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SOME OF ARISTOTLE'S WRITINGS ABOUT BIRD BEHAVIOR AND ISSUES STILL CURRENT IN COMPARATIVE PSYCHOLOGY

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> As is evident from the writings of Aristotle, Plutarch, and other classical authors, the ancients were already familiar with some of the salient features in the reproduction of birds. (Skutch; 1979: XVII).

ABSTRACT: In his search for the causes of the diversity observed in living beings, including humans (*zoa*), Aristotle did not define them by their bodily parts and generation process only. He also payed extensive attention to nutrition and especially to character (*ethos*). Indeed, combined with the other three types of features, it determines the way of life (*bios*) and subsequent activities (*praxeis*) of each species at both intra- and extra-specific levels. Character in the less developed and shorter-lived animals is less obvious. Conversely, the longer-lived ones are granted "a certain natural capability in relation to each of the soul's affections" (*HA* 608a11-13). Birds are of that kind. The present paper examines how birds are approached by Aristotle with respect to breeding and parental care in order to shed some light on the method, purpose and results of his comparative psychology.

INTRODUCTION

One of Aristotle's chief intents in what we call his zoological or biological writings was to determine the causes of "the main differentiating characteristics" (Lloyd, 1983: 18) of *zoa*, *i.e.* of all living beings including man. Indeed, these differences were reviewed with respect to such criteria as, first, faculties of sensation, means of locomotion, anatomical structure and morphology, methods of

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reproduction, etc., and, second (*HA* VII[VIII].1.588a18), activities (*praxeis*), ways of life (*bioi*), character or dispositions (*ethe*). In Aristotle's view, the behavioral patterns were interdependent and clearly deserved as much attention as the physiological ones, although his approach is not to be identified with the modern science known as ethology (Labarrière, 1993). When he listed the activities of *zoa* (*HA* VII[VIII].12.596b20-24), he first mentioned the reproductive process (mating and the production of young); then the supply of food. They "engage" as he says, "the efforts and lives of all living beings" (*HA* VII[VIII].1.589a5-6). Third, he considered how they cope with the changes of seasons and temperature variations, which are indeed crucial to any being's survival and, consequently, its chances of reproducing.

The behavioral activities leading to the production of young are mainly addressed in *History of Animals* (literally: *Inquiries Concerning Animals*), books VII and VIII (in Balme's, 1991, revised numbering). For some species they are already reported in Book VI, which is devoted to the anatomical structures and physiological process of reproduction. Some further assessments are found in *Parts of Animals* and in *Generation of Animals* (to say nothing here of the so-called *Parva Naturalia*). In other words, mating and producing young are given extensive attention, as expected from their rank in Aristotle's scale of the activities of all living beings. However, his accounts are not developed to the same extent for each of them. For practical reasons, as he made clear, he could not know the ways of life of the insects and other lower animals to the same detailed degree as he did of higher beings (*HA* VIII[IX].1.608a11-13). It is currently accepted that he was "far better informed" about marine animals (see *e.g.* Balme, 1987a: 16) than about any other group. This may be true with respect to anatomical, morphological or physiological structures, although it still needs to be checked against the evidence on the terrestrial animals, especially birds and mammals. Yet whatever the method used to examine the different animals mentioned by Aristotle in each order of the animal kingdom (Balme, 1987a: 16; Lloyd, 1983: 37, n. 135; Louis, 1975: 101; Meyer, 1855: 144; Steier, 1913: 113; Sundevall, 1863: 23-24), birds came first with about 160 different species, groups or categories considered more or less extensively. They supplied him with the largest amount of data concerning reproduction.[1] Modern naturalists and especially bird watchers are not at all surprised by this. Birds behave less secretively

[1] For an overview of Aristotle's contribution to ornithology see Streseman (1975: 3-7). Significantly enough, Labarrière (1993: 289) mainly relies upon Aristotle's account on birds.

than mammals when engaged in reproducing and appear more caring for their young than most fish and reptiles (to say nothing about the technical problems encountered to watch the reproductive behavior of these animals). Nevertheless, Aristotle's account of bird reproduction has not yet been thoroughly studied.

I shall attempt to outline some of the notable aspects of Aristotle's account, first, by surveying his report on the activities, ways of life, and character of birds with respect to the production of young; secondly, by examining two of his examples more closely; and thirdly, by looking at his purpose when considering the breeding behavior of birds, in order to reach some provisional conclusions. Before turning to the core of the matter, a few preliminary remarks need to be made.

PRELIMINARY REMARKS

Terminology

General terminology and "biological" writings. Derived from Greek terms, such words as "zoology," "biology," and "psychology" sound as if they had been coined by the ancient Greeks themselves. They are actually of much later origin. "Psychology" may be as recent as the 15th,[2] "zoology" as recent as the 16th, and "biology" as recent as the 19th century. Neither "zoology" ("scientific study of the animals") nor "psychology" ("scientific study of behavior and mental processes") was given its modern definition before the latter half of the 18th. Therefore, referring to Aristotle's "biological" writings or to Aristotle's "zoology" or "psychology" is done so for convenience.

"Genus" and "species". The terms "genus" and "species" have generated an impressive array of research due to their importance in Aristotle's writings (see *e.g.* Gotthelf, 1985: 17-128 [six papers on "Substance, Form and Species"]; Lennox, 1987; Pellegrin, 1986, 1987, 1989). These terms will be used here only when birds mentioned by Aristotle are identified with the corresponding categories in the Linnaean classification. For instance, *coccux* = *Cuculus canorus* (Grey cuckoo);

[2] Boring (1966: 167) called attention to a paper by Krstić (1964) on Marco Marulić (1450-1524), author of a lost book entitled *Psichiologia de ratione animae humane* (*sic*). Unnoticed in *OED* and in *TLF*.

perdix = *Alectoris* gen. (Partridge).[3] Elsewhere, colloquial words such as "kind," "type," etc., are used.

Aristotle's "biological" writings

The authorship, chronology, general aims and sources of that part of the Aristotelian corpus, more than 25% of the whole, are still much debated. It is not appropriate to examine them at length here, but a few limited comments will be made.

Authorship and chronology. Regarding authorship, I follow David Balme (1991) and accept his arguments against those who claim that books VII and VIII (in Balme's numbering) of *History of Animals* are spurious. The period of Aristotle's life when he was supposed to have written his "biological" treatises is another puzzling issue that does not directly affect the present article. I refer the interested reader to the provocative arguments developed by Balme (1991: 1-13).

General aims and method. Taken as whole, Aristotle's "biological" writings were not designed to be an "animal encyclopaedia" (Balme, 1987a: 9; see also *e.g.* Lloyd, 1983, 1987). Neither should they be assimilated, when taken separately, "to the present-day categories, classifying the *HA* as natural history, the *PA* as comparative anatomy, the *PN* as physiology, the *GA* as embryology." They are rather to be considered (Balme, 1987a: 11) as "studies of ... philosophical concepts ... made through empirical data" on *zoa*. Indeed, they address similar problems to those under examination in the writings on logic and metaphysics and focus upon what may be learned from living beings and their "biological" processes about substance, form, species, essence, *logos*.

Sources. The origin of Aristotle's information in his "biological writings" is another much discussed issue referring to the interrelated questions of his method and of the reliability of his work. Three main categories of sources used by Aristotle are recognised by modern commentators. First, Aristotle obtained data from former or contemporary writers (regardless of their own aims and specialities). He identified the authors he criticized more often than he did those he agreed with, although he is not as spiteful towards his predecessors as claimed by Byl (1980). As a result, the identity of all the authors of his written sources may not be fully ascertained.

[3] Thompson (1936) remains the reference book on ancient Greek evidence about birds, although it is now out of date in some respects and needs updating.

Second, Aristotle relied upon information provided by animal specialists such as hunters, fowlers, fishermen, farmers and breeders, etc., and, especially with respect to birds, by occasional watchers and owners. The importance of the latter should not be underestimated. Indeed, birds played a prominent role in the lives of people from the earliest times and thereafter (Keller, 1913; Pollard, 1977). Countless sources of evidence of many kinds (see, for instance, Böhr, 1992; Spyropoulos-Vanderpool, 1985) confirm that the Greeks were fond of birds and rather well informed about them (for various reasons or purposes). Aristotle referred to this category of his sources anonymously. He introduced their reports by such sentences as: "The experts declare" (*HA* VIII[IX].8.614a19); "It is commonly reported" (*HA* VIII[IX].13.615b24); "Some say" (*HA* VIII[IX].13.615b24-25); "So they say" (*HA* VIII[IX].15.616b7); "Others say" (*HA* VIII[IX].29.618a16); "They say" (*HA* VIII[IX].32.619a8); etc. Depending on the opinion proffered, he included their data in his account as further examples, or argued against them, or took them as starting points for his own comments.

Last, and certainly important, his third source comprised his own observations, some of which were based upon experimental programmes carried out by himself or others in his circle of influence (for example, egg development: *HA* VI.3.561a4 - 562a22; and probably bird song: *HA* IV.9.536b14-17; etc.).

OVERVIEW OF BIRD BREEDING

Had Aristotle given his own definition of parental care in birds, he likely would not have agreed with the restricted definition of some modern scientists who limit parental care to the activities displayed by parents after egg hatching. Aristotle's evidence on breeding behavior in birds involved all stages of the process of bird reproduction (Skutch, 1979). For the sake of clarity, they are listed in Table 1. Such were the main points Aristotle touched upon or developed to some extent, referring to the rich avifauna of the East Mediterranean area (Kanellis, 1969).

Table 1. A selection of Aristotle's evidence on breeding behavior in birds.

Behavioral stages	Bird species	Reference
nesting season, formation of pairs and stability	pigeon	*HA* VI.1.558b13; VIII(IX).7.612b32-34; etc.
nest sites	partridge, quail and the like	*HA* VIII(IX).8.613b6-12
	eagle	*Ha* VIII(IX).32.619a25-28
nest building	swallow	*HA* VIII(IX).7.612b23-28
courtship	pigeon	*HA* VI.2.560b25-30
female reactions after mating	hen, pigeon or goose	*HA* VI.2.560b7-11
egg laying & clutch size	partridge	*HA* VIII(IX).8.613b22-23
sitting period	pigeons (female and male taking turns)	*HA* VI.4.562b18-19
	goose or bustard	*Ha* VI.6.563a28-29
hatching	pigeon	*HA* VI.4.562b19-21
brooding and temperature regulation	pigeon	*HA* VI.4.562b21-23
nest sanitation	swallow	*HA* VIII(IX).7.612b29-32
feeding	pigeon	*HA* VIII(IX).7.613a3-6
defending the nestlings		
directly:	passerines	*HA* VIII(IX).29.618a30-31
	eagle	*HA* VIII(IX).32.619a23-25
by stratagems:	partridge	*HA* VIII(IX).8.613b18-22
teaching the nestlings how to feed	partridge	*HA* VIII(IX).8.613b12-13
	eagle	*HA* VIII(IX).32.619a20-23
teaching the nestlings how to fly when fully-fledged	"black eagle"[4]	*HA* VIII(IX).32.618b29
teaching how to sing	song-birds	*HA* IV.9.536b14-19

The accuracy of many of Aristotle's data on bird behavior (as well as on anatomy, morphology, and physiology) has been confirmed in

[4] Considering Aristotle's data, Pollard (1977: 77) tentatively identifies the "black eagle" with Bonelli's eagle (*Hieraaëtus fasciatus*). See also Thompson, (1936: 2-3).

modern times.[5] Conversely, he has been shown to be wrong on some other points (for instance, on duration of incubation, see Peck, 1970: 246-247), for reasons which themselves need further investigation. They are likely to be linked to his theoretical prejudices such as on the pairs "right, left," "male, female," etc. (Lloyd, 1991) or his philosophical convictions, for instance on the still much discussed issue of natural teleology (Balme, 1987; Cooper, 1987; Gotthelf, 1987).

Here, it will be enough to emphasize that Aristotle considered both wild and domestic birds. The remoteness of some species (for instance, vultures: *HA* VIII[IX].11.615a13-14, or eagles: *HA* VIII[IX].32.619a25-27) did not prevent him from gathering first-hand information on their breeding habits. However, the largest amount of reliable information concerns birds that were most familiar to the Greeks, either because they were domestic species (cocks and hens, etc.) or because they were reared, or tamed, like partridges and quail (Pollard, 1977: 105-109), or were kept as singing birds (Pollard, 1977: 135-40).

Most of Aristotle's descriptions of bird reproduction were listed (even in *HA* VI) as further examples of the differences being investigated in all kinds of living beings. They generally point out one feature or another. They are sometimes repeated with or without additional details or, worse, with apparent discrepancies (for example, concerning the hoopoe's nest, compare *HA* VI.1.559a8-11 and VIII[IX].15.616a37 - b1). The way he arranged the data also refers to the organization of the biological treatises. It does not always provide easy and reliable access to Aristotle's thinking, a problem exacerbated by his defining few, if any, of his key-terms. Nevertheless, clues can be found that shed some light on the concepts underlying his approach to the reproductive behavior of birds.

CLOSER EXAMINATION OF TWO EXAMPLES

Brood parasitism of Cuckoo

The brood parasitism of the Grey cuckoo (*Cuculus canorus*) is one of the compelling issues in bird breeding. As is well known, European cuckoos do not build nests. After mating the female selects the nest of

[5] For instance, on partridges see Johnsgard (1988:114-118); on pigeons, Cramp-Simmons, IV (1985: 288-298), Grüll (1980: 25-42), and Vindevogel *et al.* (1987: 108-112); on eagles, Brown-Amadon; and on bird song, Armstrong (1973), Hartshorne (1992), and Thorpe (1961).

another bird, nearly always a song-bird of the species which had raised her. She makes her choice of the nest at the time when the host female has started laying. The cuckoo female picks up one egg (which she will throw away or swallow) from the host's clutch and lays her own. Her egg usually hatches before the eggs of the host, and her nestling shoves them out, reducing the breeding success of the host. Indeed, only the young cuckoo is likely to survive, and it is cared for by the host or foster parents (Wyllie, 1981).

Aristotle described the cuckoo's reproductive process, in comparison to that of other animals, at some length (*HA* VI.7.563b29-564a3; VIII[IX].29.618a8-31; *GA* III.1.750a12-16). However, he obviously did not have an extensive knowledge of what happens to the eggs or nestlings of the host species and the circumstances and causes of egg destruction or of host-nestlings' starvation (Bodson, 1982). Aristotle reported three hypotheses conveyed by common opinion (introduced by: "so they say"), based upon "people's own watching" (see above). He did not suggest which hypothesis should be accepted, and he concluded by saying (VIII[IX].29.618a26-31; Balme's translation):

> It seems that the cuckoo manages its reproduction intelligently (*phronimon*): for because it is conscious of its own cowardice and inability to give help, for this reason it makes its own chicks supposititious, as it were, in order to save them. For this bird is exceptionally cowardly: it has feathers plucked by the little birds and runs away from them.

Modern ornithologists still discuss the origin and adaptation of the cuckoo's brood parasitism. They confirm that the cuckoo female is attacked by the smaller birds (passerines) whose nests she parasitizes, but ornithologists refrain from describing her as being cowardly. In Aristotle's biological works, such words as "cowardly," "courageous," "gentle," "aggressive," "scheming," "fawning," "jealous," etc., are commonly used (Bertier, 1993). They did not originate from popular belief as was once admitted by Lloyd (1983: 24; 1984).[6] These terms did not retain their anthropomorphic meaning either. Being transposed from man and his distinctive scale of values to other animals, they lost their ethical connotations and simply relate to natural behaviors and reactions (Fortenbaugh, 1971: 67-70; Labarrière, 1990: 415; Lloyd, 1983: 25).

Deemed more important here is the intelligence (*phronesis*) attributed by Aristotle to the cuckoo. *Phronesis*, precisely "practical intelligence," is the criterion in *GA* III.2.753a8-17 by which he classifies the *zoa* with respect to their intimacy and attachment to their offspring.

[6] Criticized by Labarrière, 1993 and Lennox, 1985.

There the class of birds (taken as a whole) is listed in second position, after human beings and some other mammals. The latter, which "have more practical intelligence (*phronimoteron*), ... which are endowed with most practical intelligence (*phroneseos*), show intimacy and attachment towards their offspring even after they have reached their perfect development". Birds "show it –only– until they have produced their chicks and brought them up". Remarkably enough, the cuckoo, managing its offspring as it does, is said to be no less intelligent than swallows, pigeons, partridges, etc., all birds actively caring for their own nestlings. Indeed its *phronesis* is deemed to make the cuckoo conscious of its cowardice and capable of reaching the supreme aim of reproduction: survival of the offspring.

The origin of the swallow's art of nest building

Aristotle opens (chapter 7) his extensive review (*HA* VIII[IX]) on animal ways of life with the case of the swallow. He first mentions the process of nest building (*HA* VIII[IX].7.612b23-28; slightly modified from Balme's, 1991, translation):

> In the mixing of straw into mud she keeps the same order. She interweaves mud with the stalks, and if she lacks mud, she moistens herself and rolls her feathers into the dust. Further she builds the nest just as humans build, putting the stiff materials underneath first, and making it match herself in size.

Despite Thompson's (1936: 316) statement, Aristotle does not provide such details as those mentioned by other ancient authors[7] (for instance, Theocritus, *Idylls* 14.39; Vergilius, *Georgica* IV.307, as cited in Arnott, 1967); Theaetetus Scholasticus, in *AP* X.16.5-6) that clearly differentiate the House Martin (*Delichon urbica*) from the Barn Swallow (*Hirundo rustica*). Both species build a cup-shaped nest of mud (Goodfellow, 1983, Ch. 7; Hund-Prinzinger, 1985: 484-487; Suter, 1985: 310-311, Fig. 52, 410-423; Turner-Rose, 1989: 26-27, pl. 15 and 24), although what Aristotle said of making mud (moistening themselves and rolling their feathers in the dust) has not been confirmed and is

[7] This statement by Pollard (1977: 30), is ambiguous: "The Ancients did not distinguish the swallow (*hirundo rustica* [*sic*]) from either the house martin (*delichon urbica* [*sic*]) or sand martin (*riparia riparia* [*sic*])." He should have added "in their naming". Their descriptions, especially on the nesting site, confirm that they did not confuse the species with one another.

indeed questionable.[8] Nests differ from one another only by their position, attached to a roof or a beam: *Hirundo rustica* or close up beneath the eaves, *Delichon urbica,* and the size of entrance: largely open in *H. rustica*, a small entrance hole in *D. urbica*. Whether Aristotle refers to the former or the latter species does not matter too much here, but how he comes to his assessment on swallow's nest building is worth considering. Indeed, having stated at some length (chapters 1-6) the differences observed mainly in mammals' behavior and character, he turned to the ways of life of other animals introducing the point as follows (*HA* VIII[IX].7.612b18-23; adapted translation, after Balme, 1991:

> In general, with regard to their lives, one may observe many imitations of human life in the other animals, and more especially in the smaller than in the larger animals one may see the precision of their discriminating intelligence (*dianoia*): for example, first in the case of the birds, the swallow's nest-building.

As in the case of the grey cuckoo, intelligence is mentioned to justify a pattern of behavior that is commonly admired. Yet the concept of "intelligence" is not referred to with the same word as that applied to the grey cuckoo. Swallows are granted *dianoia*: "analytical intelligence" or "discriminating intelligence". Aristotle was much interested in non-human intelligence, and he scrutinized the activities and conduct of many animals with respect to the smaller or larger share in different types or degrees of "intelligence" which they display. The problem is that he did not provide an explicit definition of such types or degrees. As was recently shown by Labarrière(1990), Aristotle differentiated between qualities, stages, or levels of intelligence by purposely varying his vocabulary. When preferring *dianoia*, the type of intelligence he identified in the swallow's nest building process, he used one of the words he also (though not exclusively) applied to human intelligence. This does not mean that he mistook the bird's intelligence for the human's, but that he perceived that the ability displayed by a swallow in selecting and using its materials so efficiently results from some skill superior to a merely "practical" intelligence. He viewed the swallow's action as being related to the human discernment or analytical intelligence closely enough to be called *dianoia* and not *phronesis.* His choice was all the more meaningful since what is eventually achieved by

[8] I am most grateful to Dr. A Demaret for his helpful information and comments on this particular point.

the swallow's art of nest building is indeed a "practical" or "material" piece of work.

For all its interesting characteristics, the swallow's art of nest building is not the only activity noted by Aristotle about that bird. He also emphasized other traits of its discriminative aptitude such as feeding the nestlings and teaching them nest sanitation.[9] Furthermore, the swallow's way of life is only the first of the examples Aristotle reviewed in *HA* VIII(IX). Regarding birds (before he turned to fish, insects, and mammals), he described, for example, the monogamous habits of pigeons and the stratagems of partridges saving their nestlings from the hunter. These provided him with resemblances (Fortenbaugh, 1971: 152; Thompson, 1910) or parallels (Pollard, 1977: 19) –*mimemata*– between the human way of life and the *bioi* of the other living species, namely the animals.[10]

PURPOSE

Assessing the final aim or teleology of nature in whatever is achieved is one of the main features of Aristotle's system, although his definition of final causality has not been found in what is preserved of his work (Gotthelf, 1987: 204). His statement about the cuckoo's reproductive behavior –"in order to save the chicks"– explicitly refers to the final aim. It is only implicit in the swallow's process of nest building as characterized in *HA* (see above), but it is firmly emphasized in the extensive demonstration of natural determinism in *Physics* II.199a21-30 (Balme, 1987b; Cooper, 1987), where "the swallow making her nest" is taken as a meaningful example. Nevertheless, when describing reproductive behavior and parental care in birds (and other animals), Aristotle seemed to have been more interested in the animal's

[9] Labarrière (1993: 293) says that swallows are mentioned as first examples of the category of birds "easily finding their food" (*eubiotoi*) and "kind to their young" (*euteknoi*). For such terms, see (for instance) *HA* VIII(IX).11.614b31-34 (*euteknoi*), 15.616b10 (*eubiotos*). Indeed, swallows relate to both classes with respect to their breeding behavior. However they are explicitly given those qualifications nowhere in the biological treatises. Even in 612b18-22. Aristotle refers to swallows neither as *euteknoi* nor as *eubiotoi*, but for their paradigmatic *dianoia*. See next paragraph.

[10] Cole (1990: 53, n. 18, unchanged from the 1st edition), after Sikes (1914: 61-62), states that in Aristotle's view, "birds learned to build nests in imitating human dwellings." Bertier (1994: 488, n. 2) has the same, although apparently independent from Sikes and Cole, misinterpretation (which involves Democritus, 68 B 154 Diel[6]-Kranz. See Bodson, 1996).

intelligence and cognitive faculties (Dierauer, 1977; Sorabji, 1993) than in anything else. Indeed, the topic involves further comparisons between all living beings, not so much between birds and birds or mammals or insects as between humans and other animals. Intelligence was a key issue in Aristotle's logical classification (Pellegrin, 1987) with humans at the top of the hierarchy (Lloyd, 1983: 26-42).

CONCLUSION

The aim of this survey was to outline the Aristotelian evidence on the breeding process and parental care in birds. The first provisional conclusion is that the amount and diversity of data gathered on such matters in the biological treatises is fairly impressive, in both extent and general accuracy, although this needs further investigation. Meanwhile, Aristotle's research on birds appears to be rooted in the ancient Greeks' cultural interest in those animals and in his own attention to them. It led him to conduct or to instigate observations and experiments, the accuracy of which remains astonishing in some cases. As to his comparative psychology, when dealing with bird breeding, it appears, not surprisingly, to refer repeatedly to human features. The fact is consistent with Aristotle's main purpose, and it enabled him at the same time to provide the European tradition of ornithology with a masterful opening.

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ABBREVIATIONS

AP = Anthologia Graeca
GA = Generation of Animals
HA= History of Animals
OED = Oxford English Dictionary
PA = Parts of Animals
PN = Parva Naturalia
TLF = Trésor de la langue française

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