



## HUMAN ECOLOGY: SCIENCE OR PARADIGM?

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### ABSTRACT

This research aims to discuss the scientific status of human ecology in Brazil. As a methodological proposal, a bibliographic review was conducted on the topic, using the contributions of national authors, which allowed the analysis of information through the construction of articulated links. To do this, the following points were established as parameters for the evaluation of scientific status: the existence of concepts; hypotheses and propositions; and methods and research techniques specific to human ecology. The research highlights the discussion about the positions of the analyzed theorists who present themselves as participants. In this way, the present article contributes to the discussion about the scientific status of human ecology in Brazil and it approaches the concept of a scientific paradigm because it is not bound to the limits of the disciplinarity or of a science for presenting elements that distinguish it as a discipline.

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### INTRODUCTION

Studies of human ecology (HE) have been around for several years, with contributions from the studies carried out for the growth and improvement of the quality of life of humanity, ranging from the collaborations of the Chicago School with the studies of urban sociology (PIERSON, 1970) to issues related to the defense of the immaterial capital of urban communities, environmental management, ecodesvelopment (SILVA; LUI; MOLINA, 2007; MARQUES, 2014), and the consequences of human interference with global climate balance. Regarding the accomplishment of studies related to HE, whether in its content or methodology, Brazil was not different from the other countries, since even before Donald Pierson's contribution at the beginning of the last century, the themes related to interdisciplinary studies focused on the analysis of human cultural relations (VALERA, 2017) and their interface

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with the environment in which they are inserted (BOMFIM, 2016) are being carried out in the country and the studies carried out by the Free School of Sociology and Politics in São Paulo (CORTES; LIMA, 2013). However, within this theme there are no significant discussions about the epistemology of human ecology. Recently interest has centered about its scientific perspective, and when the subject of epistemology is broached, one does not observe any deepening in its analysis, with the position being defended and sometimes even shifted in the course of the works of the same author (BOMFIM, 2017). Scientific thought as we know it today originated in the seventeenth century. Yet since the age of the classical theory of knowledge in ancient Greece there has been a record of scientific thought, this being humans' attempt to understand and explain the natural and social phenomena that occur in the environment of which they are a part (BEHRENS, 2007; BRITO; CARABETTA JÚNIOR, 2011). This article aims to contribute to answering the question about the scientific status of human ecology, especially as it has been constructed by Brazilian researchers, eminently interested in the phenomena that have afflicted traditional peoples and communities and as

formed by contributions from several areas of knowledge (BOMFIM, 2017). Starting from this premise, three propositions are raised: (1) Does human ecology have the necessary elements to be considered a science? (2) Is it possible to do scientific research in human ecology? (3) Does human ecology have sufficient characteristics to be considered an emerging paradigm? Thus, aware of the hegemonic role played by science in Western society (MINAYO, 2016), we seek to identify the existing theories in Brazil and how the academic community, with its scientific status, situates human ecology. In order to respond to these propositions and to identify the state of the art of the scientific status of human ecology in Brazil, bibliographical research was used as a scientific research technique (PRESTES, 2007). For this purpose, Brazilian authors were used as a reference, which allowed the identification of key themes and concepts for the understanding of the necessary elements for which a given area of study is considered a science or a scientific paradigm. To do this, we will analyze the writings of the authors in human ecology, seeking to identify in their contributions the existence of the elements that Minayo (2016) presents as necessary for an area of study to be considered a science, a scientific discipline, or even a scientific paradigm. These elements consist of concepts; hypotheses and propositions; and methods and research techniques peculiar to human ecology. From this basic position, we will attempt to infer their scientific status.

With this objective, the following authors with their respective works were selected:

- Fernando D. de Ávila-Pires: Principles of human ecology (1983)
- Paulo de Almeida Machado: Human ecology (1984)
- Maria José Araújo Lima: Human ecology: Reality and research (1984)
- Alpina Begossi: Human ecology: An overview of man-environment relationships (1993)
- Manuel Cesario: Health, environment and development: Human ecological framework (2004)
- Ronaldo Gomes Alvim: Bases of human ecology (2014)
- Ronaldo Gomes Alvim and Hernán Gerardo Castellanos: Human ecology on the construction of multidisciplinary knowledge (2017)
- Juracy Marques: Human ecology in Brazil (2014)
- Luciano Sérgio Ventin Bomfim: In Brazil, is human ecology a scientific paradigm or another type of emerging science? (2016)
- Luciano Sérgio Ventin Bomfim: The roots of human ecology in Brazil (2017)

### Scientific status of human ecology

Aware of the existence of various types of knowledge in the world and that science is only a form of inconclusive and indefinite expression of knowledge, we recognize that this field of knowledge in modern Western society has assumed the role of supremacy in the construction of reality and is used as a reference for the usefulness and morality of almost everything we possess (MINAYO, 2016). It is within this scenario that we situate the debate on the scientific status of human ecology. Bomfim (2016) affirms that the theorists of human ecology in Brazil do not care to discuss their scientific status and for this

reason there is no clear positioning about whether it is a science with a disciplinary character or a paradigm with questions to be answered (by biologists, geographers, anthropologists, pedagogues, ecologists, botanists, physicians, etc.). The scientific method presupposes that for a branch of knowledge to leave the field of common sense, it must follow the steps of observation of the question under study, the proposition of hypotheses, the experimentation of the hypotheses raised, the formulation of laws, and finally the emergence of theories which can be validated or not by the laws previously created (RICHARDSON, 2004; SALOMON, 2004). The following passages will analyze the contributions of national theorists, especially on the presentation of concepts, propositions, hypotheses, methods, and research techniques specific to human ecology.

### Concepts

For Minayo (2016) concepts are words full of meaning, constituting, delimiting and focalizing expressions of a theme under study, which communicate and express values, and synthetically and pragmatically convey stories and social actions. Avila-Pires (1983), a biologist by training, performs the interpretation of the facts based on concepts of biology, not dealing in his work with the existence of concepts specific to HE, in his own research in the field of medical and sanitary ecology. However, from the analysis of the work, it is observed that because "human ecology forms the basis of sociology and medical sociology, it is necessary to investigate the influences of social behavior on diseases" (ÁVILA-PIRES, 1983, p. 74). He also states resolutely that ecologists should go beyond the interests of their specialties to analyze and propose new structures and to plan ecosystems the continuity of human existence in a society with a quality of life (ÁVILA-PIRES, 1983).

When referring to the forms of treatment of controversial subjects, Ávila-Pires recognizes the following phenomenon:

Certain controversial issues involving complex economic and social problems, such as the conservation of nature through the rational use of natural resources, the destruction of arable land, the replacement of natural ecosystems by forest or agricultural cultivars, and urban pollution require the cooperation of professionals of all the areas, for their equation in real and operational bases. (1983, p. 148).

In this way, we can infer that, with regard to the discussion of interdisciplinarity in HE, the author favors the framing of HE as a paradigm. Concerning this point, Machado (1984) discusses the scientific status of human ecology by making the following statement:

Human Ecology ceases to be a chapter of a science, it is not a synthesis of all sciences nor the study of marginal areas of different disciplines, nor is it the sum of limited areas of different sciences. [...] Human Ecology is above all a new level of thought within the reach of different disciplines. (MACHADO, 1984, p. 33)

Machado characterizes human ecology as possessing the elements of a new scientific paradigm when affirming that HE is not a chapter of a science nor the study of marginal parts of different disciplines, but that HE lies within reach of different disciplines for constituting a new level of thought. In this way,

understanding the elementary concepts of a science conquers the intelligence of facts (MACHADO, 1984) in this field of knowledge, thus allowing the researcher to work science in a dialectical way, valuing the quantity and qualities, seeking to identify the contradictions of human achievements (MINAYO, 2016, p. 24) and providing the continuous evolution of scientific knowledge. For Pierson (1970), HE constitutes a unique social science, since his studies distinguish humans from plants and animals by means of the analysis of the bases of life in society. However, for the realization of this scanning, it is necessary to resort to concepts from other disciplines, which for Lima (1984) is evident when faced with a complex problem, the human ecologist expands his theoretical perceptions of the social system through the principles of general ecology. The approach of human ecology must be global, in which it is necessary to use concepts of classical ecology, looking for the necessary appropriation of concepts existing in other areas of knowledge for the understanding of human problems. In this regard, within a discussion based on Marxist principles, Lima (1984) writes:

The human ecologist is faced with a complex problem, when he is forced by the nature of his studies to conceive man as an animal connected, on the one hand, with the web of life under the same conditions as other living beings, and, on the other hand, with the social system as author and actor. Idealized in these terms, human ecology, in addition to using the principles of general ecology, needs to broaden its theoretical framework to scale the holistic emphasis implicit in its whole idea. (p. 20)

Thus, any study that aims to clarify the relationship between man and the environment will necessarily have to address the double aspect of man: on the one hand, that being that in the ecological complex is part of the biosphere, playing a role in the food web, and, on the other hand, that being that in the social complex is able to transform nature producing social evolution. It is concluded that this analysis involves biological, social, economic, political and cultural aspects that, from a process of intersection, constitute the object of study of human ecology. It is, therefore, an overall approach that is only feasible in a concrete biosocial context, given the implications of interdependence between these factors. (p. 24)

At this point, it remains evident that the author opposes the fragmentation of the real that occurred after the middle ages (BOMFIM, 2016), arguing that the human ecologist must necessarily establish a holistic view of the real in the development of his research. Begossi (1993) seeks to carry out the analysis of the state of the art in relation to the main existing contemporary approaches that deal with the scientific status of HE, but the author, even pointing out the problematic of classification or not of HE as a science, does not clearly point out its position, restricting himself to describing the opinions existing between the main theoreticians and pointing out the existing majority position.

For Cesario (2004), HE is both science and art, using scientific disciplines in search of the forces that impel human development. HE constitutes an interdisciplinary approach since it can involve many areas of knowledge, such as engineering, landscaping, public health, and nature conservation. The concepts of these disciplines are used to study the diverse relationships between humans and the environment and how social structures adapt in quality and quantity to the available natural resources (CESARIO, 2004).

In contrast, when Alvim (2014) attempts to understand HE and value and analyze the existing relations between humans and their environment, he appropriates concepts from different areas of knowledge (medicine, law, biology, etc.), revolutionizing modern scholarship and constructing innovative methodologies for the solution of human problems through transversal vision. In practical cases, theorists often approach HE through biology, sometimes with the least irresponsible and disrespectful attitude (BOMFIM, 2017; BEGOSSI, 1993), appropriating its conceptual framework (ALVIM, 2014). In this way there are no particular concepts assigned to human ecology, since it incorporates in itself a little of each area. Instead, it is bound to biology, anthropology, architecture, sociology, psychology, geography, and ethnoscience as its bases (ALVIM; CASTELLANOS, 2017). However, in the same work, Alvim, writing with Castellanos (2017), also stands facing the opposite direction, stating that it is demonstrated that, by working with multifocal analysis, HE is integral, possessing its own language and terminology and is itself a science permeated by the network vision that allows the researcher to evaluate the socioenvironmental dynamics of collective and individual life. At this point, there is an evident oscillation in the author's position over the years, which in some cases defends HE as a discipline of its own while in others affirming that it achieves the convergence of concepts from different disciplines for the benefit of humanity. For Marques, human ecology is a science and a paradigm that in Brazil must dissociate itself from the European and North American epistemological values, and assume and carry out discussions on current topics that portray the Brazilian cultural reality; it is important to note that there is a lack of knowledge about the nature of the group and its relation to nature, since it is striking in national history that there are significant struggles of marginalized groups in the search for recognition and respect (MARQUES, 2014). In his oratory, Marques the theorist also records that for human ecology, being classified as a science occupies a secondary role, since it defends the break with the chains of the traditional structures of knowledge, understanding that any researcher who wishes to venture into HE does not need to defend this classification and that the science that resolves to classify HE does so by its own ignorance (MARQUES, 2014). Marques also understands that the homogenization existing in the identity of the Brazilian people limits the analyses carried out by a researcher in critical human ecology.

This position's bias was affirmed in Bahia when the proposal was made to initiate a Master's in Human Ecology at the State University of Bahia (UNEB), the first such degree program in the country, and HE was initially classified as being part of ecology, one of the biology subareas. However, currently, taking into account the current criteria for classification of sciences in the country, it is not possible to achieve the perfect framework of HE in any one specific discipline (MARQUES, 2014). According to Bomfim (2016, 2017), there is not one single ecology but several human ecologies, and it is necessary to perform epistemological studies with the purpose of establishing whether HE in Brazil presents itself as a science or approaches more of an emergent scientific paradigm to be assumed by every researcher who is concerned with the dynamics of human relations. Bomfim defends the existence of several human ecologies, which have a common origin, linked in four pillars: "a) Interface / interchange Nature-Human Being, that is, Culture-Environment, b) interdisciplinarity, c) systemic conception of the real and d) Human Emancipation"

(BOMFIM, 2016, 2017). In this way, all research to fit as aligned o human ecology and contribute to human development must meet these minimal requirements.

**Hypotheses and propositions:** Richardson (2004) clarifies that a hypothesis is a possible answer to be tested for the solution of a previously formulated research problem, having as a characteristic the possibility of being rejected or accepted even partially. Along this same line, we understand as propositions the proven hypotheses about phenomena or processes previously analyzed (MINAYO, 2016). Avila-Pires (1983) in his work does not point out the existence of hypotheses exclusive to the practice of HE, limiting itself, when it exposes its definition to scientific research, to affirm that however viable a hypothesis is, as long as it is not demonstrated, it belongs to the field of science fiction. For Machado (1984), the introduction of a working hypothesis in a research study introduces the risk of establishing subjective elements for the analysis of the researched object, which compromises the results obtained, since only real results could be obtained. If they are the result of research carried out, it comes from an objective observation, without preconceptions. From the analysis of the work of Machado (1984), it is observed that for the author:

Human ecology has as its object the interactions between man and the environment. Man is considered as a whole, a system of organs and functions, endowed with instincts and intelligence, with a genetic and cultural patrimony. Environment is considered the system constituted by the biotic, abiotic and social universe in relation to man. (p. 32)

In Human Ecology we focus on the interactions between two systems. One is man, a much more complex system than those found among higher mammals, where intelligence, creativity, free will, and mastery of the arts and sciences generate performances that go beyond what is conditioned by the binomial genes-environment, where they weigh the respectable concepts of Wilson. The other is the environment of man, also more complex than any other, since it is constituted not only of the abiotic universe and the biotic universe, but also of the environment constructed by man, his religions, doctrines and theories, his economy, his machines, their governments, their society, their myths, etc. (p. 39).

In this way, we can infer that the author's research establishes as a hypothesis the focus on the interactions between the man system, the most complex found among the higher mammals, and the environment; since they are not limited by genetic / environmental factors and the human environment system, more complex than any other because it consists of elements of the biotic and abiotic universe complemented by the contributions of religions, economics, governments and society, among other human constructions.

The teacher, Lima (1984), is categorical in affirming that:

The human ecologist is faced with a complex problem, when he is forced by the nature of his studies to conceive man as an animal connected, on the one hand, with the web of life under the same conditions as other living beings, and, on the other hand, with the social system as author and actor. Idealized in these terms, human ecology, in addition to using the principles of general ecology, needs to broaden its theoretical framework to scale the holistic emphasis implicit in its whole idea. (p. 20)

In this way, the research carried out in HE, besides resorting to the principles of general ecology, need to extrapolate their theoretical framework in order to employ an integral understanding of the phenomena described in their ideas, a posture that can be understood as the elaboration of a hypothesis for the solution of a research problem.

For Alvim (2014, p. 27) “because it is a science that requires integral training, its greatest obstacle lies in the scientific disciplinarity in which the researcher is indoctrinated”; in making this statement, the researcher establishes as a hypothesis that the greatest obstacle of HE is the absence of a researcher of integral formation, which is not the result of a disciplinary, Cartesian formation in which his researchers are indoctrinated during the formation to a context of disciplinarity. In the same way, the individual, the collective, the physical-natural and the ecological are pointed as fundamental points for the understanding of an investigation carried out under a human ecology approach. For Ávila-Pires (1983), the valid propositions for HE are linked to the hypotheses related to the emphasis on humans, an integral part of the biosphere and unique in their ability to understand and modify it; in their relations with the environment, which may occur socially, economically and culturally; in their development, which has as its goal the human being itself and for this reason should not cause its sacrifice in this process and the survival of the species that will only occur with the correct management of natural communities and the prevention of diseases.

Complementing the hypotheses raised, Machado (1984) proposes that the abandonment and substitution of traditions leads humans to maladaptation, a proper concept of biology, and that maladaptation explains the causes of the migration of human communities, since humans adapted to the environment do not spend the effort necessary to migrate, nor do they modify their cultural habits. Machado's work proposes that the standardization of the metropolitan lifestyle of the mass media is being absorbed by the population and tends to destroy the identity of these communities. In turn, this lifestyle stimulates new desires, which are incompatible with immediate reality, generating frustrations and new migrations and maladaptations. He further states that the analysis of ecosystems generates the implantation of planned interventions in the ecosystems, realized through the insertion of compatible forms of new information in the observed reality that favor the system homeostasis (MACHADO, 1984); these are true predictions.

On this point, Lima (1984), referring to the contribution of Firey and Hatt (1946), teaches this:

The principles that guided this theoretical framework are valid as they seek to elucidate mechanisms responsible for the organization, adaptation, distribution and substitution of plant and animal species in the biosphere. However, they proved insufficient when used in studies of human communities (FIREY; HATT, 1946). The interrelationships processed in these communities are controlled by processes other than those purely biological. (pp. 19-20).

In making this statement, Lima proposes that the principles that guide the theoretical frameworks of the biological sciences – valid for elucidating the causes of the phenomena called organization, adaptation, distribution and substitution – are

unsatisfactory when used in the study of human communities since the existing relations in these populations are regulated by processes complementary to those essentially biological. For Alvim (2014), the result of factors such as birth rate, mortality, and migration are presented as responses of success or failure of the interaction between humans and the environment in which they are inserted. He proposed that all attempts to classify the HE do not detach themselves from the concepts of humans, physical nature, and nature built for the formulation of their understanding, that Brazilian ecologists consider the spirit of others, and that we must free ourselves from these bonds. We must seek something new, so that HE in Brazil should be seen as an invention and not a copy of the North American or European format.

### Methods and techniques

Salomon (2004) points out that the methods and techniques are the various strategies and tactics indicated for each phase of scientific research. In this way, the whole collection of knowledge produced by humans (historical, artistic, technological, etc.) can be codified, processed, reproduced and transmitted to other human beings, becoming a non-genetic patrimony transmissible and perpetuated by generations (ÁVILA-PIRES, 1983). Avila-Pires (1983) has stated that in HE methods and techniques can be registered that refer to the empirical observation made by cavemen, who tried to relate the appearance and scarcity of food with the arrival of spring or winter or the growth of plants with the rainy seasons. At the same time, the ecological analysis of an ecosystem is complex, a condition that requires a team of professionals from different areas (ÁVILA-PIRES, 1983). In this way, the author acknowledges the lack of particular methods and techniques in HE when he treats in his work the use of concepts from biology and anthropology for the treatment of human problems, focusing on various opportunities in the concepts of adaptation, competition, selection and the problems of geographic distribution and dispersion in the field of HE studies. Machado (1984, p. 124) states that the scientific methodology used by epidemiologists resembles in many ways the one that should be used by human ecologists, consisting of the following points: (1) exact observation with a description of the frequency and distribution of the disease in the study population, (2) correct interpretation, (3) rational explanation, (4) formulation of the causal hypothesis, (5) assumption of the relationship leading to the cause, (6) verification of the hypothesis, (7) verifying the truthfulness of the relationship through statistical methods, and (8) conclusion. Machado further states that the methodology used in epidemiology “distinguishes Human Ecology by the constancy of the identification of variables and probabilities before the formulation of the causal hypothesis and the substitution of the conclusion by a prospective probabilistic analysis” (1984, p. 124). When referring to interdisciplinary research, Machado (1984) indicates that the use of systems theory requires competent specialists and that the researcher must first recognize that the methods and techniques particular to his area of action will not provide him with all the answers and that only the contribution of experts from other disciplines will provide the desired answers. Regarding the solution of human problems related to spatial distribution, Machado (1984) states that the systemic vision and the prospective analysis are presented as techniques that can inspire effective policies for the spatial ordering of the population. Lima (1984) suggests the use of the Marxist dialectic as a method or technique to be

used in HE, complementing this assertion when the analysis of her work shows the choice of the field research as a means of obtaining the necessary data for research and the knowledge of the way of life and the monitoring of the changes that take place in it. The author suggests – now specifically for the accomplishment of a study in HE – the realization, from a historical perspective, of a systematization and reflection of the way in which humans and nature have interacted.

The work of Begossi (1993) tries to examine the disciplines related to human ecology, stating that HE deals with the study of the complex relationship between humans and the environment, understanding the researcher that HE transcends ecology, the branch of biology in which it was originally based, even pointing out that there are some who defend the existence of its own object and methodology. Hypotheses, propositions or methods, and techniques exclusive to HE are not treated by Begossi (1993), since even though the instigation of the scientific status of HE exists in some points throughout the text, it is treated in a transversal way, through their relationship with various disciplines (anthropology, sociology, geography, ethnobiology, cultural ecology, etc.) that in their object of study, epistemology, techniques, and methods resemble those practiced by human ecologists. Begossi (1993) presents a collection of disciplines that at some point can approach to the point of being confused with or distanced from HE, presenting several techniques and methods specific to each discipline, such as the concentric zone model used in the Chicago School and of epidemiology. For Cesario (2004), research in HE, by its condition of interdisciplinarity, can resort to the use of any method or technique existing in another discipline, as long as it is appropriate to the research that is being performed. However, the theorist points out the tendency to use the case study technique as a research strategy in HE, pointing out that this choice is due to the possibilities for the researcher to exercise greater control on relevant unmanaged behaviors, allowing the establishment of “how” and “why” questions, even those that occur punctually over time. Alvim (2014) contributes to the discussion when he states that initially HE incorporates the methods and techniques of biology and sociology to carry out its research, becoming part of this study, incorporating its fundamental roots. However, human ecologists in an interdisciplinary context use terms and methods of other disciplines in their research to support its object of study (ALVIM ;CASTELLANOS, 2017). He complements his contribution by recalling that initial studies in HE were permeated by ethnography and the use of biological concepts. However, with the passage of time, researchers began to use techniques and methods of other sciences, such as anthropology and geography, while nowadays they use several technical-methodological approaches in their interface with HE, especially those related to ethnoecology and ethnobiology (ALVIM, 2014).

### Final Considerations

Despite the importance and contributions of the research into human ecology developed in Brazil, little has been discussed about the epistemological bases of HE, especially considering the sometimes conflicting positions of their theories, even within their own texts. This research proposed to carry out a discussion, even if only briefly, identifying the authors who carried out this debate and reading their works to identify the points that constitute the scientific status of an area of study.

From the reading of the works, we can determine that the authors position themselves differently on the scientific status of human ecology in Brazil, in this way. From the evaluation of the positions adopted by each author, it can be concluded that for most of them human ecology in Brazil is not now limited to the frontiers of disciplinarity. Approached in this way, more of the concept of a scientific paradigm than that of a science as we understand it today now presents itself as a scientific discipline with its own techniques and methods. As stated by Alvim (2014), the proposal of human ecology is to escape from the simplified view of human problems in the Cartesian–Newtonian paradigm, moving beyond the frontiers of disciplinarity, and seeking, through an interdisciplinary and transdisciplinary perspective, the real vision of problems in modern society.

This condition does not prevent the production of scientific knowledge by its researchers, since the findings in human ecology derive from science and produce new knowledge that does not come out of the model of data treatment recommended in scientific disciplines, which can be considered as a scientific activity (SALOMON, 2004). However, this research does not exhaust the discussion of the theme, which must still observe several contributions before the pacification of this problem, opinions that will show solutions to existing questions, such as these: When modifying or adapting a technique specific to a particular discipline so that it can be used in human ecology, are you creating a new technique or not? When is the adaptation of terms and concepts of other sciences for use in research in human ecology creating a new definition? What vocational training should be required of an ecologist? On what laws and theories would the activities of these ecologists be based?

These lines of thought deserve greater reflection and academic practice on the part of the involved subjects that will produce innovations and gains in the way of seeing human ecology in Brazil.

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