



QUALI-QUANTITATIVE ANALYSIS OF MOSQUITO SPECIES IN EMILIA-ROMAGNA REGION (ITALY) FROM 2010 TO 2016

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Introduction

Mosquito surveillance in Europe is essential for early detection of invasive species with public health importance and for the prevention and control of pathogens like West Nile virus (WNV). Information on distribution, abundance and population dynamics of the mosquito fauna in the Emilia-Romagna region plain area (around 12,000 km²) have been collected in the frame of the Regional Vector-borne diseases surveillance program, from 2010 to 2016.

Materials and Methods

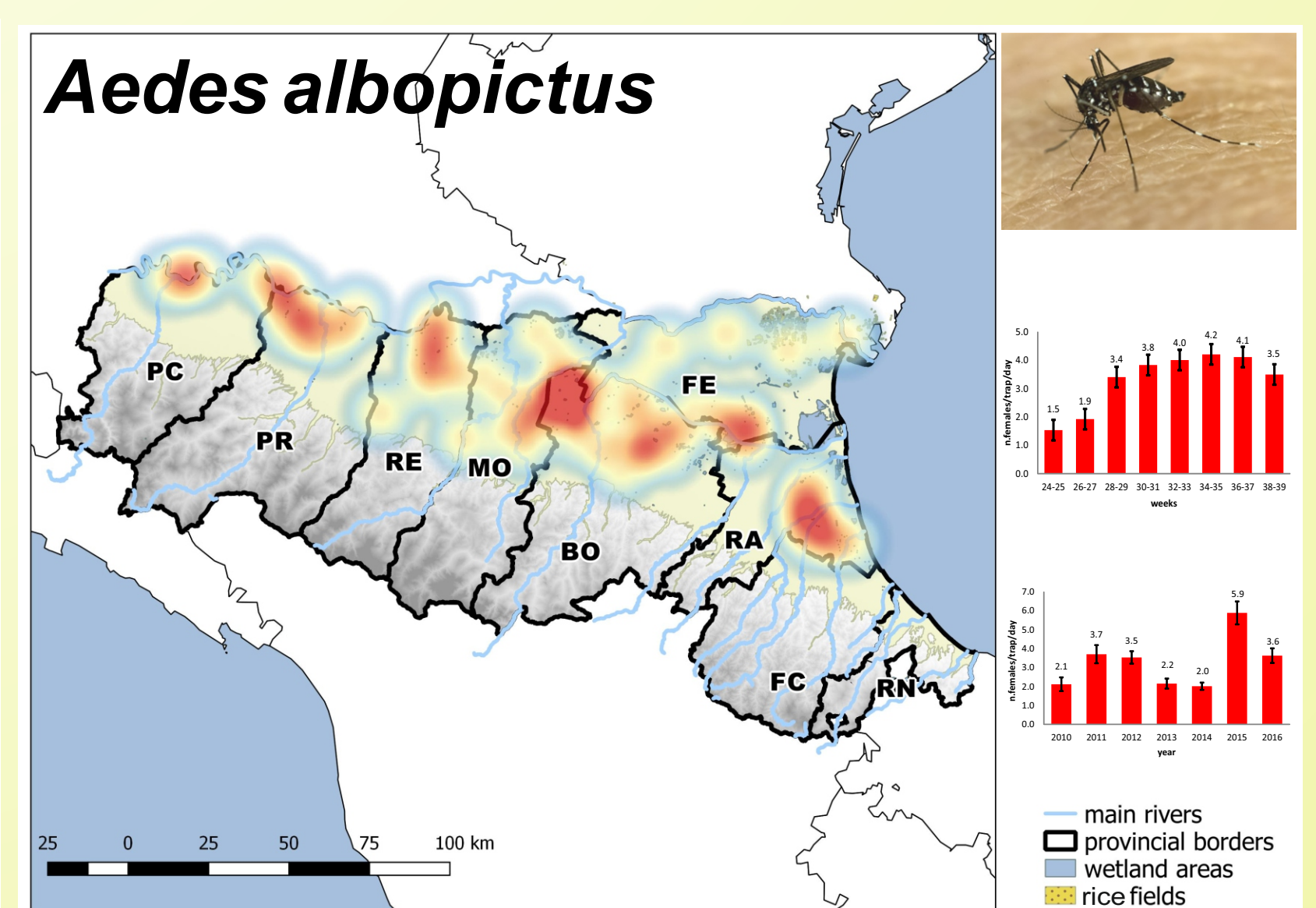
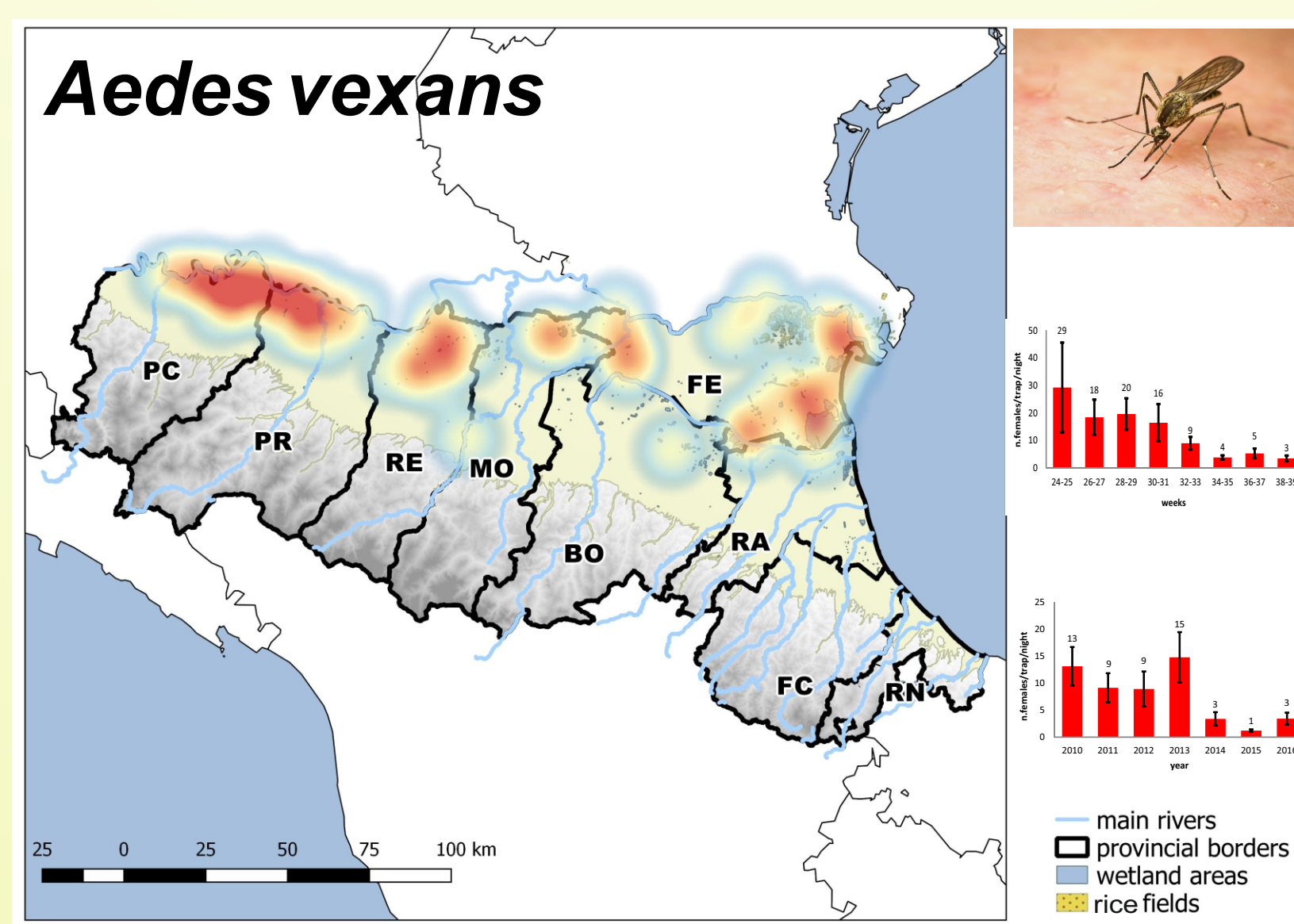
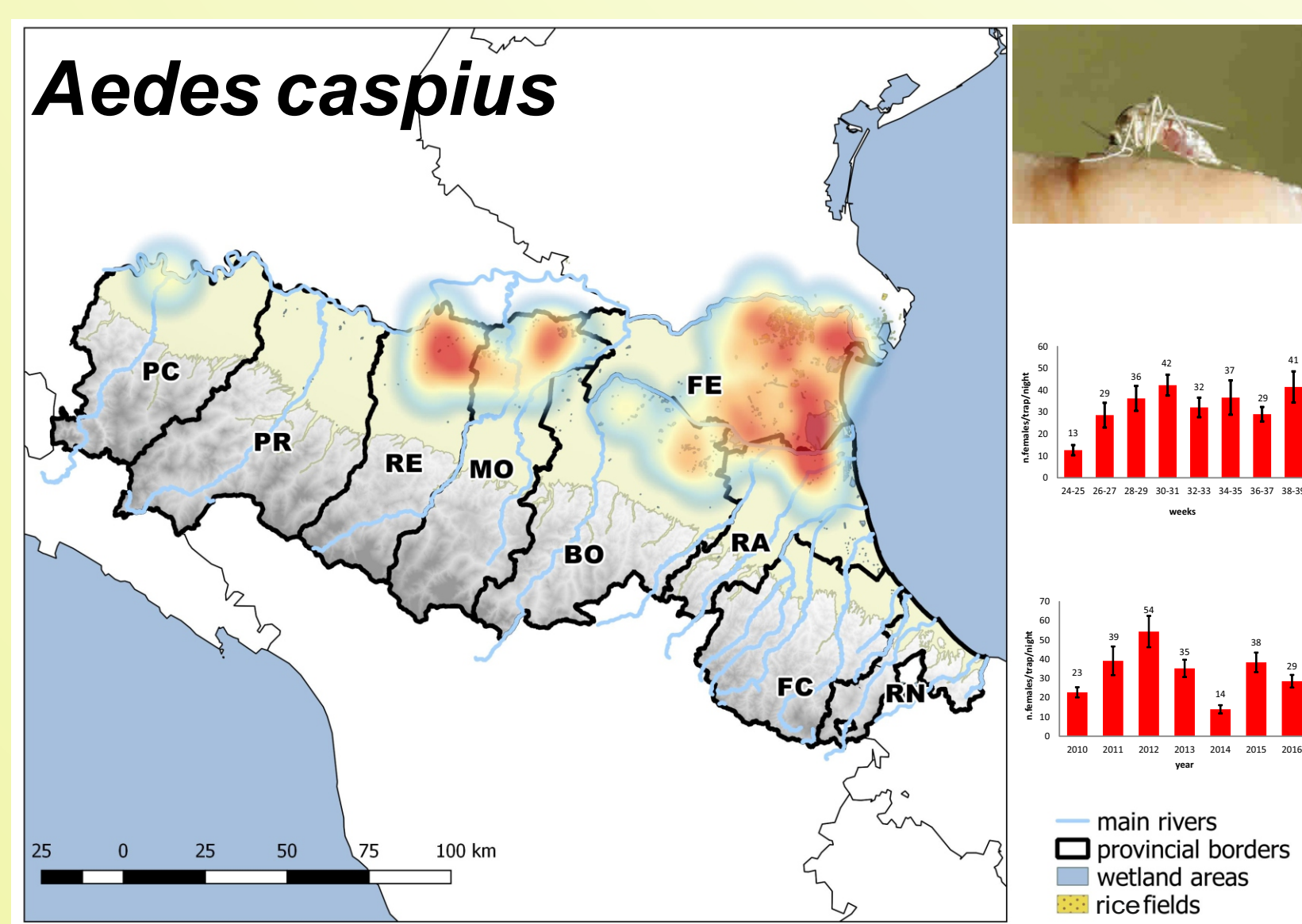
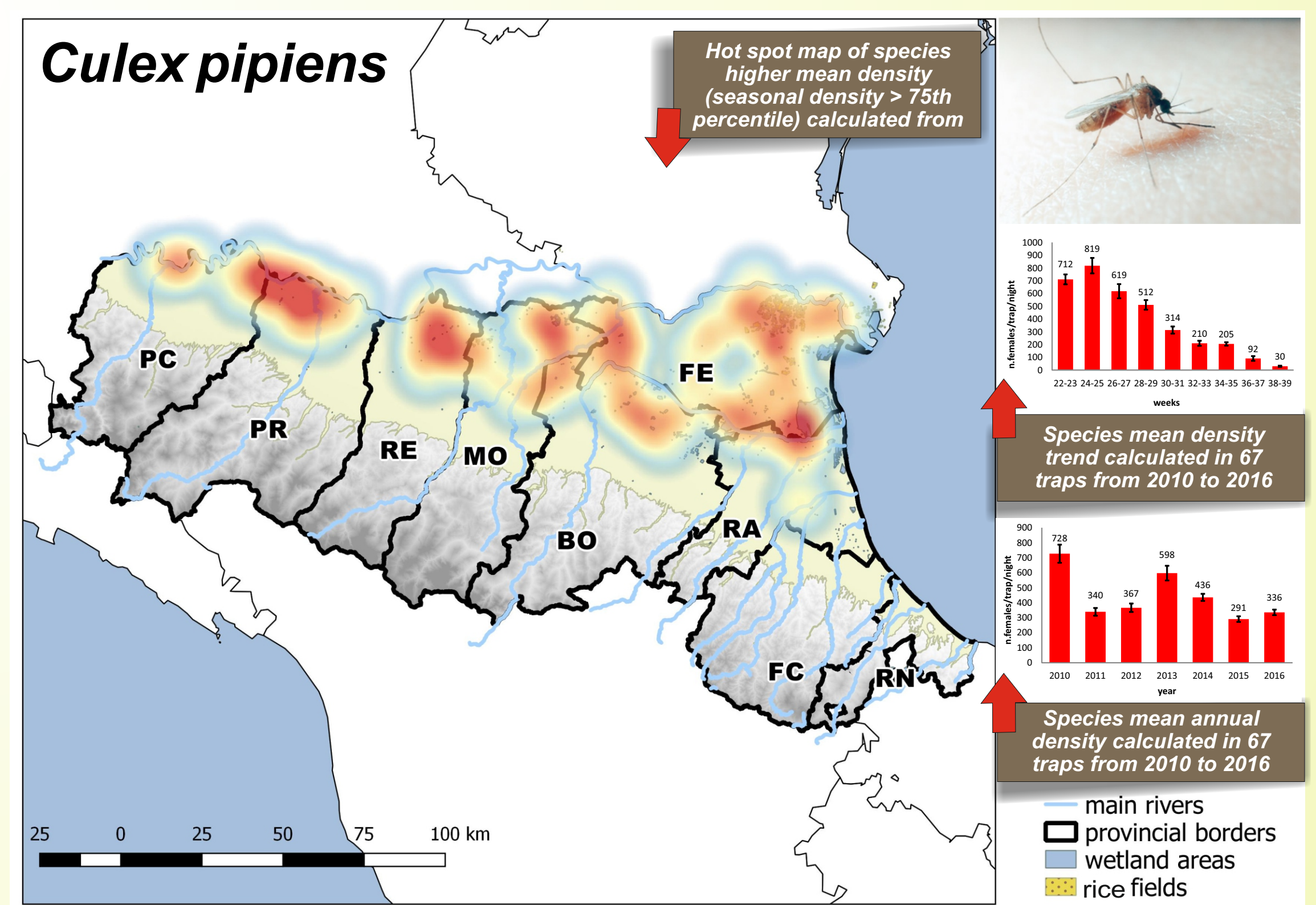
The data presented document the collections of adult mosquitoes by the standardized use of CO₂ traps and gravid traps in the plain area of the 9 provinces of the region. During the period 2010-2016, more than 2,400,000 adult mosquitoes were collected by 88 to 110 mosquito traps, sampled every 2 weeks from the end of May to the beginning of October and were identified to species level. Exploratory Spatial Data Analysis was performed and preliminary hot spots maps were created using an open source GIS software (QGIS 2.18 - <http://www.qgis.org>).

Results and Discussion

Year	2010	2011	2012	2013	2014	2015	2016
N. fixed CO ₂ traps	110	90	88	76	72	72	77
N. fixed Gravid Traps	0	0	8	16	16	16	16
N. adult females mosquitoes	602,721	294,401	309,190	416,948	313,045	237,755	247,135
Commonest species (%)	<i>Cx. pipiens</i> (92.4) <i>Ae. vexans</i> (4.1) <i>Ae. caspius</i> (2.8)	<i>Cx. pipiens</i> (88.4) <i>Ae. caspius</i> (8.3) <i>Ae. vexans</i> (2.2)	<i>Cx. pipiens</i> (82.2) <i>Ae. caspius</i> (14.7) <i>Ae. vexans</i> (1.8)	<i>Cx. pipiens</i> (92.3) <i>Ae. caspius</i> (4.5) <i>Ae. vexans</i> (2.4)	<i>Cx. pipiens</i> (96.0) <i>Ae. caspius</i> (2.4) <i>Ae. vexans</i> (0.6)	<i>Cx. pipiens</i> (88.7) <i>Ae. caspius</i> (8.7) <i>Ae. albopictus</i> (1.6)	<i>Cx. pipiens</i> (91.1) <i>Ae. caspius</i> (6.7) <i>Ae. albopictus</i> (1.0)
N. Species	13	12	12	12	11	14	15

From 2010 to 2016, in the regional plain area, were identified 22 mosquito species. The commonest species classified were: *Culex pipiens*, *Aedes caspius*, *Aedes vexans* and *Aedes albopictus*. The most widespread species was *Cx. pipiens*, with highest densities in agricultural and peri-urban habitats, followed by *Ae. albopictus*, most abundant in urban and peri-urban habitat.

Species	Total females	Provinces								
		BO	FC	FE	MO	PC	PR	RA	RE	RN
<i>Ae. albopictus</i>	15,394	3,159	113	4,575	2,032	989	1,539	1,092	1,811	84
<i>Ae. berlandi</i>	5	3	0	0	0	0	2	0	0	0
<i>Ae. caspius</i>	150,365	14,144	33	80,889	24,380	4,580	2,136	6,244	17,859	100
<i>Ae. cinereus</i>	285	0	0	8	276	0	0	0	1	0
<i>Ae. detritus</i>	48	0	0	46	0	0	0	2	0	0
<i>Ae. geniculatus</i>	689	7	0	18	12	625	18	4	5	0
<i>Ae. rusticus</i>	2	0	0	2	0	0	0	0	0	0
<i>Ae. vexans</i>	51,756	474	15	1,815	3,071	12,089	25,270	11	9,001	10
<i>An. maculipennis s.l.</i>	3,961	213	15	2,558	735	132	56	46	206	0
<i>An. plumbeus</i>	81	16	0	7	10	15	7	0	26	0
<i>Anopheles spp.</i>	2	0	0	0	0	1	0	0	1	0
<i>Cq. richiardii</i>	697	37	0	138	3	505	2	0	12	0
<i>Cs. annulata</i>	162	30	2	81	13	10	6	6	14	0
<i>Cs. longiareolata</i>	2	1	0	0	0	0	0	0	1	0
<i>Cx. hortensis</i>	2	0	0	1	0	0	1	0	0	0
<i>Cx. mimeticus</i>	1	0	0	0	0	0	0	0	1	0
<i>Cx. modestus</i>	5,349	177	0	2,022	2,801	124	53	65	107	0
<i>Cx. pipiens</i>	2,191,265	320,881	24,254	840,517	280,233	167,008	178,613	141,590	231,979	6,190
<i>Oc. berlandi</i>	17	16	0	0	0	0	1	0	0	0
<i>Oc. cantans</i>	1	0	0	0	0	1	0	0	0	0
<i>Oc. flavescens</i>	5	0	0	0	0	4	0	0	1	0
<i>Ur. unguiculata</i>	1	1	0	0	0	0	0	0	0	0
Total species	22	15	11	14	12	14	14	12	16	11



The quali-quantitative analysis of data shows that the composition of the mosquito populations in the Emilia-Romagna region plain area varied between geographical locations, seasonal period and surveillance years, as shown in the histograms and maps: *Cx. pipiens* has a seasonal regular mean trend with a peak in weeks 24-25, it was most abundant in 2010 and it has high density hot spots in all provinces apart from Forlì-Cesena (FC) and Rimini (RN); *Aedes caspius* density was higher in 2012 and each year was concentrated near rice fields and wetland areas in provinces of Ferrara (FE), Modena (MO) and Reggio-Emilia (RE); *Aedes vexans* mean density was higher in 2013 and most concentrated in provinces of Piacenza (PC) and Parma (PR) along Po river area; *Ae. albopictus*, like *Cx. pipiens*, follows a regular mean population trend but with a less defined peak at weeks 34-35, it was most abundant in 2015 and it was most spread in the middle of the regional plain area.

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