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A BIOGRAPHIC APPROACH TO THE STUDY OF BIOCULTURAL LEARNING

PODEJŚCIE BIOGRAFICZNE W BADANIACH NAD UCZENIEM SIĘ BIOKULTUROWYM

ABSTRACT: Natural environments such as arable lands, lakes, the sea, forests and savannahs are not only places for living and supporting the livelihoods of people, they constitute contexts of significance for sustainability. On the one hand, the study of the knowledge that people generate about their local natural environments has mainly been characterised by romantic views and false assumptions of learning, and more specifically knowledge generation (acquisition), as a merely social or collective process within social-ecological systems literature. It has led to unequal power relationships between different types of knowledge (scientific and experiential) as they were totally separated in human cognition development and structure, and professional knowledge and practices. On the other hand, there is limited interest in the study of professional learning among local communities having natural environments as their living and workplaces within adult educational research. Based on the empirical study of Swedish fishers and farmers, this article contributes to further development of approaches and methods for the understanding of *biocultural learning* or professional learning in and about nature. It answers the research questions of how the study of *biocultural learning* benefits from using a biographical approach and a variety of data collection methods, and how individual and social circumstances impact *biocultural learning*. Findings contrast the previous research literature on local ecological knowledge, and lead to reflections about the role of adult education research for the development of theories and methods for sustainability research and practices.

KEYWORDS: biocultural learning, biographical approach, adult education, natural environments, local ecological knowledge, sustainability.

ABSTRAKT: Środowiska naturalne, takie jak grunty orne, jeziora, morza, lasy i sawanny, są nie tylko miejscem życia oraz pozyskiwania środków do życia przez ludzi, ale stanowią także konteksty istotne z punktu widzenia zrównoważonego rozwoju. Z jednej strony badania wiedzy tworzonej przez ludzi na temat ich lokalnego środowiska naturalnego charakteryzowały się głównie romantycznymi poglądami i fałszywymi założeniami, prezentowanymi w literaturze dotyczącej systemów społeczno-ekologicznych, zakładającymi, że uczenie się, a dokładniej generowanie (nabywanie) wiedzy, stanowi proces wyłącznie społeczny lub kolektywny. Doprowadziło to do nierównego stosunku sił między różnymi typami wiedzy (naukowej i empirycznej), ponieważ były one całkowicie rozdzielane w ramach rozwoju i struktury ludzkiego procesu poznawczego oraz wiedzy i praktyki zawodowej. Z drugiej strony, w badaniach nad edukacją dorosłych występuje ograniczone zainteresowanie edukacją zawodową w społecznościach lokalnych, w których miejscem życia i pracy jest środowisko naturalne. Opierając się na badaniach empirycznych dotyczących szwedzkich rybaków i rolników, artykuł ten przyczynia się do dalszego rozwoju podejść i metod, służących lepszemu zrozumieniu *uczenia się biokulturowego* lub edukacji zawodowej w i o środowisku przyrodniczym. Odpowiada on na pytania, jakie korzyści badania nad *uczeniem się biokulturowym* czerpią z podejścia biograficznego i różnorodnych metod gromadzenia danych, a także, jak warunki indywidualne i społeczne wpływają na *uczenie się bio-*

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kulturowe. Wyniki badań kontrastują z wcześniejszą literaturą naukową dotyczącą lokalnej wiedzy ekologicznej i prowadzą do refleksji na temat roli badań nad edukacją dorosłych w rozwoju teorii i metod badań i praktyki w zakresie zrównoważonego rozwoju.

SŁOWA KLUCZOWE: uczenie się biokulturowe, podejście biograficzne, edukacja dorosłych, środowiska naturalne, lokalna wiedza ekologiczna, zrównoważony rozwój.

Introduction

That nature's goods and services are the ultimate foundation of life and health is widely recognised (e.g. World Health Organization 2005). Natural environments such as arable lands, lakes, the sea, forests and savannahs are not only places for living and supporting people's livelihoods, they constitute contexts of significance for sustainability¹ (see e.g. United Nations 1992, 2015; FAO 2015, 2018). The rich knowledge that many communities – e.g. of fishers, farmers, hunters and reindeer herders – have of their local ecosystems is the result of the intimate relationship they have had with their natural environments across generations (e.g. Davis & Ruddle 2010). This relationship between individuals and their local natural environments is mainly shaped by everyday life and work (e.g. Urquhart & Acott 2013). This connection to natural environments – that need to be understood not only as physical but also social places – leads to the development of strong emotional bonds to and a sense of belonging to places (e.g. Garavito-Bermúdez & Lundholm 2017; Garavito-Bermúdez 2019). Thus, for such communities – who depend directly on local ecosystems to maintain their livelihoods – natural environments are places for living, working, belonging and defining themselves.

During the last three decades, scholars and practitioners from different scientific traditions (i.e. humanities, social and natural sciences) and disciplines (e.g. anthropology, ethnography, ecology, human geography and ethnobotanic) have paid attention to the knowledge about natural environments held by local communities (e.g. Poizat & Baran 1997; Garcia-Allut 1999; Fazey et al. 2006; Hamilton 2005; Moller et al. 2004). Within social-ecological systems research, such knowledge is known as *traditional* (TEK), *indigenous* (IEK) and/or *local* (LEK) ecological knowledge, in which the terms of *indigenous* and *traditional* often denote aboriginal and indigenous peoples, and *local* is sometimes used for fishing or farming people. TEK/IEK/LEK has been defined as

¹ Understood as the capacity to make sustainable development by ensuring “that it meets the needs of the present without compromising the ability of future generations to meet their own needs” (United Nations 1992; United Nations 2015). Three forms of sustainability are included. The ecological that is defined as the maximum long-term use of a natural resource of raw material or energy, the capacity for the use or destruction of waste and exploitation of living organisms. The social that is understood as the inherent stability of a social organisation and its components, the minimum requirements for system resilience to system oscillations, individual rights, limitations and duties for sustainability. The economic sustainability means a mass balance and economic feedback principles (Sverdrup & Stjernquist 2002, pp. 21-22).

“a cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with another and their environment” (Berkes 1999, p. 8; Berkes et al. 2000, p. 1252). Unfortunately, the study of TEK/IEK/LEK has been limited in two ways. Firstly, this type of knowledge has been largely simplified, romanticised and compared to Eurocentric knowledge (i.e. Western science) (see critical views against such positions by Suchet 2002; Banerjee & Linstead 2004; Briggs 2005). In consequence, it has rarely been granted a professional status, and has been reduced to knowledge that is merely transferred (e.g. Barthel et al. 2010; Singh et al. 2010; Calvet-Mir et al. 2016; Socies-Fiol & Cuéllar-Padilla 2017). Secondly, by assuming that ecological knowledge and practices are simply regenerated, retained and revived through collective memory and cultural transmission, the role of learning – particularly individual’s internal processes (e.g. cognition, emotions, motivations, volition) – and personal agency (e.g. Billet 2008) has been ignored. The assumption of learning as a merely social or collective matter, and the social learning discourses that flood natural resource management literature (see Rodela 2013) are criticised by researchers in adult education (e.g. Illeris 2004) by highlighting that only in special cases learning outcomes will be the same for all the individuals involved, and that knowledge acquisition is highly individual.

Within educational sciences in general, research on learning about natural environments has been restricted to the separated study of cognition (e.g. Serman 1997; Hmelo et al. 2000; Goldstone and Sakamoto 2003; Magtorn et al. 2007; Sweeney & Serman 2007), emotions (e.g. Kudryavtsev et al. 2012) or learning environments (e.g. Lindemann-Matthies 2002) mostly within formal education settings (with few exceptions e.g. Mukute 2009; Slade 2013; Garavito-Bermúdez et al. 2016; Garavito-Bermúdez & Lundholm 2017; Garavito-Bermúdez 2019). Furthermore, the qualitative study of learning has commonly been framed by the use of traditional methods such as interviews (see Punch & Oancea 2014; Cohen et al. 2007).

The limitations mentioned above has led to the introduction of the concept of *biocultural learning* (see Garavito-Bermúdez 2019). *Biocultural learning* denotes learning processes involved in working practices among people with natural environments as their workplace. This concept wanted to underline the complexity of learning processes that not only have impact on knowledge generation, but on identity construction, sense of belonging and place attachment in comparison to other professions in an ordinary workplace (e.g. companies, schools, offices and hospitals).

With the aim to contribute to further development of approaches and methods to the study of learning processes among people having natural environments as their living and workplaces, this article poses the research questions: how can the study of

biocultural learning benefit from the use of a biographical approach and a variety of data collection methods?; and, how do individual and social circumstances impact *biocultural learning*? These questions are answered through an empirical study of Swedish fishers and farmers from an adult education perspective.

The outline of this article is as follows. It first develops in detail the concept of *biocultural learning*. A brief overview of the use and value of a biographical approach for the study of learning within adult educational research is then presented. The next section elaborates the major findings of applying a biographical approach to the study of *biocultural learning* in line with the research questions. The last section offers a set of major conclusions and reflections with regard to the relevance of a biographical approach and mixed data collection methods for the research on *biocultural learning*.

The conceptual framework of biocultural learning

The concept of *biocultural learning* is comprised of two central elements: ‘*biocultural*’ and ‘*learning*’. Firstly, the term *biocultural* derives from the well-recognised term ‘biocultural diversity’ introduced within the fields of ethnobiology, conservation ecology and anthropology in the ‘90s (e.g. Dasman 1991; McNeely & Keeton 1995; Posey 1999). Biocultural diversity is commonly referenced in nature conservation contexts and institutions such as IPBES², UNESCO, UN and FAO³. *Biocultural diversity* denotes “the diversity of life in all of its manifestation – biological, cultural, and linguistic – which is interrelated (and likely co-evolved) within a complex socio-ecological adaptive system” (Maffi & Woodley 2010, p. 5). This concept highlights the linkages between biodiversity and cultural diversity within human communities and their mutual evolutionary development over time.

Secondly, there are many definitions of learning within and between a variety of disciplines (see Barron et al. 2015). The definition of learning used in this research has emerged from previous research on learning compiled by Illeris (2003; 2004) through his learning model. Thus, *learning* is defined as “all processes that lead to relatively lasting changes of capacity, whether they be of a motor, cognitive, psychodynamic or social character, and which are not due to genetic-biological maturation” (Illeris 2003, p. 397). Illeris’ learning model (2003) integrates the cognitive, the emotional or psychodynamic as the internal processes, and the environmental dimension as the external process. Particularly, the cognitive dimension is described as knowledge and skills behind a learner’s understanding, abilities and attitudes. The emotional or psychodynamic dimension encompasses feelings and motivations. The environmental

² Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services.

³ Food and Agricultural Organization of the United Nations.

dimension comprises participation, communication and cooperation. With specific reference to learning in working life, the cognitive dimension refers to learning content, the emotional or psychodynamic dimension denotes learning dynamics, and the environment dimension connotes both the technical-organisational and the sociocultural features of the learning contexts.

Consequently, the concept of *biocultural learning* refers to learning processes about natural environments embedded mainly in – but not limited to – work practices among local communities (Garavito-Bermúdez 2019). Learning processes about natural environments (e.g. biodiversity and its use for human wellbeing, ecosystem complexity and ecological processes) are the result of the interactions between individuals and their local natural environments overtime (Garavito-Bermúdez et al. 2016). These interactions extend to the development of living strategies that in modern life can be seen as traditional work practices such as fishing, hunting, farming, husbandry and reindeer herding, unlike other work practices such as medicine, nursing, biology or landscape planers that involve formal (school setting) education. Having natural environments as a workplace assumes particular interactions with multiple species of animals, plants, fungi and microbes shaping and transforming ‘the human’ compared to an ordinary workplace (Garavito-Bermúdez 2019; Garavito-Bermúdez & Green 2020).

Figure 1 illustrates the internal (cognition: content; emotion or psychodynamic: dynamics) and external processes (environment: the technical-organisational, sociocultural

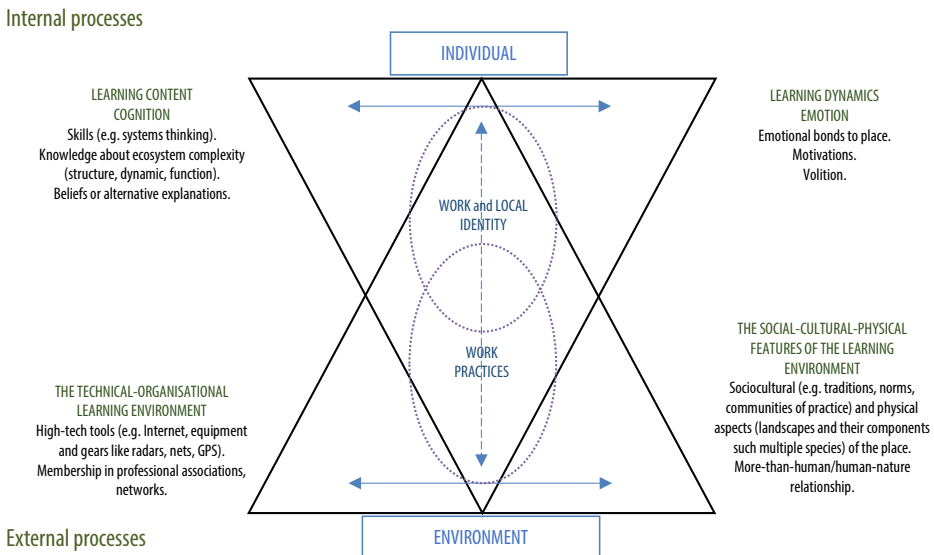


Figure 1. Biocultural learning (Garavito-Bermúdez 2019). Exemplified with Illeris’ learning model (2004).

and physical features) embedded in learning in and about natural environments. Such processes and dimensions influence the development of local and work identities among fishers and farmers, which are important for sustainable work practices (e.g. Garavito-Bermúdez et al. 2017). Furthermore, it shows the significance of particular interactions that fishers and farmers develop with multiple species especially of animals (e.g. fish, cows and sheep) and plants (e.g. trees and oats), that transform and shape ‘the human’ (Garavito-Bermúdez & Green 2020).

The next section presents a brief overview of the biographical approach and methods used for the study of biocultural learning.

Biographical approach and methods for the study of learning

The biographical method is an umbrella term for various biographical narrative methods developed for understanding how individuals or groups, make sense of events and actions in their lives within social sciences and humanities (e.g. Znaniecki & Thomas 1918-1920; Schütze 1992; Miller 1999; Plummer 2001; Robertson 2002). In particular, the use of biographical approaches for the study of learning within adult educational research have contributed to the interpretation of people’s learning constraints and conditions in a variety of educational setting (e.g. Goodson 1983; Handal et al. 1995; Armstrong 1998). Thus, biographical approaches have both served as a tool for learning itself (Goodson 2011), and a way of understanding the relationship between an individual’s circumstances and their social contexts (Goodson 1983). For instance, the biographical approach to the study of learning may make use of narration as a cognitive instrument for human development and learning (Egan 1997). Furthermore, the biographical approach has been extended to the study of the relations between adult and lifelong learning and identity (e.g. Bron 2017; Bron & Thunborg 2018; Bron 2018). Biographical approaches have also proved relevant to the study of ‘how’ and ‘why’ adults learn in professional learning contexts (e.g. West 2001; Stroobants 2005; Fillis 2015; Gustomo et al. 2019), and further understanding of motivation within adult learning in higher education (e.g. Armstrong 1998).

Biographical approach for the study of biocultural learning

The study of *biocultural learning* emphasises three central aspects: (a) how is professional knowledge about natural environments generated, maintained and updated by individuals; (b) how is such knowledge related to professional practices in natural environments; and (c) how is such knowledge interconnected to identity construction, sense of belonging and place attachment? These aspects were studied by using a biographical approach – based on participants’ life story – that utilised primarily in-depth

narrative interviews, participant observations, personal blogs and family picture analysis. The data collected provide a greater understanding of fishers' and farmers' life stories and how such stories belong to particular contexts. This combination of data collection methods facilitated the understanding of the interactions between the cognitive, emotional and environmental dimensions of learning.

Two groups of professionals with natural environments as their living and workplaces were selected: Swedish fishers and farmers. Participants' localisation and the relevance of their work practices for conservation (embedded in biocultural diversity) of highly threatened marine, freshwater and farmland biotopes were criteria for the selection. A total of 27 voluntary participants constituted the sample within selected groups, constituting 20 fishers and seven farmers in four different geographical areas: Lake Vättern (14 fishers), Blekinge Archipelago in the Baltic Sea (six fishers), Roslagen (five farmers) and Uppland farmlands (two farmers). Respondents participated in the two above-mentioned projects between 2009-2016 and 2017-2019, respectively. All the fishers were men aged 27-72 years old; and all performed high-tech small-scale fishing. Farmers were aged 43-64 years old, three of whom were men and four of whom were women. Two performed small-, three medium- and two large-scale farming. In addition, all the participants had at least a high-school education, some of them even higher education degrees in engineering, economics, biology and teaching. In the next section, anonymity was assured through denoting fishers by "FIS" and farmers by 'FAR', and a number according to the order in which they were interviewed.

The next section presents the findings from the study of *biocultural learning* in line with the research questions – i.e. how the study of *biocultural learning* benefits from the use of a biographical approach and a variety of data collection methods, and how individual and social circumstances impact *biocultural learning*.

Discussing major findings

The benefits of using a biographical approach in the study of biocultural learning

The interpretation of the relationships between fishers and farmers' individual and social circumstances – mainly derived from in-depth narrative interviews – were supported by participant observation, analysis of personal blogs and pictures. A range of benefits are listed in the following, which can be extended to other informal learning contexts.

Firstly, in-depth biographical narrative interviews provided an opportunity to approach fishers and farmers in their world of everyday life. It provided both an understanding of participants' lives and a way of approaching to their social reality. Secondly, the two groups of professionals selected illustrate more general principles based on examples of 'real people in real situations', illustrating situations 'in ways that are not

always susceptible to numerical analysis' (Cohen et al. 2007, p. 253). The findings from the selected groups of Swedish fishers and farmers are to some extent generalisable at the 'analytical or theoretical level', and 'empirical or demographical level' (Lundholm 2004). Differences characterising the selected cases provided relevant information on the implications of having natural environments as a workplace, in contrast to conventional working places. Thirdly, the information captured through interviews was complemented and reinforced by participant observation of fishers' and farmers' homes and workplaces (e.g. harbours and shops). Participant observation relates to understanding how fishers' and farmers' professional knowledge about natural environments was used in their everyday work. A good example of that are the author's notes from participant observation during a workday with FAR1 – a 63 years old female farmer with 30 years of experience in professional farming:

When I arrived, FAR1 was busy taking the heifers outside in the field into the barn, and then dividing all between three groups. The groups were those heifers who would stay in the yard, another group were those pregnant heifers that would be moved to a milking farm, and a last group to be driven to the slaughterhouse. I helped FAR1 and her husband to divide the heifers. After that, FAR1 wanted to be herself and work alone and asked me if I wanted to help her husband to build an "electric fence" to teach young heifers how the fence works. (Excerpt 1. Data from a workday participant observation with FAR1)

By meeting participants at their homes and workplaces, old objects, family pictures and equipment that had a familial and professional value for the participants became sources of biographical account. For instance, author's meeting with FIS20 at his home offered the opportunity to go deeply into his family background by showing old pictures from his ancestors that reflect professional pride and a sense of community:

Lastly, another important biographical account was constituted by personal blogs. Some participants provided access to personal blogs. Such texts had significant value for the biographical research because they constituted autobiographical narrative texts.



Pictures 1 and 2. Artisanal electric fences in place, young heifers will learn how fences work
Source: Photographs taken by the author during observation.



Pictures 3, 4 and 5. Family pictures of FIS20 from the old days. His ancestors. Men and women involved in fishing activities in Blekinge Archipelago in the Baltic Sea

Source: Photographs taken by the author during interview.

Excerpt 2 is a good example of telling a particular history to an audience and herself' as a way of reaffirming and reconstructing 'the self' by FARI. She considers herself as a pioneer in supplying eco-milk in the region for 20 years. Excerpt 2 illustrates FARI's critical view of the current discussion on meat consumption and production from her professional perspective:

The waves of discussion go loud at the kitchen table. The younger generation is at home in the yard with friends and boyfriends. Served veal made from beef from the farm. Meat and meat quality engage both the farmer and the chef and ordinary "eaters" who want a tasty meal.

The chef travels the country to find the very best ingredients for his restaurant. The farmer makes sure that the animals have good living conditions with good feed, fresh water and great freedom in the pastures in the summer and in the loose barn in the winter. But what happens to the meat between the farmer and the chef?... Do you punish the more expensive Swedish meat that comes from animals that have grazed in Swedish pastures for cheaper meat that comes from other countries where the animals are finished with large amounts of concentrate and that can get antibiotics and hormones to grow better? (Excerpt 2. Data from a FARI's personal blog)

In summary, the rich data emerged from the combination of data collection methods – such as author's notes and participants' personal blogs captured the complexity of interactions between internal and external processes that rarely are caught by merely using interviews. In this sense, the data generated contrasts traditional research on learning that mainly focuses separately on internal or external processes and very little on the interaction between them.

The impact of fishers' and farmers' individual and social circumstances on biocultural learning

By allowing the participants to tell personal stories, a set of accounts emerged. Such personal reflections allowed for the making of connections between participants'

knowledge, feelings and views, as well as sociocultural and historical features of their contexts. In this sense, approaching individual life stories was helpful for identifying the cognitive, psychodynamic and environmental dimensions of learning. Thus, participants' lives and professional choices were interconnected with their contextual circumstances, in line with previous research on the biographical approach to adult education research (e.g. Goodson 1983; Handal et al. 1995; Armstrong 1998). A good example of this was given in 2012 during an interview with FIS16 – a 65-year-old male eel-fisher in Blekinge Archipelago with 46 years of experience in fisheries. He and his two brothers inherited the profession from their father and grandfather through apprenticeship, who like them were eel-fishers in an island in the Baltic Sea. Hence, FIS16's professional and local identity was intrinsically connected to the profession and the place by his family story, so, his knowledge about eel. His statement shows that:

For five generations, my ancestors have known that the eel is from the Sargasso Sea. How did they know it in the 17th century? And it has been told by my parents over generations. They told them they fished with slings and braided baskets with a stretch, so all the eels came in there. There was so much eel... I live on street Skuregränd. The people who came and fished eel were called the forest people. We have a certain dialect so 'forest' ['skog'] becomes 'scourge', and 'skogsfolk' [forest people] becomes 'skure'. I and several others are called 'skurefolk'. I am of that family. So, we are just some relatives who own this and who have inherited it and our children. I'm one of them." (Excerpt 3. Data from an in-depth narrative interview with FIS16).

The above statement confirms the value of a biographical approach for identifying the relations between adult and lifelong learning and identity, in agreement with previous research (e.g. Goodson 1983; Bron 2017; Bron & Thunborg 2018; Bron 2018). It also exhibits the significance of learning about natural environments through apprenticeship, especially how the knowledge about eel was generated, maintained and updated across several generations of fishers. Consequently, the role of apprenticeship was highlighted by participants having or not having familial connections to the professions. Apprenticeship from older or more experience peers was highly important for learning the professions (work knowledge and practices). Besides, FIS16 stated that he was one of the last small-scale fishers in the Swedish Baltic. Information about the decreasing number of professional fishers was confirmed in a report about small-scale coastal fishing by the Swedish National Board of Fisheries in 2010. All the fishers, who I was in contact with in the locality of Blekinge Archipelago, expressed their sadness and disappointment about the difficulties to compete with industrial fisheries and the low recruitment rate within small-scale fisheries established by authorities. These issues in combination with the decline of fish populations in the Baltic Sea mainly due to overfishing by industrial ships, are some of the reasons behind the disappearance of the fishing practices and knowledge about natural environments according to the fishers themselves. In agreement FIS18 – a 69 years old male eel-fisher with 55 years

of fishing experience in the same geographical area – reinforces this disappointment. He also underlined the tacit or embodied nature of this knowledge:

Knowledge sits in my body. Kind of. It's like I said previously in relation to edges and stuff. I cannot sit here now and explain all of it, but when I am at the place then I know. It's like a feeling. Take for example when we go out fishing during the night. We always ask among ourselves. We are five men aboard: "where shall we go tonight?" One can say 'there!' Another one say 'there!' I say 'I believe we should go there, that's where the herring is tonight'. 'OK, let's try it then' they say. Most of the times it's myself with one or two [others] who say the same. Nine out of ten times we are right when we get to the place. So, we have experienced the movement that gives you the feeling for it. An awful lot is about feeling. This knowledge is important. I think that there exists a real danger nowadays that this knowledge will die out together with all the fishers who are now old. Unfortunately. (Excerpt 4. Data from an in-depth narrative interview with FIS18)

Furthermore, participants' individual and social circumstances were interconnected by approaching internal (cognitive and psycho-emotional) and external processes (technical-organisational and social-cultural) biographically from participants' life stories. Internal processes concern learning content (e.g. skills, knowledge, beliefs or alternative explanations) and learning dynamics (e.g. emotions and volition) involved in fishers' and farmers' informal learning about natural environments. The content of learning was mainly constituted by an understanding of ecosystem complexity, and psychodynamics of learning were integrated with emotional bonds to place, sense of belonging and proximity maintenance to natural environments. Examples of the content of learning are illustrated in the next excerpts from FIS4, FIS6 – both were men fishing in Lake Vättern, aged of 62 and 52, respectively, with 30 and 32 years of professional experience respectively, and almost an entire lifetime as leisure fishers – and FAR1 (see participant's background linked to Excerpt 1). FIS4 and FIS6 explain the feeding interactions between species and temporal spatial distribution of fish, and FAR1 describe the significance of manure for soil and hay harvest and the benefits of open pastures grazed by grazing heifers for biodiversity:

One can fish common whitefish at all depths. From one metre deep in early spring to 100 metres in winter... you could say that the common whitefish is mostly in open water. It can be said that the best season is autumn and winter. It's because you have a more uniform water temperature. Whitefish, it is fished exclusively on the, what is it? The bottom set net. So, it must be "above" the bottom right. And it will be there, where you have the same temperature throughout the water coat. [Then he says that the temporal-spatial distribution of fish depends on food access]. (Extract 5. Data from an in-depth narrative interview with FIS4)

They eat the same food... In specific stages in the life of the Arctic char and whitefish, they eat plankton. Then, whitefish eat plankton and bottom organisms and stuff, but some whitefish become extremely large, over 2-3 kg, and they eat common whitefish and smelt or stuff like that. Not everyone but there are a few... so they eat almost the same as Arctic char, but not all do, it's just a few. Large fish can eat both common whitefish and smelt, but there are large variations in the "fish

species”... otherwise whitefish in Vättern are very small adults or stuff, it is related to the fact that they do not get as much food... (Excerpt 6. Data from an in-depth narrative interview with FIS6)

Manure is an important ingredient in organic farming. The fertiliser contains important nutrients that enable a good harvest of feed and food. The manure should be able to release the nutrients and build on the humus content in the soil. Furthermore, heifers contribute to biodiversity by going in the summer and grazing on various pastures around Broströmmen [a specific place]. Heifers make sure that the grass doesn't compete with species like cat foot and blue violet by grazing on the meadows down towards Brosjön. [This grazing] also maintains also open spaces for other rare plants like cross-owl, St. John's wort and night violet to grow. (Excerpt 7. Data from a FARI's personal blog)

On the other hand, external processes or socialisation processes concern the influence of technological-organisational and sociocultural-physical features of learning environments. The technological-organisational aspects of learning concerned the use of artefacts and technologies, as well as communication with peers (including older fishers they learned the profession) and other professional groups (scientists and authorities), and through apprenticeships (from older to younger fishers). The 'sociocultural-physical features of learning environments' refer to e.g. traditions and norms being part of the communities of practices and to the physical features of the landscape and its components. Both technological-organisational and sociocultural-physical features of learning environments are triggers for internal processes such as the generation of knowledge about ecosystem complexity, emotional bonds to place, identity, sense of belonging and proximity maintenance to natural environments. The next excerpts illustrate examples of this. FAR6 – a 48-year-old male farmer active in Roslagen with 2 years of experience in professional farming – states the significance of communicating with scientists and reading scientific reports and books to his professional knowledge of egg production:

My knowledge of chickens was quite non-existent when I started with egg production. I have taught myself. I guess I'm pretty good at my work now because I have some communication with experts in the chicken field. I sit quite isolated here, so I have read quite a lot of poultry literature. The Swedish University of Agricultural Sciences has produced the lot, especially when it comes to feed for organic chickens. Then my analytical ability has been good, being able to count on stuff. But I'm not a salesman, I'm a technician, but in my former career I learned that it is important to focus on the customer's needs. I'm pretty good at finding solutions. I think it's important to learn about what people did in the past, because most of the knowledge already exists. I love craftsmanship so my main guide is a handbook of poultry care from the 70s. It helps me a lot, for instance, it has good advice about fish silage and how much of it I add in chickens' food in order to obtain eggs of quality. (Excerpt 8. Data from an in-depth narrative interview with FAR6)

FIS18 (see participant's background linked to Excerpt 4) expresses the links between use of fishing gear, scale and strategies and the generation of professional knowledge:

So, small-scale [...] boats are disappearing. And this knowledge is disappearing with them. I believe... the idea that one needs to have a good understanding of ecosystems when you operate different type of fisheries, and that operating small boats requires more skill because you need to be able to operate the gear, know where to put it in. You need also to know the life cycles of the different species that you fish. Now, if you think of large-scale fishing, they work with a method that is not selective; a method that catches everything. (Excerpt 9. Data from an in-depth narrative interview with FIS18)

FIS16 talks about the significance of fishing places for his life, professional identity and feelings for the profession:

It's a free profession and that makes me feel like I create something by myself. I lay in my worktime as I wish [...]. I usually work out in the fresh air. I like when I deliver a certain number of kilos of fish, I feel proud of it; that's professional pride [...].

I had idiotic thoughts about leaving the sea and everything. Selling everything [...] and just move, gone. Just to avoid seeing when everything is put on land [the disappearing of coastal fishing]. I don't want to see it!

When I die, it [fishing] will die with me. I have three boys and they can't inherit fishing. They've got good jobs, so they don't want to deal with fishing anyway. But if they could have inherited it, they could have brought this forward, in some way, but now it is not possible. It's sad to think that all this that has been built with money, blood and sweat for five generations of fishers will disappear when I die. (Excerpt 10. Data from an in-depth narrative interview with FIS16)

The above excerpts show how participants' individual and social circumstances were interconnected with approaching internal and external processes within participants' life stories. In this sense, the study of *biocultural learning* was facilitated by the understanding of the impact of social circumstances in participants' lives and work practices.

Participants' professional knowledge and practices were influenced by their personal meaning and agency, highlighted by Billet (2008), as much as by a set of social circumstances in a particular time and place (e.g. Domecka et al. 2012). This is clearly expressed by Domecka and colleagues: 'actions are placed in specific social contexts which form out of preceding activities from the individual, and from reactions of interacting partners towards these and other situational conditions, such as surrounding organisational structure, a mental structure that dominates the environment, or institutional structures' (2012, pp. 23-24). For instance, a particular circumstance highlighted by participants' life stories was the difficulty of small-scale working. Part of the challenges faced by many of them is competition with large-scale or industrial producers. Swedish small-scale producers face high production costs and quality standard requirements from Swedish and European regulations (e.g. for ecologic production, animal welfare and social justice) and low economic profitability, in contrast to foreigner large-scale producers. Participants' desires and ethical considerations towards natural environments were important for their professional choices, including small-scale production. All the participants struggled with the idea and feeling of doing

right and exploiting natural resources in sustainable ways. A clear example of this was given by FAR2 – a 66-years-old male farmer with 32 years of professional experience in farming – who states his professional role in environmental solutions:

Our way of working is what we wanted to do, how we wanted our farm. We didn't want to go into a smelly stable where the animals stood and thought it was boring. At the same time, I saw it as my role, and I think that many farmers feel that they want to bring something forward... doing different things because it is an obligation as well. Trying to do something better. It's a bit of a mission. That assignment I have received from my children. For example, you have young people talking about climate change. We couldn't just stand there and watch what happens. We need to do something about it. (Excerpt 11. Data from an in-depth narrative interview with FAR2)

Another example about the significance of taking care of natural environments was given by FAR1:

Today we celebrate that we [she and her husband] have been organic farmers for 20 years. On July 1, 1996, we started supplying organic milk from our farm. Then we had 20 cows in a long boat barn with heifers tied up on the side that had been horse stables once in a while. It was a changeover. Calves did not have to be tied up, the newborn calves would be with their mother's colostrum period and feeding them with beet was not used. At that time, 20% conventional feed had to be used. I did not belong to the real pioneers, but I was quite alone in supplying eco-milk here in the area. I started delivering eco-milk on January 1, 1997. (Excerpt 12. Data from a FAR1's personal blog)

As the last excerpts showed, the biographical approach developed, permitted the interpretation of how fishers and farmers' individual learning constraints and conditions were influenced by social circumstances (e.g. surrounding social structures, norms and traditions). Also, how professional learning impacted their identity and attachment to natural environments.

The next and last section offers a set of major conclusions and reflections concerning the relevance of a biographical approach and a variety of data collection methods for the research on *biocultural learning*.

Conclusions

With the aim of contributing to the further development of approaches and data collection methods aimed at the study of learning processes among people having natural environments as their living and workplace, this article answered the research questions of how the study of *biocultural learning* benefits from the use of a biographical approach and a variety of data collection methods, and how individual and social circumstances impact *biocultural learning*. Based on the empirical study of Swedish fishers and farmers, this article allows for a set of conclusions and reflections.

Firstly, this article concludes that the knowledge about natural environments generated by people living and working in natural environments or TEK, IEK and LEK

is connected to identity construction and emotional bounds to place (in line with previous research e.g. Garavito-Bermúdez et al. 2017; Garavito-Bermúdez 2019). The exploration of these interconnections was possible through the use of Illeris' learning model (2003; 2004), which brings insights about fundamental interactions between internal and external learning processes and the role of personal agency (suggested by Billet 2008) behind the generation of such knowledge. These findings challenge false assumptions of knowledge generation (acquisition) and learning as merely social or collective processes that have characterised previous research literature on socio-ecological systems and natural resource management, and that have unfortunately contributed to unequal power relationships between types of knowledge (scientific and experiential). Different ways of knowing coexist in human development and structure, and the variety of ways of knowing that enable fishers and farmers – that is mainly based on experience in combination to science literacy⁴ – to perform work is equally comparable to scientists' professional knowledge. Thus, this article provides insights on the professional status that TEK, IEK and LEK deserve as other professional knowledges. Providing a professional status to TEK, IEK and LEK is key for its integration within environmental management policies, and what is most important, for the social integration of those who can affect positively the sustainable use of natural resources and nature conservation by everyday work.

Secondly, this article concludes that the study of biocultural learning was possible through the use of a biographical approach and data collection methods that allow for the establishment of a relationship between fishers' and farmers' individual and social circumstances. It means that the environmental dimension of learning (technical-organisational and social-cultural-physical features of the learning environment) influences and is influenced by learning content (cognition, skills, knowledge) and dynamics (emotions, motivations, volition). Added to it, the use of complementary methods – in contrast to the merely traditional use of interviews (see Punch & Oancea 2014; Cohen et al. 2007) – such as author's notes and participants' personal blogs and pictures, captured important information that increases and facilitates the comprehension of the influence of learning dimensions and processes on identity construction, sense of belonging and place attachment. For sustainability, these findings mean, basically, that biocultural learning is key for engaging people in long term strategies aimed at the sustainable use of natural resources and conservation. Because of this, learning can be considered as a vehicle for social transformation by creating an understanding of environmental challenges that society faces (e.g. climate change, biodiversity loss,

⁴ Considered as “the knowledge and understanding of specific concepts and processes required for personal decision-making” National Research Council 1996, p. 22).

pandemics), as well as motivating and engaging people to adopt new ways of living and re-thinking humanness.

Finally, it leads to reflections about the role of adult education research in the development of theoretical frameworks and of a methodological approach to filling the deficiency of insights on learning commonly presented in sustainability research and practices e.g. socio-ecological systems literature. Consequently, it highlights the important contributions that adult educational research can achieve through research and practice within formal, informal and non-formal learning settings. In line with this, this article wants to highlight the need to study other aspects embedded in biocultural learning for global development and social transformation towards sustainability, in agreement with Agenda 2030 and the Sustainable Development Goals.

Acknowledgments

I would like to thank the Swedish Biodiversity Centre and the Swedish Research Council for Sustainable Development for funding my postdoctoral and doctoral projects, respectively. Firstly, I acknowledge the academic support, feedback and discussions provided by Tuija Hilding-Rydevik and Carina Green, at the Swedish Biodiversity Centre. Secondly, I appreciate the constructive discussions around my research by the research group of Adult Learning at the Department of Education, Stockholm University, specially to Agnieszka Bron and Camilla Thunborg for their academic support and feedback. Thirdly, I thank the invaluable collaboration of the fishers in Lake Vättern and Blekinge Archipelago, and the farmers in Norrtälje's and Uppsala's municipalities, for opening their homes and taking the time to talk to me about their lives and work. Last but not least, to Benedict Singleton for English proofreading and to reviewers and editors for their critical reading and improving this article.

References

- Armstrong P. (1998), *Stories adult learners tell... Recent research on how and why adults learn*, 39th Annual Adult Education Research Conference, San Antonio, Texas, University of the Incarnate Word, pp. 7-24.
- Banerjee S.B. & Linstead S. (2004), *Masking subversion: Neocolonial embeddedness in anthropological accounts of indigenous management*, "Human Relations", Vol. 57(2), pp. 221-247.
- Barron A.B., Hebets E.A., Cleland T.A., Fitzpatrick C.L, Hauber M.E. & Stevens J.R. (2015), *Embracing multiple definitions of learning*, "Trends in Neurosciences", Vol. 38(7), [https://doi: 10.1016/j.tins.2015.04.008](https://doi.org/10.1016/j.tins.2015.04.008).
- Barthel S., Folke C & Colding J. (2010), *Social-ecological memory in urban gardens – Retaining the capacity for management of ecosystem services*, "Global Environmental Change", Vol. 20, pp. 255-265.

- Berkes F. (1999), *Sacred ecology: Traditional ecological knowledge and resource management*, Taylor & Francis, United States of America.
- Berkes F., Colding J. & Folke C. (2000), *Rediscovery of traditional ecological knowledge as adaptive management*, "Ecological Applications", Vol. 10, pp. 1251-1262.
- Billett S. (2008), *Subjectivity, self and personal agency in learning through and for work*, in: *Handbook of workplace learning*, M. Malloch, L. Cairns, K. Evans & B.N. O'Connor (eds.), New Directions, Sage Publications Ltd, pp. 52-62.
- Briggs J. (2005), *The use of indigenous knowledge in development: Problems and challenges*, "Progress in Development Studies", Vol. 5(2), pp. 99-114.
- Bron A. (2017), *O badaniach biograficznych krytycznie. Critical approach to biographical research*, "Nauki o Wychowaniu. Studia Interdyscyplinarne" (Educational Sciences. Interdisciplinary Studies), Vol. 4(1), Uniwersytet Łódzki, Łódź, pp. 16-34.
- Bron A. (2018), *Feeling like a fish in water or like a fish out of water? A female academic career and experience in North Europe*, "Papers of Social Pedagogy", Vol. 8(1), pp. 83-97.
- Bron A. & Thunborg C. (2017), *Theorising biographical work from non-traditional students' stories in higher education*, "International Journal of Contemporary Sociology", Vol. 54(2), pp. 112-127.
- Calvet-Mir L., Riu-Bosoms C., González-Puente M., Ruiz-Mallén I., Reyes-García V. & Molina J.L. (2016), *The transmission of home garden knowledge: Safeguarding biocultural diversity and enhancing social-ecological resilience*, "Society & Natural Resources", Vol. 29(5), pp. 556-571.
- Cohen L., Manion L. & Morrison K. (2007), *Research methods in education*, Routledge, New York.
- Dasman R.F. (1991), *The importance of cultural and biological diversity*, in: *Biodiversity, Culture, Conservation, and Eco-development*, Oldfield M. & Alcorn J.B. (eds.), Westview, Boulder CO, pp. 7-15.
- Davis A. & Ruddle K. (2010), *Constructing confidence: Rational skepticism and systematic enquiry in local ecological research*, "Ecological Applications", Vol. 20(3), pp. 880-894.
- Domecka M., Eichsteller M., Karakusheva S., Musella P., Ojamäe L., Perone E., Pickard D., Schröder-Wildhagen A., Siilak K. & Waniek K. (2012), *Method in practice: Autobiographical narrative interviews in search of European phenomena*, in: *Evolution of European identities: Biographical approaches*, R. Miller & G. Day (eds.), Macmillan Distribution Ltd, Houndmills, Basingstoke, Hampshire, England, pp. 21-44.
- Egan K. (1997), *The educated mind: How cognitive tools shape our understanding*, University of Chicago Press, Chicago.
- FAO (Food and Agricultural Organization of the United Nations) (2015), *Voluntary guidelines for securing small-scale fisheries in the contexts of food security and poverty eradication*, <http://www.fao.org/3/a-i4356en.pdf> [7.04.2020].
- FAO (Food and Agricultural Organization of the United Nations) (2018), *Sustainable agriculture for biodiversity: Biodiversity for sustainable agriculture*, Rome, Italy, <http://www.fao.org/documents/card/en/c/85baf9c5-ea7f-4e25-812f-737755a8b320/> [7.04.2020].
- Fazey I.R.A., Fazey J.A., Salisbury J.G., Lindenmayer D. & Dovers S. (2006), *The nature and role of experiential knowledge for environmental conservation*, "Environmental Conservation", Vol. 33(1), pp. 1-10.
- Fillis I. (2015), *Biographical research as a methodology for understanding entrepreneurial marketing*, "International Journal of Entrepreneurial Behaviour and Research", Vol. 21(3), pp. 429-447.
- Garavito-Bermúdez D. (2019), *Biocultural learning – Beyond ecological knowledge transfer*, "Journal of Environmental Planning and Management", Vol. 63(10), pp. 1791-1810.
- Garavito-Bermúdez D. & Green C. (2020), *Biocultural learning – shaping 'the human' by interacting with natural environments*, Manuscript.

- Garavito-Bermúdez D. & Lundholm C. (2017), *Exploring interconnections between local ecological knowledge, professional identity and sense of place among Swedish fishers*, "Environmental Education Research", Vol. 23(5), pp. 627-655.
- Garavito-Bermúdez D., Lundholm C. & Crona B. (2016), *Linking a conceptual framework on systems thinking with experiential knowledge*, "Environmental Education Research", Vol. 22(1), pp. 89-110.
- García-Allut A. (1999), *Compartición de conocimiento tradicional y científico para una gestión más adecuada de las pesquerías* [Sharing the traditional and scientific knowledge for a better management of fisheries], "Etnográfica", Vol. 3(2), pp. 309-331.
- Goldstone R.L. & Sakamoto Y. (2003), *The transfer of abstract principles governing complex adaptive system*, "Cognitive Psychology", Vol. 46, pp. 414-466.
- Goodson I. (1983), *The use of life histories in the study of teaching*, in: *The ethnography of schooling*, M. Hammersley (ed.), Driffield, Nafferton, UK, pp. 129-154.
- Goodson I. & Gill S.R. (2011), *Narrative pedagogy. Life history and learning*, Peter Lang Publishing Inc., New York.
- Gustomo A., Febriansyah H., Ginting H. & Martinovita Santoso I. (2019), *The impact of direct storytelling interventions on increasing employee engagement among employees of state-owned enterprise in West Java, Indonesia*, "Journal of Workplace Learning", Vol. 31(2), pp. 166-191.
- Hamilton R. (2005), *Le savoir écologique autochtone et relatif aux comportements de concentration et de frai nocturne de l'empereur békine, Lethrinus erythropterus*, [Indigenous ecological knowledge and related to the concentration and nocturnal spawning behaviours of the Bekin Emperor, Lethrinus erythropterus], "Ressources marines et traditions", Bulletin de la CPS, Vol. 18, pp. 9-17.
- Handal G., Vaage S. & Carlgren I. (eds.) (1995), *Teachers' minds and actions: Research on teachers' thinking and practice*, Routledge.
- Hmelo C.E., Holton D.L. & Kolodner J.L. (2000), *Designing to Learn about Complex Systems*, "The Journal of Learning Sciences", Vol. 9(3), pp. 247-298.
- Illeris K. (2003), *Towards a contemporary and comprehensive theory of learning*, "International Journal of Lifelong Education", Vol. 22(4), pp. 396-406.
- Illeris K. (2004), *A model for learning in working life*, "Journal of Workplace Learning", Vol. 16(8), pp. 431-441.
- Kudryavtsev A., Stedman R.C. & Krasny M.E. (2012), *Sense of place in environmental education*, "Environmental Education Research", Vol. 18(2), pp. 229-250.
- Lindemann-Matthies P. (2002), *The influence of an educational program on children's perception of biodiversity*, "The Journal of Environmental Education", Vol. 33(2), pp. 22-31.
- Lundholm C. (2004), *Case studies - exploring students' meanings and elaborating learning theories*, "Environmental Education Research", Vol. 10(1), pp. 115-124.
- Maffi L. & Woodley E. (2010), *Biocultural diversity conservation, a global sourcebook*, Earthscan, New York.
- Magntorn O. & Helldén G. (2007), *Reading new environments: students' ability to generalize their understanding between different ecosystems*, "International Journal of Sciences Education" Vol. 29(1), pp. 67-100.
- McNeely J.A. & Keeton W.S. (1995), *The interaction between biological and cultural diversity*, in: *Cultural Landscapes of Universal Value: Components of a Global Strategy*, B. von Droste, H. Plachter & M. Rössler (eds.), Fischer and UNESCO, New York, pp. 25-36.
- Miller R.L. (1999), *Researching life stories and family histories*, Queen's University Belfast.

- Moller H., Fikret B., Lyver P.O. & Kislalioglu M. (2004), *Combining science and traditional ecological knowledge: monitoring populations for co-management*, "Ecology and Society", Vol. 9(3), <http://www.ecologyandsociety.org/vol9/iss3/art2/> [27.03.2020].
- Mukute M. (2009), *Cultural historical activity theory, expansive learning and agency in permaculture workplaces*, "Southern African Journal of Environmental Education", Vol. 26, pp. 150-166.
- National Research Council (1996), *National Science Education Standards*, National Academies Press, Washington DC.
- Poizat G. & Baran E. (1997), *Fishermen's knowledge as background information in tropical fish ecology: a quantitative comparison with sampling results*, "Environmental Biology and Fishes", Vol. 50, pp. 435-499.
- Posey A.F. (1999), *Cultural and spiritual values of biodiversity*, UNEP and Intermediate Technological Publications, Nairobi.
- Plummer K. (2001) *Documents of life 2. An invitation to a critical humanism*, (Eds. second edition), University of Essex, UK.
- Punch K.F. & Oancea A. (2014), *Introduction to research methods in education*, SAGE Publications, London.
- Robertson B. (2002), *Biographical research*, Open University Press, Buckingham.
- Rodela R. (2013), *The social learning discourse: Trends, themes and interdisciplinary influences in current research*, "Environmental Sciences & Policy", Vol. 15, pp. 157-166.
- Schütze F. (1992), *Pressure and guilt: War experiences of a young German soldier and their biographical implications*, "International Sociology", Vol. 7(2), pp. 187-208.
- Singh R.K., Pretty J. & Pilgrim S. (2010), *Traditional knowledge and biocultural diversity: Learning from tribal communities for sustainable development in northeast India*, "Journal of Environmental Planning and Management", Vol. 53(4), pp. 511-533.
- Slade B. (2013), *Professional learning in rural practice: a sociomaterial analysis*, "Journal of workplace Learning", Vol. 25(2), pp. 114-124.
- Sociés-Fiol A. & Cuellar-Padilla M. (2017), *¿Quién mantiene la memoria cultural y la agrobiodiversidad en la isla de Mallorca? Algunos aprendizajes desde las variedades locales de tomate*, [Who preserves biocultural memory and agro-diversity in Majorca? Learning from local varieties of tomato], "Revista de Dialectología y Tradiciones Populares", Vol. 72(2), pp. 477-503.
- Sterman J.D. (1997), *Learning in and about complex systems*, "Systems Dynamics Review", Vol. 10(2:3), pp. 291-330.
- Stroobants V. (2005), *Stories about learning in narrative biographical research*, "International Journal of Qualitative Studies in Education", Vol. 18(1), pp. 47-61.
- Suchet S. (2002), *'Totally wild' colonising discourses, indigenous knowledges and managing wildlife*, "Australian Geographers", Vol. 33(2), pp. 141-157.
- Sverdrup H. & Svensson M.G.E. (2002), *Defining sustainability*, in: *Developing principles and models for sustainable forestry in Sweden, Managing Forest Ecosystems 5*, H. Sverdrup & I. Stjernquist (eds.), Springer Netherlands, pp. 21-32.
- Sweeney L.B. & Sterman J.D. (2007), *Thinking about systems: student and teacher conceptions of natural and social systems*, "System Dynamics Review", Vol. 23(2-3), pp. 285-312.
- United Nations, Sustainable Development (1992), Conference on Environment and Development, Rio de Janeiro, Brazil.
- United Nations, General Assembly (2015), *Transforming our world: the 2030 Agenda for sustainable development*, https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E [7.04.2020].
- Urquhart J. & Acott T. (2013), *Constructing 'the stade': Fishers' and non-fishers' identity and place attachment in Hastings, south-east England*, "Marine Policy", Vol. 37, pp. 45-54.

- West L. (2001), *Doctors on the edge: General practitioners, health and learning in the inner-city*, Free Association Books.
- World Health Organization (2005), *Millennium ecosystem assessment, Ecosystems and human well-being: synthesis*, Island Press, Washington DC, <https://www.millenniumassessment.org/documents/document.356.aspx.pdf> [7.04.2020].
- Znaniecki F. & Thomas W. (1918-1920), *The Polish peasant in Europe and America: Monograph of an immigrant group*, Vol. 1-5, University of Chicago Press, Chicago.