

ACTIVITATS DE L'ASSOCIACIÓ CATALANA DE BIOSPELEOLOGIA



COL·LABORACIÓ EN EL PROJECTE

EVOLUCIÓ I FILOGÈNIA DEL GÈNERE
Troglocharinus, EN ESPECIAL DEL GRUP *ferreri*
(COLEOPTERA, LEIODIDAE, LEPTODIRINI)



Autors:

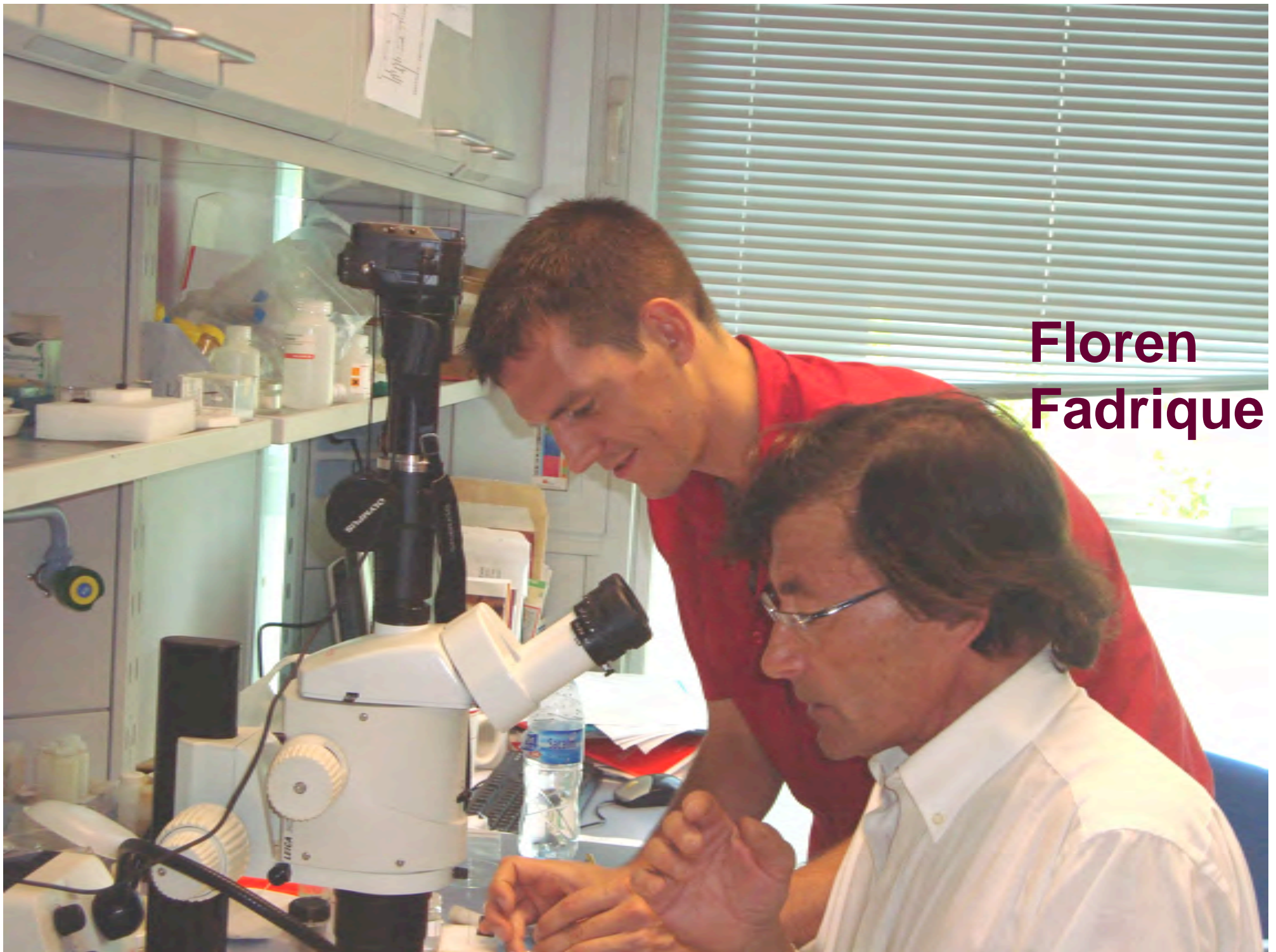
V. Rizzo; J. Comas; F. Fadrique; X. Fresneda i I. Ribera

ESTUDIS A L'INSTITUT DE BIOLOGIA EVOLUTIVA (CSIC-UPF)

Jordi Comas

Valeria Rizzo





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I. Ribera

J. M. Victòria

SECCIÓ D'INVESTIGACIONS
ESPELEOLÒGIQUES DEL C.E.A.

Paisatge del Garraf



Paisatge del Garraf



Paisatge del Garraf



Avenc de la Línia, Ordal

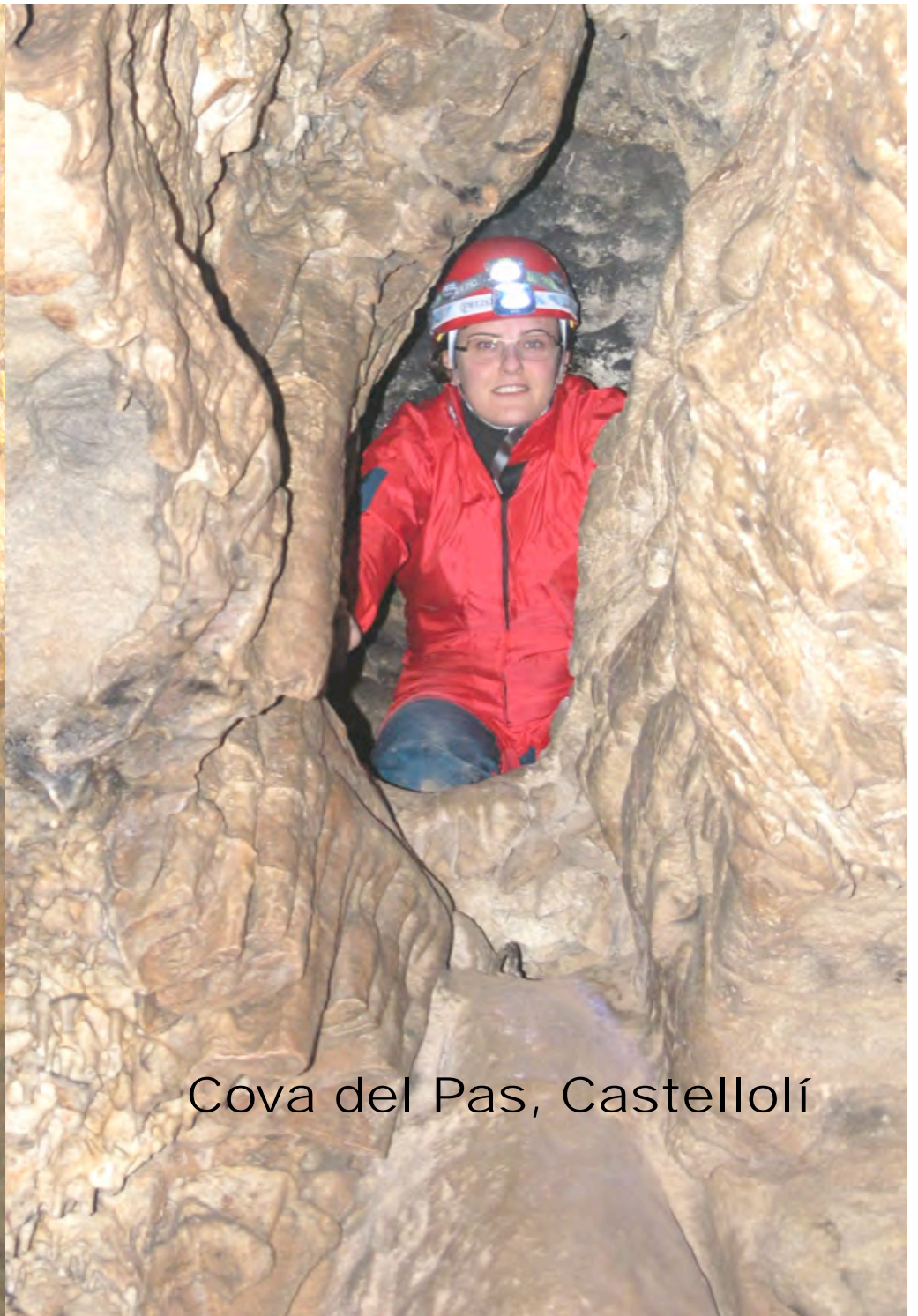


Avenc de les Banderes, Garraf





Cova Petrecó, Esparreguera



Cova del Pas, Castellolí

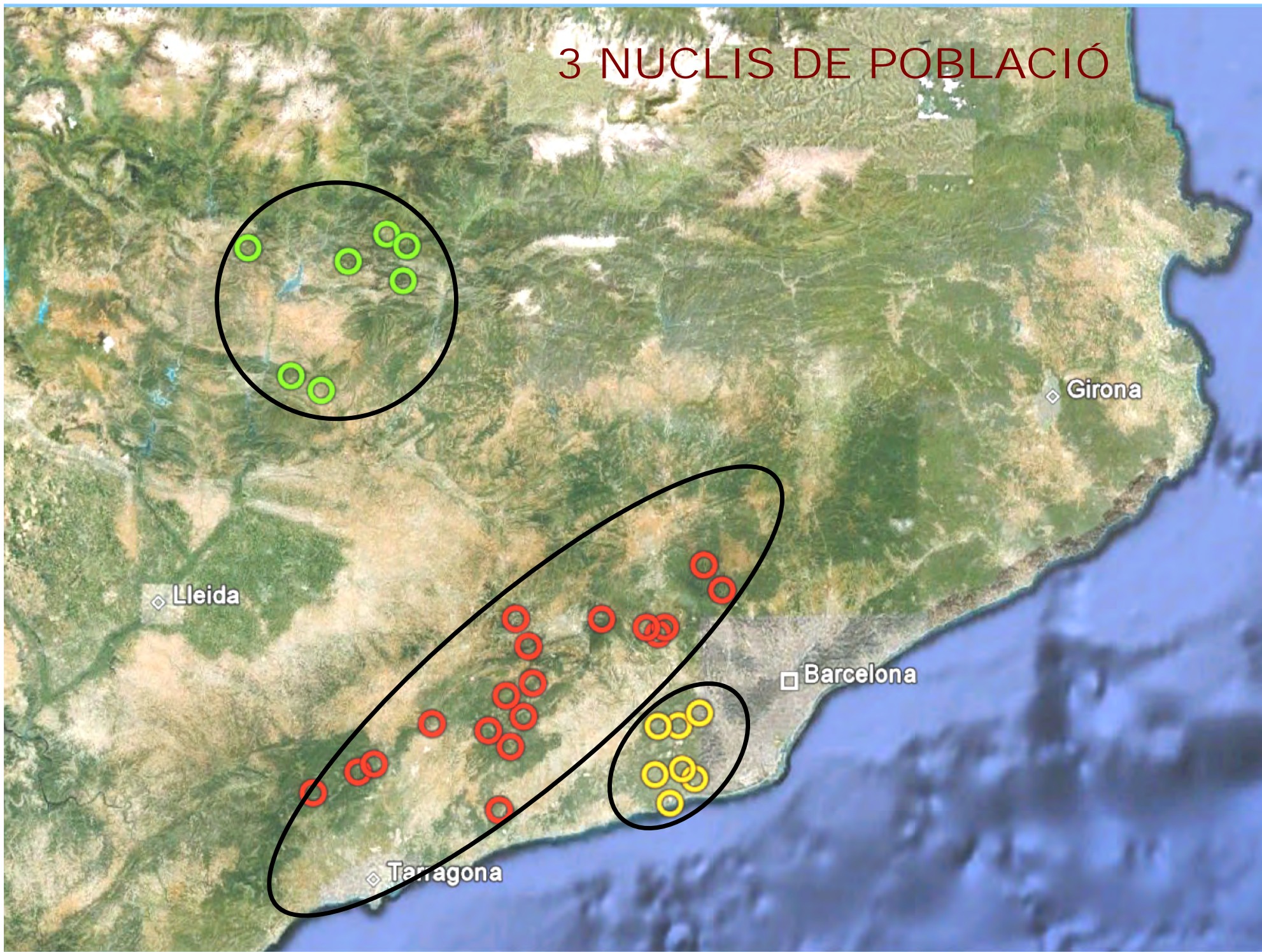
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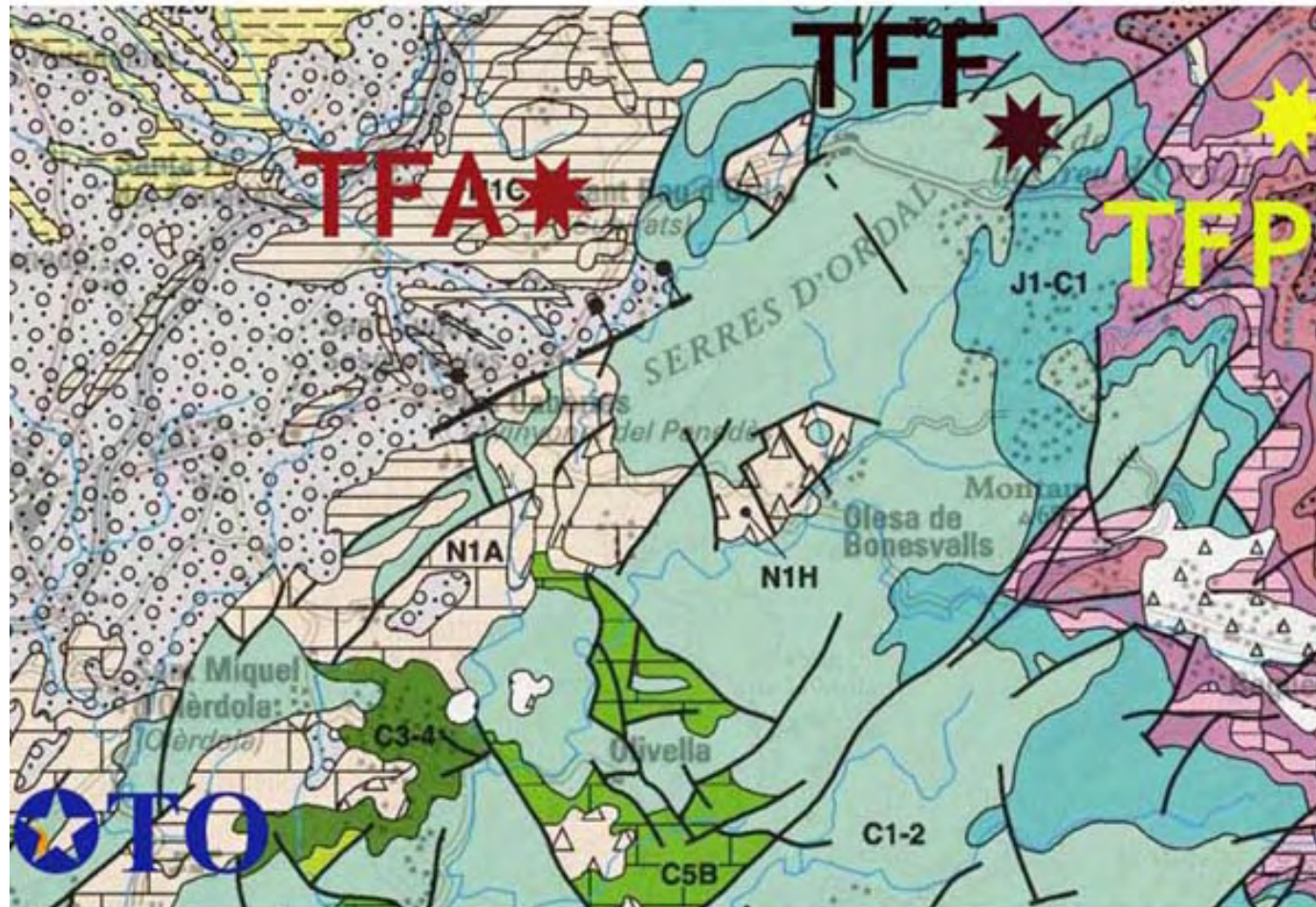
Avenc d'Esteles, Ordal



3 NUCLIS DE POBLACIÓ



COLEÒPTERS CAVERNÍCOLES DEL GARRAF



Distribució dels Troglocharinus al Garraf

TO: *Troglocharinus olerdolai*

TFP: *Troglocharinus ferreri pallaresi*

TFF: *Troglocharinus ferreri ferreri*

TFA: *Troglocharinus ferreri abadi*



Cova Petrecó, Esparreguera

Obtenció de la fauna.
Cova del Pas, Castellolí





***Troglocharinus ferreri ferreri* Reitter 1908**



Evolution and phylogeny of the subterranean genus *Trogloderus* (Coleoptera, Leiodidae, Leptodirini)

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INTRODUCTION

Among Coleoptera, the tribe Leptodirini (Leiodidae, Coleoptera) includes some 146 genera and 900 exclusively subterranean species that present morphological and physiological characters related to the endogean habitat: Mydriasis, decompensation, typical "tube-walk" or "tubicolous" morphologies, size reduction, or changes in physiology and life cycle. They are mainly distributed in the north side of the Mediterranean area, from the Iberian peninsula to the Middle East. Despite continuous attention from entomologists for the last two centuries, their phylogenetic relationships and evolutionary origin remain controversial. In this work we study the phylogeny and diversification of the genus *Trogloderus*, a member of the recently identified monophyletic Pyrenean clade of Leptodirini, largely corresponding to the traditional *Speranzus* series. The genus *Trogloderus* presents a disjunct distribution, with twenty species distributed in the coastal ranges of Catalonia (Garrig, San Llorenç del Munt i Obac and Montserrat), and further in the pre-Pyrenees (Sera del Montsec de Rubies, Serra del Boumort, All Urgell and Serra de Lleràs), with a single isolated species in Alto Aragón. Due to the strong convergence of external morphological characters and the abundance and intraspecific variability of some taxa the taxonomy of the genus has been very unstable.

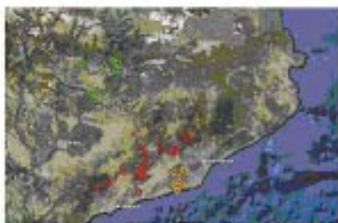


Figure 1. Distribution of the genus *Trogloderus* (red circles) and genus *Leptoderus* (white circles) in the studied area. The National Park of Garraf and the San Llorenç del Munt and Obac are also shown.

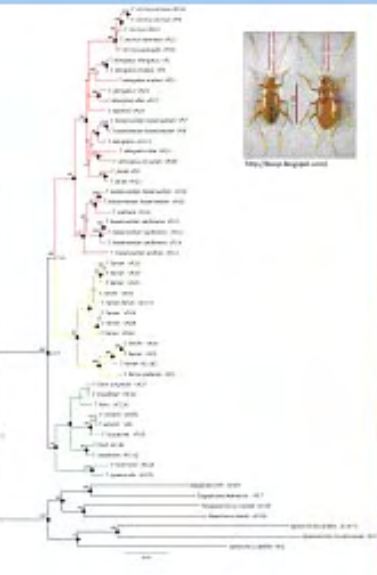


Figure 1. Phylogenetic tree obtained with MrBayes with the JTT matrix. The values correspond to the posterior probability of the nodes (top) or to the bootstrap values (bottom) obtained with RAxML. Bootstrap values are indicated at the nodes (top) or to the bootstrap values (bottom) obtained with RAxML.



MATERIALS AND METHODS

We aim to establish a robust phylogeny to study the evolution of this extensive subterranean species radiation, and to provide a temporal framework for the diversification of various lineages and the colonization of the geographical areas in which they occur. For that purpose we use molecular phylogenies of the mitochondrial *cox1*, *cyb*, *rnl*, *rns* and *rnd1* and two nuclear (*SSU* and *LSU*) genes.

DNA extraction, amplification and sequencing

The specimens used in the study were collected in the field and directly preserved in absolute ethanol. Extractions of single specimens were non-destructive, using commercial columns (Qiagen, Miniprep and DMS) samples will be kept in the collection of the Museu Nacional de Ciències Naturals, Madrid (MNHN) and the IB (Barcelona). Sequences were assembled and edited with Sequencher TM 4.1.4 (Gene Codes, Inc., Ann Arbor, MI). Raw sequences will be deposited in GenBank.

Phylogenetic analyses

The protein-coding genes (*cox1*, *cyb*, *rnd1*) had no indels, and alignment of sequences was trivial. For aligning the ribosomal genes we used multiple progressive pairwise alignment with secondary refinement using the MAFFT online v.6. Bayesian analyses were conducted on a combined data set with MrBayes 3.1.3, using five partitions. Evolutionary models were estimated prior to the analysis with Modeltest 2.2. MrBayes ran for 10,000 generations using default values, saving trees every 500. "Burn-in" values were established after visual examination of a plot of the standard deviation of the split frequencies between two simultaneous runs. For comparative purposes we also conducted maximum likelihood analyses in RAxML v.7.0.4 (<http://www.raxml.org>) using the GTR+I+G model with an estimated GTR+I+G model and gene partition. Support was measured with 1000 bootstrap replicates.

Estimation of diversification rates

To obtain an ultrametric calibrated tree we used Bayesian estimation, as implemented in BEAST 1.8.4. For the Bayesian analysis in BEAST, the main nodes were constrained to be monophyletic, and a GTR+I+G model was enforced as a Yule process operation model. Priors and other parameters were left with default values, with the exception of the prior of the evolutionary rate (0.001 substitutions/site/My) and a standard deviation of 0.001. The results of the run were merged with Tracer v.1.4.1.

Results and working progress

The topologies of the trees obtained with MrBayes and those obtained with Maximum Likelihood in RAxML were either identical or compatible with each other. The results strongly support the monophyly of the genus *Trogloderus*, which has two highly supported clades, with well defined geographical disjunct distribution: the coastal and the pre-pyrenean zone. This node was estimated to date back to ca. 2.3 Mya (see Fig. 2). Support for these geographically restricted clades is very high, while the relationship inside them is less well supported, as shown in the tree. In fact, the differences in tree topologies only affected the internal phylogenetic relationship of some species that revealed, after the genetic analyses, to be cryptic lineages. Our results highlight the need to reorder the systematics of the genus, specially the *T. isenerti* and the *T. ferreri* groups. The *T. ferreri* group presents a wide range of genetic variability, and a very interesting microallopatric distribution. In the next future we plan to intensify the sampling to clarify its internal phylogenetic relationships.



Figure 2. Sampling map with the distribution of the genus *Trogloderus* (red circles) in the studied area. The National Park of Garraf and the San Llorenç del Munt and Obac are also shown.

Evolution and phylogeny of the subterranean genus *Trogloderus* (Coleoptera, Leiodidae, Leptodirini), with an emphasis on the *T. ferreri* group

Valeria Rizzo (1), Jordi Comas (2), Floren Fadrigue (2), Javier Fresco de (2), Ignacio Ribera (1)

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(2) Museu de Zoologia, Ap. 553, 08080 Barcelona, Spain

OBJECTIUS

In this work we study the phylogeny of the genus *Trogloderus*, a member of the monophyletic Pyrenean clade of Leptodirini, largely corresponding to the traditional *Speranzus* series. The genus presents a disjunct distribution, with twenty species distributed in the coastal ranges of Catalonia (Garrig, San Llorenç del Munt i Obac and Montserrat), and further in the pre-Pyrenees (Sera del Montsec de Rubies, Serra del Boumort, All Urgell and Serra de Lleràs), with a single isolated species in Alto Aragón.

MÉTODES

Due to the strong convergence of external morphological characters and the abundance and intraspecific variability of some taxa the taxonomy of the genus has been very unstable. We aim to establish a robust phylogeny to study the evolution of this extensive subterranean species radiation, and to provide a temporal framework for the diversification of various lineages and the colonization of the geographical areas in which they occur. For that purpose we use molecular phylogenies of five mitochondrial (*cox1*, *cyb*, *rnl*, *rns* and *rnd1*) and two nuclear (*SSU* and *LSU*) genes.

RESULTATS

The results strongly support the monophyly of the genus *Trogloderus*, which has two highly supported clades, with well defined geographical disjunct distribution: the coastal and the pre-pyrenean zone. This node was estimated to date back to ca. 2.3 Mya (see Fig. 2). Support for these geographically restricted clades is very high, while the relationship inside them is less well supported, as shown in the tree. In fact, the differences in tree topology only affected the internal phylogenetic relationship of some species that revealed, after the genetic analyses, to be cryptic lineages.

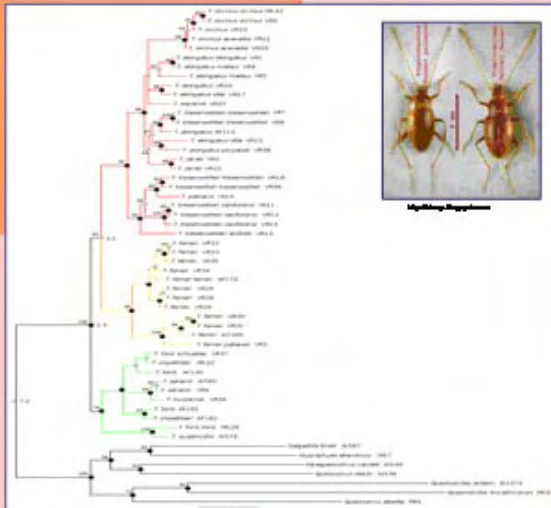


Figure 2. Phylogenetic tree obtained with MrBayes with the JTT matrix. The values correspond to the posterior probability of the nodes (top) or to the bootstrap values (bottom) obtained with RAxML. Bootstrap values are indicated at the nodes (top) or to the bootstrap values (bottom) obtained with RAxML.

CONCLUSIONS

Our results highlight the need to reorder the systematics of the genus, specially the *T. isenerti* groups. The *T. ferreri* group presents a wide range of genetic variability, and a very interesting microallopatric distribution. In the next future we plan to intensify the sampling to clarify its internal phylogenetic relationships.

REFERÈNCIES

Comas, J., Ribera, I., & Fadrigue, F. (2010). Evolution and phylogeny of the subterranean genus *Trogloderus* (Coleoptera, Leiodidae, Leptodirini), with an emphasis on the *T. ferreri* group. *Journal of Insect Evolution*, 14(1), 1-15.

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Diputació
Barcelona



Ajuntament
de Gavà

VI Trobada d'Estudiosos del Garraf i d'Olèrdola

Museu de Gavà
18 de novembre de 2010

www.diba.cat

Variables
del complex
Reiter (Llucòria)

La Valeria i en Jordi en la presentació

Foto: J. Ml. Victòria



Cervellò, 26 Febrer 2011

V Sessió Científica sobre Invertebrats i Medi Ambient

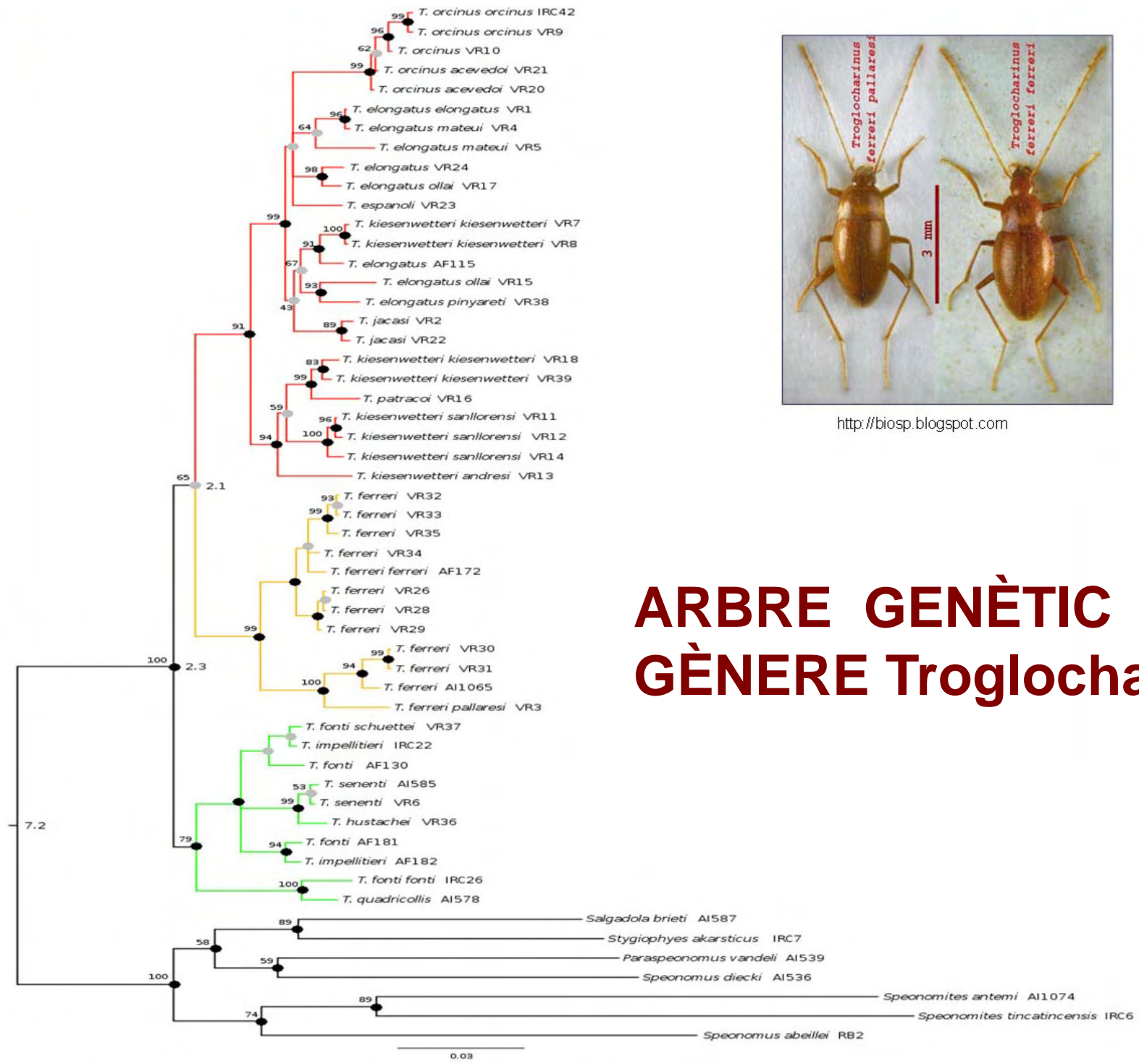
Evolución y filogenia del género *Troglocharinus*, en especial del grupo *ferreri* (Coleoptera, Leiodidae, Leptodirini)

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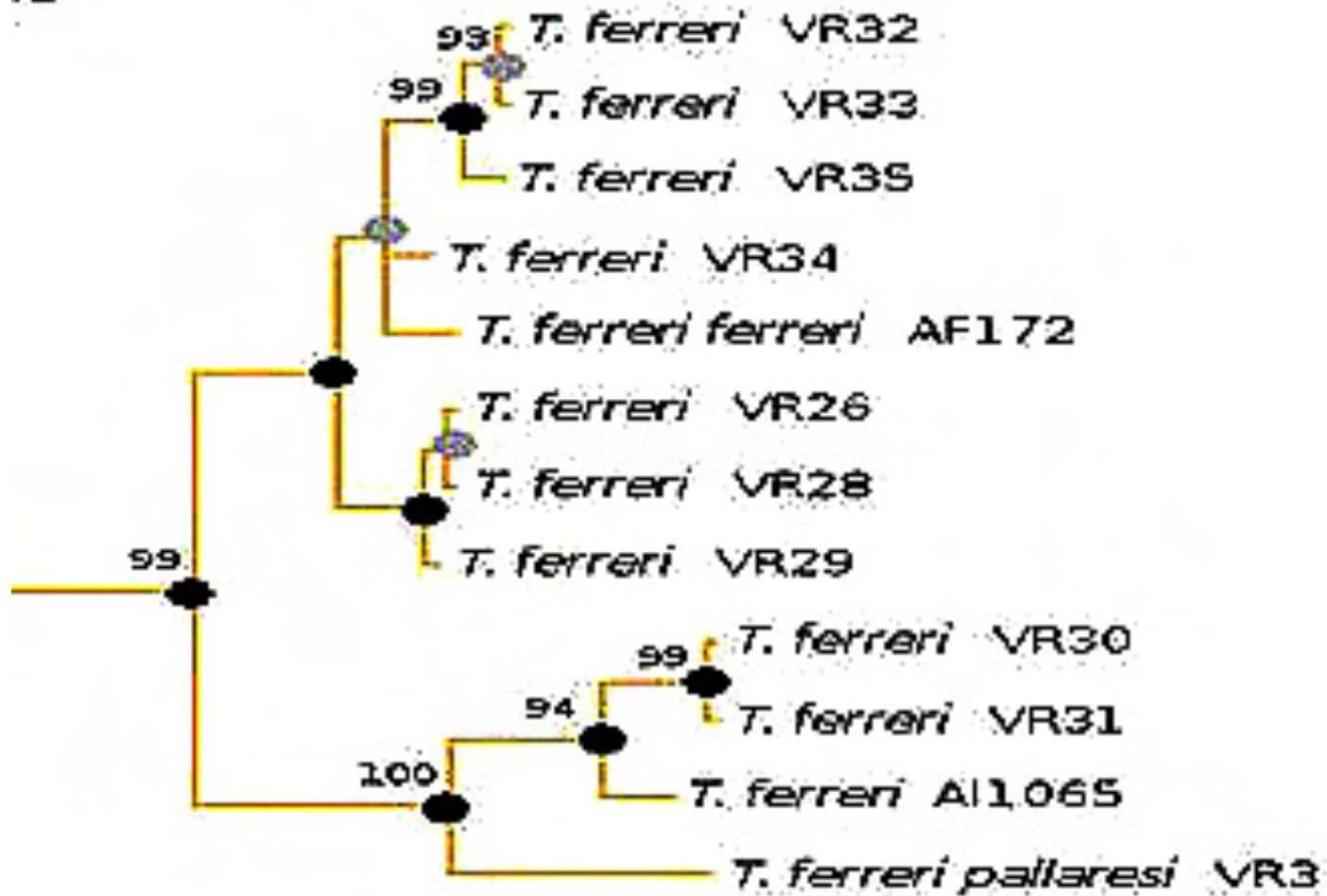
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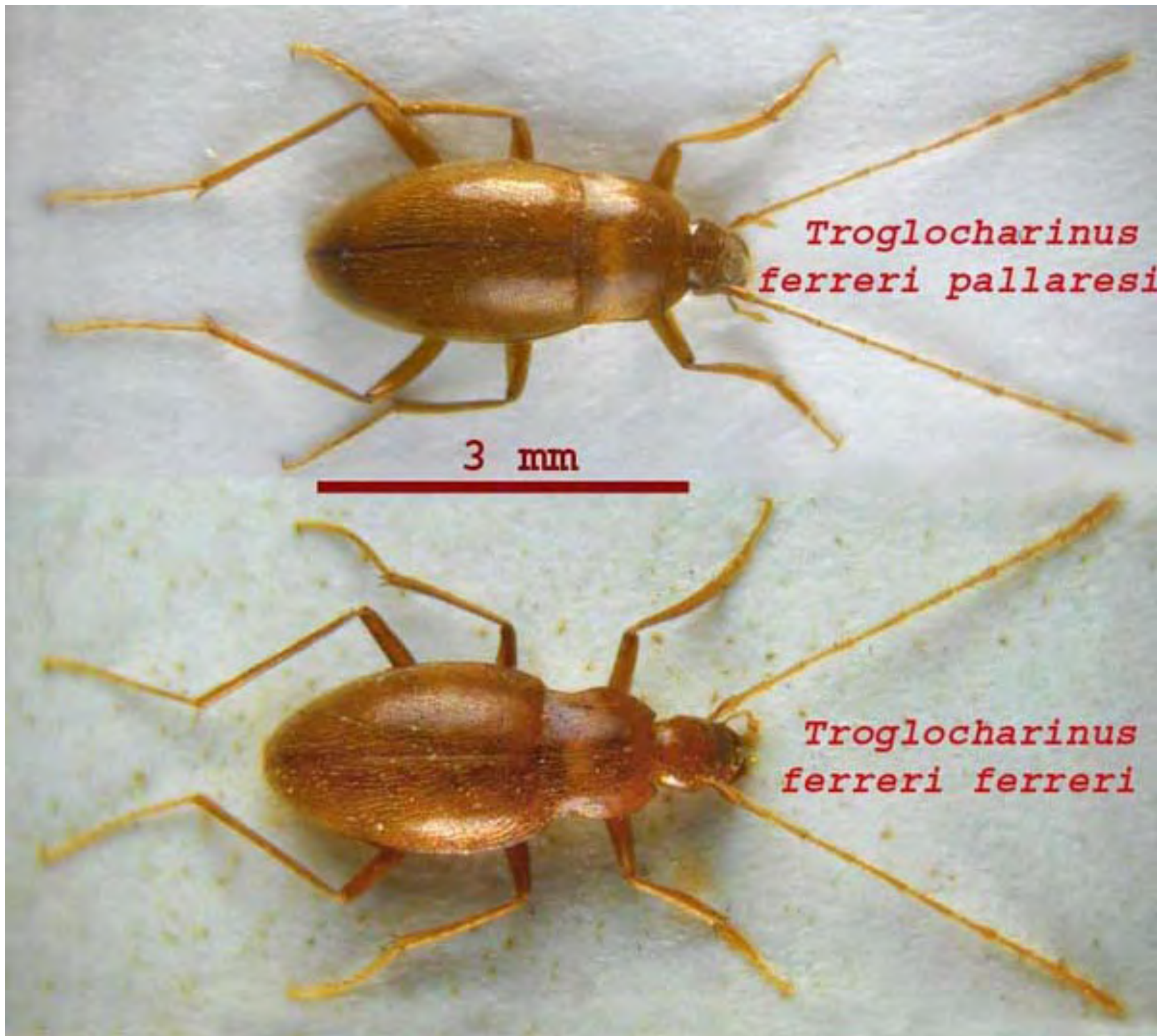


<http://biosp.blogspot.com>

ARBRE GENÈTIC DEL GÈNERE Troglocharinus

ARBRE GENÈTIC DE *T. ferreri*





*Troglocharinus
ferreri pallaresi*

3 mm

*Troglocharinus
ferreri ferreri*

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QUE ENCARA NO ÉS DEFINITIU