Geographical Spread of the Exotic Mite *Tropilaelaps* spp.: State of Play of the Worldwide Situation in March 2025

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This note presents a state of play of the geographical distribution and spread of *Tropilaelaps* spp. mites, parasite of bees and exotic in the European Union (EU) in March 2025.

It has been initially published in French on the website of the French Animal Health Epidemiological Surveillance Platform on 3rd March 2025. It was translated into English and updated following the detection of *Tropilaelaps* spp. in Azerbaijan.

Highlights

- Geographical spread of *Tropilaelaps* spp. mites occured in the last decade.
- Detection of *Tropilaelaps mercedesae* in territories close to the European Union: presence in the Russian regions of Krasnodar and Rostov (close to Ukraine and Georgia) since 2021 at least, and in Georgia since 2023 at least.
- Increased risk of introduction into the EU due to the geographical spread of the parasite and climatic conditions favouring its survival.
- Among the two species of *Tropilaelaps* identified in *Apis mellifera*, *T. mercedesae* has the larger geographical distribution.
- Phylogenetic data provide a better understanding of the links between the different introductions, but still need to be consolidated.

Data source

- Data extracted on 14 March 2024 of the World Animal Health Information System of the World Organisation for Animal Health (WAHIS-WOAH).
- Scientific publications (see at the end)
- Informal sources (e.g. beekeeping associations' websites, exchanges with scientists from concerned countries).

Note to readers:
Few health events on Tropilaelaps *spp. are reported to WOAH. Most of the data analysed in this article come from scientific publications and come from studies conducted in the framework of research projects and not from official surveillance systems. These data were collected according to different protocols and do not allow a detailed and comparable analysis of the health situation in each country.*
Since the European Union (EU) is currently free of Tropilaelaps spp., no data came from the EU Animal Disease Information System (ADIS).

Tropilaelaps mites are external parasites of bees, originating from Asia. They reproduce and feed in the brood on bee larvae and pupae. They cause weakening, hive desertions, colony mortality and potentially significant production losses. Since *Tropilaelaps* depends on bee brood for its food, its survival time on adult bees and in bee matrices (e.g. pollen, royal jelly, honey, hive frame) is short (around 3 to 6 days) (Franco and Duquesne 2024).

Four species of *Tropilaelaps* have been described: *T. clareae, T. koenigerum, T. mercedesae* and *T. thaï*. Originally, each species tends to be associated with a giant Asian honeybee, such as *Apis dorsata, Apis laboriosa* and *Apis breviligula*. Currently, only *T. mercedesae* and *T. clareae* reproduce on *Apis mellifera* brood, the honeybee of European origin. These species have adapted to this new host, in which they can reproduce and ensure their parasitic cycles (de Guzman *et al*. 2017).

Infestation of honey bees with *Tropilaelaps* spp. mites is included in the list of diseases of Apinae of the WOAH. The WOAH member states are required to provide information on their health situation via the WAHIS system.

The European Union, which is free from this exotic parasitosis, regulates this disease for bees of the genus *Apis*. Infestation with *Tropilaelaps* spp. is listed in categories D and E in the EU Regulation 2018/1882 and in accordance with the Animal Health Law (EU Regulation 2016/429). Its presence must be notified.

Evolution of the geographical distribution

Description

Tropilaelaps spp. mites were first identified in the 1960s in tropical and subtropical areas of Asia where their primary hosts, giant honeybees, live. Delfinado and Baker first described this mite in the Philippines in 1961 (Delfinado and Baker 1961). Since then, its observation in Asia has continued to increase. However, the precise geographical distribution of *Tropilaelaps* and its different species remains relatively poorly understood; only a few studies exist on the subject (Figure 1 and 2).

The species *T. mercedesae* is the most widespread in Asia. It is present in areas with a tropical climate as well as a temperate climate (Figure 2).

Tropilaelaps mercedesae has been confused with *T. clareae* for a long time. *T. clareae* is the other species infesting *A. mellifera* and it has only been reported in the Philippines (except the Palawan Islands) and Indonesia (de Guzman *et al*. 2017). The geographical range of *T. clareae* is therefore much smaller than the geographical range of *T. mercedesae* (Figure 2).

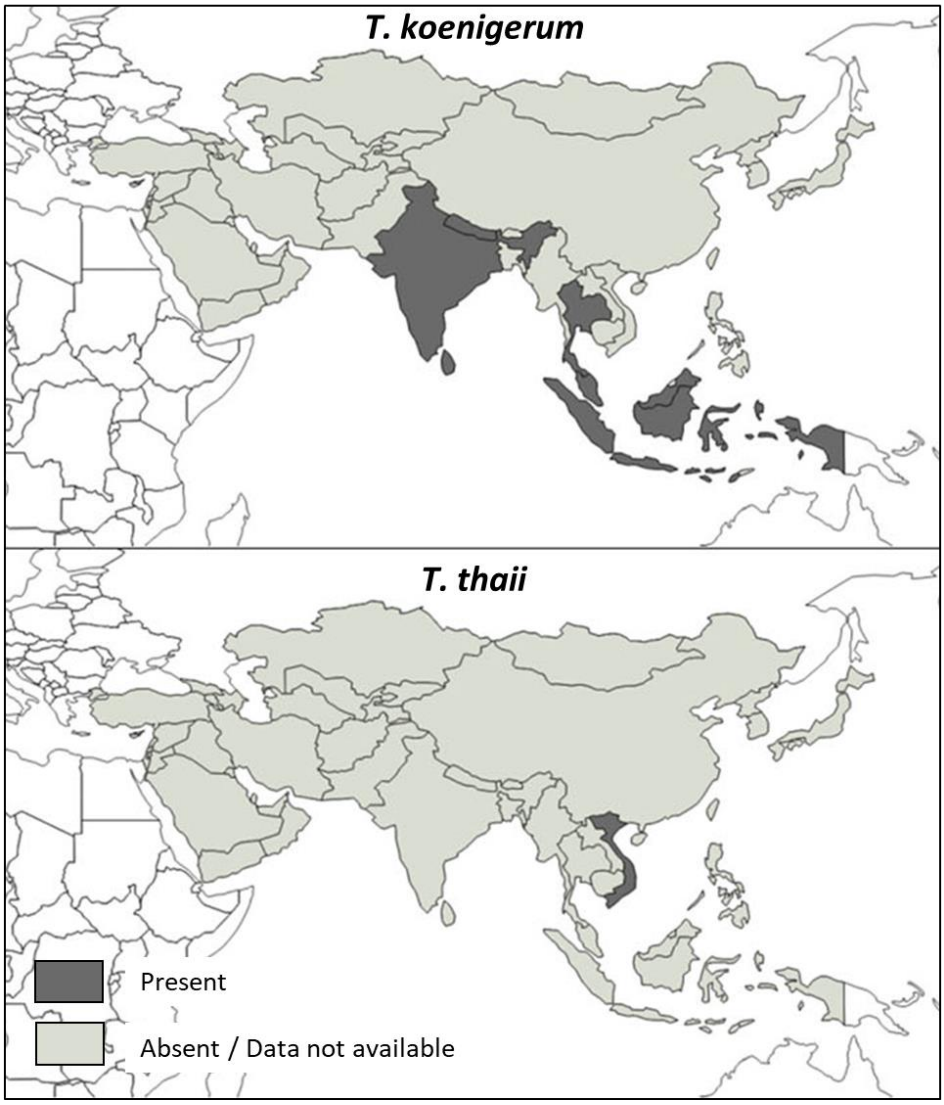

Figure 1 Geographical distribution of the two *Tropilaelaps* species not observed in *Apis mellifera* in 2016 (*T. koenigerum* and *T. thaii*) (Chantawannakul *et al*. 2016).

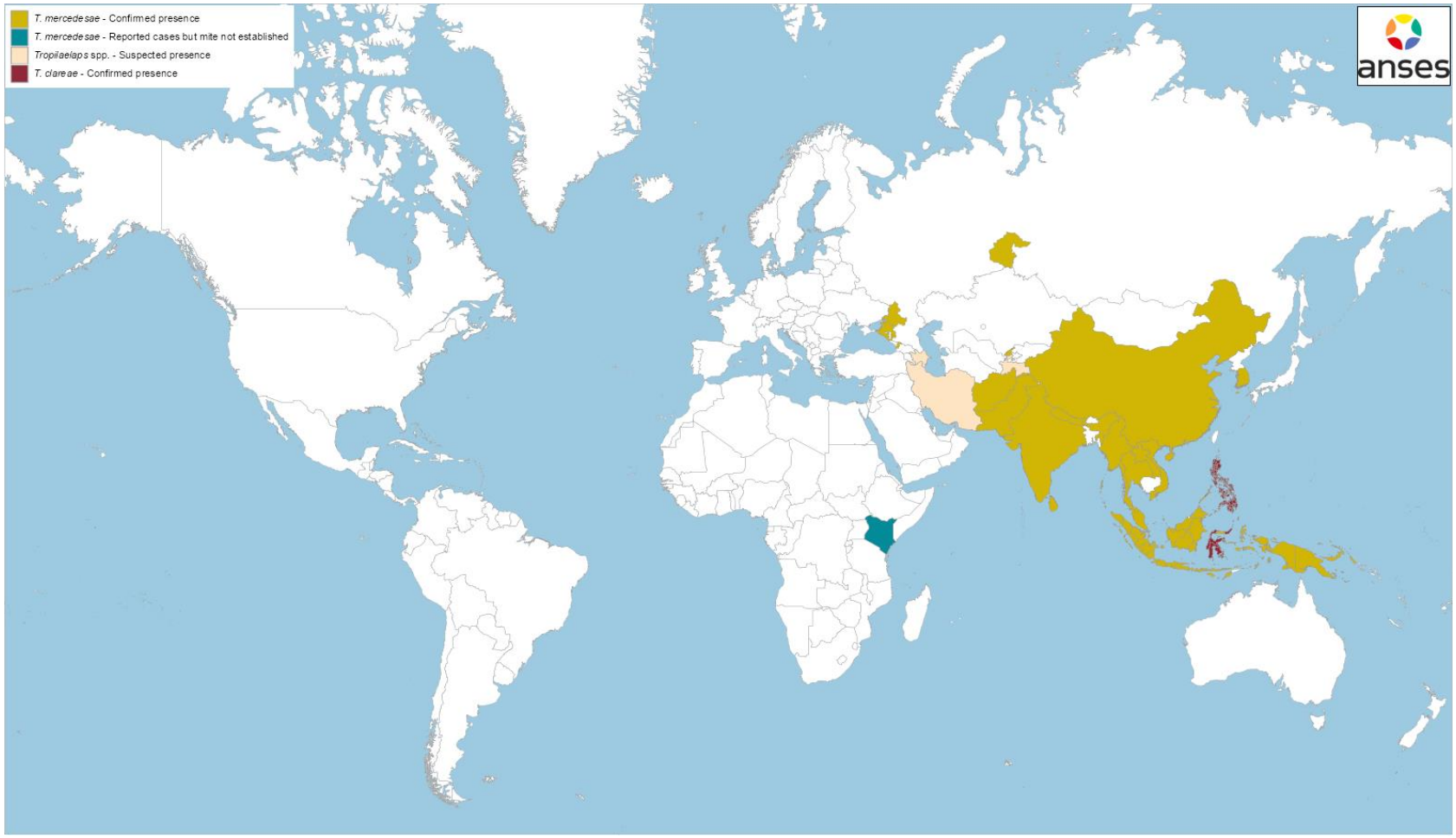

Figure 2 Worldwide geographical distribution of the two species of *Tropilaelaps* observed in *A. mellifera* (*T. clareae* and *T. mercedesae*). Sources: Anderson and Morgan 2007, Chantawannakul *et al*. 2016, de Guzman *et al*. 2017, Brandorf *et al*. 2024, Mohamadzade Namin *et al*. 2024, Joharchi and Stolbova 2024, Janashia *et al*. 2024, Sammataro *et al*. 2000, WOAH event notifications (WAHIS-WOAH consulted on 14th March 2025), information on the website of a local media outlet (regarding Azerbaijan) and personal communications with the Anses laboratory in Sophia Antipolis (regarding Iran and Tajikistan).

- **Detection in several regions of Russia**

At the end of 2022, a Russian beekeeping association reported significant losses of bee colonies linked to the presence of *Tropilaelaps* in several regions of Russia and in neighboring countries (Uzbekistan and Tajikistan in particular). This information was disseminated on Internet (Video extracted from the "Conference on Natural Beekeeping - 2022", Published online on December 5, 2022[1]).

Since then, several scientific publications have confirmed its presence:

- In the Russian regions of Krasnodar and Rostov, located on the Black Sea coast, between Georgia and Ukraine (Brandorf *et al*. 2024) (Figures 2 and 3). According to Brandorf *et al*. (2024), the mite has been present in these territories since the summer of 2021. The infestation showed the presence of irregular brood, leading to a weakening of the colonies and significant mortalities (53% of mortality in the colonies monitored in the study). Genetic analyses identified the species *T. mercedesae*.
- In the Tyumen region, located in western Siberia, close to the border with Kazakhstan (Joharchi and Stolbova 2024) (Figures 2 and 3). The article by Joharchi and Stolbova (2024) does not specify when *Tropilaelaps* mites were collected from the hives, nor does it provide information on the health of the colonies infested with the mite. The identification of the species *T. mercedesae* was based on morphological criteria.

- **Detection in Georgia**

In 2024, the presence of *T. mercedesae* was confirmed in the northwestern part of Georgia, in the Samegrelo-Zemo Svaneti region, close to the infested Russian territories (Janashia *et al*. 2024; WOAH website consulted on 31st January 2025) (Figures 2 and 3). The results of the study by Janashia *et al*. (2024) suggest that *T. mercedesae* has been present in this region for at least a year. The study, which was conducted in three *A. mellifera caucasica* apiaries, also revealed some high colony infestation rates (up to 24% of capped brood cells infested with *Tropilaelaps*).

- **Presence in Uzbekistan**

The presence of *T. mercedesae* in Uzbekistan was confirmed for the first time in 2024 based on molecular and morphological analyses by Mohamadzade Namin *et al*. (2024) (Figures 2 and 3). In this study, the mites were collected in 2022 nearby Tashkent. However, the article does not indicate whether the mite is present in other regions in Uzbekistan or what health consequences are observed in infested apiaries.

- **Suspected presence in Tajikistan, Iran and Azerbaijan**

Discussions between the Anses[2] laboratory of Sophia Antipolis and Tajik and Iranian scientists suggest the presence of *Tropilaelaps* in Tajikistan and Iran (personal communications in 2022 and 2024, respectively) (Figures 2 and 3). According to these discussions, bee colonies infested with the mite would suffer significant losses.

It is not known how long the mite has been present in these countries. The publications of Sammataro *et al.* (2000) and Shahrouzi (website consulted on 15th January 2025) mentioned the presence of *Tropilaelaps* in Iran in the 2000s. A study, conducted in 2011-2012, had nevertheless shown the absence of *Tropilaelaps* in the northeastern mountainous region of Iran near the border with Turkmenistan (Moshaverinia 2013).

[1] https://www.youtube.com/watch?v=frn1Ffywb4o&t=1146s

[2] French Agency for Food, Environmental and Occupational Health and Safety

In Azerbaijan, the Azerbaijani Beekeeping Association declared to a local media outlet that *Tropilaelaps* first appeared in the northern and western regions of the country (Online post on the website musavat.com dated from 14 March 2025). It would have been recently discovered in Bilasuvar, a district located in the southeast part of the country near the Caspian Sea. Bee losses of 40 to 50 % have been observed this last autumn and winter. They idendified *Varroa* and associated viruses as the probable cause. It is not clear when *Tropilaelaps* spp. would have been introduced in Azerbaijan and if it is responsible for these mortalities. Official authorities did not confirm this introduction for the moment, but reported a decrease of 3.1% in the number of bee colonies in 2024 compared to 2023 (Online post on the website of the State Statistical Committee of the Republic of Azerbaijan from 12 March 2025).

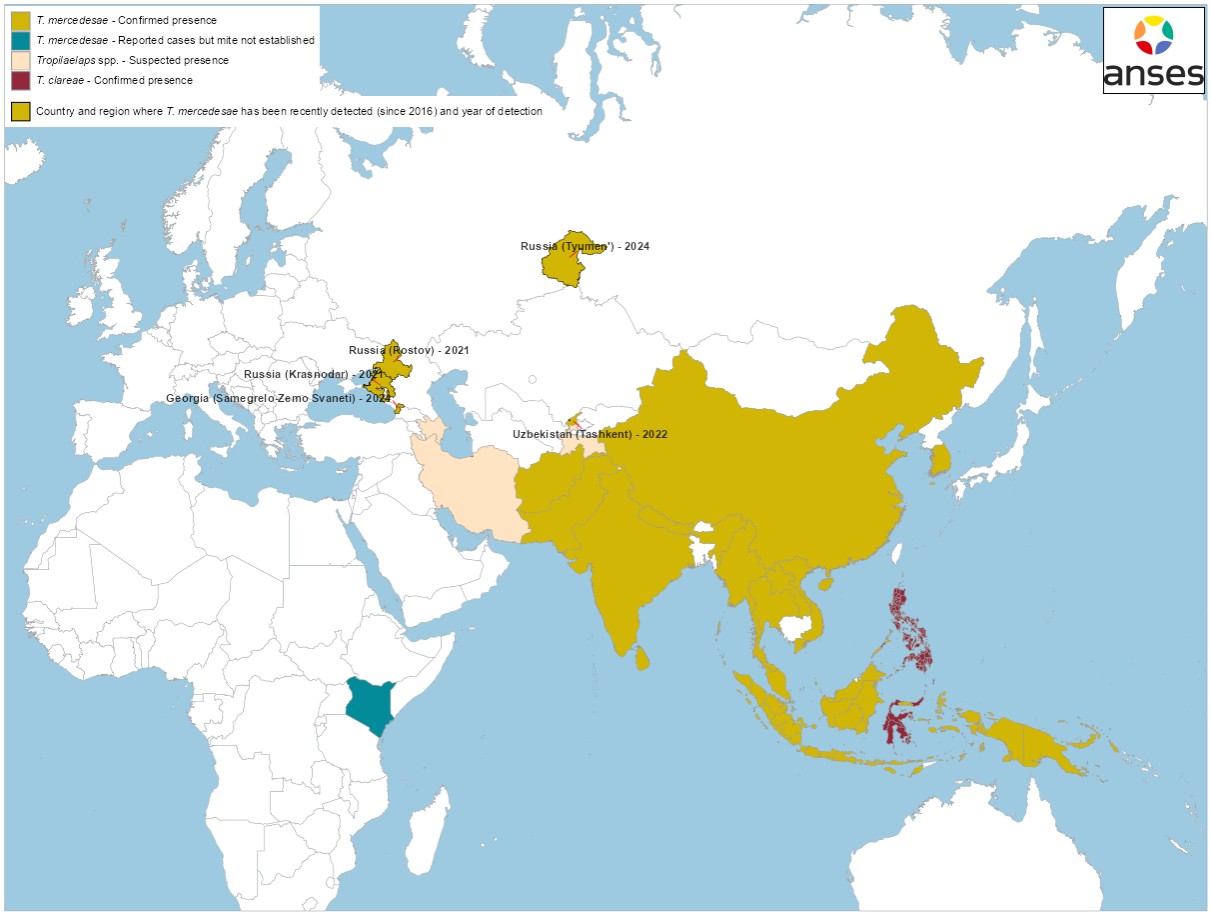

Figure 3 Geographical distribution of *T. clareae* and *T. mercedesae* in Asia and Europe and new confirmed detections since 2016 (as of 14th March 2025). Sources: Anderson and Morgan 2007, Chantawannakul *et al*. 2016, de Guzman *et al*. 2017, Brandorf *et al*. 2024, Mohamadzade Namin *et al*. 2024, Joharchi and Stolbova 2024, Janashia and al. 2024, Sammataro, Gerson and Needham 2000, WOAH event notifications (WAHIS-WOAH consulted on 14th March 2025), information on the website of a local media outlet (regarding Azerbaijan) and personal communications with the Anses laboratory in Sophia Antipolis (regarding Iran and Tajikistan).

Discussion

- **Data available show a spread of *T. mercedesae* towards Central and Western Asia, reaching the Eastern part of the European continent in 2021 (Figure 4).**

These data do not allow to accurately describe the epidemiological situation in the concerned territories as most of them do not come from official surveillance systems.

Most of the data come from scientific projects targeting the study of one or a few apiaries. Their objective is not to have a state of play of the prevalence of *Tropilaelaps* nor its spread.

It should be noted that almost no notification has been made to WOAH on the different cases of introduction, nor more broadly by all the countries infested with *Tropilaelaps* spp. mites. Only the detection of *Tropilaelaps* in Georgia has recently been the subject of a notification in the WAHIS system (consulted on 31st December 2024).

Furthermore, the various sources of information often report late detection of the mite (generally at least one year after the presumed period of introduction).

Data of *Tropilaelaps* geographical distribution should be considered with caution and call for increased vigilance in the context of imports of bees from territories considered “officially free” of *Tropilaelaps* spp. mites but geographically close to infested areas, or involving commercial or "beekeeping" links with infested areas.

- **International spread probably favoured by bee movements and climate change.**

Several factors contribute to the spread of *Tropilaelaps*:

- Pillage and drifting promoting the natural dispersal of the mite between bee colonies, at the local level;
- Beekeeping practices, such as colony division, transfer of brood frames between colonies or migration;
- Trade of colony, package of bees, nuclei or even queens;
- Introductions occuring via the transport of infested swarms sometimes accidentally installed on ships (de Guzman *et al*. 2017);
- Illegal trade of bees (e.g. trade of queens in particular), without official controls, increasing the risk of spread.

Regarding the cases of introduction recently notified, the invasion routes are not known. However, the hypothesis of a link with anthropogenic movements (migration and trade of live bees in particular) is probable (Janashia, 2024; Video extracted from the “Conference on Natural Beekeeping - 2022”, Published online on December 5, 2022[3]).

Climate change also creates suitable conditions for the spread and establishment of *Tropilaelaps* (Chantawannakul *et al*. 2018). Indeed, the presence of brood in colonies for a large part of the year (a phenomenon linked to global warming) promotes its multiplication and survival during winter (de Guzman *et al*. 2017). The dispersal of *T. mercedesae* in regions with cold winters (particularly in South Korea and China) also suggests that it could survive the winter in the absence of brood. The survival modalities are not yet known. Studies are still necessary to better understand the biology of the mite, particularly in its new host *A. mellifera*.

[3] https://www.youtube.com/watch?v=frn1Ffywb4o&t=1146s

- **The presence of *Tropilaelaps* in territories close to the EU is an increasingly serious threat to the European beekeeping sector.**

The risk of introduction into the EU through Turkey[4] is significant. The Turkish border is located at less than 200 km of the region where *Tropilaelaps* was detected in Georgia (Figure 4). Although the introduction of queens from Georgia is prohibited in Turkey, their illegal trade could promote the introduction of *Tropilaelaps* into Turkey (Janashia *et al*. 2024; personal communication). Intensive migratory beekeeping in Turkey could subsequently cause its rapid spread to western Turkey.

The risk of introduction into Ukraine, via the Russian regions of Krasnodar and Rostov, is difficult to assess due to the geopolitical context that complicates the surveillance of the parasite. The real situation regarding the spread of *Tropilaelaps* and its control remain difficult to understand.

[4] Last data come from a study conducted in 2018/2019 in 40 Turkish provinces and show the absence of *Tropilaelaps* (Gürler *et al.* 2024).

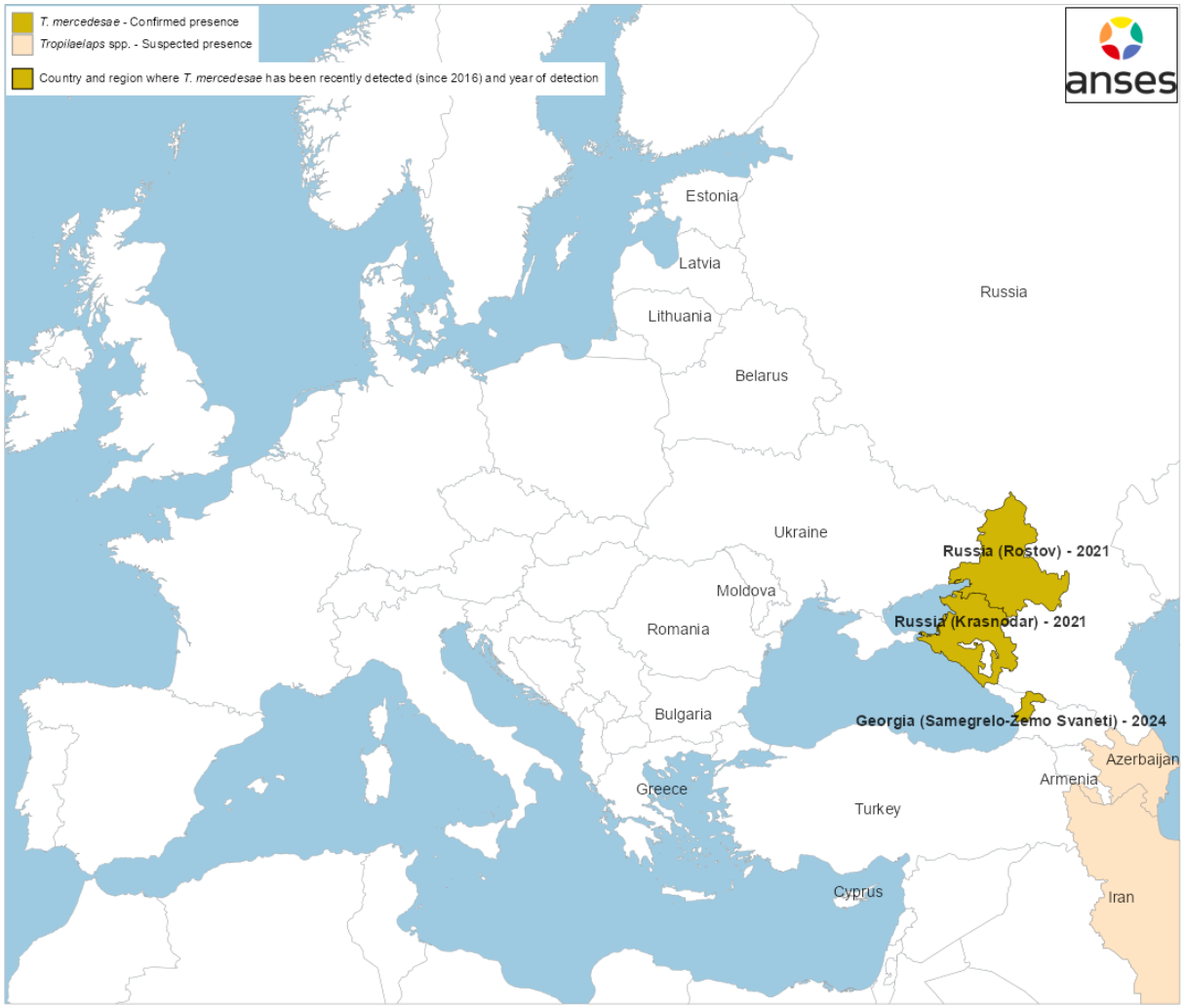

Figure 4 Geographical distribution of *T. mercedesae* in territories close to the European continent as of 14 March 2025.

Genetic aspects

Description

Analysis of morphological characteristics does not allow easy differentiation between the different species of *Tropilaelaps*. The first genetic studies were carried out in 2003 (Tangjingjai *et al*. 2003), showing an initial divergence between the two species *T. clareae* and *T. koenigerum*. Indeed, restriction fragment length polymorphism (RFLP) analysis of ITS (Internal Transcribed Spacers) sequences revealed a difference of approximately 4% over 600 base pairs (bp) between these two species. In addition, analysis of DNA amplified by the random amplified polymorphic DNA (RAPD) method also revealed genetic differences. In 2007, sequencing of a part of the ITS gene and the cytochrome oxidase C subunit I (COI) gene of the two species *T. mercedesae* and *T. thaii* confirmed the differences observed in morphological characteristics (Anderson and Morgan 2007). The nucleotide difference in the COI gene has been estimated at between 1 and 4% within a species, and between 11 and 15% among the four species (Anderson and Morgan 2007). Based on these results, the development of a real-time PCR followed by a high-resolution temperature curve (PCR-HRM) allows rapid identification of the four *Tropilaelaps* species (Del Cont *et al*. 2021).

Up until recently, the number of sequences of the two genes mentioned above and present in the databases was not sufficient to consider a significantly representative phylogenetic study. Mohamadzade Namin *et al*. (2024) were able to carry out a phylogenetic study on 112 sequences of the COI gene of the species *T. mercedesae*. The results of this study not only confirm a genetic divergence within this species but also provide information on the geographical origin, movements and spread of this exotic parasite. Indeed, according to the study, the specimens present in the Asian zone can be distinguished into two groups or "clades" (Figure 5). Clade I includes a majority subgroup or "subclade" (continental subclade), and three subclades including specimens from the zones of Tibet, Indonesia and Malaysia. Clade II includes specimens from the Philippines and Sri Lanka.

Concerning the specimens collected from the new introductions in Russia and Georgia, *in silico* analysis of partial sequences of the COI gene (Janashia *et al*. 2024) shows an identity of 96.80% (with 100% coverage) between the two specimens from these introductions. Comparison of the sequences with those available in the databases reveals that the specimens collected in Russia are closer (99.83% identity) to some specimens collected in Thailand, China and India. These two new strains would therefore be part of clade I, the most predominant (Figure 5). Further phylogenetic analyses must be undertaken to confirm the links between the different introductions.

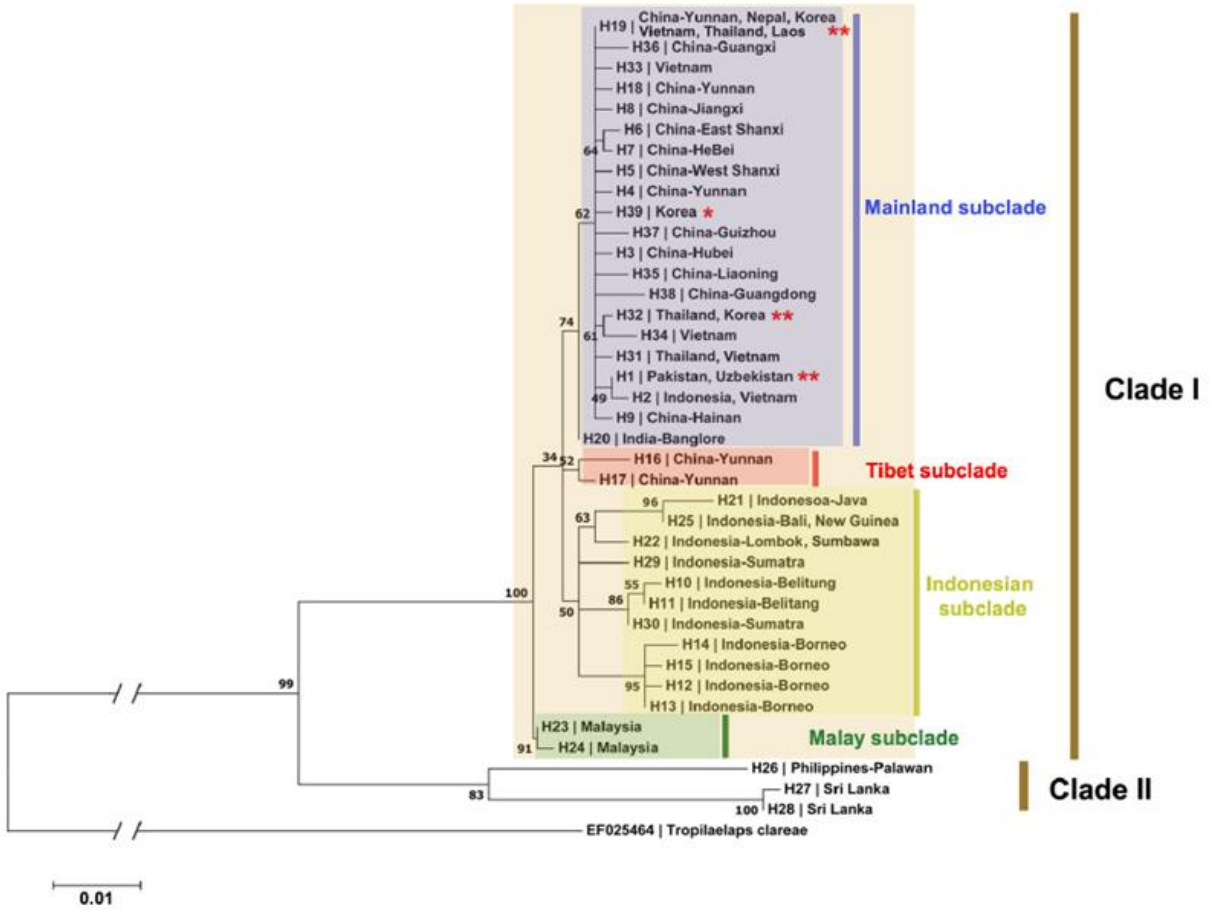

Figure 5 Likelihood phylogenetic tree of a part of COI sequences (538 bp) from 112 *T. mercedesae* sequences (Mohamadzade Namin *et al*. 2024).

Discussion

- **Sequencing of part of the COI gene provides initial information on the spread of *Tropilaelaps* strains.**

The published sequences make it possible to genetically link the specimens introduced into Russia and Georgia to the most predominant clade, present mainly in Asia. These studies support the hypothesis of the influence of exchanges between the beekeeping regions of the two countries in the spread of strains. Molecular tools become more efficient to reveal these relationships. However, the obtained sequences must be located in the same region of the gene for a relevant analysis. Additional molecular studies will be necessary to confirm the suspected link.

Conclusion

Despite the low quality of available epidemiological data, several sources of information show a geographical expansion of the species *T. mercedesae* in recent years towards Central and Western Asia.

This spread represents a major risk for the worldwide beekeeping sector, and in particular for the European Union due to the presence of *Tropilaelaps* in neighbouring territories of Ukraine and Turkey. The context of global warming favours the spread and establishment of the mite.

Most of the introductions have not been notified to the WOAH, calling for increased vigilance in the context of bee movements, which are rapid spread routes for the parasite. Regulation on imports into the EU and intra-Community trade make it possible to limit the risk of introduction.

Phylogenetic studies provide information on the evolutionary relationships between the different specimens of *Tropilaelaps* present worldwide and subsequently a better understanding of the links between the different introductions. They still deserve to be consolidated.

The consequences of infestation with *Tropilaelaps* in bee colonies could be more severe than infestation with *Varroa destructor*. *Tropilaelaps* multiplies more quickly than *Varroa*, thus increasing the parasitic pressure on the colony. Its presence would require the implementation of control strategies adapted to the biology of this parasite, which is still poorly understood. Early detection of any possible introduction is therefore essential to attempt eradication and prevent its establishment.

Regulatory Framework for *Tropilaelaps* spp. infestation in the European Union

- Infestation with *Tropilaelaps* spp. mites is listed in categories D and E pursuant to the EU Regulation 2018/1882 of 3 December 2018. Category D is a disease "for which measures are needed to prevent it from spreading to parts of the Union". Category E is a disease "for which there is a need for surveillance within the Union".
- Rules for entry into the Union, and the movement and handling after entry of consignments of certain animals, germinal products and products of animal origin are detailed in the Commission Delegated Regulation (EU) 2020/692 of 30 January 2020 supplementing Regulation (EU) 2016/429 of the European Parliament and of the Council.
- Commission Delegated Regulation (EU) 2020/688 of 17 December 2019 supplements Regulation (EU) 2016/429 of the European Parliament and of the Council, as regards animal health requirements for movements within the Union of terrestrial animals and hatching eggs.
- Commission Implementing Regulation (EU) 2021/404 of 24 March 2021 lays down the lists of third countries, territories or zones thereof from which the entry into the Union of animals, germinal products and products of animal origin is permitted in accordance with Regulation (EU) 2016/429 of the European Parliament and the Council.
- Commission Implementing Regulation (EU) 2021/403 of 24 March 2021 lays down rules for the application of Regulations (EU) 2016/429 and (EU) 2017/625 of the European Parliament and of the Council as regards model animal health certificates and model animal health/official certificates, for the entry into the Union and movements between Member States of consignments of certain categories of terrestrial animals and germinal products thereof, official certification regarding such certificates and repealing Decision 2010/470/EU.
- Regulation (EU) 2016/429 of the European Parliament and of the Council of 9 March 2016 on transmissible animal diseases and amending and repealing certain acts in the area of animal health ('Animal Health Law'). Official Journal of the European Union. 21.04.2021 — 002.001 — 1.

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