Novitates Theriologicae, **12** (2021): 69–85
doi: http://doi.org/10.53452/nt12126

Conceptualization of the species problem

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Pavlinov, I. Ya. **Conceptualization of the species problem.** — The species problem is understood as a result of the contradiction between aspiration and inability to reduce diversity of species conceptions (SCs) to a single one. Any SC represents the natural species phenomenon in a certain cognitive situation and serves as a heuristic model of this phenomenon in the latter. SCs of various levels of generality emerge as a result of sequential multiple reduction cascade; the more reduction steps lead to a particular SC, the less it is adequate to the natural species phenomenon. The entire array of SCs can be represented by a conceptual pyramid, within which various SCs occur as particular interpretations of more general (inclusive) concepts and have no sense without contexts imposed by them. It is suggested that, in order to define natural "species in general," a certain concept of biota should be fixed at the top of conceptual pyramid allowing to distinguish between species and non-species (such as life form, syntaxa, guilds) phenomena. The ontology of the natural species phenomenon is presumably determined by its essence, viz. specieshood. The latter is a part of the entire natural history of organisms, so its manifestations are group-specific and evolve with the evolutionary development of the structure of biota.

Introduction

The general concept of species takes an accentuated position in the basic thesaurus of biology along with concepts of gene, cell, organism, ecosystem, evolution, etc. Recognition of the fundamental significance of species is evidenced by a proposal to single out a biological discipline dealing with various species issues, it was designated as *hexonomy* (Skvortsov 1967), or *eidology* (Zavadsky 1968) (not in the sense of Husserl), or *eidonomy* (Dubois 2011).

A specific "enclosure" of the species concept is shaped by an equally fundamental species problem. On the whole, it is caused by a variety of different species conceptions, though its main content and historical origins can be thought of in different ways. Some authors considered it from a philosophical perspective (Ereshefsky 1992, 2009, 2010; Ruse 1995; Ellis 2011; Wilkins 2009; Bartlett 2015; Nathan 2017), whereas others accentuate on its biological content (de Queiroz 2005; Reydon 2005; Pavlinov 2009, 2013a; Amitani 2015; Zachos 2016; Mishler 2021). This conceptual *species uncertainty* (Hey *et al.* 2003) can be traced back to Aristotle's natural philosophy, who burden the general notion of species, or rather *eidos*, with several fundamentally different meanings (Balme 1962). As a peculiar scientific phenomenon, the species problem was recognized and denoted explicitly as early as in the first half of the 20th century (Robson 1928; Hawkins 1935). It has been being actively discussed since then, with several festschrifts (Mayr 1957;

Wilson 1999; Wheeler & Meier 2000; Pavlinov 2013b) and monographs (Volkova & Filyukov 1966; Ghiselin 1997; Hey 2001a; Morgun 2002; Stamos 2003), including most recent ones (Wilkins 2009; Richards 2010; Zachos 2016; Mishler 2021), being published on this matter. These still lasting hot debates, with no clear "light at the end of the tunnel," motivated Scott Atran to point out that "ongoing inquiry into the 'species problem' surely counts as one of the basic set of scientific puzzles by which to measure success" of theoretical biology (Atran 1987: 270).

Regardless of particular perspectives, from which this "scientific puzzle" can be considered—empirical and theoretical, biological and philosophical, ontological and epistemological, etc., it is clear that all its considerations are theory-burden. Therefore, the whole of the species problem is to be subject to the thorough conceptual analysis aimed at the uncovering fundamental causes of the species uncertainty—philosophical, cognitive, historical, etc. Such an analysis is significant both in itself and eventually by paving the possible ways toward transforming the species problem into a resolvable task.

To make it (hopefully) clearer what is presumed by conceptualist standpoint with regard to the species in general and the species problem in particular, let us consider three basic modes of ontologizing the species phenomenon. According to *nominalism*, species does not exist in nature at all, so it is but a cognitive artifact. According to *realism*, the natural species phenomenon exists, and its existence is self-evident and does not require any reasonable justification. According to *conceptualism*, an initial assumption asserts that there some complexly organized multifold structure of the diversity of living matter exists, and one of its manifestations is species. To recognize the latter and to distinguish between "species" and "non-species" phenomena, a certain theoretical construction—namely, general concept of species—is needed (Pavlinov 2009, 2017; Richards 2010; Amitani 2017). Particular conceptions result from focusing attention at different aspects of the complex species phenomenon, so they acknowledge substantively different particular species units within that multifold structure.

This article investigates a possible format of contemplation of the species problem within the context of contemporary conceptualism, as it is outlined by Chris Swoyer (2006). Accordingly, it will be first outlined briefly the structure of cognitive situation, within which this problem is considered from a conceptualist standpoint, including its three-component partitioning, reduction cascade responsible for generating the whole of species uncertainty, and conceptual pyramid of particular species conceptions of various levels of generality. These philosophical reflections will be continued with the analysis of fuzzy nature of the general notion of species as one of the causes (and noticeable manifestations) of the species problem, including an important issue of species definition(s). At last, contribution of the contemporary essentialism to the conceptualization of the problem in question will be highlighted, with emphasizing on the specieshood as an integrated part of the whole natural history of organisms, with its diversity being largely responsible and thus partly explaining ontologically the species problem.

Why the species problem?

The reason for emergence and persisting of the species problem in its traditional understanding was indicated above: it is due to the existence of different particular species conceptions. However, it seems to be only a part of the problem in question; another (and probably most fundamental) one is a contradiction between an aspiration and inability of biologists and natural science philosophers to reduce this diversity to a single species conception, be it the most general ("omnispective") or a certain privileged particular one (Pavlinov 2013a, 2017, 2018). From the conceptualist perspective, the latter contradiction can be thought of as a manifestation of a more general confrontation between monistic and pluralistic treatments of both Nature itself and the ways of its cognition.

The monistic attitude is rooted in the Antique natural philosophy with its idea of the fundamental "first principle" of Nature, which was strengthened in the Middle Ages by the Biblical faith in that this "first principle" was actually the Divine plan of creation. This standpoint underlies the whole of classical natural sciences with its aspiration to describe and explain everything by a unified and thus universal theory operating with universal notions and concepts. In classical biology, the universal Natural System of organisms appeared to be such theory, one of the basic notions of which was that of species. That is why classical paradigm in biology is aimed at searching for such universal species concept applied uniformly to all groups of organisms; this is so-called *species monism*.

The non-classical philosophy of science recognizes that any natural phenomenon is too complex to be explained exhaustively by such a unified "theory of everything" and represented adequately by a single universal concept. This is because any concept is but a simplified account of such a complex phenomenon unable to generalize it in an exhaustive form. So, supposing for granted that there *is* (or *might be*) species as a natural phenomenon inherent in Nature, viz., *natural species* in the sense of Kunz (2012), any one particular species conception captures only its certain particular manifestation. Accordingly, the most adequate "omnispective" representation of such generally understood natural species can be approximated only by a certain combination of these conceptions. This presumes *species pluralism* that was considered by many authors on various grounds, both philosophical (Kitcher 1984; Ereshefsky 1992, 1998; Stanford 1995; Dupré 1999; Hull 1999; Nathan 2017) and biological (Mishler & Donoghue 1982; Pavlinov 2009, 2013a; Zachos 2016; Minelli 2020).

Trying to put species monism and pluralism in a certain balance, it seems to be reasonable to distinguish between two major levels of conceptual generalizations about species. One of these is a general *idea of species*, to which a certain *general concept of species* may accord. It is a legacy of that stage in the development of natural science when species was thought of as a fundamental element of the natural-philosophically understood System of Nature being a universal law of nature (Atran 1987; Pavlinov 2018, 2021). The latter became outdated subsequently, but its integrating effect remained to unite all particular treatments of this general concept in a certain way. Such treatments correspond to more or less formalized par-

ticular species conceptions representing various treatments of the general idea/concept. So, one of the key issues in the species problem, as it is seen from the conceptualist standpoint, is to understand interrelations between general and particular species conceptions within such hierarchy (Mayden 1997; Naomi 2011; Pavlinov 2013*a*).

Cognitive situation

Modern conceptualism, coupled with cognitive science (Swoyer 2006; Velichkovsky 2006), acknowledges a fundamental role of three-partitioned *cognitive* (or *knowledge*) *situation*, in which all the cognitive activity is conducted (Wood 1940; Yudin 1997). Accordingly, conceptualist analysis of the species problem should begin with the clarifying how the respective cognitive situation is structured and functioning.

The latter is composed of ontological, epistemological, and subjective basic components. They interact with each other in a complex manner, and it is their interaction that shapes the structure of cognitive situation. Aphoristically, the latter can be represented as a kind of *cognitive triangle*: its vertices correspond to these three components, while its edges signify their mutual interrelations (Pavlinov 2017, 2018, 2021).

The *ontological component* outlines *what* is studied in the given cognitive situation; this "what" refers to an object being cognized, species phenomenon in our case. It is important to emphasize that the component in question is not natural species as such, i.e., as a natural phenomenon outside and besides a cognitive situation, but its representation in the latter by the general species concept. According to one of its possible interpretations, such concept can be considered a *cognitive model* (in the sense of Wartofsky 1979) of what the natural species is or may be. Since this concept is obviously not the natural phenomenon itself, but its partial representation (cognitive model), an *ontological gap* arises between them (Williamson 2000), which is responsible largely for the species problem. The general concept together with all its particular interpretations outlines the ontologically (metaphysically) sound *conceptual space* (in the sense of Gärdenfors 2000), so the latter looks like a kind of "patchwork" with particular conceptions as its "patches" (Novick & Doolittle 2021). Being a cognitive model, each conception functions as a kind of heuristic designed to arrange the diversity of organisms into an ordered set of certain units traditionally called species. So, the main task of developing ontological component of cognitive situation is to make the species concept an adequate representation of natural species, which simultaneously makes the model in question most reliable as an heuristic.

The *epistemological component* is about *how* the natural species phenomenon can and should be represented and explored in the respective cognitive situation. Its main task is to develop some episteme as a means of comprehension of and dealing with this phenomenon being conceptualized ontologically one or another way. This episteme includes the rational conditions of acknowledging natural species phenomenon existing and knowable, together with the rational principles of its

cognition conceptually and distinguishing practically. The occurrence of the epistemological component in the cognitive situation leads to a hidden epistemic pitfall due to ignoring or downplaying the above ontological gap. This pitfall is brightly expressed by one of the Zen Buddhism aphorisms: "a person mistakes his finger pointing at the moon for the moon itself." This means that, when biologists analyze the species diversity, they hardly take into account that it is a particular species conception (a "finger") that makes them seeing in nature a certain phenomenon they call species (the "moon").

The significance of the *subjective component* of the cognitive situation is determined by the very fact that such situation does not exist without a knowing subject (Toulmin 1972; Haack 1979). It is the latter that creates and configures the entire situation by fixing, some or another way, the above two its basic components and their interrelations. In fact, it is the subject (scientific community, research school, person) that is responsible for both inventing a general idea of species and elaborating and implementing particular species conceptions, according to which it is decided what species is and what it is not, whether it is real or nominal, is it stationary or evolving, etc. Thus, a subject's influence is inevitably present in any scientific knowledge, and its formative input in the species problem should not be ignored.

The above-considered distinction between two basic levels of species concepts, general and particular ones, makes it reasonable to distinguish between similar levels in the structure of overall cognitive situations, with which the (still non-existing) "theory of species" operates. A lower one corresponds to the particular rather simply construed situations, each dealing with a particular species conception. So the latter can be thought of as a focal center of the respective cognitive triangle. A higher level corresponds to a common meta-situation colligating particular ones, just as particular species conceptions are colligated by the general one. The respective "meta-triangle" has in its focal center not only the general species concept but also the species problem. In fact, the latter does not exist in any one of particular situations, and it encompasses all uncertainties generated by attempting to combine them.

Reduction cascade

According to one of the principal ideas put forward in the previous section, the multi-faceted natural species phenomenon is represented in the respective cognitive situation not by itself, but by a certain more or less formalized concept serving as its cognitive model. Another important idea is that such a concept (model) is simpler as compared to the phenomenon in question. This means that construing such a cognitive situation involves certain *ontological reduction*, which means both "cutting" an investigated species phenomenon from its natural "environment" and its simplification. Such a reduction is an obligatory part of the epistemological component responsible for the above-mentioned ontological gap.

Epistemological justification of the ontological reduction is two-fold. On the one hand, its fundamental cause is the above-emphasized limited ability of human

cognitive means. On the other hand, an ultimate aim of the epistemological component is to elaborate certain operational conceptions as concrete tools for the analysis of species diversity in nature. From this perspective, more simple conceptions are preferable to more complex (Mishler & Donoghue 1982); e.g. phenetic or cladistic conceptions are "better" in this respect as compared to the evolutionary one.

The whole reduction operation can be represented in the form of a descending stepwise *reduction cascade*. It begins with the recognizing certain structures or processes within biota, one of which elements is supposed to be the natural species. The next is reduction of the general species concept to certain particular conceptions, each being defined with the reference to particular processes (causes) structuring biota; these may be evolutionary or phylogenetic or ecological conceptions. The latter may be, of necessity, reduced to far more particular ones; for instance, several particular theoretical conceptions (such as lineage, node-based, etc.) can be separated within the more complex phylogenetic one. The stepwise reduction is finalized by elaboration of the operational conceptions and criteria for delineating particular species based on the empirical data.

Biota is a complexly organized hierarchical system, whose constituting elements and processes of different levels of generality interact with each other both "horizontally" (within each level) and "vertically" (between levels). It is evident that the more of such interactions are "cut off" at each of the succeeding reduction steps, the less the respective conception thus construed retains references to the properties of the real nature. Respectively, the more of effects of epistemological and subjective components of the cognitive situation are accumulated in it that are responsible for the ontological reduction. Therefore, the longer the reduction cascade is, the wider is the ontological gap between an idea of natural species phenomenon and a particular species conception produced ultimately by this reduction. This means that the more steps are involved in the reduction cascade leading to a particular species conception, the less the latter is "natural" (refers to something actually existing in nature) and the more it is "artificial" (refers to something non-existing out of a particular cognitive situation).

At each sequential step of this reduction cascade, recognition of certain phenomena of various levels of generality are justified by certain substantive theoretical considerations. This means that the higher-order considerations serve as a kind of the conceptual frameworks for respective lower-order ones making the latter *framework-relative* (Bartlett 2015). This makes the whole cascade clearly conceptualized from the very beginning to the end.

Conceptual pyramid

As far as the above-discussed ontological reduction means simplification, there is a potential possibility for the natural species phenomenon to be represented by several particular conceptions, each of which being adequate to its certain manifestation or aspect. For instance, "species in general" can be reduced either to ecological or phylogenetic species conceptions, and the phylogenetic one can be decom-

posed into narrower conceptions depending on the treatments of species as a particular fragment of phylogenetic tree (node, internode, lineage, etc.). Therefore, the reduction cascade leads inevitably to a consequential multiplication of the species conceptions: more general and inclusive ones are less in their number than more particular ones. Accordingly, a hierarchy of species conceptions of various levels of generality is generated that may be imagined as a *conceptual pyramid* as another representation of the cognitive situation dealing with the species problem. It formalizes Richard Mayden's idea about hierarchical relationships between species conceptions (Mayden 1997, 1999; Naomi 2011; Pavlinov 2013a; Zachos 2016).

It is of prime importance to emphasize that at each level of generality of the conceptual pyramid thus construed, save for the highest one corresponding to undefined "unique beginner" (in the sense of Berlin *et al.* 1973), the lower-level species conceptions arise not by themselves, but as more detailed interpretations of the higher-level ones. It is such interpretations that make respective particular conceptions meaningful according to a certain biologically sound generalizations operating at higher levels of generality. Correspondingly, without reference to the latter, any particular species conception seems to be introduced *ad hoc* without serious biologically meaningful justification.

This leads to an important conclusion concerning operational species conceptions: these are the theoretical ones that make operational ones biologically sound. So, figuratively speaking, it is the particular theoretical conception that "dictates" a researcher how the empirical data should be analyzed and which units of biodiversity should be recognized as the concrete species. Therefore, the empirical conceptions of least recognizable or least inclusive units, though preferable from a pure pragmatic standpoint (Cracraft 1989; Brasier 1997; Claridge *et al.* 1997; Pleijel & Rouse 2000; Seifert 2014), seem to be "biologically empty" to the extent they do not refer to any biologically sound metaphysics. This conclusion, followed from the above-mentioned framework-relative epistemology, agrees with the general conceptualist idea of the theory-ladenness of any empirical observations in natural sciences (Quine 1969; Carrier 1994).

Defining species

One of the profound outcomes of the conceptual pyramid for consideration of the species problem is that it implies certain epistemological limitations to the fundamental issue of defining species as a natural phenomenon.

One of them is imposed by the classical hierarchically organized genus–species scheme of logical definitions (Voyshvillo 1989), according to which any notion of species of whatever particular meaning can be consistently defined as a "species particular" in the context of respective "generic universal." Following this argumentation scheme, no species conception of a certain level of generality can be rationally defined outside a framework context provided at a higher, more inclusive level within the respective conceptual pyramid. From this perspective, the most popular definition of species as a "group of organisms" (either similar or cross-breeding or else) cannot be considered logically consistent: it refers not to a higher-

level “generic universal” (evolutionary process, structure of biota, etc.) but to a lower-level “species particular” (organisms etc.). Unlike this, say, definition of species as a phylogenetic lineage looks more consistent by referring to a higher-level phenomenon, viz., phylogenetic pattern.

In this regard, a fundamental question inevitably arises as to how to define the general notion of natural species phenomenon to meet the provisions of the genus–species scheme. It seems that a valid answer to this question can hardly be obtainable within a conceptual pyramid with the general species concept taking its top position: in such a pyramid, the respective notion would remain an undefined “unique beginner.” Therefore, in order to answer this question correctly, the sought highest level of generality is to be set by a more general biologically sound notion as a “logical genus,” by which division it would become possible to get a “logical species” containing general definition of natural species phenomenon. It is to emphasize that, in order to avoid logical “genus–species” tautology, it is necessary to define simultaneously in the same more general context (“logical genus”), some other biological units (other “logical species”) of the same level of generality as the natural species proper, but which are certainly not species. For instance, it is of importance to distinguish between species and life form (biomorph), syntaxa, guilds, etc., which all are equally significant units of biodiversity. Such an approach is aimed at understanding what the species phenomenon is and how it differs from any “non-species” phenomena. Otherwise, it seems to appear impossible to decide conceptually why we think of particular biodiversity units as of species and not anything else.

Thus, a certain natural phenomenon is requested to set at a top of the conceptual pyramid as the “logical genus,” with reference to which structural/functional units of a certain level of generality could be defined as its various “logical species.” Taking into consideration that both “species” and “non-species” units are thought of as the elements of evolving and structured biota, it seems reasonable to fix a framework concept of the latter at the top of the respective conceptual pyramid (Pavlinov 2013a, 2018, 2021). In this regard, treating biota as a developing non-equilibrium system looks very attractive: it allows making the main emphasis on those natural causes (factors) that operate at the level of biota and structure it, as it develops and functions, thus generating and individualizing its various structural supra-organismal units. The joint co-action of these causes yields dynamic stability of both the whole biota and its various structural-functional units, including species, as one of their most fundamental properties to be comprehended (Brooks & Wiley 1986). This means that, in order to get both logically consistent and metaphysically sound definition of the natural species phenomenon, the entire conceptual pyramid should be construed as a descending cascade of the causes that structure biota and provide dynamic stability of both “species” and “non-species” units.

Such standpoint yields a causal and, by this, explanatory conceptualization of the species phenomenon aimed, first of all, at comprehension of why such a phenomenon got generated by the evolution of biota. Accordingly, if a multi-causal nature of the natural species is acknowledged, then its sought definition should be

not reductive by indicating only one particular cause (historical, ecological, functional, etc.), but as exhaustive (omnispective) as possible to incorporate all causes ensuring its existence (Sluys 1991; Wilkins 2009; Pavlinov 2013*a*; Nathan 2017). Accordingly, a conjoint consideration of these causes responsible for the dynamic stability of the species units in different groups of organisms seems to may become one of the main issues in eidology. On the one hand, this would provide a comprehension of what makes "species in general" just the species and not some other unit of the structure of developing and functioning biota. On the other hand, this would allow recognizing more clearly the causes responsible for particular manifestations of the natural species reflected in respective particular conceptions.

Another epistemic limitation is yielded by the principle of *inverse relation between the rigor and meaningfulness of concept definition* (Voyshvillo 1989). It states that the more rigorously a notion is defined, the less likely there something exists in nature to which it may correspond. In the case of species, a "negative" effect of this principle is evident in different interpretations of species as a historical unity (Hull 1997; Hey 2001b; Pavlinov 2009, 2013a; Wilkins 2009; Kunz 2012). In fact, all attempts to make its definitions more rigid lead to the introduction of reductionist conceptions (cladospecies, apospecies, paraspecies, etc.) departing from the initial general idea and thus becoming least "natural."

"Fuzzy" species

An apparently reasonable means to circumvent the just above epistemic limitations is provided by realizing that any definition of species as a rather complex natural phenomenon, claiming to be meaningful biologically, is deemed to be non-rigid semantically. Because of this, the epistemic component of cognitive situation dealing with the species problem should include some elements of fuzzy logic. One of the latter's important features is that it formalizes a possibility of operating with non-rigid context-dependent definitions (Kosko 1993). The relevant probabilistic concept of language (Nalimov 1979) presumes that in a conceptual space "fuzzily" understood, every conception is represented by a certain probabilistic distribution of its possible particular meanings that are fixed contextually in particular cognitive situations. Employing such logic presumes that, when defining a particular species notion, it makes sense to fix somehow the latter's "core" and not to try to formalize its "periphery." As a result, different species conceptions of the same level of generality (e.g., different interpretations of generative conception) will inevitably overlap by their semantic "peripheries."

A fuzzy (imprecise) character of any sound species definitions entails an unfeasibility of strict and unambiguous applications of the respective conceptions in the practical studies. First, such definitions cannot be invariably applied to all groups of organisms; their explications seem to be dependent on the contexts set by biological specifics of these groups (Pavlinov 2013a, 2017, 2021; Maxwell *et al.* 2020; Mishler 2021; Novick & Doolittle 2021). This conclusion follows from a metaphysical supposition that the essential properties of species as natural phenomenon, whatever they might be, do not exist by themselves but are constituents

of the whole natural history of organisms (see below). Besides, definition fuzziness leads to impossibility, in some groups, of an unambiguous decision as to how to interpret respective units of the structure of their diversity. For example, in fungi, it is usually difficult to distinguish unambiguously between the species, be they defined either reproductively or genealogically, and the life forms (biomorphs) defined mainly morpho-ecologically (Parmasto 1986; Brasier 1997). For the same reason, various species units distinguished in different groups on the basis of apparently the same conception may not strictly coincide in a biologically meaningful way.

Such a fuzzy vision of species conceptions makes "fuzzy" the entire species problem with all its ingredients including both species recognition and species ranking. They refer to different manifestations of the natural species phenomenon, so the conceptual relation between them is among the most relevant to the problem in question. The concepts of species unit and species rank (category), although usually considered separately, are intercorrelated: in fact, the species rank is attributed to a certain unit (viz., species unit), while the latter is presumed to be of a certain fixed level of generality (viz., species rank). Therefore, when any one of them is considered, the other is always present in mind.

Their interrelatedness implies that the species rank (category) should not be treated as rigorously and discretely ordered as in the classical "Linnaean" hierarchy, but rather more or less blurred. Indeed, it seems illogical to anticipate that any species rank definition might be less fuzzy than any species unit definition. Such an attitude would make surplus most of the debates concerning precise fixation of the "neighbor" ranks, be it species, mesospecies, semispecies, allospecies, superspecies, etc., as far as they cannot be both unambiguously defined in theory and distinguished in practice. So it might be more reasonable to speak about some "around-species" ranks in a fuzzy hierarchy rather than about discretely distinguished particular ranks to which particular units should be definitely allocated (Mikhailov 2003; Pavlinov 2017; Pfander 2018).

Evolving specieshood

The attempts to conceptualize the general notion of natural species in a metaphysically sound manner seem to plunge the entire species problem into the context of "new essentialism" quite pertinent to modern biology (Ellis 2001; Okasha 2002; Devitt 2008; Wilson *et al.* 2009; Rieppel 2010; LaPorte 2017; Maxwell *et al.* 2020). This means acknowledging that, if species is not reducible to just a sum of its constituent organisms, it must be endowed with a certain emergent intrinsic property (Sober 1980; Devitt 2008), even though of a fuzzy character. Such a property of whatever content, considered in the whole, may be informally designated as *specieshood* distinguishing the species from any "non-species" with their own essences or "-hoods" (Pavlinov 1992, 2009, 2013a, 2018, 2021; Griffiths 1999; Wilkins 2007; LaPorte 2017; Barker 2019). From this conceptualist perspective, one of the main issues of the species problem becomes searching for such

specieshood as a kind of emergent quality (essence) of the natural species phenomenon.

The first noticeable step toward biologically substantive understanding of the specieshood had been imposed by defining species as a syngameon (Poulton 1904), which was subsequently transformed into biological (actually, interbreeding) species conception by Dobzhansky–Mayr. It became clear thereafter that, for different organisms possessing different systems of reproduction, there should be different species conceptions corresponding to different "kinds of species" (Cain 1954; Mayr 1963; Richards 2010). This linking hypothetical specieshood to the species reproductive system, viewed from a more general metaphysical perspective, turns out to be quite important for understanding of possible biological meaning of the specieshood. This presumes imagination of the latter, however concretely conceptualized, an *integrated part of the overall natural history of organisms* (Pavlinov 2013a, 2018, 2021). It incorporates, in a certain unobvious way, particular mechanisms responsible for the dynamic stability of particular species—their self-reproduction and mutual isolation, their place in the niche structure of ecosystems, their persistence as genealogical lineages, etc.

Such understanding evidently yields an assumption that specieshood should depend, to a more or less degree, on other aspects of the integrated natural history of organisms. This inevitably makes specieshood group-specific: even if we suppose that the natural species phenomenon may be endowed with certain emergent properties common to all (or to the vast majority of) living beings, it may have different manifestations depending on the particular biological properties of the particular groups of organisms. So, the existence of different "kinds of species" associated with different breeding systems is but one of the outcomes of such group-specific specieshood manifestations.

Taking this dependence for granted, it might be assumed next that the presumed specieshood manifestations change together with other biological properties of organisms in the course of biological evolution along with the development of functional and structural organization of biota in general and its various elements in particular (Pavlinov 2013a, 2018, 2021). So we have here something like an "evolving essence" which might be pertinent to the so called "historical essentialism" (Griffiths 1999; Pedroso 2012; Maxwell *et al.* 2020). Among other things, this yields a supposition that the biological mechanisms responsible for the dynamic stability of species and constituting their respective specieshoods were quite loose at the beginning of the biological evolution. At its end, more perfect intrinsic mechanisms shaping the specieshood became developed in more advanced organisms thus making respective species units more cohesive and discrete (Dobzhansky 1970; Eldredge 1985; Brooks & Wiley 1986).

So, the loosely and fuzzily integrated "around-species" units of viruses, prokaryotes, and lower eukaryots may properly be termed *quasispecies* or *pseudospecies* (Eigen 1983; Nowak 1992; Van Regenmortel 1997; Domingo 2002; Wilkins 2006; Andino & Domingo 2015). In contrast to them, the more strongly integrated "around-species" units emerged at the final phase of the evolution of the species-

hood may be termed *euspecies*; this term has been coined to designate a particular step of the speciation process (Dillon 1966), but it seems to be quite apt to use it in this more general sense. An integrity of quasispecies seems to be provided mostly extrinsically by specific ecological niche occupancy, while in the case of euspecies, it is supported greatly by certain intrinsic mechanisms of within-species interactions (Brooks & Wiley 1986; Van Regenmortel 1997; Richards 2010; Pavlinov 2013a).

It is to be noted that it should be an important task of comparative eidology/eidonomy to study distribution of various kinds of species, with their particularly manifested specieshoods, among the groups of organisms with different natural histories. Resolving of this task would be aimed at revealing whether there are indeed any intercorrelations between these "-hoods" and "histories," which would provide a more reasonable ground for discussing possible causes of the evolution of both specieshood and its intercorrelations.

The species pluralism

The conceptualist look at the species problem leads to the acknowledging irreducible plurality of species conceptions and thus to the recognition of *species pluralism* (Pavlinov 2009, 2013a; Bartlett 2015). The latter has a significant impact on various aspects of research and applied activity addressing the biological diversity. So the problem in question encompasses several issues concerning the handling of the species pluralism.

It is to be emphasized, first of all, that such a pluralistic standpoint legalizes an application of different species conceptions as heuristics (research instruments) in different groups of organisms that are most adequate to their biological properties responsible for their diversity (Richards 2010; Pavlinov 2013a, 2017; Bzovy 2016; Maxwell *et al*. 2020). This seems to be more productive than the endless and fruitless debates about appropriateness of one or another particular species conception to all groups of living beings.

Facing the species pluralism, one of the fundamental tasks to be resolved is a constructive combination of different conceptions without eliminating any one of them from the respective conceptual space. One of its possible solutions may be the development of something like a *faceted classification* (see: Kwasnik 2000; Broughton 2006 on it). The latter provides a possibility to combine particular species conceptions, based on different causalities, into a single pool by means of an appropriate meta-language with an exhaustive substantive ontology for a general cognitive meta-situation "patched" by particular conceptions. One of the main objectives of developing such meta-language is to make various particular conceptions mutually interpretable within the framework of a common conceptual space. This seems to allow overcoming the problem of substantive, or "taxonomic" (in the sense of Sankey 1998), incommensurability of particular species conceptions fixing different biological features of the natural species phenomenon.

For such faceted classification of species conceptions to be theoretically well-founded instead of being just a fairly artificially composed "patchwork," it would

be important to reconsider the whole of the diversity of these conceptions and to find a broad meaningful basis for making them mutually compatible and comparable. The above-considered evolutionary interpretation of the diversity of particular manifestations of the supposed specieshood might be of use for outlining this basis and arranging species conceptions into an appropriate conceptual pyramid.

Such integrative approach would make meaningfully interpretable and comparable the species classifications elaborated for particular group of organisms within different conceptual frameworks. Due to this, species diversity in different groups of organisms can be effectively explored on the (roughly) same phenomenological basis, albeit conceptual treatments of species in these groups might be different (Sterelny 1999; Wilkins 2018). This might provide a constructive basis for incorporating diverse operational methods into a conceptually integrated toolkit for counting such phenomenologically understood species without their strictly uniform conceptualization (Claridge *et al.* 1997; Sites & Marshall 2004; Casiraghi *et al.* 2016; Reydon 2019; Garnett *et al.* 2020).

Acknowledgements

This article was prepared as a part of the Governmental Theme no. 121032300105-0 implemented by the Research Zoological Museum, Lomonosov Moscow State University.

I am indebted to John Wilkins (University of Melbourne, Australia) and Frank Zachos (Naturhistorisches Museum Wien, Austria) for their useful comments on the early version of the article.

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Резюме

Павлінов, І. Я. **Концептуалізація проблеми виду**. — Проблема виду розуміється як результат суперечності між прагненням і неможливістю звести різноманітність концепцій виду (КВ) до єдиної концепції. Будь-яка КВ представляє феномен природного виду в певній когнітивній ситуації і служить евристичною моделлю цього феномена. КВ різних рівнів узагальнення виникають в результаті каскаду послідовної множинної редукції; чим більше кроків редукції призводить до певної КВ, тим менше вона адекватна природному виду. Вся сукупність КВ може бути представлена концептуальною пірамідою, в межах якої різні КВ виникають як приватні інтерпретації більш загальних (що включають) концепцій і не мають сенсу поза їхніх контекстів. Пропонується для коректного визначення природного виду в його загальному розумінні на вершині концептуальної піраміди вводити поняття біоти, що дозволяє розрізняти видовий і «невидові» феномени (такі як життєві форми, синтаксони, гільдії). Онтологія феномена природного виду, як можна вважати, визначається його сутністю, що позначається як «видовість». Остання є частиною всієї природної історії організмів, тому її прояви специфічні для різних груп організмів і еволюціонують разом з історичним розвитком структури біоти.