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Survey on *Aedes albopictus* (Skuse) (Diptera: Culicidae) infestation in Desenzano del Garda (Brescia province-Italy). (*) (**)

Introduction

Aedes albopictus, first described by Skuse in 1894, belongs to the subgenus *Stegomyia*, group Scutellaris, subgroup Albopictus. During the last century this native of south-east Asia spread south-east as far as New Guinea, east as far as Hawaii, west as far as Madagascar and north as far as Beijing in China and the Sendai region in Japan (Hawley, 1988).

The recent passive spread of this species into new areas is mainly caused by an increase in international trade in used tyres which provide a suitable habitat for the eggs (Hawley *et al.*, 1987). The selection of strains which exploit the embryonic diapause mechanism to overwinter in temperate climates has led to colonization of wide areas (Hawley *et al*, 1989, Pumpini *et al.*, 1992).

The first infestation in the USA was reported in Houston, Texas, in 1985 (Sprenger and Wuithiranyagool, 1986) and since then it has spread rapidly to colonize 22 states (Moore, 1993). In Brazil, it was first identified in San Paolo in 1986 (Forattini, 1986) and has since colonized 4 states (Rai, 1991). In the African continent it was first reported in 1991 when it was implicated in an epidemic of yellow fever in Nigeria (Savage *et al.*, 1992). In Europe, it was first reported in Albania in 1987 (Adhami and Murati, 1987).

In Italy, the first indication dates back to September 1990 (Sabatini *et al.*, 1990) when it was identified in a nursery school in Genoa. Investigations carried out the following year showed that the species was also present in another 12 areas of the city (Ranieri *et al.*, 1991). In 1991 a new infestation focus was discovered in the province of Padua. This had its origin in tyres imported from Atlanta (Georgia) (Dalla Pozza and Majori, 1992). In 1992 it was subsequently reported in the city of Padua itself and in the provinces of Vicenza (Breganze), Treviso (Monte-

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belluna and Susegana) (Romi *et al*, 1993), Venice (Portogruaro) (Zamburlini, 1992) and Civitavecchia (Della Torre *et al*., 1992). In 1993 it was discovered by the Public Local Health Units in Brescia city and in the province of Mantua (Fig. 1). Its extreme adaptability and proven capacity to overwinter in our country, together with the fact that it only becomes a public problem a minimum of one to two years after colonization, make it probable that *Ae albopictus* has already colonized other areas and that it is capable of spreading rapidly in Italy.

In Asia, *Ae albopictus* has been implicated in the transmission of a number of disease-causing agents including Dengue Fever (DHF and DSS), the Chikungunya virus, Japanese Encephalitis and *D. immitis*. It has also proved to be a vector for indigenous arboviruses in America (La Cross, Easter Equine Encephalomyelitis, St Louis Encephalitis and Western Equine Encephalomyelitis), Africa and South America (yellow fever) (Mitchell, 1991).These viruses are not yet present in Italy and the arboviruses transmitted by indigenous mosquitoes, which cause generic and often negligible symptoms, have not been studied in great depth. Given the efficiency with which it transmits *Dirofilaria immitis* and *D. repens*, there is high probability that *Ae albopictus* may contribute to the spreading of canine filariasis (Cancrini *et al*., 1992).

Materials and methods

Since 1991, noxious problems caused by biting insects were reported in an area around the town of Desenzano del Garda. As a result, in 1993 the Public Health Service of Local Health Unit 40 set up an entomological investigation into the cau-

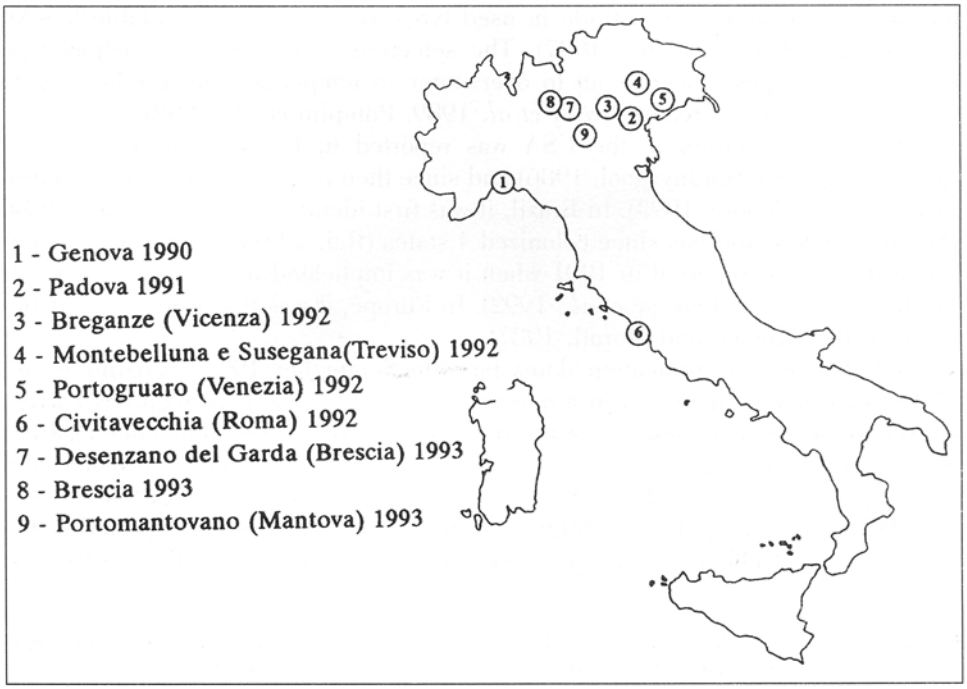

Fig. I - Presence of *Aedes albopictus* in Italy.

ses. Between March and October 1993, surveys were carried out in the towns of Desenzano and Rivoltella. The following potential breeding sites were considered:

– public and private drain manholes. About 800 manholes were inspected for larvae, 400 during June and July and 400 during August and September. Samples were taken every 14-21 days from ten manholes in the most intensively colonized area;

– flowerpots and associated dishes, flower troughs, watering cans and manholes in cemeteries in Desenzano and Rivoltella;

– all used tyres stored in the open;

– containers in private and public, urban and surrounding areas.

The adult population was also monitored by means of CDC type attraction traps baited with dry ice (Sudia and Chamberlain, 1962; Gillies, 1980). The traps were randomly placed in the urban area (total of 24 different stations) between 13 March and 30 October.

Identification of the species responsible was carried out by morphological examination based on the description supplied by Huang (1972).

Results and discussion

The infestation at Desenzano probably originated from the international used tyre trade. Enquiries made in the city's industrial zone produced reports of a heavy infestation of mosquitoes in 1988 near the warehouse of a used tyre importer who traded with Japan, the Netherlands, Germany and Great Britain. These mosquitoes, biting during the day, caused a disturbance to people living and working in the area, to the point where they persuaded the owners to carry out insecticide treatment of the outside pile of tyres.

Findings of larvae began in the third week of May and continued until the middle of October. Some IV instar larvae were found on 9 November in small containers left in gardens. Of the 400 manholes examined in June and July, 12.5% were found to be infested, while the figure rose to 22.75% in August and September. A preference for manholes in shaded areas was noted. The most heavily infested areas were characterized by numerous flower and vegetable gardens and private garages. Near these the larval development is often continous troughout the summer season, favoured by water coming from garden irrigation, the washing of cars, etc. Fig. II shows the trend of the average larval density found on 10 sample manholes in the most heavily colonized area. The maximum larval density was observed on 18 August. Control activities (1 gr temephos a.i. application in all the manholes) began on 17 September and continued until the middle of October. It was not therefore possible to have data until the end of the development period.

No *Ae albopictus* larvae or adults were found in either of the cemeteries investigated.

Ae albopictus larvae and adults were, however, detected in all tyres stocked outside tyre repair dealers. The species was also found in all used tyres abandoned in the open.

In the study carried out on urban containers, larvae and eggs were found in: dishes under potted plants in gardens and on balconies; small containers such as

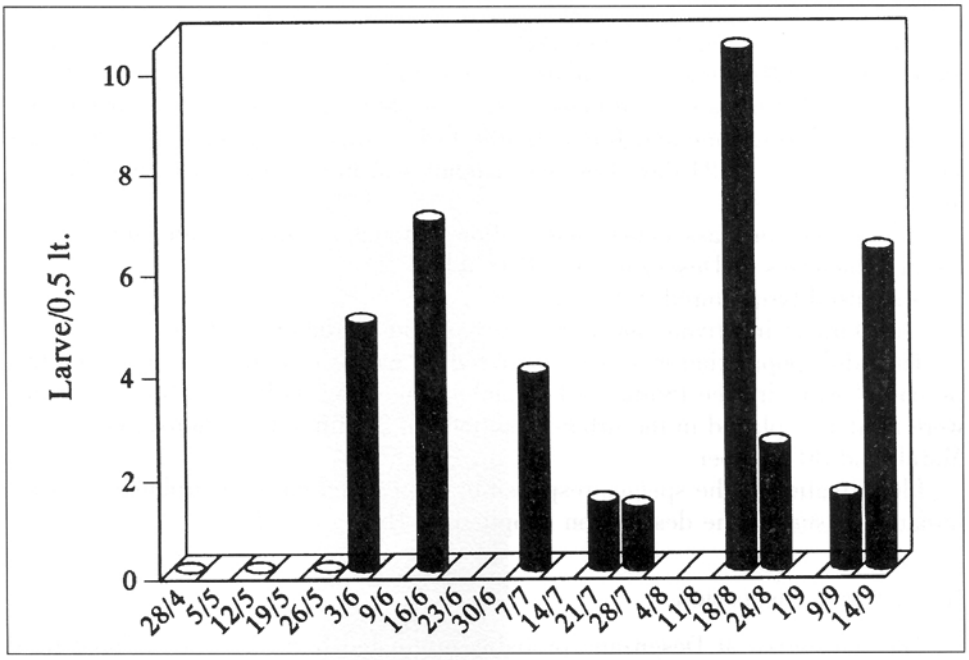

Fig. II - Average *Aedes albopictus* larval density in 10 sample road manholes situated in the middle of the infested area.

buckets, bins, drums and pots often found in flower and vegetable gardens; glass

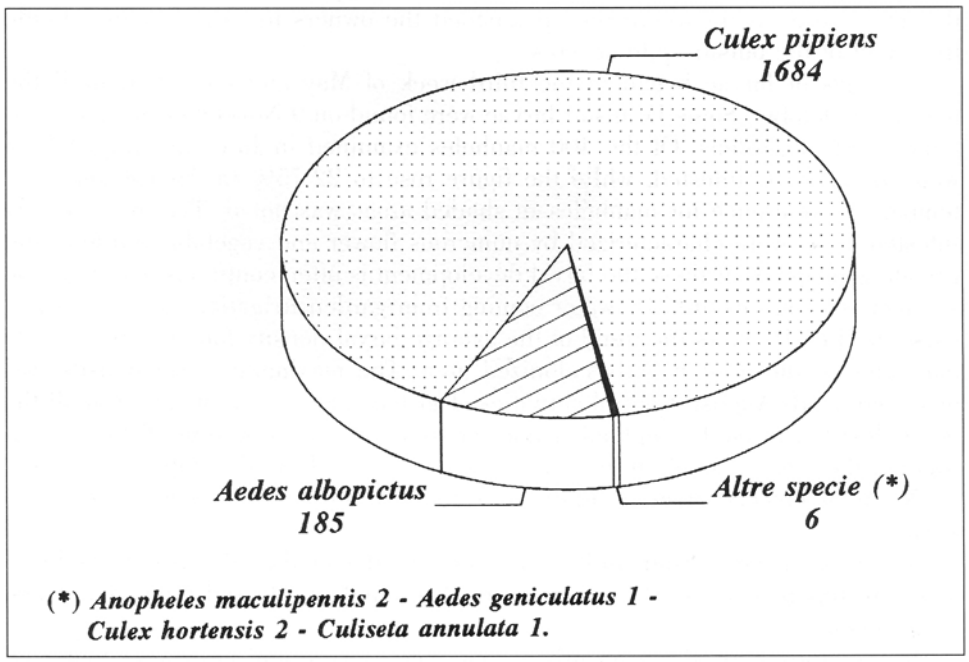

Fig. III - Composition of captures made by CDC type traps baited with CO_2 arranged in 24 stations.

or plastic pots used for hydroculture; eroded ornamental stones; water connection pits; animal drinking troughs, uncovered boats and plastic watering cans.

Ae albopictus adults were captured by the CDC attraction traps in 10 stations in the town of Desenzano. Figure III shows the composition of the catches obtained in all the 24 monitoring stations. *Culex pipiens molestus* was the prevalent species representing 89.8% of all mosquitoes obtained. *Ae albopictus* was the second species (9.9% of the total mosquitoes captured). Other species captured only in a few specimens were: *Ae geniculatus* (1), *Anopheles maculipennis* s.l. (2), *Cx hortensis* (2), *Culiseta annulata* (1). *Ae albopictus* females activity was first reported on 27 June and continued until 12 October. A greater aggressivity and mobility of the females was noted during August.

In utilizing CDC trap data to assess the distribution of the species, it must be remembered that *Ae albopictus* does not have a great fly ability and the range of attraction seems to be about 4-5 m (Mogi and Yamamura, 1981; Nishimura, 1982). The CDC traps are not therefore particularly effective in surveillance programs.

An area of about 800 hectares was found to be colonized (Fig. IV). The investigation showed that *Ae albopictus* is widely established in the towns of Desenza-

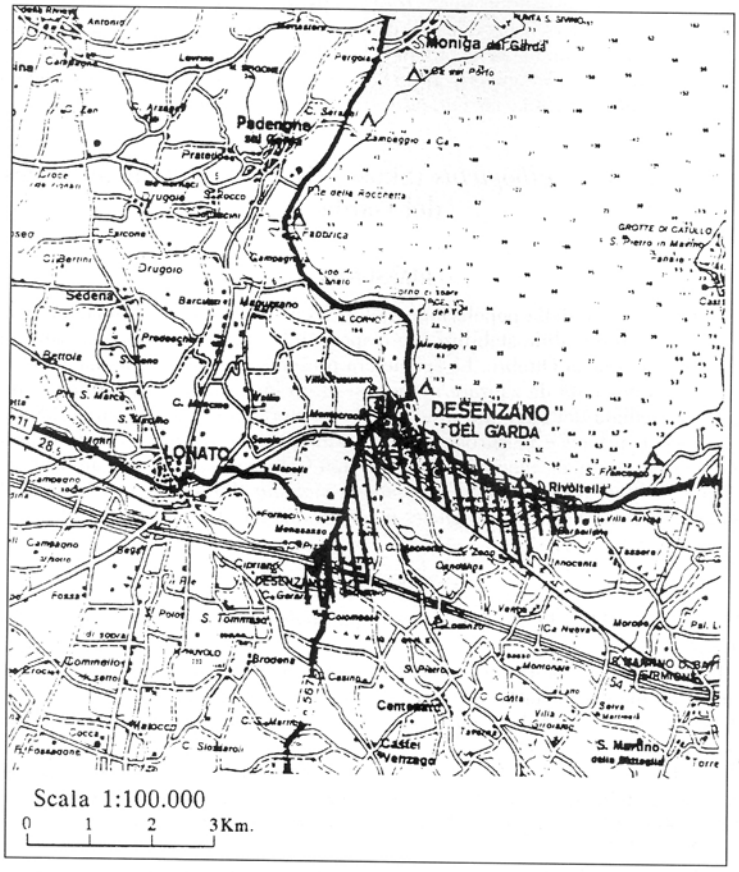

Fig. IV - Area colonized by *Aedes albopictus* in the Town of Desenzano del Garda - 1993.

no and Rivoltella where it develops in a variety of water containers. As well as causing serious discomfort to residents and tourists alike, the high density recorded in the investigated area is a risk to health which, although at present is only potential, cannot however be ignored.

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SUMMARY

Following complaints from the local population, an investigation was initiated in 1993 to establish the cause of the problem. *Aedes albopictus* was found to be responsible, detected from the middle of May until the middle of October. The species had probably been present since 1988 when extremely noxious mosquitoes were noticed near an importer premises of used tyres. It is now well established in the town under investigation where it develops in various urban and suburban water containers over an area of about 800 hectares. Road manholes constitute the main habitat for larval development. The mosquito population monitored by CDC type traps baited with dry ice consisted of *Culex pipiens molestus* (89.8%) and *Ae albopictus* (9.9%) as well as a few specimens of *Ae geniculatus, Anopheles maculipennis* s.l., *Cx hortensis* and *Culiseta annulata*.

Insediamento di *Aedes albopictus* (Skuse) (Diptera: Culicidae) a Desenzano del Garda.

RIASSUNTO

In seguito alle lamentele della popolazione, nel 1993 è stata avviata un'indagine per stabilire la causa dei disagi. E' stato possibile stabilire che responsabile era *Aedes albopictus* rinvenuta a partire da metà Maggio fino a metà Ottobre. La specie era presente probabilmente dal 1988 quando venne segnalata una forte nocività da zanzare nei pressi di un importatore di pneumatici usati. Attualmente risulta ben insediata nel territorio in esame dove interessa un'area di circa 800 ha e colonizza diversi microfocolai urbani e periurbani. Luogo principale di sviluppo larvale è la tombinatura stradale. Dalle catture effettuate mediante trappole tipo CDC con aggiunta di anidride carbonica la fauna culicidica è risultata composta da *Culex pipiens molestus* (89.8%) e *Ae albopictus* (9.9%) oltre a pochi esemplari di *Ae geniculatus*, *Anopheles maculipennis* s.l., *Cx hortensis*, *Culiseta annulata*.

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