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Couverture / *Cover:*
Couleuvre de Montpellier, *Malpolon insignitus* Geoffroy Saint-Hilaire, 1827, déployant son cou comme un cobra. Crédit photo : T. Danelis / *Eastern Montpellier snake,* Malpolon insignitus *Geoffroy Saint-Hilaire, 1827, spreading its neck like cobra. Photo credit: T. Danelis.*

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What snake bit Philoctetes? A zoological commentary on the ancient Greek myth

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ABSTRACT
Philoctetes, son of Poeas, was a mythical character better known as friend of Hercules and hero who participated in the Trojan War. However, on the journey to Troy, Achaeans abandoned Philoctetes in Lemnos Island because of his foul-smelling wound caused by a snakebite. This study examines the myth of Philoctetes by a herpetological perspective focusing on the snake. Based on ancient sources and modern herpetological data, the study sought to identify the snake species of the mythical incident. Considering the different versions of the myth, the terms "hydrus", "echidna/echis", "ophis", "drakon/draco", "cenchrines", and "coluber" are explored in various ancient texts, seeking for zoological explanation. Furthermore, the study takes into account the possible locations that have been suggested as the place of the mythical incident examining the presence of relative snake species. The comparative analysis leads to the conclusion that the snake of the myth was likely a "hydrus" and specifically a Grass snake, *Natrix natrix* (Linnaeus, 1758). This outcome can be further supported by medical and behavioural records correlated with this species in literature. Ultimately, this study demonstrates how interdisciplinary approaches can bridge myth and science to reveal insights into cultural beliefs and the natural world.

KEY WORDS
Homer,
Sophocles,
Nicander,
water-snake,
viper,
hydrus,
echidna,
cenchrines,
Natrix,
defensive behaviour.

RÉSUMÉ
Quel serpent a mordu Philoctète? Un commentaire zoologique sur le mythe grec antique.
Philoctète, fils de Poeas, était un personnage mythique plus connu comme ami d'Hercule et héros ayant participé à la guerre de Troie. Cependant, lors du voyage vers Troie, les Achéens abandonnèrent Philoctète sur l'île de Lemnos à cause de sa blessure nauséabonde causée par une morsure de serpent. Cette étude examine le mythe de Philoctète d'un point de vue herpétologique, en se concentrant sur le serpent. Sur la base de sources anciennes et de données herpétologiques modernes, l'étude vise à identifier l'espèce de serpent à l'origine de l'incident mythique. Compte tenu des différentes versions du mythe, les termes « hydrus », « echidna/echis », « ophis », « drakon/draco », « cenchrines » et « coluber » sont explorés dans divers textes anciens, à la recherche d'une explication zoologique. En outre, l'étude considère des lieux suggérés comme des sites possibles de l'incident mythique, en examinant la présence des espèces de serpents correspondantes. L'analyse comparative permet de conclure que le serpent du mythe était probablement un « hydrus » et plus précisément une couleuvre à collier, *Natrix natrix* (Linnaeus, 1758). Cette conclusion peut être étayée par les données médicales et comportementales liées à cette espèce dans la littérature. En définitive, cette étude montre comment les approches interdisciplinaires peuvent jeter un pont entre les mythes et la science et révèle des informations sur les croyances culturelles et le monde naturel.

MOTS CLÉS
Homère,
Sophocle,
Nicandre,
serpent d'eau,
vipère,
hydre,
échidné,
cenchrines,
Natrix,
comportement
de défense.

INTRODUCTION

Mythology constitutes the facet of a culture's self-expression that deals with ultimate questions and expresses the truth at its most fundamental level for the people of a given society (Taber 1969). The study of myths helps with understanding the values of a culture, along with the thought patterns that shaped that culture (Philips 1978).

Philoctetes, the son of Poeas (Homer, *Od*. 3.190; Sophocles, *Phil*. 263), was better known as the one who ignited the pyre for Hercules, relieving him from the agonizing pain due to the Shirt of Nessus (Apollodorus, *Bibl*. 2.7.7). As a gesture of gratitude, Hercules gave to him his bow and the poisoned arrows (Ovid, *Met*. 9.229).

Philoctetes was forced to participate in the Trojan War (Homer, *Il*. 2.716-20; *Od*. 8.219-20) but with an unexpected turn on the way to Ilios (or Ilion, Troy). While he was performing a sacrifice on the sacred island of Chryse (Sophocles, *Phil*. 269-70) or Tenedos (Proclus, *Chr*. CYP. 9), a snake bit him on the leg, causing excruciating pain and the wound emitted a foul smell (Proclus, *Chr*. CYP. 9). His cries and the stench prevented the army from resting and conducting sacrifices (Sophocles, *Phil*. 8-11), so the Achaeans, led by Atreides, Menelaus and Agamemnon, and Odysseus (Sophocles, *Phil*. 264-5), abandoned him on Lemnos Island (Homer, *Il*. 2.721-3).

In the tenth year of the siege of Ilios, a prophecy compelled the Achaeans to bring back Philoctetes and his legendary weapons from Lemnos (Proclus, *Chr*. LI. 2; Sophocles, *Phil*. 1337-42). Philoctetes returned to the Greek camp, was healed and finally played a decisive role in slaying Paris (Proclus, *Chr*. LI. 2).

Studies have examined the symptoms of the wound of Philoctetes' foot and the possible causes of his illness (Jouanna 1988; Stefanato 1989; Johnson 2003; Powlson 2004; Mayhew 2017) while the myth of Philoctetes remains relevant in medicine (Bayerle *et al.* 2022; Kampourelli 2022; Wang *et al.* 2023). However, besides of medical perspective, no herpetological data have been used to interpret the myth so far. To date, many comparative studies have attempted to correlate animal descriptions from ancient literature and art with modern taxonomic names (e.g. birds, Johansson 2012; snakes, Bodson 1981; Böhme & Koppetsch 2021; fishes, Guasparri 2022; primates, Pareja *et al.* 2020a; Urbani & Youlatos 2020). These studies present a different approach to the analysis of ancient sources, revealing the way of understanding the natural world, especially the position of animals in the myth and real life. Within the same context, this study aims to investigate the identity of the snake that could bite Philoctetes, according to the different versions of myth, through a) interpreting available ancient sources based on zoological evidence; and b) comparing current species distribution data with the areas that have been proposed as possible locations where the mythical incident occurred. At the end, new scientific discoveries about snakes' behaviour and toxicity will be discussed.

ABBREVIATIONS

ad. Lyc.	Tzetzes, *ad Lycophronem*
Alex.	Lycophron, *Alexandra*
Bibl.	Apollodorus, *Bibliotheca*
Chr.	Proclus, *Chrestomathia*
Ep.	(Pseudo-) Apollodorus, *Epitome*
Eth. Nic.	Aristotle, *Ethica Nicomacheia*
Fab.	Hyginus, *Fabulae*
Hec.	Euripides, *Hecuba*
Her.	Philostratus, *Heroicus*
Hist. an.	Aristotle, *Historia animalium*
Il.	Eustathius, *Commentarii ad Homeri Iliadem et Odysseam* (...); Homer, *Ilias*
in EN	Heliodorus, *in Ethica Nicomachea paraphrasis*
Met.	Ovid, *Metamorphoses*
Mith.	Appian, *Μιθριδάτειος* [*Mithridatic Wars*]
NA	Aelian, *De Natura Animalium*
Nat.	Pliny, *Naturalis Historia*
Od.	Homer, *Odyssea*
Phil.	Accius, *Philoctetes*; Aeschylus, *Philoctetes*; Sophocles, *Philoctetes*
Tryph.	Tryphiodorus, *The Taking of Ilios*
Ven.	Philumenus, *de Venenatis Animalibus*

THE PHILOCTETES' SNAKE IN ANCIENT SOURCES

The snake plays a crucial part in the myth of Philoctetes in all different versions of storytelling. However, the name of the snake is found with different terms among ancient sources, so it is essential to define all of them. There are seven different terms from three primary group of sources that refer to this snake. The first group includes Homer's work and the *Epic Cycle* as well as other sources that align with the epic narrative. The term is found in the Homer's *Iliad*, where is there a mention of "hydrus" [ὕδρος] (Homer, *Il*. 2.723). Additionally, mention of the same creature is found in the lost epic poem *Cypria* (Proclus, *Chr*. CYP. 9), in the *Library Epitome* by (Pseudo-)Apollodorus (*Ep*. 3.27), in *Heroicus* of Philostratus (*Her*. 28.2 & 5) and in *The Taking of Ilios* of Tryphiodorus (270). Lastly, Pausanias follows this version of the myth in his work *Description of Greece*, in his reference to the location of the mythical event (Pausanias 8.33.4).

The second and third terms are found in the second primary source that we have to examine, the tragedy *Philoctetes* by Sophocles, where is there the only mention of "echidna" [ἔχιδνα] (Sophocles, *Phil*. 266-7 & 631-2), while below, the same creature is referred as "ophis" [ὄφις] (Sophocles, *Phil*. 1327-8). In this regard, Aristotle mentions in *Ethica Nicomacheia* a snake named "echis" from Theodectes' tragedy about Philoctetes (Aristotle, *Eth. Nic.* 1150b). On the contrary Heliodorus uses the term "ophis" (Heliodorus, *in EN*. 1150b = 18-22). Similarly, Appian mentions a bronze ophis, which was located on a deserted island near Lemnos with an altar of Philoctetes in honour of the mythical event (Appian, *Mith*. 11.77).

The rest of terms are gathered from diverse and scattered sources. Firstly, there is a mention of "drakon" [δράκων] in the lost tragedy *Philoctetes* of Aeschylus (*Phil*. fr. 139), while

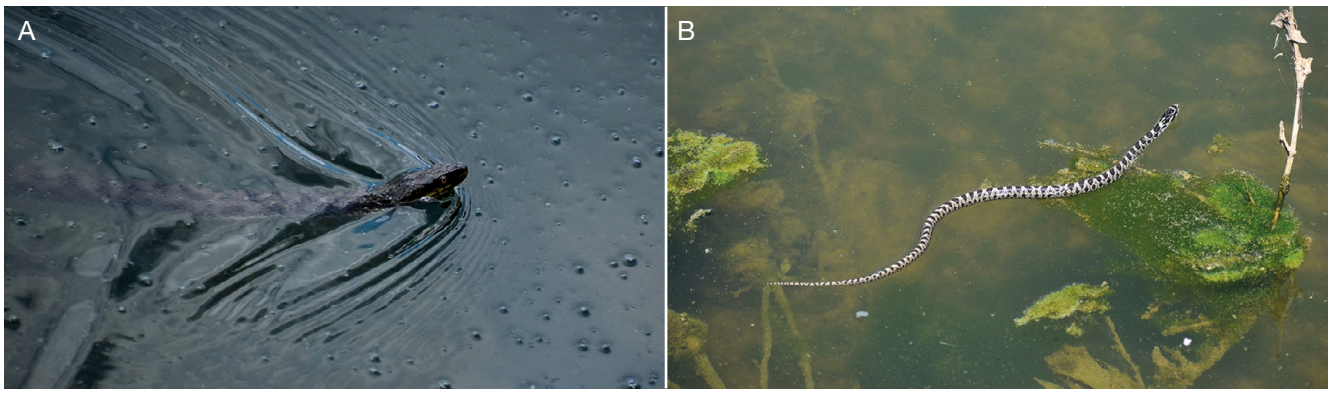

Fig. 1. — Snake swimming behaviour. **A**, The water-snakes (*Natrix* spp.) use to swim with the head above the water surface, such as this dice snake, *Natrix tessellata* Laurenti, 1768; **B**, a four-lined snake, *Elaphe quatuorlineata* Lacépède, 1789 juvenile swims bearing viper-like colouration (Batesian mimicry). Photos credit: T. Danelis.

both the noun "draco" and the adjective "viperinus" [*e viperino morsu*] found in the Accius' work *Philoctetes* (Accius, *Phil*. 552-3). Furthermore, there is a unique reference to "cenchrines" by Lycophron in his poem *Alexandra* (Lycophron, *Alex*. 912). The last mention for the snake of Philoctetes is "coluber" in Hyginus' *Fabulae* (Hygynus, *Fab*. 102).

The definition of "hydrus", "echidna/echis", "ophis", "drakon/draco", "cenchrines" and "coluber" is important to identify the snake of the myth, so writings of other ancient authors were used. These passages, presented below, offer crucial zoological clues without fictional elements.

HYDRUS – ΥΔΡΟΣ (MALE)

Herodotus first mentions this animal in his *Histories*, where he depicts the sacred ibises. Based on his description, these birds are precisely identified today with the African sacred ibis, *Threskiornis aethiopicus* Latham, 1790. Herodotus characterized the sacred ibises as "enemies" to the "ophes" [πρὸς τοὺς ὄφις] whose form [ἡ μορφὴ] resembles that of the "hydri" [τῶν ὕδρων] (Herodotus 2.76); namely, they prey on snakes similar to water-snakes, zoological evidence that is corroborated today for the species.

Aristotle makes a typical mention of "hydrus" in the *History of the Animals*, where he makes a presentation of animals that feed and dwell in water and need air (they breathe) separating them into tetrapods such as otter and beaver and crocodile [ὥσπερ ἐνυδρὶς καὶ λάταξ καὶ κροκόδειλος] and birds and legless, which is "hydrus" [ἄποδα, οἷον ὕδρος], the water-snake (Aristotle, *Hist. An*. 1.487a).

Furthermore, the arrival of a "hydrus", which indirectly causes the drowning of the mouse king *Psycharpax*, in *Batrachomyomachia*, holds significant importance for our analysis. A characteristic swimming behaviour of the animal is described in these two lines of the poem (Aristotle, *Hist. an.* BM 83-4), as its neck remained above water [ὑπὲρ ὕδατος εἶχε τράχηλον] (Fig. 1A).

Finally, "hydrus" refers to the species of water-snakes (*Natrix* spp.), according to Böhme & Koppetsch (2021), who compared the snake species recorded by Nicander, Pliny the Elder, Lucan, Aelian and Polemus Silvus in their respective works dating from Hellenistic until Roman Period. However, even some terrestrial snakes have been documented to swim, e.g. the four-lined snake, *Elaphe quatuorlineata* Lacépède, 1789 (Böhme & Szczerbak 1993; Fig. 1B), the Caspian whip snake, *Dolichophis caspius* Gmelin, 1789 (Oskyrko & Jablonski 2020) and the Western Montpellier snake, *Malpolon monspessulanus* Hermann, 1804 (Deso *et al.* 2021).

ECHIDNA & ECHIS – ΕΧΙΔΝΑ (FEMALE) & ΕΧΙΣ (MALE)

According to Aristotle (*Hist. An.* 1.490b), whereas the other "ophes" are oviparous, the "echidna" is solely viviparous [οἱ μὲν ἄλλοι ᾠοτοκοῦσιν ὄφεις, ἡ δ' ἔχιδνα μόνον ζῳοτοκεῖ]. This sentence properly delineates the animal's biology: although all other snakes lay eggs, only vipers give birth to live offspring.

Böhme & Koppetsch (2021) come to the same conclusion, that "echidna" refers to viper species (family Viperidae). On the other hand, "echis" is the same animal but male (Bodson 2012).

OPHIS – ΟΦΙΣ (MALE)

Based on the previous passages, it is clear that the term "ophis" does not a particularly refer to snake species, but rather includes all snakes. In fact, the term "ophis" could well signify "snake" itself (Bodson 1981). However, in Aristotle (*Hist. An.* 8.621a), a sea snake [ὄφις ὁ θαλάττιος] is mentioned, though this likely refers to a distinct animal, not a snake in the modern sense (suborder Serpentes), and should not be confused with water-snake, eel [ἔγχελυς] or moray [σμύραινα], which are also mentioned within the same work.

DRAKON (& DRACO) – ΔΡΑΚΩΝ (MALE)

In the most ancient writings with zoological interest, the name "drakon" appears to be used in the same way to denote large elongated snakes of family Colubridae. Bodson (1981) classified "drakon" as snake species of former genus *Coluber* such as the Aesculapian snake, *Zamenis longissimus* Laurenti, 1768 (Fig. 2A) and the four-lined snake, *Elaphe quatuorlineata* (Fig. 2B). Lastly, Böhme & Koppetsch (2021) identify "drakon" as python species, the Central African rock python, *Python sebae* Gmelin, 1789 and the Indian python, *P. molurus* Linnaeus, 1758, as the four-lined snake as well.

Fig. 2. — "Drakon" and "echidna" species. European species of large elongated snakes such as: **A**, the Aesculapian snake, *Zamenis longissimus* Laurenti, 1768; **B**, the four-lined snake, *Elaphe quatuorlineata* Lacépède, 1789 and **C**, the Caspian whip snake, *Dolichophis caspius* Gmelin, 1789 have been identified as "drakon" in the ancient sources (Bodson 1981; Johansson 2012; Böhme & Koppetsch 2021); **D**, the nose-horned viper, *Vipera ammodytes*, Linnaeus, 1758 is the most common and widespread viper species in Greece mainland. It would be the "echidna" that Sophocles and the most of the Athenians could recognize. Photos credit: Taxiarchis Danelis.

CENCHRINES – κεγχρινης (MALE)

The first mention of "cenchrines" (or "cenchris" [κεγχρίς]) occurs in Nicander's *Theriaca* where it is described as a venomous snake that has inhabited Thracian islands of Lemnos and Samothrace [Εἴ γε μὲν Ἡφαίστοιο χαλαίποδος ἐν πτυχὶ νήσου / βήσεαι ἠὲ Σάμον δυσχείμερον, αἵ τ' ἐνὶ κόλπῳ / Θρηϊκίῳ βέβληνται] (Nicander, *Ther*. 458-460). According to Nicander (*Ther*. 458-482), it is a long [δολιχὸν] and swift [αἰόλον] creature, aggressively attacks sheep and their shepherds and is able to wrap around killing them. The similarity with lion [ὅν τε λέοντα] (Nicander, *Ther*. 463) may derive from its a) appearance; b) strength; and/or c) perceived danger (Fol 2016) (Fig. 3). Philumenus states in *On poisonous animals and their remedies* that "cenchrines" bears green-yellow colour [χρὼαν χλωρός] especially on the belly (Philumenus, *Ven*. 26] while Lucan specifies the appearance in *Pharsalia* referring to "cenchris" that is full of spots, similar to millet (Lucan, *Pharsalia* 9. 713-715), where the name came from (Bodson 1986; Barbara 2009)[1]. Hence, the descriptions evoke a monster [τέρας] (Nicander, *Ther*. 463), a mythical creature rather than a real animal (Böhme & Koppetsch 2021).

However, the revision of this opinion is necessary, considering that Nicander had probably never been or seen the places and animals that he described so there are more fictional elements in his descriptions (Wick 2009; Overduin 2009, 2012). Gossen & Steier (1921) suggest that "cenchrines" is possibly the Balkan whip snake, *Hierophis gemonensis* Laurenti, 1768, while Overduin (2015), following Leitz (1997) and Bodson (1981), refers to the Ottoman viper, *Montivipera xanthina* Gray, 1849. A related whip snake species, known for its nervous (but harmless) nature and live on these islands, is the Caspian whip snake, *Dolichophis caspius*. Not only the strength and behaviour but also the yellow-orange head can bear witness to the similarity of this species with lion (Fig. 2C). Over time, stories in local Greek folklore and urban myths tell of people being chased by this kind of snakes due to their whip-like tail (Nestoridis 1894; pers. obs.).

Further research leads us to the French naturalist Pierre Belon's work of 1553, *Les observations de plusieurs singularitez et choses memorables trouvées en Grèce, Asie, Judée, Egypte, Arabie, & autres pays estranges* (Belon 1553). In this book, Belon presents, together with the ophiofauna of Lemnos (Table 1), a naïve portrait of a snake called "cenchriti" by locals, following

1. However, Lucan's "cenchris" lives in Libya, North Africa, not in Thracian islands, Greece.

TABLE 1. — The snakes that Pierre Belon (1553) recorded on Lemnos Island according to his work *Les observations de plusieurs singularitez & choses memorables, trouvées en Grèce, Asie, Judée, Egypte, Arabie, & autres pays estranges,* and their current taxonomic names. The species list is based on Strachinis & Roussos (2016).

Pierre Belon's names (16th century A. D.)			
Common ("vulgar") name	**Ancient name**	**Taxonomic name**	**Comments**
Cenchriti(s) [Κεχρίτης]	Cenchris [Κεγχρίς]	*Malpolon insignitus* Geoffroy Saint-Hilaire, 1827	See in text: Fig. 3. Merle (2001) states that Cenchris is the Nore-horned viper, *Vipera ammodytes* but there is no viper species on Lemnos (see below).
Laphiati(s) [Λαφιάτης]	Elaphis [Ἔλαφίς]	(colubrid) *Dolichophis caspius* Gmelin, 1789	Laphiatis (or Lafiatis) refers to *Elaphe quatuorlineata* but the species is not present on Lemnos (Strachinis & Roussos 2016).
Ochendra [Ὄχεντρα]	Echis/Echidna [Ἔχις/Ἔχιδνα]	(viper?) *Natrix natrix* Linnaeus, 1758; *Eryx jaculus* Linnaeus, 1758	There is no viper species on Lemnos; confused with *Natrix natrix* or *Eryx jaculus* because of the colouration (Strachinis & Roussos 2016).
Sagittari [Σαϊττάρι]	Iaculus/Acontias [Ἀκοντίας]	*Platyceps najadum* Eichwald, 1831	See depiction of Saetta/Sagitta in Belon (1553: 88).
Tephliti(s)/Tephlotis [Τυφλίτης/Τυφλώτης]	Tiphlini(s) [Τυφλίνης]	*Pseudopus apodus* Pallas, 1775	Legless lizard but considered as a snake by Belon (1553).
Nerophid(i)a [Νεροφίδα]	—	*Natrix natrix*	Nerophida (Νεροφίδα) = Water-snake
Amphisbena [Αμφίσβαινα]	Amphisbena [Ἀμφίσβαινα]	*Eryx jaculus*	Amphisbaena (Αμφίσβαινα) refers to worm lizards due to their tail that looks like a second head but here, Belon (1553) might refer to *Eryx jaculus* because of the same characteristic.

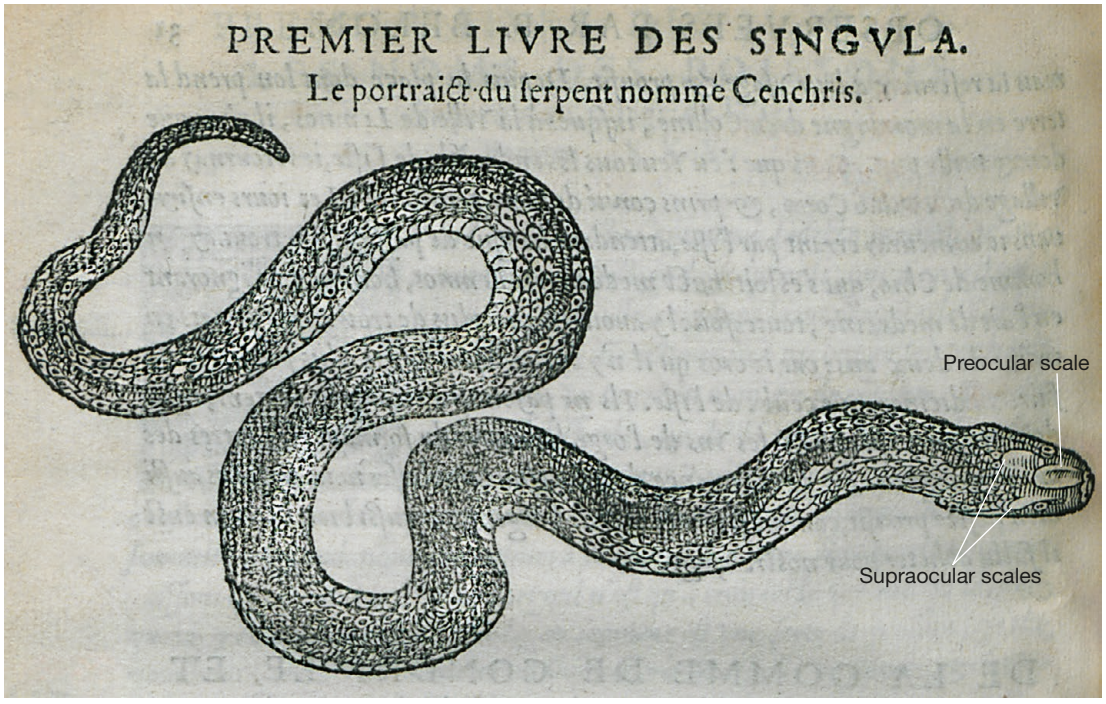

FIG. 3. — Naïve portrait of "Cenchris" or "Cenchriti" on Lemnos Island, Greece, by Pierre Belon (1553) in *Les observations de plusieurs singularitez & choses memorables trouvées en Grèce, Asie, Judée, Egypte, Arabie, & autres pays estranges*. The snake is identified as the Eastern Montpellier snake, *Malpolon insignitus* Geoffroy Saint-Hilaire, 1827. Despite the simplicity of the illustration, the two supraocular scales and the preocular scale are shown while the black spots across the trunk resemble to colouration of female and juvenile individuals. Photo credit: Aikaterini Laskaridis Foundation (http://eng.travelogues.gr/item.php?view=43835, last consultation on 24 October 2024), modified and published under permission.

the ancient name of "cenchris" (Belon 1553; Fig. 3). Based on modern herpetological data (Cattaneo 2001; Strachinis & Roussos 2016) and an examination of the snake's depiction, we can identify the Eastern Montpellier snake, *Malpolon insignitus* Geoffroy Saint-Hilaire, 1827, an opisthoglyphous (rear-fanged) and nervous species which can bite and inhabits Samothrace, too (Kasapidis *et al.* 1996; Cattaneo 2001). Belon chose to show the two prominent supraocular scales and the oversize preocular scale, diagnostic characters for *Malpolon* spp. identification (Mohammed *et al.* 2019: 150, fig. 2b; Di Nicola *et al.* 2022). Also, the spotted dorsal scales resemble the colouration of female and juvenile individuals

(Jimenez-Cazalla 2012; Strachinis & Roussos 2016: 243, fig. 4d; Di Nicola *et al.* 2022).

Last but not least, modern Greek literature refers to the blotched snake, *Elaphe sauromates* Pallas, 1811 as Cechritis [Κεχρίτης].

COLUBER (MALE)

"Coluber" (or "colubra") can be considered as "snake", similar to the term "ophis" (Charlesworth 2004). Pliny the Elder mentions in *Naturalis Historia*: the liver of the water snake, likewise that of the "hydrus" [*iecur aquaticae colubrae, item hydri*] (Pliny, *Nat*. 32.39).

THE CONCEPT OF "SNAKE" IN THE EXAMINED SOURCES

Aside from the biological data retained by writers who lived several centuries after Homer, we must place the name "hydrus" within the overall context of Homeric literary works and explain that the term refers to a distinct species and is not synonymous with other related snake terms.

Nowhere in Homer's two works, *Iliad* and *Odyssey*, is there any other reference to any "hydrus", only in Homer *Il*. 2.723, which we have already discussed. The most common term found in the two Homeric works is "drakon", detailed in Sancassano (1997). In the *Iliad*, among the different mentions (Homer, *Il*. 3.33; 6.181; 11.26; 22.93), there are only two appearances of alive "drakons". The first appearance can be found in *Rhapsody* B, when a "drakon" ate the little birds and the mother of them in Aulis (Homer, *Il*. 2.308-10). The second one is in *Rhapsody* M, where an eagle, which has been identified as the short-toed snake eagle, *Circaetus gallicus* Gmelin, 1788 (Johansson 2012), was holding a "drakon" in its claws (Homer, *Il*. 12.202) in the well-known incident with Hector and the seer Polydamas (Homer, *Il*. 12.220). In the Odyssey, there is only one mention during the narration of Menelaus to Telemachus. It is about the different shapes Proteas assumes, including transforming from a lion to a "drakon" [ἔπειτα δράκων] (Homer, *Od*. 4.457).

In the Iliad, there is only one mention to the term "ophis", specifically in the previously mentioned episode in *Rhapsody* M, with the eagle and the "drakon". When the "drakon" fell dead from the eagle's claws in front of the terrified Trojans, they were observing the swift "ophis" [αἰόλον ὄφιν] (Homer, *Il*. 12.208).

It is worth noting that the mythical "drakon" monster appears in other myths like those of Cadmus and Jason, as different mythologies, religions and even modern literature, known as dragon (Ogden 2013; Christopoulos 2018). However, in Homer's work, specifically in *Rhapsodies* B and M of the *Iliad*, the "drakon" emerges as an animal interacting with other creatures in their natural environment, playing the roles of both the predator and the prey. Johansson (2012) identifies the animal as the Aesculapian snake (Fig. 2A), in *Rhapsody* B, and the snake species *Coluber jugularis* Linnaeus, 1758, in *Rhapsody* M, now known as Caspian whip snake, *Dolichophis caspius* Gmelin, 1789 (Fig. 2C).

As a result, Homer's use of various terminology is not random, and it seems there is a clear distinction between the terms "drakon" and "hydrus", both of which are included under the umbrella term "ophis". Nonetheless, the snake that bit Philoctetes could simply be regarded as a generic "ophis", just a snake. However, the author of the *Iliad* deliberately specifies it as a "hydrus".

On the other hand, the terms "drakon" and "ophis" have been suggested as synonyms meaning "snake" in the most ancient sources related to art and myth (Sancassano 1997; Rodríguez Pérez 2020). In this context, we may consider of the "drakon" in the works of Aeschylus and Accius as a big, terrifying guard with mythological basis rather than a natural snake species (Ogden 2013; Rodríguez Pérez 2020).

The snake in the Philoctetes myth is referred to as a "hydrus" in the rest of extant ancient sources, presumably influenced by the Homeric epic poem itself. Even Tzetzes on Lycophron's *Alexandra* supports that "hydrus" is the right snake species instead of "cenchrines" (Tzetzes, *ad. Lyc.* 912). The only last significant exception is the tragedy Sophocles' *Philoctetes*. The alternate version of viper instead of water-snake marks a turn toward heightened tragedy, especially given the nature of these two animals. Water-snakes (*Natrix* spp.) are aglyphous, generally harmless snakes, in comparison to vipers (Viperidae) which are venomous and potentially deadly.

A representative example might help to better understand the artistic trick in Sophocles' play. In his portrayal, Lemnos – the island where the hero is abandoned – is presented as deserted and absent of inhabitants. This contradicts, not just contemporary historical data (e.g. Efstratiou *et al.* 2014), but also the mythological understanding of prehistoric Lemnos, which was believed to be settled (e.g., Homer, *Il*. 7.467-8; *Od*. 8.283; Euripides, *Hec*. 887). Additionally, Aeschylus and Euripides' lost tragedies with the same topic featured Chorus composed of men from Lemnos. We should note that these homonymous tragedies were staged in 471 and 431 B.C. respectively, before Sophocles' work in 409 B.C. Hence, Sophocles' choice to show the island as uninhabited likely intended to emphasize the terrible fate that befalls the hero (Ntanaka 2016).

Likewise, the reaction of Athenians to the mention of a venomous snake should be more acute than that to a harmless water-snake. If this is correct, we can draw conclusions about the social treatment of snakes in Classical Athens. It seems like the "echidna" had been considered as a more fearsome snake than the "hydrus", equivalent to a viper and a water-snake at the present day (Fig. 2D).

MYTHICAL LOCATION AND SPECIES DISTRIBUTION

Until recently, numerous studies attempted to recognize the area where the myth has taken place. However, the available ancient written sources did not allow us to pinpoint exactly where Philoctetes may have been bitten. First of all, Homer provides no hints for the place, but Sophocles (*Phil*. 194, 1327) mentions an island near Lemnos named "Chryse", dedicated to

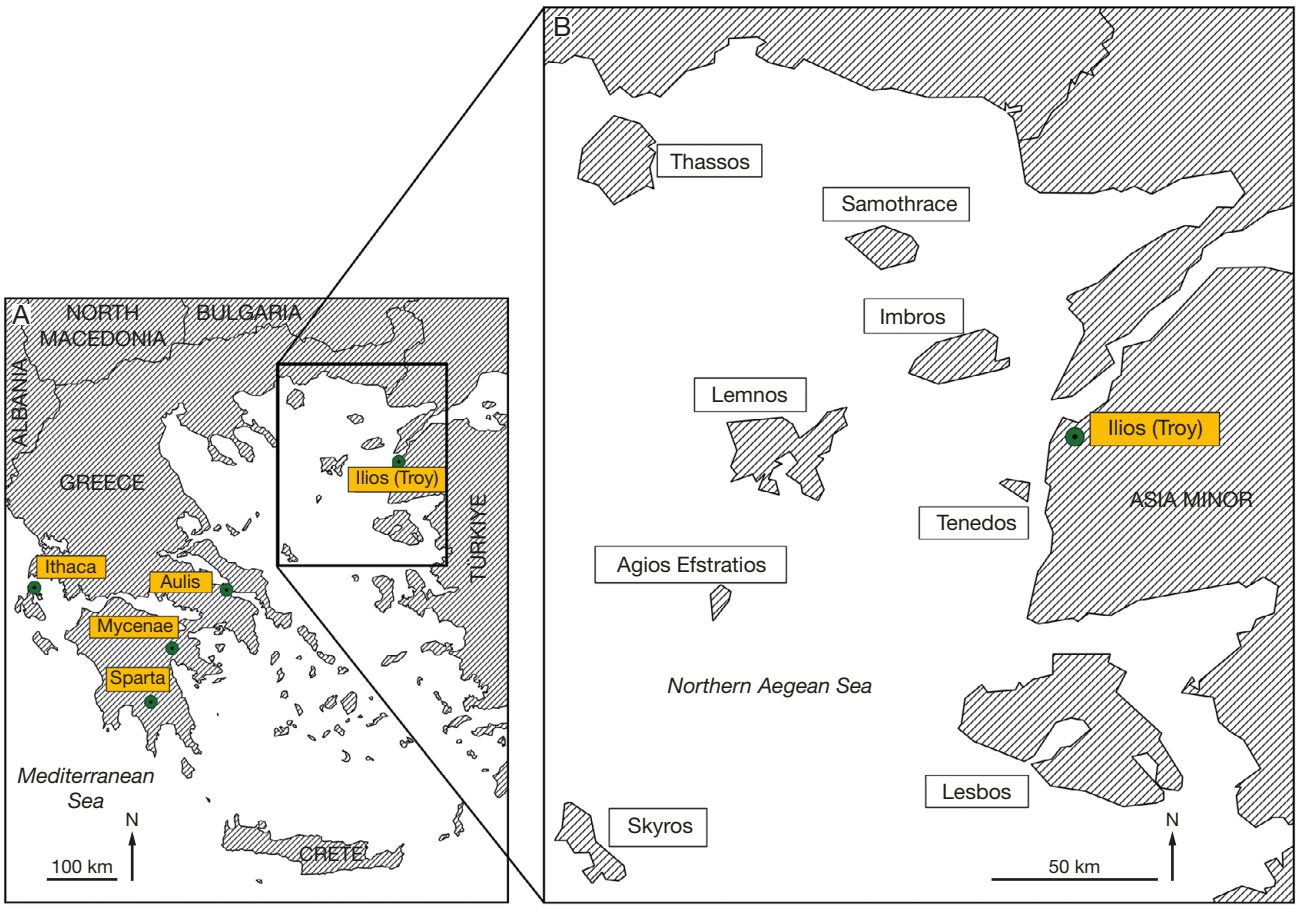

FIG. 4. — Map with the examined areas of this study: **A**, Greece with important Myceneans cities of Troyan Cycle (green points with yellow label); **B**, islands of Northern Aegean Sea linked to the myth of Philoctetes, where the snakebite incident may have occurred.

its eponymous deity, where the episode happened. Hercules may have visited the same island earlier, during the "First" Trojan War, according to Euripides' lost *Philoctetes* play (Ntanaka 2016; Nagy 2021a). In addition, Appian (*Mith.* 11.77) notes a deserted island near Lemnos. As previously noted in this paper, an altar of *Philoctetes* with a bronze snake was located on this island. Pausanias (8.33.4) mentions Chryse island but reports its submergence by his time. So, "Chryse" existed during the first century B.C. but three centuries later, by the time of Pausanias, it had disappeared (Nagy 2021b).

The name "Chryse" itself further complicates the investigation of the mythical location, while it raises the question about the link between the deity Chryse, her sacred island, the priest Chryses, his daughter Chryseis and the location Chryse, where Achaeans return the daughter to her father (Nagy 2021c). Homer mentions that priest Chryses overseeing Chryse, Killa and Tenedos (Homer, *Il.* 1.37-8), three places that only two of them can be identified. Stephanos Byzantios lists multiple toponyms under name "Chryse", including a city on Lesbos, another on Skyros, and a cape on Lemnos (Stephanos Byzantios 696.15-697.1). Different scholars place "Chryse" either in Lesbos or Asia Minor, distinct from the sacred island that Philoctetes visited (Nagy 2021c). Harrison (1989) argues that the priest Chryses' home and "Chryse island" of Philoctetes should not be confused.

On the other hand, both Proclus in Cypria and Pseudo-Apollodorus in *Library* mention Tenedos as the location of the snakebite, with no reference to any "Chryse". Nevertheless, various islands in the Northern Aegean Sea have been linked to the mythical "Chryse". Paton (1888) suggests that "Chryse" is likely present-day Thassos, while unsupported conjectures refer to Agios Efstratios island.

Moreover, the poor archaeological evidence makes difficult the identification of the location. Possible remains were discovered to the east of Lemnos, near Kharos Bank, which have been linked to Pausanias' description of the mythical island's sinking (Frazer 1961). Furthermore, a partially submerged islet named Varvara is located near the northwest coast of Lemnos, where the preliminary research has uncovered remnants suggesting the existence of ancient human activity (Lagos 2009). However, no further scientific investigations have been carried out at the sites to date.

Taking into account all the locations in the Northern Aegean Sea that have linked to the name "Chryse" or have been proposed as possible locations for mythical Chryse island (Fig. 4), this study aims to examine the presence of snake species within these areas. However, the available literature lacks information about reptile presence on small islets around Lemnos (such as Sergitsi, Alogonisi, etc.) as well as the Rabbit Islands (Karayer adaları) in Turkey.

TABLE 2. — Distribution of snake species based on the various versions of the Philoctetes myth on the islands of the Northern Aegean Sea and the coasts of Asia Minor: +, present; –, absent; [a], Cattaneo 1998; [b], Strachinis & Roussos 2016; [c], Cattaneo 2001; [d], Buttle 1989; [e], Tok & Çiçek 2014; [f], Tosunoglu *et al.* 2009; [g], Chondropoulos 1989; [h], Kasapidis *et al.* 1996; [i], Hofstra 2003; [j], Hofstra 2008.

Snake species	Skyros [a]	Agios Efstratios [b]	Lemnos [b,c]	Thassos [c]	Samothrace [c, d]	Imbros [e]	Tenedos [e, f]	Lesbos [g, h ,i ,j]	Asia Minor [e]
Natrix natrix Linnaeus, 1758	+	–	+	+	+	+	+	+	+
Natrix tessellata Laurenti, 1768	–	–	–	–	–	–	–	+	+
Montivipera xanthina Gray, 1849	–	–	–	–	+	+	–	+	+
Vipera ammodytes Linnaeus, 1758	–	–	–	+	–	–	–	–	–
Dolichophis caspius Gmelin, 1789	–	+	+	+	+	+	+	+	+
Malpolon insignitus Geoffroy Saint-Hilaire, 1827	–	–	+	+	+	+	+	+	+
Elaphe sauromates Pallas, 1811	–	–	–	+	–	–	–	–	+

Within the examined areas, seven species are present which reflect the ancient interpretations that have already been discussed. Two species belong to genus Natrix: the grass snake, *Natrix natrix* Linnaeus, 1758 and the dice snake, *Natrix tessellata* Laurenti, 1768; two species of family Viperidae: the nose-horned viper, *Vipera ammodytes* Linnaeus, 1758 and the Ottoman viper; two species of family Colubridae: the Caspian whip snake and the blotched snake; and the Eastern Montpellier snake. The results are presented in Table 2.

The results show that *N. natrix* and *D. caspius* are the most widespread species. *Natrix natrix* is present in all examined areas except for the island of Agios Efstratios while lives in sympatry with *N. tessellata* only on the island of Lesbos and in Asia Minor. On the other hand, *D. caspius* is absent only on the island of Skyros being the only snake species in Agios Efstratios in general (Strachinis & Roussos 2016). *Malpolon insignitus* is another one quite widespread species inhabiting the most of the examined areas, absent only in Skyros and Agios Efstratios. On the contrary, the insular range of *E. sauromates* is limited to Thassos island. Furthermore, all the examined areas have at least one viper species, except for the islands of Skyros, Agios Efstratios, Lemnos and Tenedos, while no sympatry of viper species has been documented so far.

The results, as it turns out, do not allow for the clear recognition of any area, as more than one version of the myth can be supported in nearly all areas. The Homeric version of "hydrus" is supported everywhere with exception for island of Agios Efstratios, as version of "echidna" can be supported for several islands as well. Though the version of Proclus and Pseudo-Apollodorus cannot be dismissed.

DISCUSSION

Based on the zoological interpretation of available ancient sources and modern data on species distributions, this study offers a new perspective to Philoctetes' myth providing new insights into understanding of ancient ophiofauna. In fact, identifying ancient snakes with modern taxonomic names seems impossible for the majority of cases. A single snake-name can be used for more than one species and, conversely, a species may have various names in different regions throughout its distribution (Wick 2009; Giangrasso 2015)[2].

Even if we believe Philoctetes' suffering to be a fictional event (Grmek 1991), the nature of the episode involving the water-snake attack cannot be rejected. The subsequent serious infection is understandable under modern medical terms linked to Madura foot (mycetoma) and osteomyelitis (Johnson 2003; Powlson 2004; Schwartz & Shpiro 2015). These diseases are related to infections caused by fungi and bacteria, transmitted through an open wound, a snakebite in this case.

Considering that Philoctetes' wound was not fatal, as even Eustathius comments on the *Iliad* (Eustathius, *Il.* 2.723), the scenario of "echidna", a viper, as Sophocles depicted, can be rejected, initiating a search for a less deadly species.

First, "drakon" as a distinct animal seems to not be involved in this myth. Homer is clear about the identity of the serpent while the later authors might use the term "drakon" as a synonym for the generic term "ophis". Although the blotched snake, *Elaphe sauromates*, and the Caspian whip snake, *Dolichophis caspius*, have potentially aggressive behaviour including tail waving, hissing and biting (Böhme & Szczerbak 1993; Bjelica *et al.* 2024, and references within), there is no recorded medical cases to date. In the most regions in Greece, these species are better known as "Lafiatis"; this common name is associated with genus *Elaphe* and specifically, the four-lined snake, *E. quatuorlineata*, and is being used to describe long and robust snakes, even where the four-lined snake is not present (Strachinis & Roussos 2016). This "type" of snake carries a respected contribution in Greek culture since ancient times (Bodson 1981; Böhme & Koppetsch

2. See for modern examples: e.g. "Lafiatis" and vipers on Lemnos (Strachinis & Roussos 2016; this study); "Astritis"/"Ochia" for male and female viper (Böhme & Koppetsch 2021).

FIG. 5. — Grass snake, *Natrix natrix* (Linnaeus, 1758). This is the typical "water-snake" species in Europe. This species is probably the snake that bit Philoctetes according to the *Iliad* and the *Epic Cycle*. Photo credit: T. Danelis.

2021), raising the question of potential semantic similarities between these two terms[3].

Second, the issue about the identity of "cenchrines" (Gossen & Steier 1921; Bodson 1981; Leitz 1997; Merle 2001; Overduin 2015) arises because the Balkan whip snake does not inhabit Lemnos and Samothrace as no viper species is present in Lemnos as well (Buttle 1989; Kasapidis *et al.* 1996; Cattaneo 2001; Strachinis & Roussos 2016). In contrast, the Eastern Montpellier snake, *Malpolon insignitus*, is the best candidate for "cenchrines". The long, swift and venomous creature that can wrap around its victims fits with the snake that Nicander describes. The snake "cenchritis", observed by Pierre Belon in Lemnos in the 16th century A.D., is reasonably linked to the ancient beast (Belon 1553). Snakes of genus *Malpolon*, as rear-fanged snakes, are responsible for different medical cases, including mainly local envenomation symptoms and no systemic manifestations; however, serious disturbances such as cranial nerve dysfunctions have been reported (Pommier & De Haro 2007; Malina *et al.* 2008; Weinstein *et al.* 2011; Ballouard *et al.* 2022; Dibiasi & Lüddecke 2023).

Lastly, the snake that implicated to the myth is "hydrus", according to the majority of ancient scholars. "Hydrus" may refer to *Natrix* spp. in the case of Philoctetes' myth, however, the name might work as an umbrella term encompassing more than one species with swimming behaviour, being harmful to humans or even deadly (Bodson 1986; Wick 2009). This can be explained by the similarity of some water-snakes with vipers. First of all, the vipers, the only deadly venomous snakes in Europe, are able to swim (Märtson *et al.* 2001; Allain 2020). Furthermore, Batesian mimicry such as flatten triangular head, hissing (Kabisch 1974; Brodie & Brodie 2004; Tuniyev *et al.* 2011; Valkonen *et al.* 2011; Aubret & Mangin 2014; Bjelica *et al.* 2023a) and colouration (e.g. "schweizeri" and "punctata" morphotypes; Jablonski *et al.* 2023) can lead to a misconception of venomous water-snakes[4] driven by the vipers' body and colour (Hayakawa *et al.* 2011; Strachinis & Roussos 2016; Valkonen *et al.* 2018; Frynta *et al.* 2023).

This confusion leads to another debate about the correlation of "hydrus" with "chersydrus" [χέρσυδρος] and "chelydrus" [χέλυδρος], species mentioned by Nicander in *Theriaca*. Tzetzes, the scholiast of Lycophron's *Alexandra*, states that "chelydrus" is the same species with "chersydrus" and "hydrus" (Tzetzes, *ad. Lyc*. 293). Based on symptoms that their bite causes, other studies came to the same conclusion (Morel 1928; Mayhew 2017) refer probably to a viper species (Andreozzi 2020, and references within). Philumenus mentions that "hydrus" and "chersydrus" are the same species without mentioning

3. On the other hand, in modern Greek folklore, the Alpine newts, *Ichthyosaura alpestris* Laurenti, 1768, that inhabit the alpine lakes of Mount Tymphi and Mount Smolikas, Epirus region, are called "drakoi" (plural of drakos [δράκος]) or "drakakia" ([δρακάκια], little dragons) and the lakes Drakolimnes ([Δρακόλιμνες] Dragon-lakes) (Anagnostopoulos 1916; Oikonomidis 1953; Sotiropoulos 2020; Azmanis *et al.* 2021).

4. Even connecting to Lernaean Hydra, the mythical creature that Hercules slayed, a connection that Eustathius (*Il.* 2.723) has already noted.

Fig. 6. — Details of stamnos G 143 of Hermonax (Athens, *c.* 450 B.C.) in Musée du Louvre representing Philoctetes wounded by the snake in the Sanctuary of Chryse: **A**, in this scene, Agamemnon is aiming his sceptre at the snake at the bottom of the altar; **B**, the snake displays an S-shape forebody and tail-waving, an indicative defensive behaviour of Natricine snakes. Photos credit: F. Karavatsou.

"chelydrus" (Philumenus, *Ven*. 24). However, according to the comparative philological analysis of Giangrasso (2015), "chersydrus" and "hydrus" may be identified as the same species but both are distinct with "chelydrus". Aufrère (2012) suggests that "chersydrus" is a hybrid between the Eastern Montpellier snake, *Malpolon insignitus*, and the dice snake, *Natrix tessellata*. Instead, we can suggest that "chersydrus" is the False cobra, *Malpolon moilensis* Reuss, 1834, a snake species that spreads its neck and hisses like cobra and can be easily mistaken for a water-snake due to its diced body pattern (similar to the dice snake) and the presence of a black blotch at the end of the jaw, like a "fake" collar (similar to the grass snake). Otherwise, if we focus on ecology and exclude the deadly nature of the creature, we can agree that "chersydrus" is identical to "hydrus" or at least a "hydrus" species, *Natrix* spp., considering the S-coiled position and hooding similar to cobra (Nicander, *Ther*. 359-60; Philumenus, *Ven*. 23.2; Pokrant *et al.* 2017; Paterna 2019), the frog diet (Nicander, *Ther*. 366-7) and the terrestrial life (Nicander, *Ther*. 369; Philumenus, *Ven*. 23.1-2; Brenning 1904).

The snake responsible for biting Philoctetes is most likely the grass snake, *Natrix natrix* (Fig. 5), a common species in Asia Minor and the Northern Aegean islands except for Agios Efstratios. Grass snake have already been related to folklore and religious traditions in northern Europe (Lenders & Janssen 2014). Also, it has been recognized as a potential host of important pathogens such as *Salmonella* spp. (Zając *et al.* 2016) and *Alaria alata*, and other parasites (Bełcik *et al.* 2022) N = 15 but no case of human infection have been recorded until now.

On the other hand, there are three documented cases of water-snake attacks so far. The first comes from the ancient times and is found in Aelian's work *On the Characteristics of Animals*, specifically in 4.57, where it refers to Aristotle's account of a person being bitten by a "hydrus" (Aelian, *NA* 4.57). Even if the similar symptoms, such as the foul stench, were reminiscent of the Philoctetes story, the fatal bite of that serpent could be traced to a viper (Mayhew 2017).

The second and third cases, which occurred in the 20th and 21st centuries, involve the *Natrix natrix sensu lato* species. One case was recorded in England in 1967 (Gardner-Thorpe 1967), a bite by a snake which has now been identified as the barred grass snake, *Natrix helvetica* Lacépède, 1789[5]. The other case was reported in Poland in 2004 and involved a *Natrix natrix* bite (Satora 2004). However, both cases are

5. The barred grass snake, *Natrix helvetica*, and the grass snake, *Natrix natrix*, were considered the same species until recently (Kindler *et al.* 2017).

categorized as unreliable, because the species of the snake was not absolutely confirmed beyond the patients' testimonials (Ebell *et al.* 2004; Weinstein *et al.* 2011).

In contrast, there is scientific documentation of defensive biting behaviour in *N. natrix* (Ushakov 2007, and references within; Gläßer-Trobisch & Trobisch 2008) and the sister species *N. helvetica* (Di Nicola *et al.* 2023). Specifically, there have been three recorded cases, for the years 2018 and 2022, but this behaviour is quite uncommon, as the authors state (Di Nicola *et al.* 2023). Although medical records are somewhat unreliable, behavioural evidence offers support for the possibility of a water-snake bite, despite its rarity. This bite can be toxic given that primitive venom glands, named Duvernoy's glands, and enlarged modified rear maxillary teeth have been recognized for the genus *Natrix* (Paolino *et al.* 2023; Paterna 2023).

Because mythical stories serve to preserve and immortalize significant events, the rarity of this behaviour may explain its origin. Given the significant size of some females of the species, even a seasoned warrior would be surprised by a warning bite from an otherwise harmless creature. A possible real-world explanation for a myth can challenge existing interpretations, leading to a better understanding of how ancient myths were inspired by natural phenomena.

The myth also inspired the art of pottery bringing forth some revealing aspects. It is impressive to notice the snake in stamnos G 13 of Hermonax (Athens, *c.* 450 B.C.) in Musée du Louvre (Fig. 6). Whether intentional artistic choice or mere coincidence, it is worthy to note that the S-coiled position of forebody and the tail display are indicative of *Malpolon* and natricine snakes (Gregory 2016; Pokrant *et al.* 2017; Bjelica *et al.* 2023b), suggesting defensive behaviour due to the threat of Agamemnon and his sceptre. On the other hand, the depiction of the snake in krater G 342 of the Altamura Painter (Athens, *c.* 460 B.C.) does not help us recognize a specific species but rather a colubrid (Millingen 1813: pl. 50). This kind of representations may reflect a deeper observation of nature considering that ancient Greeks were paying attention to portraying postures and gestures in humans and animals to express their emotions (Kitchell 2020). In any case, we cannot exclude the fact that we are discussing about artworks (Pareja *et al.* 2020b).

Last but not least, it is important to consider the social aspects of the myth. Besides the ancient ophiolatry, the worship of snakes (Bodson 1981; Pafilis 2010; Christopoulos 2018), the harm caused upon the hero-victim underlines the fierce side of divine serpents. In contrast to the admiration, the myth of Philoctetes reflects an innate fear of snakes, even non-venomous ones – a fear that persists to this day (Ceríaco 2012). The divine snake can bring health but also punishment to our hero (Demetriades 2003; Nagy 2021a). Among the fear of the different types of snakes, reflected in Hellenistic and Roman works, the fear of echidnas, the vipers, should be greater (Souchet & Aubret 2016). Sophocles modifies the myth based on this psychological human aspect, effectively documenting the existence of ophidiophobia in Classical Athens indirectly.

CONCLUSIONS

This study, based on herpetological evidence, gives a holistic view combining clues from different scientific fields such as archaeology, medicine, etc. to interpret the myth of Philoctetes. We can conclude that the snake responsible for biting Philoctetes was a hydrus, a water-snake, which caused him a secondary pathogen infection, taking into account that Philoctetes' wound was not fatal. The wide distribution of grass snake across most islands in the Northern Aegean Sea and the mimicry of viper provide further evidence that the snake in the myth is likely a "hydrus", a water-snake, specifically belonging to the *Natrix natrix* species. Moreover, no area can be characterized as more suitable than others based only on distributional data.

Last but not least, ancient "cenchrines" appears to be related to the Eastern Montpellier snake, *Malpolon insignitus*, referred as "cenchritis" by the Lemnians in the 16th century A.D. Despite ancient scholarly opinions suggesting that "cenchrines" may not be the snake in the incident, we can agree that the Eastern Montpellier snake can bite and inflict mild damage.

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