Researchers have identified areas of Italy that have a climate capable of sustaining a population of tiger mosquitoes, an invasive mosquito species that can carry several human diseases. The findings also indicate how these areas will expand as the climate changes in future.

Although invasive species are rarely welcome, some species pose a particular threat to human populations as they can carry infectious diseases. The tiger mosquito, *Aedes albopictus*, is one such invasive species. Originating in south-east Asia, it was first found in Genoa in Italy in 1990 and has since spread throughout the country. Wild populations of tiger mosquitoes have been found to carry human viruses including dengue fever and West Nile virus.

The mountainous Trento Province in north-eastern Italy provided a test area for the researchers, who developed a model for predicting the spread of the insects, which can be applied across most of Europe. The study could help health agencies throughout Europe predict the spread of the mosquito and the viruses it carries.

For their analysis, the researchers used traps in Trento Province to establish where the mosquitoes lived. They compared this to daily land surface temperature maps recorded by sensors on NASA’s Terra and Aqua satellites to establish how four environmental factors affected mosquito distribution. These were: average January temperature, average annual temperature, human population density and distance to human population centres. Rainfall is also important for the tiger mosquito, but the average rainfall in Trento is well above the minimum amount the mosquitoes require (around 500mm annually), so it was not included in this study.

The research found that the land surface temperature was the most useful factor for predicting the distribution of tiger mosquitoes. In particular, the mosquitoes thrived in areas with an average January temperature above 0°C and an annual average temperature of at least 11°C. Information about human population density and the distance to human population centres was less helpful for forecasting where the mosquitoes could be found.

The satellite data also revealed variations in local micro-climates that were not apparent from just examining the altitude of an area or from local meteorological station data. For instance, the area around Pregasina is at a relatively high altitude for the tiger mosquito. Despite this, the temperatures in this region were above the threshold the mosquitoes required.

As mountainous regions, such as the Alps, are particularly sensitive to climate change, the researchers also used a future climate change scenario to model the changing temperatures in the region from now until 2050. They found that areas suitable for the mosquito could expand northwards as temperatures rise. Transmission of disease also depends on the temperature, so rising temperatures could make it easier for the diseases carried by mosquitoes to spread to local people.

The model created by the researchers could be used throughout much of Europe, but not in areas where annual rainfall is less than 500mm. It would provide an early warning system for health agencies and others, warning them as and when new areas become vulnerable to colonisation and allowing authorities to control the mosquito and prevent the spread of mosquito-borne disease.


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Theme(s): Biodiversity, Environment and health