduce drought-related risks. A similar measure is deep ploughing, which is also actively practised by modern farmers. The purpose of deep ploughing is to increase the soil water retention ability. Today, deep ploughing means a depth greater than 50 cm, whilst the usual depth rarely exceeds 20 cm (e.g., Baumhardt et al. 2008).

Land management

Field rotation allows for growing a sequence of different plants on the same fields with the aim of maintaining fertility and decreasing the risk of soil-born attacks. The rotation systems used traditionally in Georgia vary from almost no rotation (in the plains of western Georgia) to systems which rotate three or more (at mid altitudes of Georgia). The most elaborate seven-field rotation, as documented by ethnographers in the Javakheti Plateau, was practised until the middle of the last century (George Zedginidze, the report to the Institute Ethnology registered on July 22, 1982). Under this regime, the first field is sown with dik'a wheat (*Triticum turgidum* subspecies *carthlicum*), the second with a legume (usually bitter vetch *Vicia ervilia*), the third with barley (*Hordeum vulgare*) and the fourth with a legume; three fields are left fallow. In this way, each field is sown with a cereal and legume sequentially for four years and then is left fallow for the next three consecutive years. In almost all rotation systems wheat and barley present invariably, while bitter vetch can be replaced by other legumes such as grass pea (*Lathirus sativus*), common vetch (*Vicia sativa*), and honey clover (*Melilotus albus*) (Pruidze et al. 2016). Three and four field rotation systems have also been documented in other regions: Shida Kartli, Racha, Meskheti and Kakheti (Beriashvili 1973; Baidauri 2006).

The selection of fields for arable farming is a special task. In the dry eastern plains it is dictated by the ease of irrigation, whilst in western lowlands by the possibility of drainage. At mid-altitudes fields are rainfed and local variations in climate become important. In western Georgia where there is a relatively humid climate, the fields are chosen on southern and eastern slopes as they are sunnier and drier. In eastern Georgia, on the contrary, the fields are chosen to be exposed to the western and northern humid winds and be sheltered from the dry winds of the south and east. In the highlands, cereal fields and vegetable gardens are exposed to the sun. Where winters are hard and long (eastern and western highlands, Javakheti Plateau) hay meadows acquire a special importance as they provide fodder for the cattle which are overwintered in barns. Wide areas are arranged as hay meadows, usually on slopes cleared of subalpine forests and are regularly mown once a year; the mown grass is dried and collected in stacks, and after approximately two weeks new grass grows and the cattle are allowed to graze on it again.

In rural Georgia there is a strong tradition of forest management. Villages often have their own forests, which they have succeeded in managing sustainably over millennia by selective logging, rotation (subalpine forests), coppicing and pollarding (mostly riparian forests). As such, the traditions of forest management in Georgia deserves a separate study. Here I will only describe a rotation management preserved in the eastern highlands in the province of Khevi. The dominant species of the subalpine forests here is birch (*Betula pubescense* subsp. *litwinowii*). The forests are largely cleared for hay meadows and pastures, but each village maintains a part for rotational felling, which appear as an island in the meadow. Each woodland is divided into 25 strips, which are cut consecutively once a year thus-self-regenerating every 25 years until it is cut again. Sacred forests are never touched and they usually adjoin important places of worship (Kopaleishvili 1993). A good example is again in Khevi — the famous Holy Trinity Church near the village of Gergeti, on the right bank of the river Chkheri, situated at an altitude of 2170 m a.s.l. The sacred forest below the church, on the slopes down to Stepantsminda, is traditionally kept untouched. There is another example above the village of Zoti (Guria, Chokhatauri Municipality) where there is a large strip of sacred forest, which the villagers believe protects them from landslides, mudslides, avalanches and other natural disasters.

Tourism and traditions

The tasks of ethnobiology include not only the proper documentation of traditional subsistence systems, but also the conservation of these traditions as invaluable parts of the Georgian culture. We can see both how traditions disappear and also see cases where they are kept alive. Understanding why requires an exact knowledge of the ecological meaning of a tradition, which is one of the major aims of ethnoecology.

Sometimes this is obvious; for example, irrigation clearly aims at increasing crop productivity. But other traditions may require more research to elucidate a meaning. For example, intercropping makes sense in areas where there is a serious risk of summer drought and irrigation is not feasible. The knowledge of the context for a tradition is very important, especially for the revival and conservation of given traditions.

In this section, a case study is described to illustrate this. It was conducted in two regions with similar physical and biological environments, yet with different historical factors. The traditions appeared to be beneficial to the development of tourism and have been restored in one of these regions, yet disappearing in the other (Tevzadze and Kikvidze 2016).

This study largely employed the concept of socio-ecological systems as discussed in Chapter 1. They were applied to two traditional communities of two high-mountains areas: Upper Svaneti and Upper Adjara. Indeed, these communities live in relative isolation and their subsistence largely depends on local resources, a prerequisite for considering a settlement to be a socio-ecological system (Redman et al. 2004). Let me say that the concept of socio-ecological systems originates from complexity theory, but considers typical societal and economic problems such as land use, equity and human well-being as an aid to understanding the context of local traditions. These traditions can develop differently in different historical, geographical, climatic, political and social settings. Owing to impacts from outside, or as a result of internal developments, the context can change and the old traditions might lose their meaning which can put the entire socio-ecological system into a strain. In other words, socio-ecological systems can exhibit a certain adaptability, but if change is too strong, these systems might also collapse.

Above in this chapter we have seen that climate character and environmental conditions converge at high altitudes (Figure 4.6, Appendix 4.1) as our two study regions clearly demonstrate.

Traditional communities in the Upper Adjara and Upper Svaneti are found in the subalpine zone, where natural forests are dominated by conifers (spruce, pine, fir), with an admixture of broad-leaved species (beech, oaks, chestnuts, limes). They are also rich in wild edible fruits such as apples, pears, cherries and prunes as well as hazelnuts and all sorts of berries. The same animals can be found in both Upper Adjara and Upper Svaneti: bears, wolves, foxes, jackals, lynxes, badgers, deer, hares, boars, eagles, falcons, hawks and ravens. The traditional subsistence economy in both regions also shows a strong similarity in agrarian technologies, as might be expected from the similarities in the natural landscapes and environment.

In total, we interviewed 38 locals in both locations. Culturally, the two regions have different backgrounds. Adjara received considerable cultural influence from Turkey during the Ottoman period, and in Upper Adjara people celebrate Eid al-Adha. Yet, ancient Georgian traditions were also strong and Islam did not pervade Adjara as strongly as other Muslim communities of the Ottoman empire (Sanikidze and Walker 2004). For example, pork and wine are taken in many traditional communities in Adjara, many households keep pigs and distil alcohol (authors' personal observation). Likewise, traditional communities in Upper Svaneti are nominally Christians, but their culture contains many local pre-Christian elements (Kiknadze 1996; Tuite 2004). Despite this difference in historical backgrounds, the two regions showed a marked similarity in the use of ecosystem services and the organisation of subsistence economy. Indeed, we found that, both in Upper Adjara and Upper Svaneti:

- The fields were mainly occupied by maize, beans and potatoes.
- The main fruit trees in orchards were apple, blueberry, cherry, cherry plum, pear, plum.
- The animals kept in households were cats, chickens, cows, dogs, goats, pigs, sheep and turkeys, the most important being cows and goats.
- Animal husbandry was based on summer pastures, winter indoor feeding, village pastures and extensive use of hay meadows.
- Berries and medicinal plants gathered in the forests were achillea, bilberry, blueberry, celandine, chamomile, cherry laurel, coltsfoot, currants, hogweed, raspberry, St John's wort, strawberry, strawflower, valerian, wayfaring tree (viburnum).
- Naturally, firewood was supplied from the forest.

- Home-made tinctures for medicinal purposes were made of achillea, blueberry, celandine, chamomile, coltsfoot, hogweed, St John's wort, strawflower, valerian, wayfaring tree (viburnum).
- Predators feared by the respondents were bear, jackal, lynx, wild boar, wolf.
- Livestock was protected by farm dogs, shepherds, bulls, fences.

These remarkable similarities, however, were combined with differences in cultural traditions such as cuisine and holidays. The most common Adjarian traditional dishes were achma აჩმა (type of cheesebread) and halva ჰალვა, while Svanetians named g'olo ღოლო (made of dock *Rumex* sp.), khach'ap'uri ხაჭაპური (cheesebread), k'ubdari კუბდარი (meat pie), merts'vi მერცვი or shusha შუშა (mashed potatoes with cheese), tashmijabi თაშმიჯაბი (melted or 'boiled' cheese), ch'visht'ari ჭვიშტარი (maize cheesebread). Likewise, the most often named festival in Adjara was Eid al-Adha along with festivals related to specific localities, while Svanetians named the early Christian martyrs Cyricus and Julitta along with holidays of pre-Christian origins such as the festival of Lamproba. This festival was dedicated to lunar worship in ancient Georgia; when performing this ritual, people would chant hymns glorifying the lunar deity while holding burning branches of birch (Javakhishvili 1979: p.60-61). In fact, "Lamproba" as a name of festival is derived from 'lampari', which in modern Georgian means 'lantern'. At present this is merged with the Orthodox Christian holiday of Candlemas (Gujejiani 2015).

However, the most striking dissimilarities we found in the current status of the documented traditions. In general, while these traditions were still very alive in Upper Svaneti, they were showing signs of vanishing in Upper Adjara. For example, Upper Adjara is famous for its original milk dishes, which are now offered to tourists in other areas of Georgia. But the respondents from Upper Adjara did not name these dishes as their everyday food, rather they reported dishes that are usual for western Georgia. The dishes reported by the Upper Svaneti respondents, conversely, were much more diverse and original. Svaneti residents were still active in collecting and using wild plants both for eating and for preparation of tinctures. In contrast, the Upper Adjara villagers only remembered such activities from the past. The Upper Svaneti locals kept significantly more livestock (ca. 10 heads per household) than their counterparts in Upper Adjara (ca. 5 heads per family), and the perception that the numbers of cattle were declining was significantly stronger in Adjara.

We know that both Upper Adjara and Upper Svaneti were inhabited continuously by humans from at least the early Middle Ages (Javakhishvili 1979: 43-58). This assumes that the traditional use of ecosystems that had endured for centuries, was sustainable. However today, the rules imposed by old traditions have apparently lost their validity in Adjara, while still remaining effective in Svaneti. Therefore, examining the history of these two regions might be insightful and explain the differences between the two.

Ancient and pre-industrial history

The first written reports on the mountain peoples of Georgia can be found in the works of the Greek historian Strabo (1924; XI, cap. 19), who described the Svaneti people and their lifestyles. This and other, especially archaeological, evidence shows that the human population persisted and even thrived in Upper Adjara and Upper Svaneti. In fact, important ancient trade routes from Persia to the Black Sea passed through these regions,and selling food and services to travellers could support a good standard of life in these two communities. The passes crossing the mountains at high altitudes were free of snow and safe to travel, at least during the summer months. Strabo noted especially the strength of Svaneti settlements and their importance to the contemporary world (Strabo 1924). Therefore, the locals could maintain a profitable local economy centred on civil and military services along the road. However, in the 5th century (AD), the Roman Warm Period ended and the Little Ice Age began. The Svaneti routes became blocked by ice and snow, even in summer, and the roads were abandoned. However, the Adjara routes, which connected Western Asia with the Black Sea, continued functioning as the passes were at relatively lower altitudes (Tevzadze and Kikvidze 2016). In the early 19th century the Black Sea came under the control of the Ottoman Empire and the routes lost their economic significance as West-European Empires established new routes which skirted around the Black Sea. Upper Adjara routes retained only regional importance.

The Little Ice Age ended by the 10th-11th centuries and the climate warmed again through the Medieval Warm Period. This epoch coincided with the expansion of the Georgian Kingdom when Svaneti routes were fortified so that they could connect with the North Caucasus. Between the 14th and the 15th centuries the climate cooled again, the Georgian Kingdom declined and Upper Svaneti returned to its relative isolation. By the 19th century, as the climate began to warm again, the old routes again became passable but Georgia became part of Russian Empire, and the isolation of Upper

Svaneti continued. The Soviet Era (1921-1991) brought about certain developments to promote international tourism and mountaineering: the existing roads were surfaced with asphalt, a tourist shelter and an alpine camp was built in Mestia. I will discuss this and subsequent post-Soviet developments next, first in Upper Adjara, then in Upper Svaneti.

Modern history to present days

Upper Adjara

During the Soviet Era, Upper Adjara was locked in isolation for political reasons: the region is adjacent to Turkey —a member country of NATO, the organisation which Soviets considered to be hostile to their regime. Access to the villages was strongly restricted and no large-scale development projects were implemented. However, the Soviet regime also brought about some economic benefits: the locals received small but regular salaries through village bureaucracy (members of collective farms, administrative workers, educators, young communist officials and the like). This brought an additional income to their extensive subsistence economy based on cattle, maize and horticulture. The villages were also supplied with tractors and trucks, whose use was subsidised and almost free; costs were generally low and the villagers could afford plenty of hay for their cows. After the collapse of the Soviet Union, however, all these benefits disappeared and local communities became economically strained. This led to an increased and probably unsustainable use of ecosystems — the villagers begin logging trees, operating micro-mills and selling timber. This practice continued for about a decade until the state intervened by the beginning of 21st century. Logging was banned and mills were closed, and the government began construction of large hydro-electric stations. The impact of these changes on the life of the locals was detrimental as they lost a considerable source of income. They resorted to migration; while young children and elderly villagers stayed at home, most of their relatives went for seasonal work somewhere else, mostly in Turkey. The villagers had to reduce the number of their cattle considerably because of the diminished area available for grazing (hydro-electric construction in riparian areas) and increased expenses for bringing hay from the mountain meadows. Ski resorts were built, but far away from the villages, which meant that the locals could not benefit from new job opportunities, even if small. An additional problem was possibly a result of climate change: villagers stopped growing tomatoes owing to very poor harvests,

potatoes and beans were also less productive. Indeed, in this area, the climate became drier as documented in Upper Svaneti (Bordokoff 2014, below). Along with a reduced number of livestock, there were losses to forest predators, mostly wolves: estimated as 30 to 100 head per year in one gorge (Skhalta). By our own documentation, villagers almost stopped gathering wild medicinal plants, and wild berries were picked only occasionally. To sum up, local socio-ecological systems clearly failed to cope with the rapid and dramatic post-Soviet changes.

The first reaction of the local society to the critical economic situation was very intensive timber extraction, a practice potentially damageable to the ecosystems. After imposing strict regulations on forest use, it was the locals who suffered and responded with migration and reducing traditional subsistence practices. None of these situations can be considered balanced and sustainable.

Upper Svaneti

The Upper Svaneti villages, as with those in Upper Adjara, received the benefits of subsidised bureaucracy in the Soviet Era, while the locals continued practising subsistence traditions. Unlike Upper Adjara however, Upper Svaneti saw some development in tourism and mountaineering. But these developments did not bring tangible benefits to the locals, since private business was illegal under Soviet rules and the villagers could only let their houses or sell food illegally. The post-Soviet crisis in Upper Svaneti was severe and led to very high rates of crime; a few clans began controlling everyday life and it became one of the poorest regions in Georgia. As in Adjara, illegal logging and operating mills reached a large scale. This changed in 2003, when the state cracked down on the criminal clans and started developing tourism: roads were repaired and ski resorts built. The villagers also begin to invest and many of them converted their houses into family hotels. Importantly, animal husbandry and the use of ecosystems continued in traditional ways and supplied cheap and organic local food to attract more tourists. Illegal logging was stopped. In fact, tourism generated a good income and, at the same time, provided a small but predictable market for agricultural products. Agriculture did not reach pre-Soviet levels though and ecosystems are now exploited less intensively, as is shown by fewer hay meadows. In short, the traditional communities of Upper Svaneti seem to be back to a sustainable economy and this is despite the fact that, as with Upper Adjara, it also suffers from drier summers (Bordokoff 2014).

Comparing two regions

The documented current situation together with the overview of the historical context of development given in our study (Tevzadze and Kikvidze 2016) enables the examination of the traditional communities of Upper Adjara and Upper Svaneti in terms of sustainability and adaptability, the two major characteristic features of socio-ecological systems. Sustainable subsistence is based on the balance in the exchange of benefits between humans and their ecosystem: while humans benefit from the resources extracted from the ecosystems, ecosystems benefit from human-made mosaic of various habitats that can support high biological diversity (Young et al. 2006). Sustainability is achieved if the resource extraction is 'balanced', that is, the amount of extracted resources does not exceed the capacity of ecosystem regeneration. But the situation can change, as has happened more than once with our traditional societies, and these changes can be either beneficial or detrimental. These impacts usually came from outside and are natural (climate change), political (historical changes in geopolitics or political systems), and economic (trade roads, tourism). In other words, traditions developed in a previous context might not be valid in a new one and only survive if they adapt to the new context and new reality. Trade roads that crossed Upper Adjara and Upper Svaneti began their operation in the Medieval Warm Period or earlier (Liu 2010), when the traditional subsistence system was already well-established (Chapter 1). The roads brought considerable numbers of travellers, who sought safe passage and shelter as well as good-quality food. The market that emerged benefited the economy of the traditional villagers, who adapted their subsistence economy. However, the end of the Medieval Warm Period and the beginning of the Little Ice Age removed this market in Upper Svaneti, while in Upper Adjara the same impact was a result of the geopolitical changes that included new trade roads circumventing Upper Adjara. The locals had to go back to reliance on almost entirely local natural resources to demonstrate adaptability of their socio-ecological systems. When the Soviets spread their rule over the former Russian Empire, they appropriated private ownership on the land, but this had little effect on the traditional socio-ecological systems of Upper Adjara and Upper Svaneti, since each family was allowed to own small plots of agricultural land. The Soviets also organised collective farms and provided subsidies, so that the locals could enjoy certain gains in their monetary income. Besides, there was a certain influx of machinery, and most notably lorries. Yet, these direct subsidies and

lorries did not create a new market. The villagers worked for a collective farm or in local administration and received a salary, but their households continued as before, selling a small farm surplus into “collective farmers’ markets”. The subsidies abruptly disappeared after the collapse of the USSR, which was a shock that traditional societies could not absorb. Finally, the restoration of law and justice in the early 2000s brought about strict regulations on the use of ecosystem resources. As documented in our study, the response of the traditional societies of the two regions appeared to be very different: the crisis continues in Upper Adjara with very notable migration and loss of subsistence traditions, while conversely in Upper Svaneti, we see traditions continuing to be practised both in agricultural production and popular culture. It can be concluded that the revival of the traditions in Upper Svaneti became possible by facilitating tourism that created a new market for traditional households. Similar measures in Upper Adjara have so far been unsuccessful. In other words, in Upper Svaneti tourists and visitors restored the context that brought back the original meaning of local traditions in relationship with nature.

Synthesis: ethnoecology and other sub-disciplines of ethnobiology

Ethnoecology, as already noted at the beginning of this chapter, differs from the other two major sub-disciplines of ethnobiology. Whilst ethnobotany and ethnozoology are mainly descriptive sciences, ethnoecology is able to give a causal explanation to the patterns documented by the descriptive sub-disciplines. For example, ethnobotanical research in Georgia depicts clear regional differences in the plants and their traditional uses by local communities, and reveals two major determinants of these differences: the identity of a village and its altitude. Ethnoecology goes further and explains why these two factors are important: this is achieved by establishing a link between the location (eastern versus western Georgia) and altitude (the lowlands versus the highlands), and the variation in climate character. In fact, the climate character determines the type of traditional subsistence system, including which plants and animals are the best to keep and cultivate under given conditions; in addition, we can see which traditional agricultural technologies can be practised and why they ensure sustainable productivity. In short, ethnobotany, ethnozoology and ethnoecology do not only match each other in a complementary manner, but the combination of

knowledge from these three sub-disciplines generates a new, more complex knowledge that did not exist before and that could not be built without cooperation between the sub-disciplines (Dahlberg 2008); the approach that produces such an emerging new and more complex knowledge is sometimes designated as a 'syndisciplinary' (Lagerstedt et al. 1996). Therefore, ethnoecology helps ethnobiology to provide a good example of a syndisciplinary approach.

The relationship between geographical location, climate and subsistence types can be qualitatively and quantitatively exact, and can be useful not only for the theory of ethnoecology, but also for practical purposes. The need for classifying subsistence and agricultural economies in general has existed since the first civilisations and formed major elements in geographical descriptions. A very clear example of this is the "Description of the Kingdom of Georgia" by Vakhushti Bagrationi, which the author completed in 1745 (here I cite the 1973 edition). In this work, Vakhushti has drawn a line between the lowlands and highlands using the possibility to harvest grapes and wheat as a demarcation: possible in the lowlands but not in highlands (Bagrartioni 1973; p.65; Kikvidze 1963, p.5). This major division appeared to be very useful and retains its importance today. Clearly, there is no need to abandon this tried and tested classification, yet it can be refined and made more sophisticated. For example, Vakhusti's ' lowlands' can be further divided into eastern and western lowlands where irrigation and drainage, respectively, are obligatory. It also includes a zone on mid-altitudes, which can be subdivided into eastern (mixed irrigation) and western (rainfed) parts. Vakhushti's highlands can be subdivided into eastern (rainfed) and western (irrigated hay meadows) parts. However, I leave this work for future studies: ethnoecology is a young science and we shall expect its fast development and further refinements of its concepts. I hope the studies conducted in Georgia will contribute significantly to this.

Then last but not least: even though ethnoecological studies in Georgia clearly demonstrate that traditional life and economy styles strongly depend on the climate and the available ecosystem resources, the link with the climate and culture is not that obvious. It seems to be less tight since these resources can be used in different ways. The cultural differences undeniably reflect the historical path through which a given local tradition has been evolving as well as the influence from other cultures to which it was or is exposed. In other words, culture can be a mediator between the context in which the traditions develop and the technologies that underpin these traditions. In the

previous section we saw the importance of the match between the historical context, current situation and subsistence traditions. Therefore, I emphasise the importance of culture and historical context to show the potential of ethnoecology for the conservation of our culture including the ecosystems that developed under our agency and rely on sustainable relationships between humans and nature.

Appendix 4.1. Climate character of Georgia

The character of climate is usually described by two variables: the mean annual temperature and annual precipitation (Kottek et al. 2006). Data collected from world climate data bases[28] show that the mean annual temperature and annual precipitation in Georgia can range, respectively, from 1.4 to 15 C° and 470 to 2400 mm, (Table 4.1). How the terrain can determine the variation in climate can be seen by examining the dependence of mean annual temperature on altitude (m a.s.l., where a.s.l. stands for above sea level; therefore, altitude is included in Table 4.1). In fact, the link between mean annual temperature and altitude is linear and very tight (Figure 4.5), as indicated by the value of the coefficient of determination very close to unity (squared value of the coefficient of correlation, R^2 = 0.97). In other words, by knowing the altitude we can predict the mean annual temperature in a given locality with accuracy, and thus we can substitute temperature with altitude in graphs representing the character of the climate of Georgia and its dependence on terrain. If the abscissa and ordinate show, respectively, annual precipitation and altitude, the relationship in Georgia takes a characteristic, 'humped-back' shape (Figure 4.6) with three extremities. One extremity is formed by the eastern lowlands where at ca. 300-400 m a.s.l. annual precipitation amounts just to 470-500 mm, which are the driest localities in Georgia (Gardabani, Marneuli, Rustavi). Another extremity is made by the western lowlands at nearly sea level with five times more precipitation (2200-2400 mm, Kobuleti, Makhinjauri, Batumi). The third extremity occurs at high altitudes of the central Greater Caucasus where precipitation is moderate (900-1000 mm, Diklo, Gudauri, Bochorna). From this graph it is easy to see that climatic character of localities rapidly converge as precipitation becomes less variable and approaches moderate values with increasing altitude (Figure 4.6). If we compare this humped-back distribution to the map of precipitation of Georgia (Figure 4.7), we will see that the western parts of the country receive a large amount of rainfall, while eastern parts are notably drier. Further, a comparison with the physical map of Georgia (Figure 1.9) shows that the meridional ranges in the central part of country (Likhi Range, Meskheti Range) are responsible for the observed pattern of annual precipitation, as they obstruct the flow of moist air masses from the Black Sea eastwards. However, we also see that a considerable area of the country receives moderate

[28] https://en.climate-data.org/asia/georgia-172/

precipitation, mostly on the foothills and slopes of the numerous ranges — these areas correspond to the central part of the humped-back shape of precipitation distribution.

Table 4.1. Climatic data and altitude of localities across Georgia

Locality	Altitude, m a.s.l.	Annual mean Temperature, C°	Annual Precipitation, mm
Abastumani	1372	6.4	716
Agaiani	540	11.8	592
Agara	642	9.9	697
Agaraki	766	11	608
Agrai	1821	3.9	997
Akhaltsikhe	989	8	680
Akhaltskaro	702	11.7	577
Alakumkhara	424	12.4	1390
Alpana	403	11.8	1191
Ambarikhutsa	666	11.1	1341
Ambrilauri	566	10.4	1042
Anaklia	0	14.5	1831
Armazi	552	12	573
Arsha	1780	3.9	1043
Avshniani	541	12.6	557
Azavreti	1914	3.5	716
Azhara	587	11.1	1283
Bakhmaro	2003	3.4	1308

Bakuriani	1666	4.5	766
Bakurianis Andeziti	1560	5.1	730
Batumi	5	14.2	2393
Betania	1193	8.2	737
Bichvinta	2	14.6	1487
Bochorna	2384	1.4	906
Borjomi	816	8.4	700
Bugeuli	534	10.7	1083
Burdadzori	751	11.4	498
Chala-Kadagauri	568	11.1	1247
Chanadirtkari	887	9.8	746
Chiatura	404	11.2	987
Chivtkilisa	1832	4	811
Chkhakoura	992	8.8	1063
Chkvaleri	370	12.5	1476
Cholevi	444	11.7	1229
Dedisperuli	776	10.4	825
Didi Lilo	811	11	660
Diklo	2151	2.6	901
Dmanisi	1238	7.7	619
Doberazeni	519	11.6	1371
Dochu	1924	3.8	927
Duisi	626	11.3	774

Dusheti	881	9.8	765
Dzalisi	591	11.5	622
Dzegvi	503	12.2	564
Gagra	18	14.5	1461
Gali	65	14.2	1707
Gandzani	2038	3.1	683
Gardabani	308	14.1	471
Gomi	550	11.4	591
Gona	1738	3.9	1027
Gonio	9	14.2	2276
Gori	602	10.6	603
Grakali	554	11.2	589
Grigoleti	2	14.4	2025
Guandra	847	9.7	1209
Gudauri	2285	1.5	992
Gudauta	10	14.6	1463
Gurjaani	408	13.1	641
Iprari	1935	3.4	991
Jankhoshi	807	11	520
Kaburi	1876	3.8	809
Kakabeti	770	11.3	708
Kanobi	1958	3	1027
Kareli	626	10.1	671

Kaspi	556	11.4	595
Kavtiskhevi	512	11.8	581
Kazreti	628	11.6	497
Keda	189	12.9	1831
Khachkoi	1886	3.7	806
Khakhabo	2044	3.2	914
Khandaki	501	11.9	573
Khashmi	812	11	704
Khashuri	704	9.3	737
Khe	1821	3.9	997
Kherkhvashi	1357	6.6	1047
Khetskvara	1052	8.6	1178
Khevi	322	12.8	1529
Khidiskuri	509	12	571
Khikhadziri	1103	8.5	777
Khojorni	838	10.9	524
Khulo	932	9.3	959
Khvagha	625	10.9	1233
Kiketi	1242	8	748
Kitskhi	373	11.5	1020
Kobuleti	3	14.2	2276
Kodoti	487	11.5	1235
Kojori	1341	7.4	785

Kokoleti	477	11.6	1378
Konchkati	267	13.1	1806
Koruldashi	1971	3	988
Ksani	490	12.1	567
Kumlistsikhe	1889	3.4	1029
Kurdghelauri	596	11.9	734
Kutaisi	156	13.5	1322
Kvakhvreli	560	11	595
Kvareli	436	12.6	685
Kvariati	42	14	2232
Kveda Chkhutuneti	323	12.3	1621
Kvemo Khareba	1542	5.7	740
Kvemo Nichbisi	690	11	600
Kvemo Teleti	568	12.6	538
Kveseti	1159	8.4	727
Kvitiri	121	13.9	1351
Lagodekhi	488	12.6	733
Laskrali	1935	3.4	991
Lentekhi	732	10	1139
Leshamuge	459	12	1448
Makhinjauri	1	14.1	2383
Maltakva	0	14.4	1991
Manglisi	1195	7.9	726

Mariamjvari	893	10.5	742
Marneuli	411	13.4	472
Martvili	194	13.7	1457
Mechkheri	376	12.1	1257
Mestia	1434	5.9	1003
Mintadzeebi	1287	7.6	904
Modega	1926	3.4	733
Mravaldzali	1750	4	1014
Mtskheta	454	12.6	557
Mukhatgverdi	450	12.7	549
Nakhari	922	9.4	1213
Nakra	1238	7.2	1054
Navardzeti	535	10.4	981
Niabi	563	11.3	590
Ninotsminda	797	11.1	702
Okrokana	779	11	605
Omalo	1844	4.2	916
Oni	802	8.8	959
Orkhvi	491	11.3	1193
Ozurgeti	81	14	1981
Pachkha	1084	8.6	878
Pasanauri	1072	8.1	1192
Patardzeuli	844	10.8	714

Phonichala	368	13.7	500
Poka	2100	2.8	712
Poti	2	14.4	1907
Potskho-Etseri	386	12.4	1474
Rez. Akhalchala	1851	4	1077
Rustavi	330	13.9	485
Sachkhere	431	11	936
Sadmeli	610	10.2	1060
Sairme	988	8.2	886
Sakadagiano	506	12	577
Sakdrioni	1031	9.2	829
Samtredia	24	14.9	1521
Saskhori	697	11	606
Senaki	46	14.5	1746
Shekvetili	1	14.3	2153
Shtrolta	1922	3.8	920
Shuakhevi	402	12	1377
Shubani	321	12.8	1556
Shubani	379	11.9	1197
Sighnaghi	739	11.5	703
Sioni	705	11.7	501
Skuri	596	11.2	1385
Sokhumi	6	14.8	1458

Stepantsminda	1759	3.9	1043
Surami	755	9	754
Tabatskuri	1994	3.1	770
Tavrali	1594	5.4	1021
Tavsurebi	721	10.2	1140
Tazakharaba	1845	3.9	811
Tbilisi	409	13.3	510
Telavi	738	11.1	767
Tetritskaro	1189	8.1	685
Tkhinvali	700	11.4	590
Tkibuli	568	10.6	1094
Tobakhcha	689	10.4	1161
Tsageri	492	11.3	1185
Tsalka	1496	5.6	731
Tsebelda	466	12.2	1395
Tsilkani	590	11.6	622
Tskaltubo	130	13.9	1361
Tskneti	948	9.9	661
Tvalivi	1093	8.5	998
Tvishi	428	11.7	1208
Urekhi	130	13.5	2199
Ureki	3	14.4	2069
Ushkhvanari	1402	6.2	1018

Vardisubani	589	11.4	615
Vashakmadzeebi	1217	7.9	898
Vichnashi	1902	3.5	989
Village Gldani	579	12.2	589
Yashtkhuarkhu	509	12	1382
Zahesi	500	12.5	563
Zeda Ghvardia	533	11	1153
Zemo Kandaura	891	10.6	729
Zemo Surebi	682	10.5	1178
Zeskho	1818	3.7	998
Zestaponi	163	12.9	1197
Zoti	952	9	1034
Zugdidi	105	14	1777

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Figure 4.1. Darbazi: a typical house in the eastern lowlands of Georgia. Light comes from the window on the top of the roof. Dedabodzi (Mother Pillar) decorated with traditional symbols is in the centre to support the roof. (http://bse.sci-lib.com/pictures/05/01/289985083.jpg).

Figure 4.2. Oda: typical house in the western lowlands of Georgia. Made of chestnut timber. Roof formerly spruce or fir shingle, replaced with clay tiles. The house is based on stone supports to maintain a clearance from the soil and avoid dampness. Now the Museum of Shalva Radiani, a prominent literary critic of the 20th century. (https://commons.wikimedia.org/w/index.php?curid=28830412)

Figure 4.3. Typical fortified, stone traditional dwellings of Georgian highlanders from eastern (upper panel, Khevsureti) and western (lower panel, Svaneti) Georgia.

(Upper panel: https://commons.wikimedia.org/w/index.php?curid=32149813;

Lower panel: https://commons.wikimedia.org/w/index.php?curid=46572308)

Figure 4.4. Typical house of a farmer from Kakheti, village Mirzaani (annual precipitation 650 mm). The prominent naïve artist Niko Pirosmanashvili (1862-1918) was born here. (https://commons.wikimedia.org/w/index.php?curid=26727507)

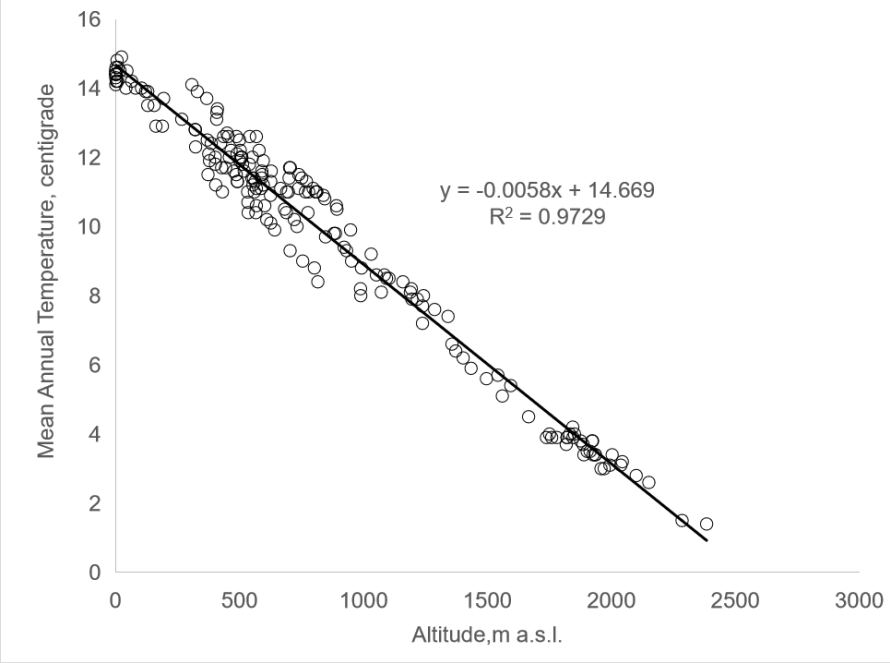

Figure 4.5. The Mean Annual Temperature and Altitude of localities in Georgia are proportional (data taken from climate-data.org).

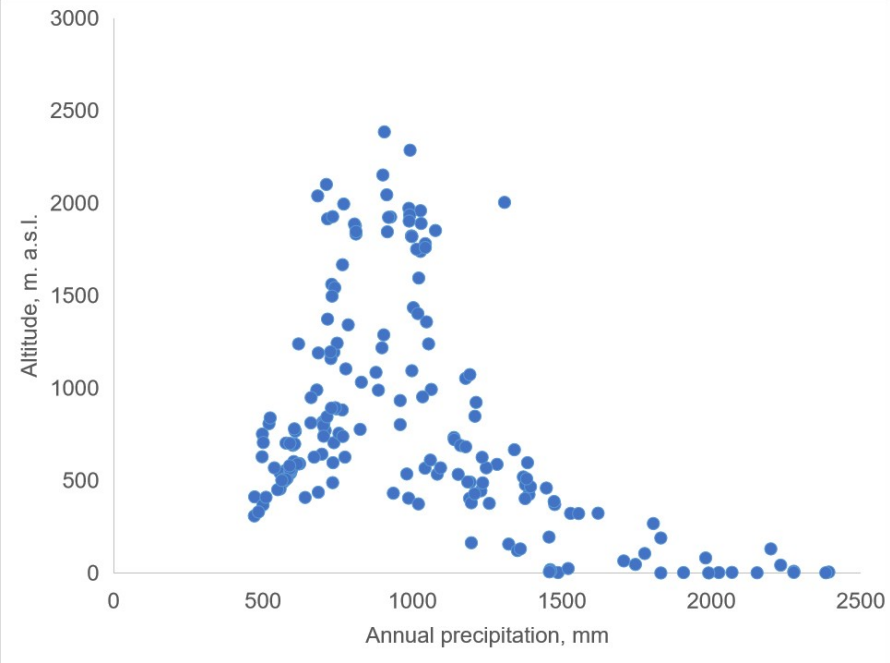

Figure 4.6. Annual precipitation distribution along altitudinal gradient in Georgia (data from climate-data.org).

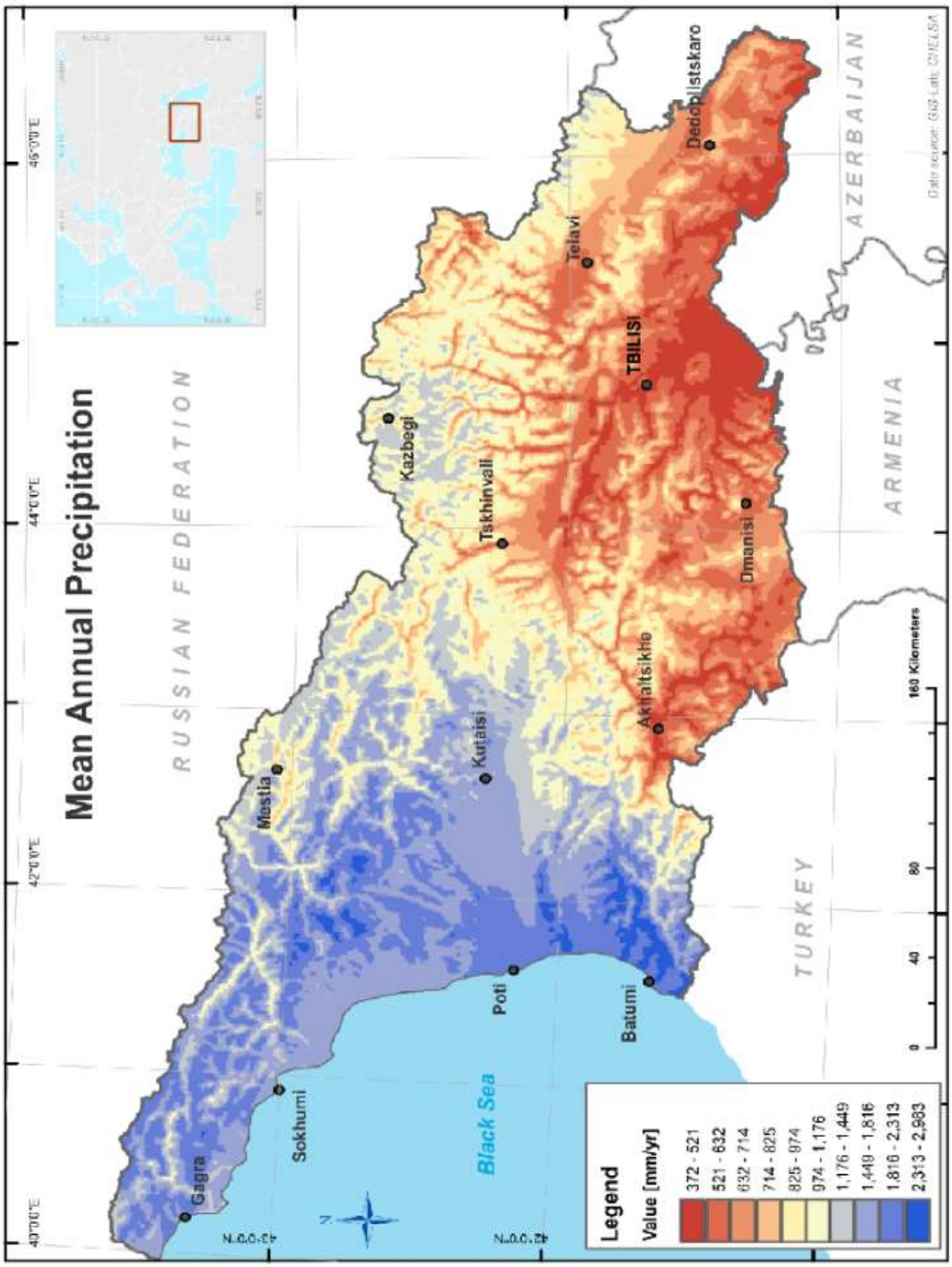

Figure 4.6. Mean Annual Precipitation in Georgia (Map courtesy of GIS-Lab, Georgia)

Concluding remarks

Dear Reader,

A few paragraphs more and this book will end. I hope it was useful as a guide to the young science of ethnobiology, which, even though with deep roots in the past, has begun to take its own shape and branch out as an independent science relatively recently. The Society of Ethnobiology defines this science as a 'study of dynamic relationships among humans, biota and environments'[29]. I hope this book answers the major questions of what these dynamic relationships are, and why we should study them.

Ethnobiologists can pursue more than one aim. The most important, and I hope many of my colleagues will agree, is that the tradition of interaction with nature is an invaluable part of the culture, not only of a given society but also humankind. Therefore, any society that cares about its culture should study ethnobiology. In fact, to me it is not only the most important, but the entirely sufficient motive for my participation in ethnobiological research. However, my colleagues might indicate other important motives too. Many of them believe that ethnobiological traditions contain potentially very useful information relative to the development of new medicines, new food, new materials and new genetic lines for breeding. Such a potential undeniably exists and is subject matter of applied ethnobiology. Still others study local traditions to find out how the ancient methods of management achieve ecological sustainability and how they can be applied to biodynamic and organic farming. Indeed, traditional subsistence systems that still operate in remote villages show not only ecological sustainability, but also quite an acceptable productivity without the use of commercial fertilisers or pesticides. Traditional subsistence systems show remarkable adaptivity and this experience can be useful in the mitigating of the consequences of catastrophic events, when there is an acute need to relocate many people, give them shelter and food and find them acceptable occupation. Georgia gives a good example of the resilience of traditional subsistence systems and their capacity to help in critical situations. Such a situation I witnessed myself —I refer to the real threat of starvation after the collapse of the USSR. Many people moved from cities to the villages of

[29] https://ethnobiology.org/

their parents and grandparents and engaged in subsistence economy. One of the respondents from Lashkheti described the life of those critical times as follows:

> "The government was not greedy and gave us money, the problem was that the markets were empty and we could not buy sufficient food. We sowed maize and beans even in our gardens and moved potato fields up to the mountains since potato yields were three times greater up there. We increased our head of cattle and pigs and were able to produce enough food not only for us but also our relatives in Kutaisi. We managed like this for a few years and survived the crisis".

Finally, this book introduces the science of ethnobiology using the example of studies conducted in Georgia. Indeed, this country is extraordinarily attractive for such studies: its ancient traditions are still in operation and well conserved in a wide range of ecosystems and landscapes of this biodiversity hotspot. I hope my book will facilitate a continuation and intensification of ethnobiological studies in Georgia to the benefit of science and culture in general.