

Genetic characterization of the invasive species *Vespa velutina* in the Portuguese territory

Caracterização genética da *Vespa velutina* em Portugal

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VESPA VELUTINA NIGRITHORAX



- ✓ Dark brown body;
- ✓ Fine yellow band bordering the abdominal segments;
- ✓ Orange-yellow segment towards the end of the abdomen;
- ✓ Yellow legs;
- ✓ Black head with orange face.

Taxonomic Tree

Domain: Eukaryota

Phylum: Metazoa

Class: Insecta

Order: Hymenoptera

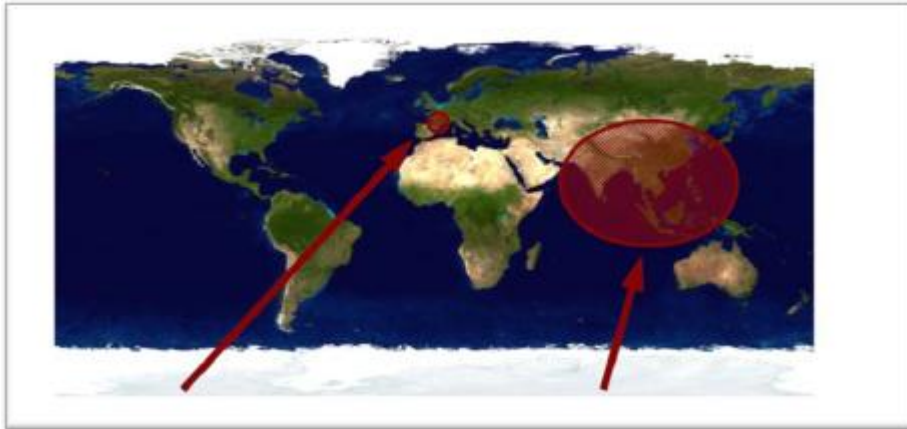
Family: Vespidae

Genus: Vespa

Species: Vespa velutina



NATIVE GEOGRAPHIC RANGE OF VESPA VELUTINA



Successful invasion of European countries:

- 2004 - France
- 2010 – Basque Country, Spain
- 2011 – Belgium and Portugal
- 2013 – Italy
- 2014 – Germany
- 2016 – UK
- 2017 – Switzerland



THREAT

Invasive species - major threat to the local biodiversity, including predation, herbivory, competitive displacement and disease.

Vespa velutina - generalist predator, consuming a large variety of insects (honeybees, *Vespula* spp. or Diptera) and scavenging a variety of protein (fish or shrimp) and fruit.

Represents a serious threat to Apiculture



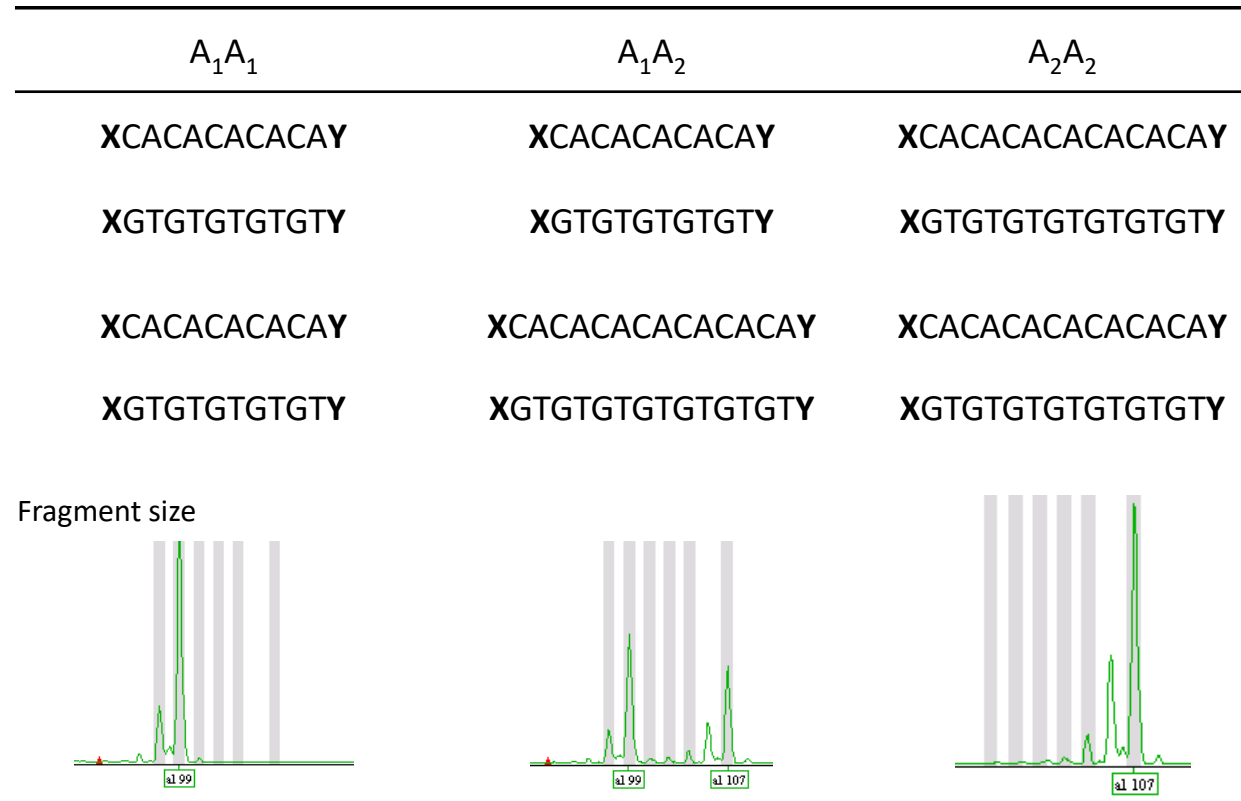
GENETIC CHARACTERIZATION

Invasive species:

- ✓ low genetic diversity;
- ✓ Inbreeding.

Comparison of genetic diversity with the potential source population can often delineate the origin of the invasive species.

MICROSATELLITES
(tandem repeats of short DNA sequences)



X and Y are primer sites



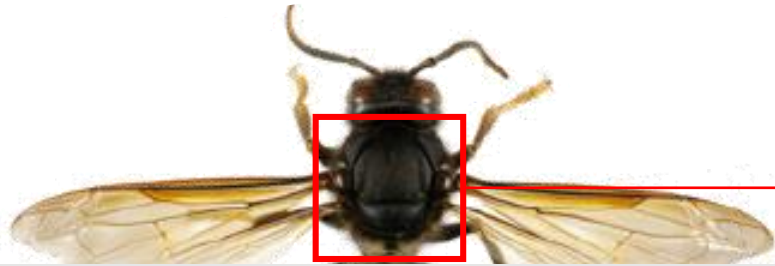
MATERIALS

Number of samples = **316**

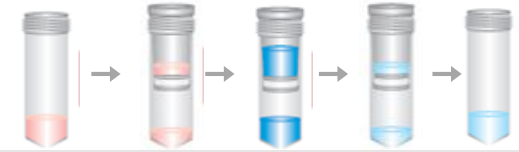


Number of samples genotyped = **223**





DNA extraction

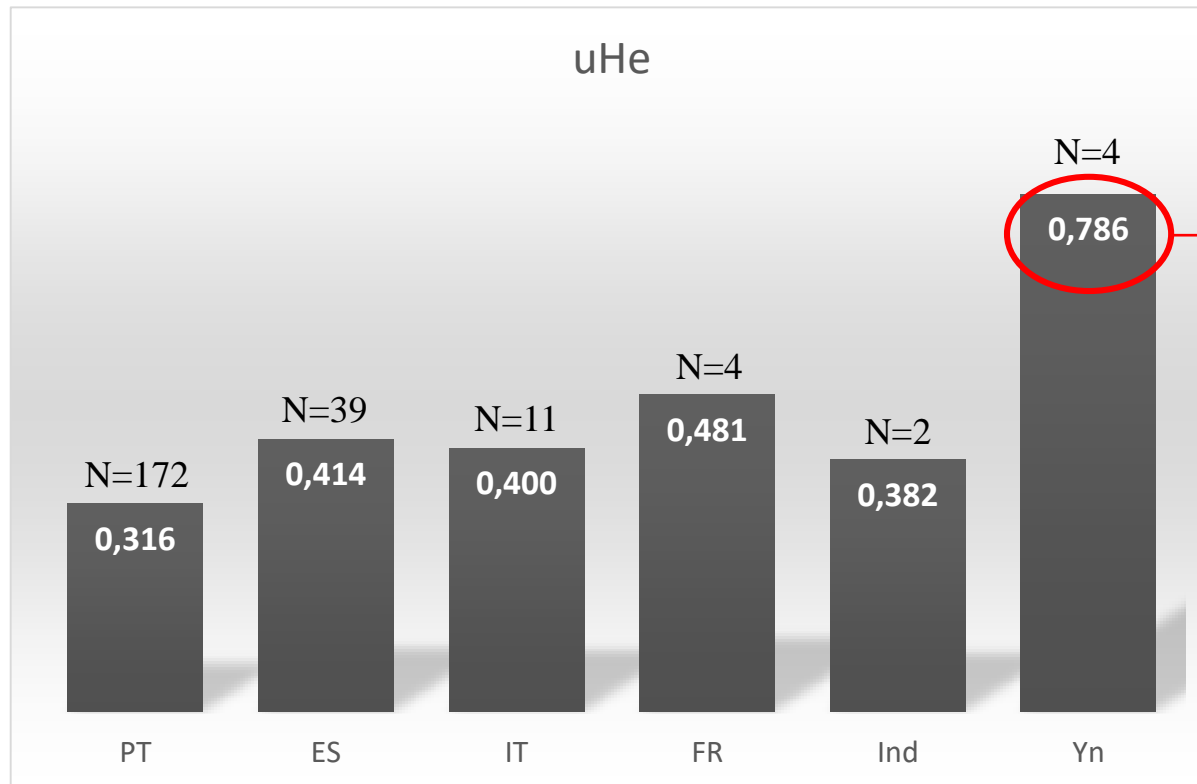


| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z | AA | AB | AC | AD | AE | AF | AG | AH | AI | AJ | | |
|----|----------|------|-------|-----|--------|-----|--------|-----|-------|-----|----------|-----|-----------|-----|-------|-----|-------|-----|-----------|-----|--------|-----|--------|-----|-------|-----|-------|-----|-------|-----|--------|-----|-------|-----|-------|-----|--|--|
| 1 | 17 | 211 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | | | 2 | 172 | 39 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Amostras | ID | R1-36 | | R1-169 | | R4-114 | | D3-15 | | LIST2015 | | LIST2020B | | R4-33 | | R1-77 | | LIST2018B | | R1-137 | | D2-185 | | VMA-8 | | R1-80 | | R1-75 | | R4-100 | | R4-26 | | VMA-6 | | | |
| 4 | 1 | 1PT | 107 | 107 | 163 | 163 | 128 | 138 | 166 | 166 | 180 | 186 | 189 | 189 | 205 | 209 | 253 | 253 | 113 | 121 | 186 | 186 | 214 | 214 | 251 | 267 | 110 | 110 | 152 | 156 | 180 | 184 | 250 | 250 | 244 | 244 | | |
| 5 | 2 | 2PT | 99 | 107 | 158 | 163 | 138 | 138 | 166 | 170 | 178 | 180 | 195 | 195 | 205 | 205 | 253 | 253 | 113 | 113 | 182 | 190 | 208 | 208 | 251 | 267 | 110 | 110 | 144 | 156 | 180 | 180 | 250 | 250 | 244 | 244 | | |
| 6 | 3 | 3PT | 99 | 99 | 163 | 163 | 128 | 128 | 160 | 160 | 178 | 180 | 189 | 189 | 205 | 205 | 253 | 253 | 113 | 113 | 182 | 186 | 208 | 208 | 251 | 251 | 110 | 110 | 156 | 156 | 180 | 180 | 250 | 250 | 242 | 244 | | |
| 7 | 5 | 4PT | 99 | 107 | 163 | 163 | 128 | 138 | 166 | 166 | 180 | 186 | 189 | 189 | 205 | 205 | 253 | 253 | 121 | 137 | 186 | 186 | 208 | 208 | 251 | 267 | 110 | 110 | 152 | 156 | 180 | 180 | 250 | 250 | 244 | 244 | | |
| 8 | 9 | 5PT | 99 | 107 | 158 | 163 | 128 | 128 | 160 | 160 | 180 | 180 | 189 | 189 | 205 | 209 | 253 | 253 | 113 | 113 | 182 | 186 | 208 | 208 | 251 | 251 | 110 | 110 | 156 | 156 | 180 | 180 | 250 | 250 | 242 | 244 | | |
| 9 | 12 | 6PT | 99 | 107 | 158 | 163 | 138 | 138 | 166 | 166 | 180 | 180 | 189 | 189 | 205 | 209 | 253 | 253 | 113 | 137 | 186 | 186 | 208 | 214 | 267 | 267 | 110 | 110 | 152 | 156 | 180 | 180 | 250 | 250 | 244 | 244 | | |
| 10 | 15 | 7PT | 99 | 107 | 163 | 163 | 138 | 138 | 166 | 166 | 180 | 186 | 189 | 189 | 205 | 209 | 253 | 253 | 137 | 137 | 186 | 186 | 208 | 214 | 267 | 267 | 110 | 110 | 156 | 156 | 180 | 184 | 250 | 250 | 244 | 244 | | |
| 11 | 16 | 8PT | 99 | 99 | 158 | 163 | 138 | 138 | 166 | 166 | 178 | 186 | 189 | 189 | 209 | 209 | 253 | 253 | 113 | 137 | 186 | 190 | 208 | 208 | 267 | 267 | 110 | 110 | 152 | 152 | 180 | 184 | 250 | 250 | 242 | 244 | | |
| 12 | 63 | 9PT | 99 | 99 | 163 | 163 | 128 | 138 | 166 | 166 | 180 | 186 | 189 | 189 | 209 | 209 | 253 | 253 | 121 | 137 | 186 | 186 | 208 | 214 | 251 | 267 | 110 | 110 | 152 | 152 | 180 | 180 | 250 | 250 | 244 | 244 | | |
| 13 | 64 | 10PT | 99 | 107 | 158 | 163 | 128 | 138 | 166 | 166 | 186 | 186 | 189 | 189 | 205 | 205 | 253 | 253 | 113 | 137 | 186 | 186 | 208 | 214 | 251 | 267 | 110 | 110 | 152 | 156 | 180 | 184 | 250 | 250 | 244 | 244 | | |
| 14 | 65 | 11PT | 99 | 107 | 163 | 163 | 128 | 128 | 166 | 166 | 186 | 186 | 189 | 189 | 209 | 209 | 253 | 253 | 121 | 137 | 186 | 186 | 214 | 214 | 251 | 251 | 110 | 110 | 152 | 152 | 180 | 184 | 250 | 250 | 244 | 244 | | |
| 15 | 66 | 12PT | 99 | 107 | 158 | 163 | 128 | 138 | 166 | 166 | 180 | 186 | 189 | 189 | 205 | 209 | 253 | 253 | 121 | 121 | 186 | 186 | 208 | 214 | 251 | 267 | 110 | 110 | 156 | 156 | 180 | 184 | 250 | 250 | 244 | 244 | | |

Genotyping



RESULTS AND DISCUSSION



Highest Genetic Diversity

Possible Country of Origin

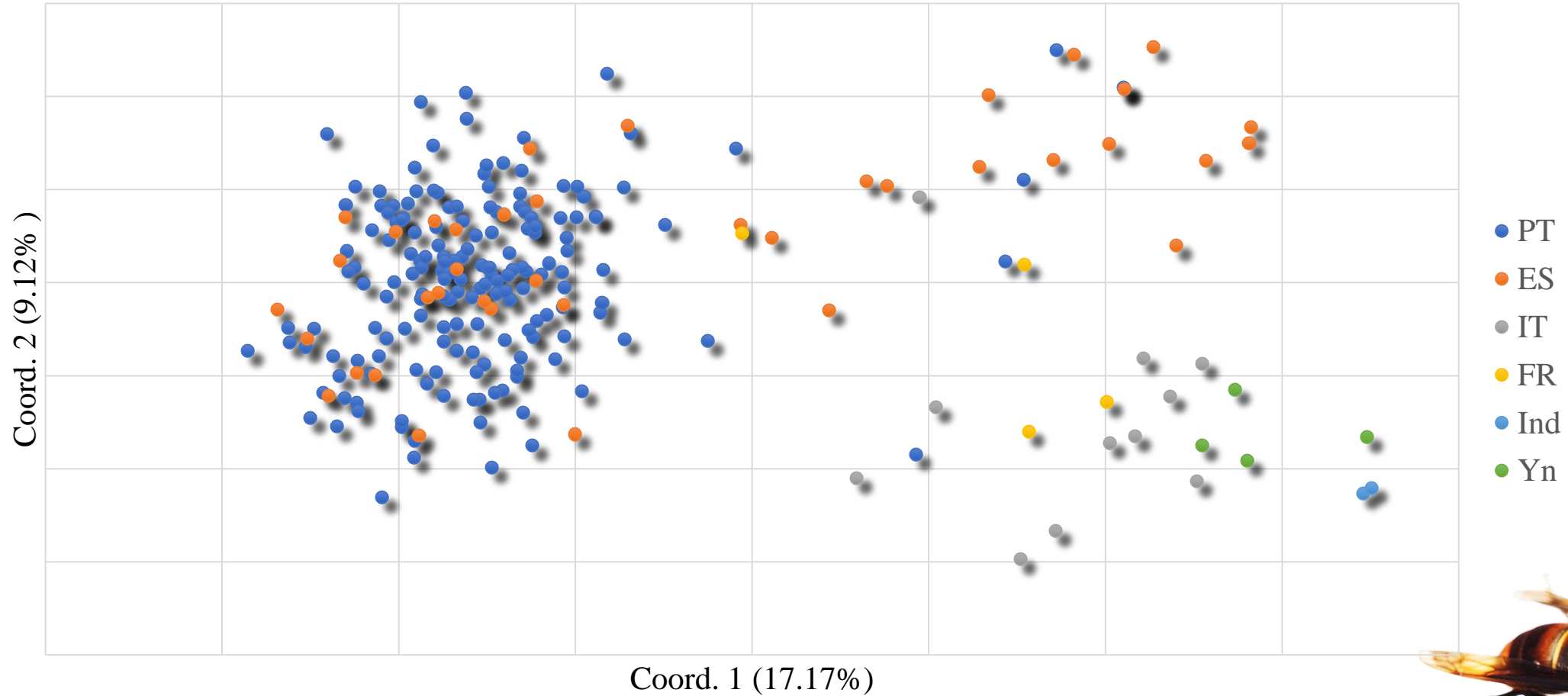
Invasion countries

Native countries

Founder Effect



PCA



- ✓ Microsatellites – useful to study invasions;
- ✓ Low diversity of invasive species;
- ✓ Portugal probably suffer a founder effect from the French founder effect.



ACKNOWLEDGEMENT

- APICAVE/ Tiago Moreira
- APIMIL/ Miguel Maia
- Turma da Abelha/ Bruno Moreira
- NATIVA/ Marco PortoCarrero
- AABA/ Nicole Filipe e Inês Madeira
- CAPOLIB/ Carla Teixeira
- AALC/ Andrea Chasqueiro
- Escola Superior Agrária de Ponte de Lima/ Ana Paula Vale
- AGUIARFLORESTA/ Carla Brites
- AANP/ João Valente
- UTAD/ Paulo Russo
- Associação de Produtores Florestais de Montemuro e Paiva/ Mónica Lopes
- Helena Ferreira
- Universidade de Santiago de Compostela/ Xulio Mazide
- David Outeiro
- Egoitz Galarza



Thank you!

