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Lactation and lactation physiology in sheep and goats: a study of Bedouin Arabic zoological terminology in *al-Muḫaṣṣaṣ* by Ibn Sīda († 1066)

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ABSTRACT
This study offers an analytical and comparative examination of Arabic zoological terminology related to udder morphology, lactation, and lactation physiology in sheep and goats (Caprinae), as recorded in Ibn Sīda's thematic dictionary *al-Muḫaṣṣaṣ*. It investigates how these lexical distinctions preserve traces of Bedouin pastoral knowledge grounded in close and repeated observation of small ruminants. The analysis shows that this terminology does not merely reflect lexical richness, but reveals a refined system of practical differentiation concerning udder form, milk production, suckling behaviour, drying-up, and atypical lactational phenomena. Several of these distinctions are consistent with phenomena documented in contemporary zoology and animal husbandry, although they must be understood within their own historical and pastoral context rather than as anticipations of modern science. The study argues that *al-Muḫaṣṣaṣ* constitutes an important source for the history of Arabic pastoral knowledge and for the study of human-animal relations in classical Arabic culture. Future research may extend this approach to other zoological sections of the same corpus, to other classical Arabic dictionaries, and to the comparison with the zoological vocabulary of present-day Bedouin communities.

KEY WORDS
Caprines,
lactation physiology,
mammary morphology,
al-Muḫaṣṣaṣ,
Ibn Sīda.

RÉSUMÉ

La lactation et la physiologie de l'allaitement chez les ovins et les caprins : une étude de la terminologie zoologique arabe bédouine dans al-Muḫaṣṣaṣ *d'Ibn Sīda († 1066).*

Cette étude propose un examen analytique et comparatif de la terminologie zoologique arabe relative à la morphologie de la mamelle, à la lactation et à la physiologie de la lactation chez les moutons et les chèvres (Caprinae), telle qu'elle est consignée dans le dictionnaire thématique *al-Muḫaṣṣaṣ* d'Ibn Sīda. Elle examine comment ces distinctions lexicales conservent des traces du savoir pastoral bédouin fondé sur une observation étroite et répétée des petits ruminants. Au-delà de la richesse lexicale qu'elle manifeste, cette terminologie révèle un système de différenciation pratique d'une grande sophistication, couvrant la morphologie mammaire, la production laitière, le comportement de tétée, le tarissement, ainsi que des phénomènes lactationnels que l'on pourrait qualifier d'atypiques. Plusieurs de ces distinctions correspondent à des phénomènes documentés dans la zoologie contemporaine et l'élevage animal, bien qu'elles doivent être comprises dans leur propre contexte historique et pastoral plutôt que comme des anticipations de la science moderne. L'étude soutient que *al-Muḫaṣṣaṣ* constitue une source importante pour l'histoire des savoirs pastoraux arabes et pour l'étude des relations homme-animal dans la culture arabe classique. De futures recherches pourraient étendre cette approche à d'autres sections zoologiques du même corpus, à d'autres dictionnaires arabes classiques, ainsi qu'à la comparaison avec le vocabulaire zoologique des communautés bédouines actuelles.

MOTS CLÉS
Caprinés,
physiologie de la lactation,
morphologie mammaire,
al-Muḫaṣṣaṣ,
Ibn Sīda.

INTRODUCTION

From the earliest human societies, humans turned to grazing after domesticating several animal species. Among these, sheep and goats, both belonging to the Caprinae family, held a privileged place due to their economic value, linked in particular to their high reproduction rate and the diversity of their products: meat, wool, and milk. They also had the advantage of requiring little care and little feed.

The Arabs were no exception to this trend: the arid climatic conditions of the Arabian Peninsula led them to base a large part of their economy on pastoralism, placing sheep and goats on the same footing as camels as vital resources. This long and close relationship between the Bedouins and their animals in the deserts and grasslands allowed them to acquire extensive experience with these animals, whose every detail they meticulously observed, and to develop a profound knowledge encompassing their reproduction, diseases, behaviour, and temperament. All of this allowed them to name and describe animals with great precision. They recorded everything related to the animal world, often going far beyond simple description, using multiple terms to designate the same aspect depending on the context. This constituted a rich lexicon, even though it had not yet been compiled and written down.

To remedy this, many scholars dedicated themselves to collecting the language from the very beginning of the Arab conquests, a time when errors and alterations began to creep into the speech of both non-Arabs and newly Arabized Arabs. These scholars focused on gathering the entire Arabic linguistic heritage, relying on direct observation of the Bedouins.

They spent many years living among them, observing their linguistic practices in all aspects of life and meticulously recording their speech. This work flourished from the Umayyad period (661-750 AD) through the Abbasid era (750-1258 AD) and beyond.

The term "Bedouin" (*aʿrāb, badw*) as used throughout this study designates the nomadic populations of the Arabian Peninsula whose speech was systematically sought out by early Arab philologists, not a fixed ethnographic or racial category. It is worth noting that the connotations of the term have shifted considerably over time and across contexts, at times acquiring pejorative overtones in modern usage that are entirely absent from its medieval philological sense. In the context relevant to this study, the Bedouin held the status of informant (*rāwī*), oral transmitter, and, in effect, guarantor of linguistic correctness: scholars of Basra and Kufa travelled to the desert, or summoned Bedouin speakers to the city, specifically to record and adjudicate points of usage, sometimes even calling upon them as arbiters in scholarly disputes over grammar (Blachère 1950; Cheikh-Moussa 2015). This reliance was not without its complications: informants occasionally embellished their material to satisfy their audience, and the reliability of certain transmitters was itself debated among the philologists who consulted them (Cheikh-Moussa 1996: 156). Yet it remains that the Bedouin functioned, within this tradition, as an authoritative source and active participant in the constitution of the classical Arabic lexicon, rather than as a passive object of observation.

Arab scholars thus selected specific tribes for linguistic collection: primarily the Qays, Tamīm, and Asad, then the Huḏayl, certain branches of the Kināna, and the Ṭayyi. They avoided drawing on the speech of settled tribes or those from the fringes of the peninsula, whose languages had been altered by contact with neighbouring peoples (Ḥamāda 2000: 7).

Thus, the linguistic collection effort can be summarized in three main stages:

– first stage: an unstructured collection phase, consisting of recording everything heard from the Bedouins, in all areas of life (Cantineau 1936-1937);

– second stage: the creation of specialized collections, which can be classified into four main groups:

• group 1: works devoted to natural phenomena and daily life (humans, animals, plants, habitats, mountains, water, etc.) (Šalqānī 1962: 110);

• group 2: treatises dealing with grammatical forms and language structures (short or long words, masculine and feminine, derivations and transformations, etc.) (Šalqānī 1962: 110);

• group 3: collections combining language, literature, and history (proverbs, popular expressions, rare words, etc.) (Šalqānī 1962: 110);

• group 4: works organized by meaning (synonyms, antonyms, homonyms, nuances of meaning, etc.).

– third stage: the creation of comprehensive dictionaries, systematically organized to allow the meaning of each word to be easily found (Amīn 1997: 265).

As for the scholars of al-Andalus, like the Arab scholars of the Orient, they also actively participated in this preservation effort. They worked to strengthen exchanges between Eastern and Andalusian scholars and to transfer numerous works from the Orient to al-Andalus (ʿĪd 1992: 34).

In the 3rd century AH, travel to the Orient was indeed considered a cultural duty for Andalusians: many of them met the most renowned linguists of Baṣra and Kufa. Thus, the masters of grammar and language in al-Andalus were mostly disciples of the Eastern scholars, so much so that the teachings of the two great grammatical schools, those of Kufa and Baṣra, spread widely among Andalusian scholars.

This exchange with Eastern scholars contributed to revitalizing cultural life in general and linguistic life in particular. It provided a strong incentive for philological and lexicographical composition in al-Andalus, fostering the emergence of several prestigious schools, among which the school of Abū ʿAlī al-Qālī (901-967 AD / 288-356 AH) remains the most important.

Al-Qālī's prestige earned him a prominent place among the scholars of his time, and thanks to him, the Arabic dictionary began to take decisive steps toward its consolidation. His Andalusian students then continued his work, developing and refining it considerably.

The lexicographical tradition continued in Al-Andalus, culminating in Ibn Sīda's thematic encyclopedic dictionary *al-Muḫaṣṣaṣ*, which ranks among the most important and representative dictionaries of this phase of the development of Arabic lexicography.

Turning to the Arabic zoological lexicon, it is clear that animals occupied a prominent place in lexicographical treatises: some of which are partially or entirely devoted to animal species. Examples of these include al-Aṣmaʿī († 828)'s *Kitāb al-Ibil* (*The Book of Camels*), *Kitāb al-Ḫayl* (*The Book of Horses*) and *Kitāb al-Šāʾ* (*The Book of Sheep and Goats*), as well as al-Ǧāḥiẓ's *Kitāb al-Ḥayawān* († 868 or 869), despite the fact that the latter work is not limited to lexicography (Aarab & Lherminier 2015; El Mouhajir & Aarab 2016, 2017; Aarab 2020).

As for sheep and goats, the works dedicated to their subject, which we have classified in chronological order, are as follows:

– the first book attested by the available documentation is entitled *Kitāb al-Ġanam wa-Alwānihā wa-ʿĪlājihā wa-Asnānihā* (*The Book of Sheep and Goats, Their Types, Their Care, and Their Ages*), written by Abū al-Ḥasan Saʿīd al-Mujāšiʿī, known as al-Aḫfaš al-Awsaṭ († 210 AH) (Ibn al-Nadīm, *Fihrist* I, 147; Yāqūt al-Ḥamawī, *Iršād al-Arīb* III, 1374; al-Qifṭī, *Inbāh al-ruwāt* II, 42).

– Abū Zayd Saʿīd al-Anṣārī († 215 AH) subsequently composed three works exclusively devoted to sheep and goats:

• *Kitāb Naʿt al-Ġanam* (*Description of Sheep and Goats*) (Ibn al-Nadīm, *Fihrist* I, 154);

• *Kitāb al-Maʿzā* (*The Book of Goats*) (Ibn al-Nadīm, *Fihrist* I, 154; al-Qifṭī, *Inbāh al-ruwāt* II, 35);

• *Kitāb al-Ibil wa-l-Šāh* (*The Book of Camels and Sheep and Goats*) (Ibn al-Nadīm, *Fihrist* I, 154).

– Al-Aṣmaʿī († 216 AH) in turn wrote *Kitāb al-Šāʾ* (*The Book of Sheep and Goats*), the only comprehensive work on this subject that has survived (Yāqūt al-Ḥamawī, *Iršād al-Arīb* IV, 1480).

– finally, shortly after al-Aṣmaʿī, Abū ʿIkrima al-Ḍabbī († 250 AH) composed *Kitāb al-Ibil wa-l-Ġanam* (*The Book of Camels and Sheep and Goats*) (Yāqūt al-Ḥamawī, *Iršād al-Arīb* IV, 1480).

The lexicographical tradition continued for several centuries, culminating in the writing of encyclopedic dictionaries such as *al-Muḫaṣṣaṣ* by Ibn Sīdah († 1066) in al-Andalus, *Lisān al-ʿArab* by Ibn Manẓūr († 1312) in Egypt, up to *Tāǧ al-ʿArūs* by al-Zabīdī († 1790) in Yemen, all three of which contain extensive information on animals.

MATERIAL AND METHOD

The work that is the subject of our study is the encyclopedic dictionary entitled *al-Muḫaṣṣaṣ*, compiled by the renowned Andalusian lexicographer Ibn Sīda († 1066).

This dictionary made a significant contribution to the preservation of the Arabic language by producing one of the most extensive lexicographical works in the Arab-Islamic heritage. It is a thematic dictionary structured into twenty-one divisions called *asfār* (singular: *sifr*). Each *sifr* is subdivided into several *kutub* (singular: *kitāb*), each of which is composed of several chapters, *abwāb* (singular: *bāb*), which can be further divided into subcategories. Each *sifr* is devoted to one or more specific domains, such as celestial phenomena, nature, human beings, or animals. In this regard, the latter are the subject of a section of *sifr* 6, as well as all of *asfār* 7 and 8, all three located in the third and fourth volumes of the edition studied here (ʿAbd al-Ḥamīd 2005). It should be noted that these volumes deal more specifically with terminological aspects relating to both zoology and animal husbandry for domestic species.

For this study, we chose to focus on the *kitāb* dedicated to sheep and goats[1], which addresses both zoological terminologies relating to behaviour, body parts, reproduction,

1. Caprinae are discussed in the last 25 pages of the seventh *sifr* and the first 23 pages of the eighth *sifr*.

and physiological states, and zootechnical terminology dealing with aspects related to the practical concerns of breeders and herders, such as variety selection and animal production.

This choice of *al-Muḫaṣṣaṣ* over other candidate dictionaries : the earlier but less comprehensive *Kitāb al-ʿAyn*, or the later, more exhaustive *Lisān al-ʿArab* and *Tāǧ al-ʿArūs*, is motivated primarily by its thematic organization[2]. Unlike alphabetically arranged dictionaries, in which terms relating to sheep and goats are scattered across numerous entries according to root rather than subject, *al-Muḫaṣṣaṣ* groups this material within a single, dedicated *kitāb*. The same peculiar zoological terms do resurface, often in scattered form, in later comprehensive dictionaries such as the *Tāǧ*[3]; what distinguishes *al-Muḫaṣṣaṣ* is not the exclusivity of its material but its thematic consolidation of it, which makes the internal structure of this vocabulary directly legible as a coherent semantic field rather than as isolated lexical entries.

The following are the various chapters dealing with the zoological and zootechnical terminology of sheep and goats. These two dimensions are not always clearly distinguished in the text; we have therefore separated them.

Regarding zoological terminology, the *Muḫaṣṣaṣ* focuses on behaviours related to oestrus, gestation, udders and lactation, weaning, and the different ages of young animals.

It also discusses their calls, their fighting methods involving goring, and their character traits. The dictionary also covers the nomenclature of different body parts, the designation of sheep and goats according to their horns and ears, their distinguishing marks, and the terminology related to their excrement, mucus, and flatulence.

Furthermore, the *Muḫaṣṣaṣ* also devotes a section to the terminology describing their defects and diseases.

Regarding animal husbandry terminology, the *Muḫaṣṣaṣ* examines milking, as well as the classification of sheep and goats according to their wool, hair, fleece, and shearing.

It also addresses their grazing, dispersal, and movements.

Other animal husbandry terminology, covering various aspects, is also presented:

– their enclosures and resting places;
– their supplementary feed;
– their castration;
– their breeds;
– their classifications according to body condition;
– their classifications according to markings;
– their selection according to the quality of their meat;
– slaughtering and the distribution of the meat;
– the calls and cries directed at sheep and goats;
– the various physical examinations.

Among the various chapters that make up the *Muḫaṣṣaṣ*, we have chosen the one entitled "Suckling in goats and sheep, their udders and their milk". This choice is explained by the richness of its entries and the precision of their distinctions.

It contains lexical series relating to:

– the intensity of suckling;
– the apparent morphology of the udder;
– the abundance of milk;
– the dynamics of milk flow;
– maternal behaviours;
– the phases of progressive decline in milk production;
– the partial or total drying up of milk;
– as well as atypical resumptions or inductions of lactation.

It would be tedious to address all the zoological terminology related to sheep and goats contained in this dictionary. Therefore, we will limit ourselves to exploring, in particular, that which concerns mammary morphology, lactation, and lactation physiology.

We have thus systematically reviewed this section to extract the terms relevant to our study. Unless otherwise indicated, the transliteration of these Arabic terms is standardized according to DIN 31635. These terms are grouped into two categories: mammary morphology on the one hand, and lactation and lactation physiology on the other.

Each term has been presented according to the definition found in Ibn Sīda's *Muḫaṣṣaṣ*. These definitions will be analysed to determine the physiological, morphological, and behavioural characteristics of female sheep and goats, and then discussed from an ethnozoological perspective in light of current data.

It should also be noted that the terminology examined in this chapter belongs exclusively to the Bedouin oral lexical stock, rather than to vocabulary introduced through the Graeco-Arabic translation movement (Gutas 1998). The material recorded in this section of *al-Muḫaṣṣaṣ* derives principally from al-Aṣmaʿī's *Kitāb al-Šāʾ*, compiled through direct fieldwork among specific Bedouin tribes before, or strictly contemporary with, the beginnings of the translation movement, which reached its full development in ninth-century Baghdad (Ibn al-Nadīm, *Fihrist* I, 147; Gutas 1998: 1-34). Moreover, the very method of collection adopted by early Arab philologists deliberately privileged Bedouin speech, considered uncontaminated by external linguistic contact, as a safeguard against foreign interference. This methodological principle also underlies the argument, developed at length by Baalbaki, that the roots of Arabic lexicography are essentially indigenous rather than the product of foreign influence (Baalbaki 2014: chap. 1). This is corroborated by the absence of any lexical overlap with the Arabic version of Aristotle's zoological corpus (*Kitāb al-Ḥayawān*), which employs generic anatomical vocabulary for the udder and milk, rather than the fine-grained behavioural and physiological distinctions found in the Bedouin lexicon (Kruk 1979). This chronological and methodological independence justifies treating the corpus studied here as a coherent, autochthonous body of pastoral knowledge.

2. On the relative chronology and comprehensiveness of these dictionaries – al-Ḫalīl ibn Aḥmad's *Kitāb al-ʿAyn* (2nd/8th c.), Ibn Sīda's *al-Muḫaṣṣaṣ* (5th/11th c.), Ibn Manẓūr's *Lisān al-ʿArab* (7th/13th c.), and al-Zabīdī's *Tāǧ al-ʿArūs* (12th/18th c.) (Baalbaki 2014: chap. 3-6).

3. A systematic comparison of the caprine entries in *al-Muḫaṣṣaṣ* and their scattered counterparts in the *Tāǧ al-ʿArūs* lies beyond the scope of the present study; we flag it here as a direction for future research.

RESULTS AND DISCUSSION

Ibn Sīda's *Muḫaṣṣaṣ* is characterized by a remarkably precise lexicon of terminology relating to the lactation physiology of sheep and goats.

It is worth noting that the Bedouin Arabs assigned a specific term to each stage, condition, or variation of physiology or milk production. This testifies to a meticulous and systematic observation characteristic of the close relationship between these populations and their small ruminants.

Udder Morphology

Ḍarīʿa (ضَرِيعَة)
Describes a sheep or goat with large udders.

Ṭurṭubāniya (طُرْطُبَانِيَة)
Describes a goat with elongated udders.

Maṣūḫa (مَصُوخَة)
Describes a sheep or goat with pendulous udders.

Šamira (شَمِرَة)
Describes a sheep or goat with udders that are close to the belly.

Muqniʿa (مُقْنِعَة)
Refers to a sheep or goat with high, firm udders.

Farqāʾ (فَرْقَاء)
Refers to a sheep or goat with widely spaced udders.

These different terms illustrate the Bedouin's precise knowledge of sheep and goat udder morphology. These nomads were able to distinguish several udder shapes and, consequently, assigned a specific term to each. In this regard, it is worth noting that these distinctions do not differ from those adopted by modern animal husbandry.

Lactation and lactation physiology

Malaqa (مَلَقَ) / Raǧala (رَجَلَ) / Raġaṭa (رَغَثَ)
Refers to a young caprine that suckles until its belly is full.

Zaġala (زَغَلَ)
Refers to a young caprine that forces its mother to suckle it.

These terms show that the Arabs distinguished several types of behaviour in young caprines during lactation:

– normal behaviour, illustrated by مَلَقَ (*malaqa*) and its two synonyms رَجَلَ (*raǧala*) and رَغَثَ (*raġaṭa*);

– excessive behaviour, represented by حَصَأً (*ḥaṣaʾa*);

– and coercive behaviour, observed in young caprines that compel their dams to allow suckling, as in the case of *Zaġala* (زَغَلَ).

Ġazīra (غَزِيرَة), hiršamma (هِرْشَمَّة), ʿaṭila (عَطِلَة), ḫawwāra (خَوَّارَة), darūr (دَرُور), wakūf (وَكُوف), ḥāfil (حَافِل)
These terms refer to a sheep or goat with abundant milk production. The importance of this quality likely contributed to the development of this polysynonymy.

Ṯarrah (ثَرَّة)
Describes a goat or sheep whose udder's milk duct has become significantly enlarged, thus allowing a large quantity of milk to flow. This precise physiological term, derived from careful observation of the shape of the milk ducts, refers more to the ease of milk flow than to overall milk production.

ʿAzūz (عَزُوز)
This term describes a sheep or goat whose milk duct is so narrow that it becomes difficult to milk. It should be noted that this physiological term describes a situation opposite to that designated by the term *ṯarrah*.

Faḫūr (فَخُور)
Refers to a sheep or goat that, contrary to expectations, despite the large size of its udder, produces only a small amount of milk. This subtle term distinguishes between a misleading appearance (a visually full udder) and a physiological reality (little milk). It demonstrates an ability not to rely solely on visual observation, but to verify through palpation or prolonged observation.

It is worth noting the difference in explanatory depth between these entries. *Faḫūr* records an observed discrepancy: a large udder yielding little milk, without offering any account of its underlying cause; the term functions descriptively, flagging an anomaly without resolving it. *ʿAzūz*, by contrast, supplies an explicit causal mechanism: the narrowness of the milk duct is identified as the reason milking becomes difficult. This distinction matters for how this lexicon should be characterized: it is not uniformly explanatory, nor uniformly descriptive, but a mixture of the two, in which causal attribution appears selectively, typically where the underlying mechanism was itself observable (duct width, unlike the internal cause of *Faḫūr*'s paradox, could be assessed by palpation). The presence of causal reasoning in some entries, and its absence in others, is therefore not a methodological inconsistency on the part of the philologists, but a reflection of the differing epistemic accessibility of the phenomena being named.

Ǧaddāʾ (جَدَّاء)
This term describes a sheep or goat whose two udders have dried up due to an abnormality.

Šaṭūr (شَطُور)
This term describes a sheep or goat whose one udder has dried up due to an abnormality.

These two terms mentioned above show that the Bedouins distinguished between bilateral and unilateral udder desiccation. They demonstrate a high level of precision in the Bedouins' knowledge of udder pathologies in sheep and goats.

Dağūn (دَجُون)
Refers to a sheep or goat that nurses the young of other females. This term refers to an exceptional situation in sheep and goats, in which nursing is exclusively reserved for their own offspring.

The case evoked by the definition of the term *dağūn* belongs to the phenomenon of imprinting, demonstrated by Lorenz (1935) in goslings and ducklings.

Poindron *et al.* (1979) highlighted a sensitive period of a few hours, after which females, if deprived of their newborn's scent, would no longer be able to recognize them and would categorically refuse to let the young nurse.

If this refusal is evident in females towards their own offspring, it is even more pronounced toward orphaned young.

The fact that this rare phenomenon involves a female accepting nursing demonstrates the extensive knowledge gained from the Bedouins' long interaction with these animals.

Tafūḥ (تَفُّوح)
Refers to a sheep or goat that, upon moving, causes milk to flow from its udder. This term indicates an overfilling of the udder, resulting in high pressure inside it. Consequently, the milk flows out and cannot be retained. This term shows that the shepherds were aware of this phenomenon of milk loss, with no hope of recovering it.

Midfāʿ (مِدْفَاع)
Said of a caprine female who, due to an excess of milk, sprays her young. This physiological phenomenon, currently called the milk ejection reflex, is due to alveolar contractions of the mammary glands.

Lağba (لَجْبَة)
Refers to a caprine female whose milk production decreases after four months of lactation. This term demonstrates that the Bedouins already possessed precise knowledge about the period naturally corresponding to high udder yield, beyond which a progressive decline in mammary activity is observed.

Muǧarriza (مُغَرِّزَة), ğadūd (جَدُود), māṣir (مَاصِر)
Refer to a sheep or goat whose milk is beginning to dry up. These words designate the female caprine at the precise point in lactation when the milk drying-up process begins.

Šaḥaṣ (شَحَص)
Refers to a sheep or goat whose milk production has ceased following prolonged lactation. This term refers to a natural cessation of lactation, following a prolonged and progressive decline in milk production that marks the end of the lactation cycle.

Makūd (مَكُود)
Refers to a caprine female whose milk production declines resulting from prolonged lactation. This term shows a natural decrease in milk production resulting from prolonged lactation, rather than from any physiological failure.

Ḍahūl (ضَهُول), bakiʾa (بَكِيئَة)
Refer to a caprine female marked by low milk production. This term shows that the Bedouins distinguished between a decline in milk production resulting from prolonged lactation and inherently low milk production in certain females.

Muḥill (مُحِل)
Refers to a sheep or goat that resumes milk production after a cessation of lactation, without having given birth again. This term designates a very rare phenomenon in nature, since, generally, caprine females, once their lactation has ceased, cannot produce milk without giving birth again, at which point lactation resumes thanks to a hormonal process involving, in particular, prolactin and oxytocin. This exceptional phenomenon was only published for the first time by Heckendorn (2023). This article discusses the case of some goat farmers who observed the natural induction of lactation in non-gestating females after a complete cessation of milk production. The explanation offered is that these goats, when subjected to repeated solicitation by a young orphan seeking to nurse, can be stimulated and produce milk again. Indeed, thanks to the mechanical stimulation induced by these repeated sucklings, prolactin, the main hormone of lactation, is secreted.

Tuḥluba (تُحْلُبَة)
Refers to a goat that produces milk without having previously been bred by a buck.

In 2013, Shibabrata Pattanayak (2013) published an article describing a domestic Bengal goat that began producing milk at four months of age and continued for several years without receiving any hormonal treatment.

It is important to note that this phenomenon occurred without the goat having gone through pregnancy. According to this researcher, this atypical case is documented for the first time, opening up new avenues of research to explore this phenomenon.

The study of zoological terminology in classical Arabic sources raises, from the outset, a major methodological difficulty. Texts such as Ibn Sīdah's *al-Muḫaṣṣaṣ* do not fit neatly into any modern disciplinary category. They are neither zoological treatises in the contemporary scientific sense, nor purely literary compilations detached from empirical reality. To approach them exclusively through philology risks reducing them to isolated lexical residues severed from the pastoral environments that produced them. Conversely, to read them through the conceptual frameworks of modern biology risks imposing explanatory structures foreign to their historical context. The corpus itself therefore resists both of these single-discipline readings and calls for a different methodological posture: rather than adopting the standpoint of philology or of biology as a fixed vantage point, this study treats the two as complementary and mutually corrective. Concretely, this means reading each lexical entry first as a linguistic fact, attentive to its morphology, its attested usage, and its place within the dictionary's own classificatory logic, and only then asking what physiological or behavioural reality it may correspond to, without allowing either question to override the other. Such an approach requires moving continuously between language, animal observation, pastoral practice, and the history of knowledge, rather than privileging any single one of these perspectives as primary (Frank 1957; Naǧaš al-Jābirī 2002).

This methodological position becomes particularly important when dealing with biological or physiological phenomena described in premodern lexical sources. Retrospective readings of ancient scientific materials often operate according to a simplified cumulative model of knowledge in which earlier cultures are evaluated according to the extent to which they anticipated modern science. Yet, as Thomas Kuhn demonstrated, scientific knowledge does not evolve through the linear accumulation of isolated facts, but within historically situated conceptual structures (Kuhn 2012). From this perspective, asking whether medieval Arab scholars "discovered" modern physiology becomes largely irrelevant. The more productive question concerns visibility itself: under what historical, economic, and pastoral conditions did certain animal phenomena become sufficiently salient to require stable lexical differentiation?

Such a shift fundamentally changes the epistemological status of the zoological lexicon. The importance of terms relating to reproduction, lactation, maternal behaviour, or physiological irregularities does not lie in their supposed anticipation of modern endocrinology or reproductive physiology. Their significance lies rather in the fact that they preserve traces of phenomena that pastoral communities repeatedly encountered, distinguished, and transmitted linguistically long before these phenomena became objects of laboratory investigation. The lexicon therefore records neither formal scientific theory nor abstract speculation, but stabilized observational experience.

This stabilization presupposes more than occasional familiarity with animals. It reflects a prolonged practical proximity shaped by herding, milking, reproduction management, selective breeding, and the economic centrality of livestock within pastoral societies. The remarkable lexical density devoted to camels, sheep, goats, and horses in Arabic zoological literature should therefore not be interpreted simply as evidence of linguistic richness. It reflects the intensity of practical relations linking humans and animals within pastoral life (Frank 1957). Lexical attention itself thus acquires historical significance: animals occupying central economic and social functions generated increasingly refined observational distinctions because even minor physiological or behavioural variations carried concrete practical consequences.

At this point, Gaston Bachelard's reflections on epistemological rupture become particularly illuminating. Scientific knowledge does not emerge through the mere accumulation of raw observations; it develops through the progressive differentiation of phenomena initially perceived as undifferentiated within ordinary experience (Bachelard 1968). What is striking in *al-Muḫaṣṣaṣ* is precisely this movement toward differentiation. The lexicon isolates unstable, intermediate, or anomalous conditions. Such distinctions reveal an observational culture operating beyond general categories toward increasingly fine physiological and behavioural differentiations.

This point also bears on the status of the "movement toward differentiation" discussed below. The fine-grained distinctions recorded in this *kitāb* are, for the most part, inherited from earlier philological collection rather than original to Ibn Sīda: as noted above, the observational culture from which this vocabulary emerged belongs to the Bedouin herders themselves and was first consigned to writing by philologists such as al-Aṣmaʿī, generations before Ibn Sīda. Ibn Sīda's own contribution lies in a different register: not in performing or reporting new observations, but in selecting, arranging, and consolidating this inherited material thematically, an editorial choice that renders the underlying differentiation newly visible as a structured system rather than a scattered inventory. The comparison with the section on weapons and weaponry, three *asfār* earlier in the same dictionary, is instructive in this respect (ʿAbd al-Ḥamīd 2005: *sifr* 5): there, thematic differentiation proceeds primarily by definitional distinction among technical objects, whereas in the sheep and goats *kitāb*, it proceeds by observational distinction among behavioural and physiological states, a difference in the *nature* of the source material being organized, rather than in Ibn Sīda's editorial method itself.

This methodological stance converges with a broader debate within the historiography of the life sciences. Roger, in his plea for what he termed "une histoire historienne des sciences", insisted that the historian's task is not to measure past knowledge against present standards, but to reconstruct the intellectual coherence proper to each period on its own terms (Roger 1995). Duris has pushed this point further, warning that treating the present state of science as a fixed endpoint toward which earlier knowledge silently progresses is one of the surest ways to misrepresent the thought of past observers (Duris 2013). Read in this light, the convergences noted below between Ibn Sīda's lexicon and contemporary zootechnical observation should not be taken as evidence of proto-scientific insight on the part of Bedouin informants, but rather as an indication that sustained empirical attention, whatever its conceptual framework, can generate durable and accurate distinctions.

It is useful, at this point, to situate *al-Muḫaṣṣaṣ* within the broader landscape of Arabic writing on animals, which does not constitute a single genre but spans several distinct textual traditions of unequal "scientific" ambition. These include: philological and lexicographical dictionaries, whether monographic (al-Aṣmaʿī's *Kitāb al-Šāʾ*) or encyclopedic (*al-Muḫaṣṣaṣ* itself), aimed at recording vocabulary rather than explaining phenomena; encyclopedic *adab* compilations combining ethical, literary, and naturalistic material, such as al-Ǧāḥiẓ's *Kitāb al-Ḥayawān*, which engage critically with Greek authorities such as Aristotle; cosmographical and "marvels" (*ʿaǧāʾib*) literature, exemplified by al-Qazwīnī, oriented toward wonder and religious meditation rather than systematic classification; and practical treatises on veterinary medicine, husbandry, and hunting (*furūsiyya*, *bayṭara*, *filāḥa* literature). Recent scholarship has described this landscape as oscillating between two poles: a more rational pole, engaged in critical dialogue with inherited Greek zoology, and a more "marvellous" pole, oriented toward entertainment or edification (Buquet & Gautier 2021). *Al-Muḫaṣṣaṣ* belongs unambiguously to the first category: a lexicographical rather than a naturalistic or a wonder-oriented text, whose "scientific" value lies not in explanatory theory but in the precision and stability of its empirical vocabulary.

Anomalous cases acquire special importance in this context. Kuhn emphasized that anomalies frequently play a central role in the development of scientific attention because they destabilize ordinary expectations and force closer observation (Kuhn 2012). Terms designating unusual reproductive or lactational situations are particularly significant precisely because they describe states diverging from ordinary pastoral expectations. They constitute not a lexicon of the normal, but a lexicon of interruption within the normal. Their existence suggests that pastoral observers devoted sustained attention to biologically unstable or behaviourally problematic situations whose practical consequences made them impossible to ignore.

This also explains why such terminology cannot be adequately understood outside the practices within which it functioned. Following Wittgenstein's reflections on language games, meaning does not arise solely from abstract lexical definition, but from use within specific forms of activity (Wittgenstein 2009; ʿAzzūzī 2018).

For this reason, as previously noted, the present study adopts an explicitly interdisciplinary approach. Philology alone, just as biology alone, remains insufficient for explaining the epistemological structure of the corpus. The analysis requires continuous movement between linguistic differentiation, pastoral practice, ethology, reproductive physiology, and the history of scientific observation (Frank 1957). Such an approach does not dissolve disciplinary boundaries arbitrarily; rather, it recognizes that hybrid objects require hybrid methodologies. *Al-Muḫaṣṣaṣ* is precisely such an object: a dictionary in its formal structure, an archive of pastoral perception in its practical function, and a reservoir of empirically structured animal knowledge in its historical significance.

CONCLUSION

The terms analysed in this study, relating to udder morphology, lactation, and lactation physiology in sheep and goats, show that the caprine vocabulary preserved in Ibn Sīda's *al-Muḫaṣṣaṣ* cannot be reduced to a simple collection of lexical curiosities. Each term isolates a precise aspect of the animal body, milk production, suckling behaviour, or mammary condition. Taken together, these distinctions reveal a form of Bedouin zoological knowledge grounded in prolonged, repeated, and practical observation of small ruminants.

Several examples are particularly significant. Terms such as *ǧaddāʾ* and *šaṭūr* distinguish between bilateral and unilateral drying-up of the udders. *Dağūn* refers to the unusual case of a female nursing the young of other females. *Muḥill* designates the resumption of milk production after a dry period without a new lambing, while *tuḥluba* refers to a female producing milk without previous mating. These cases show that the lexicon does not only record ordinary and recurrent phenomena; it also preserves rare or atypical states that became meaningful because of their practical importance in pastoral life.

The value of this vocabulary therefore lies not merely in its linguistic richness, but in the way it stabilizes empirical distinctions produced through daily interaction with animals. The Bedouin lexicon of caprine lactation reflects a close relationship between language, observation, and pastoral practice. It records what had to be recognized, evaluated, and transmitted in a context where milk production, maternal behaviour, and udder condition had direct economic and zootechnical significance.

This study also suggests that certain distinctions preserved in *al-Muḫaṣṣaṣ* are consistent with phenomena documented by contemporary zoology and animal husbandry. Such convergences should not be understood as evidence that the medieval lexicon anticipated modern science, but rather as an indication that careful empirical observation can produce highly refined categories of animal knowledge, even outside the framework of modern biological theory.

Future research may extend this approach to other zoological groups within *al-Muḫaṣṣaṣ*, as well as to other classical Arabic dictionaries. A comparison with the zoological vocabulary of present-day Bedouin communities would also make it possible to assess continuities, transformations, and losses in the transmission of pastoral terminology. More broadly, this line of inquiry may contribute to the history of animal knowledge, ethnozoology, and the study of human-animal relations in the Arabic intellectual tradition.

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This article was produced within the framework of Omar Hammoudi's doctoral research. Omar Hammoudi conducted the data collection, analysis, and preparation of the original manuscript. Aymane Amri contributed to the methodological framework and manuscript revision. Ahmed Aarab contributed to the conceptualization of the study, supervised the research, and participated in the revision of the manuscript.

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