

Macaronesian Atlas of Reproductive Biology and applications to Conservation. Fitness and threat markers with analysis of paternity

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Spectacular boom of MOLECULAR BIOLOGY has prompted a new search for "answers" on basic issues of REPRODUCTIVE BIOLOGY especially in ISLAND ecosystems (CRAWFORD *et al.*, 2015; TRAVESET *et al.*, 2016...).

MACFLOR Project represents a new approach to plant CONSERVATION that consider the more relevant reproductive traits of **Macaronesian** endemics with early detection of REPRODUCTIVE FAILURE related to **poblational decline**, like one of the RISKS more UNEXPLORED in RECOVERY STRATEGIES of endangered endemics and others species that do not appear in the red lists...

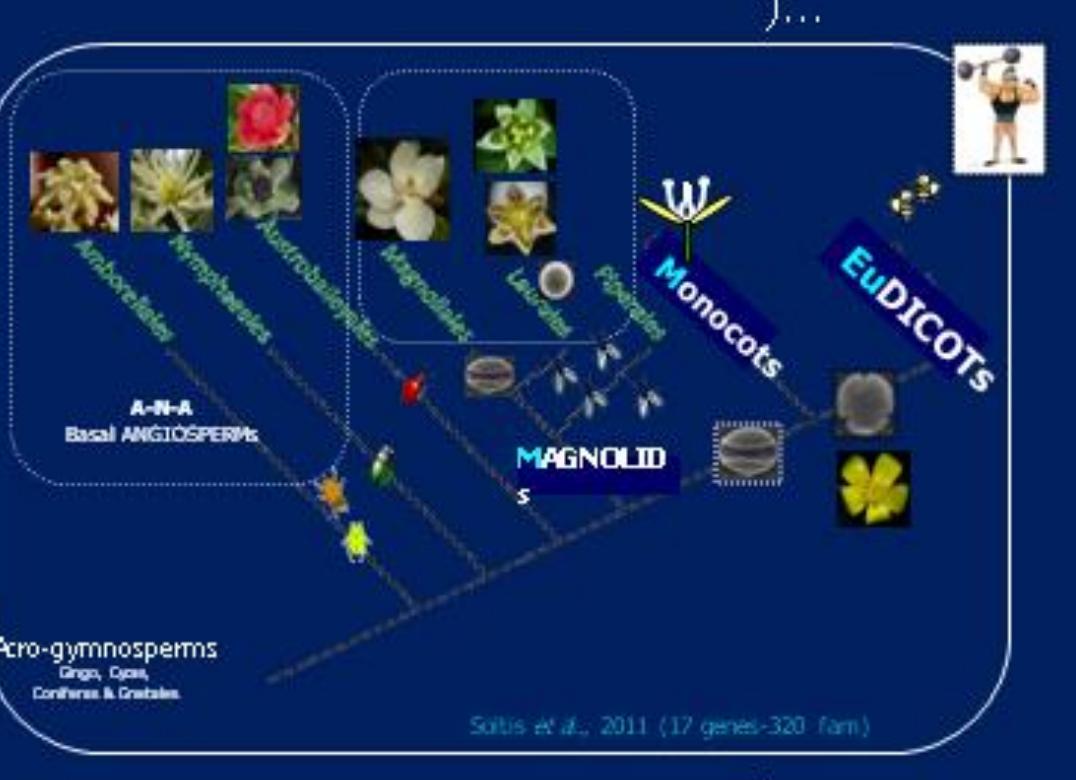


NEW APPROACH to the management of conservation in **Macaronesia** based on OLD ELEMENTARY IDEAS, which value the morphological and functional knowledge of the **FLOWERS**, as the essence of SEXUAL REPRODUCTION and REPRODUCTIVE SUCCESS of **populations** and **species** (DARWIN, 1876; BARRETT, 2015).



Starting point for this approach: island molecular PHYLOGENIES of indisputable "predictive value", which allow detection in macaronesian lineages: potential variations of floral biology, breeding systems and reproductive anomalies...

(PÉREZ de PAZ, 2002; FEBLES & PÉREZ RODRIGUEZ, 2004; SUAREZ *et al.*, 2009; FERNÁNDEZ-PALACIOS, 2010; PÉREZ de PAZ & CAUJAPÉ-CASTELLS, 2013; PÉREZ DE PAZ *et al.*, 2013 a, b, 2015 a,b, 2016 a, 2017; OLANGUA-CORRAL, 2016; DÍAS-LUIS *et al.*, 2017 ...)



... **FLOWERS** according **SEXUAL SYSTEMS** and **SELF-INCOMPATIBILITY** mechanisms (depending on evolutionary history of LINEAGES) control the FERTILE MATING and REPRODUCTIVE SUCCESS with viable SEEDS and vigorous PROGENY, influencing in genetic and morphological diversity and in the FITNESS and survival of **natural populations**...

Knowledge of **Macaronesian BREEDING SYSTEMS** and **GENETIC DIVERSITY**, in addition to questioning old myths and historical island hypotheses, reveals the NEED to know the "complete" REPRODUCTIVE CYCLE ... which begins "long before" the SEEDS SET ...

The **REPRODUCTIVE FAILURE** would be enhanced by the DISAPPEARANCE of certain individuals (morphs) with special FLOWERS (phenotype) and ALLELES (genotype) responsible for the FERTILE CROSSES. Priority ATTENTION for taxa with **1 & 2**

1. POLYMORPHIC SEXUAL SYSTEMS (SS)

detection of **unisexual flowers** and sexual polymorphism in **macaronesian** and **canarian** genus whose lineages have different pathway to **DIOECY (D)**: *Laurus*, *Ilex*... and functional **DIOECY (fD)**: *Persea* (Lauraceae), or intermediate situations ±close to dioecy, from **MONOECY**: *Pistacia* (Anacardiaceae), *Morella* (Myricaceae) ... , from **GYNODIOECY (GD)**: *Semele* (Ruscaceae), *Bosea* (Amaranthaceae), *Gymnosporia* (Celastraceae), *Phyllis* and *Plocama* (Rubiaceae), *Kunkeliella* (Santalaceae-Thesiae)

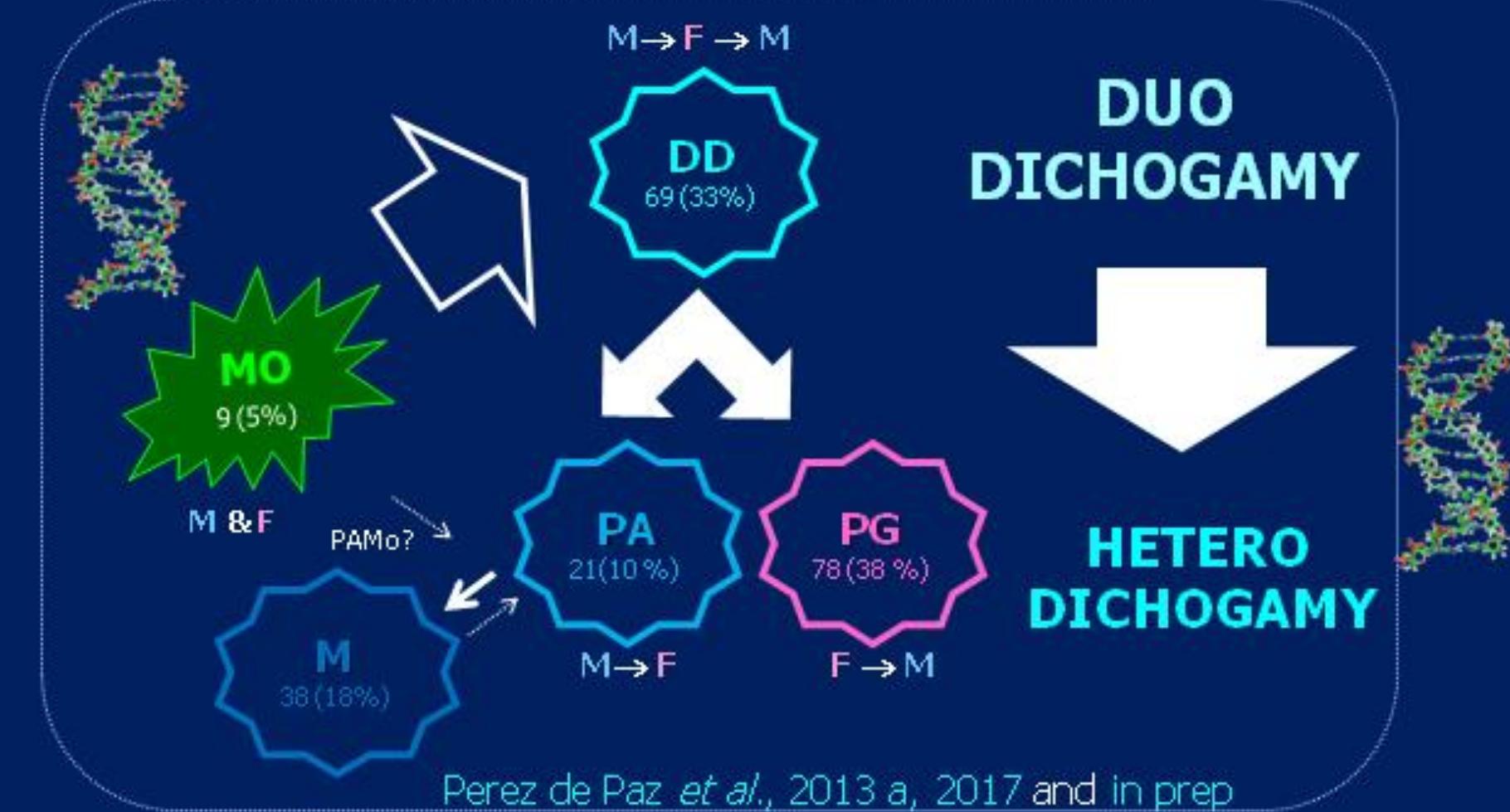
PÉREZ DE PAZ *et al.*, 2013b, 2017, in prep



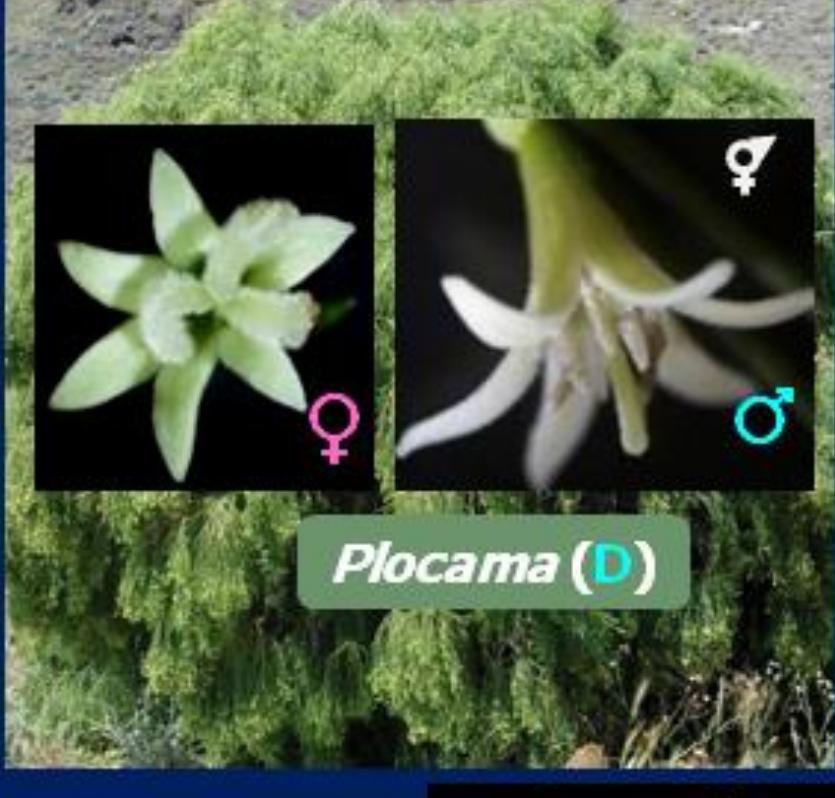
... The pathway from or to **ANDRODIOECY (AD)** can be represented by *Euphorbia*, *Mercurialis* (Euphorbiaceae), *Picconia* (Oleaceae)...



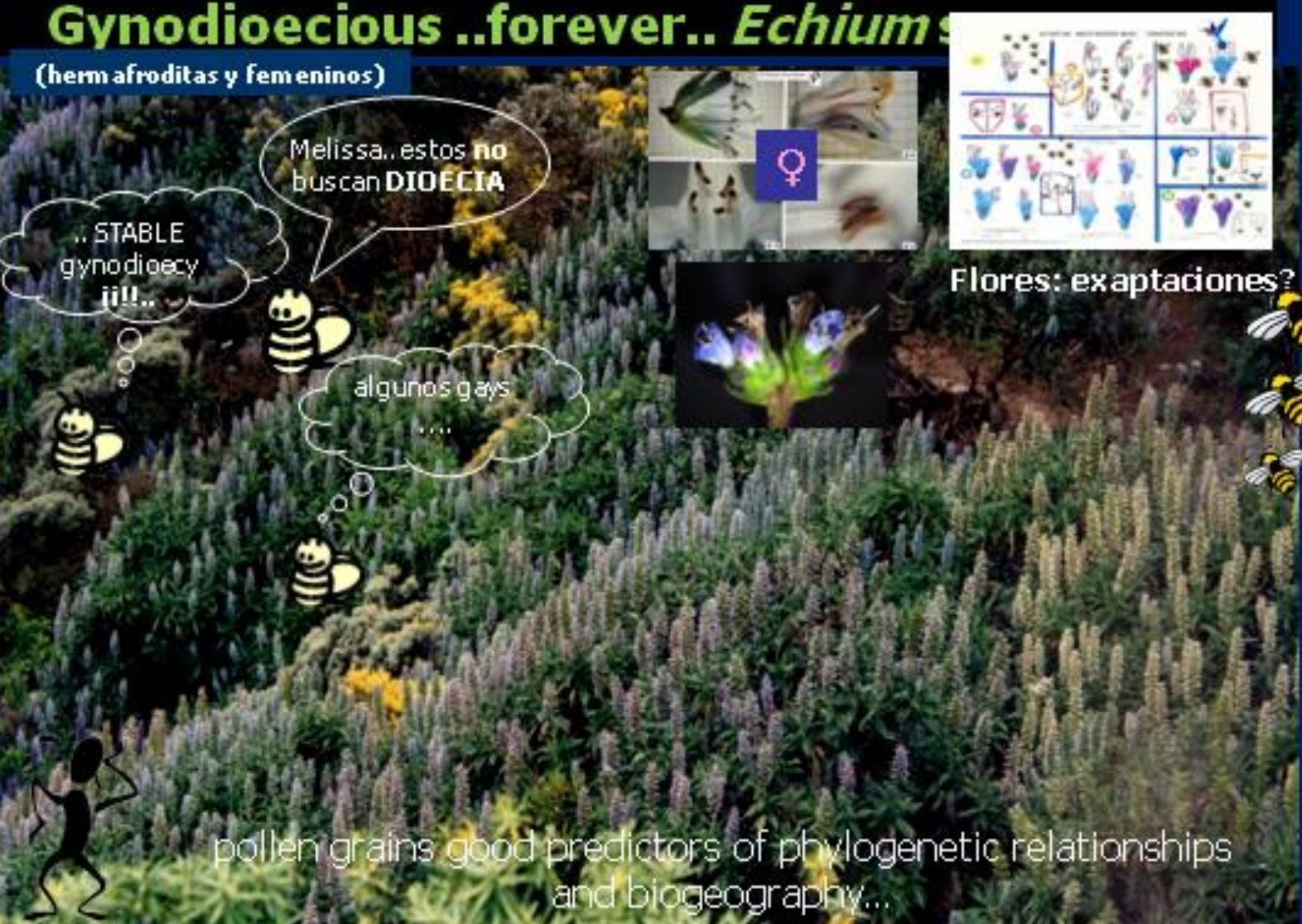
In **Neochamaelea** unavoidable **paternity analysis** (microsatellites) to verify detected sexual phenotypes of its extraordinarily rare and unknown system: **duodichogamy (DD)** with **heterodichogamy (HD)** and **androdioecy (AD)**.



Pérez de Paz *et al.*, 2013 a, 2017 and in prep



Pérez de Paz *et al.*, 2015b, 2017



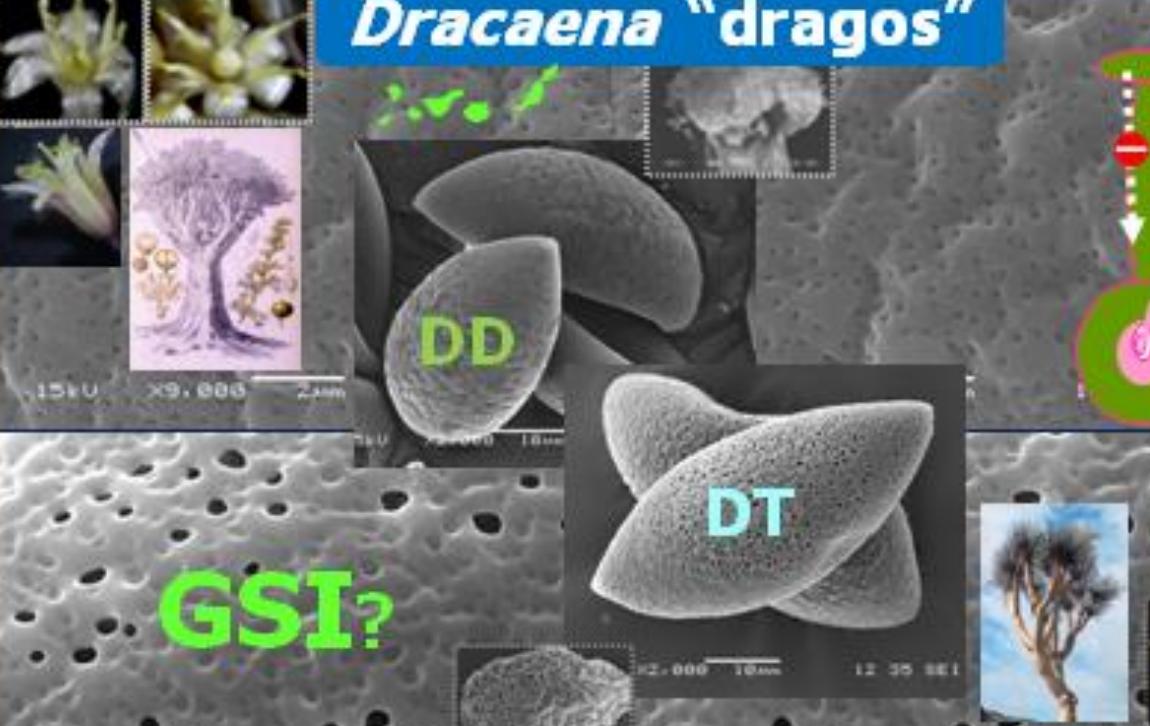
Pérez de Paz *et al.*, 2013b, 2017

2. SELF-INCOMPATIBILITY SYSTEMS (SI)

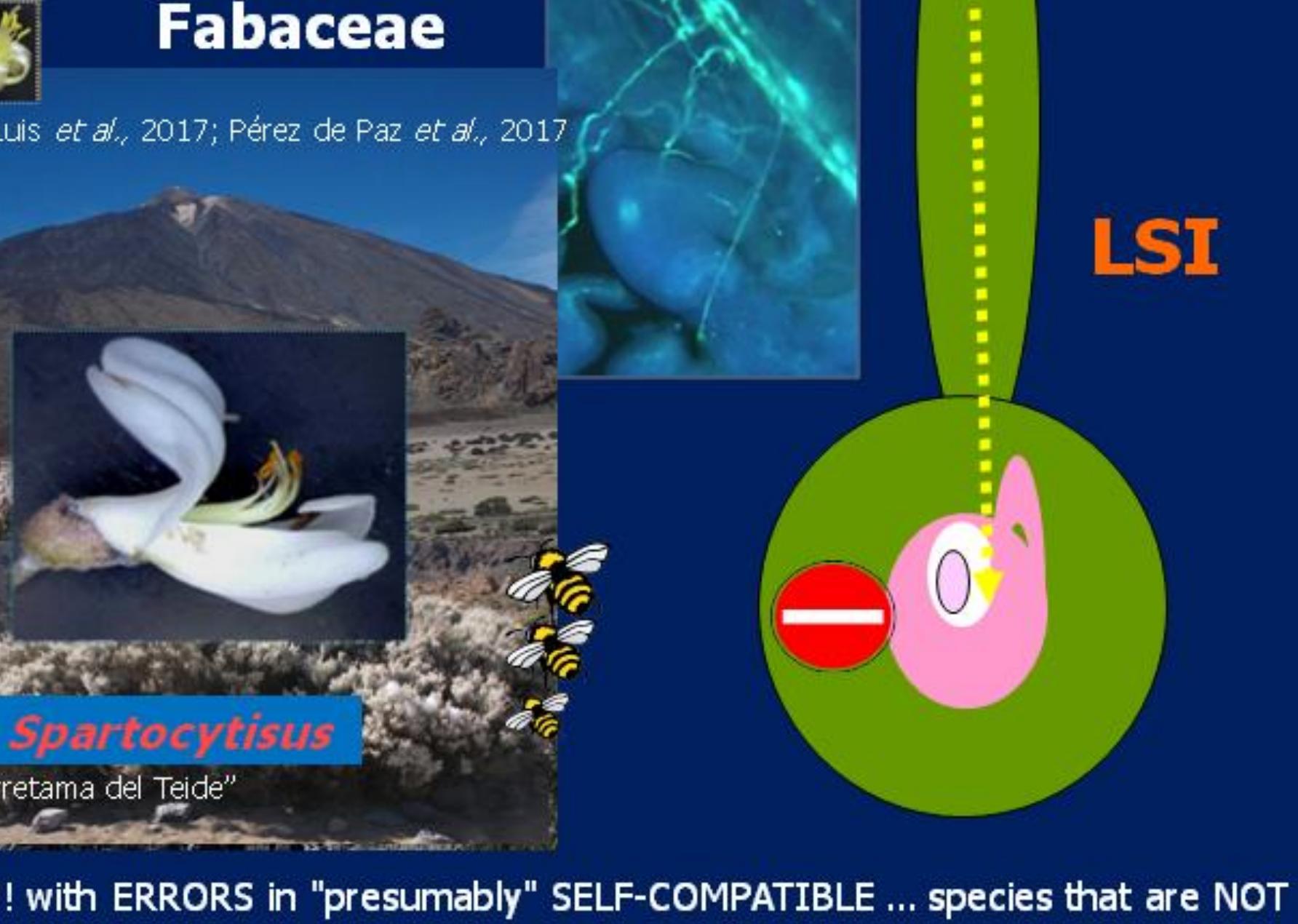
HETEROMORPHIC (*Limonium*, *Jasminum*) and HOMOMORPHIC: sporophytic (**SSI**) in *Parolinia* (Brassicaceae) and *Argyranthemum* (Asteraceae), etc., gametophytic (**GSI**) in *Dracaena?* (Dracaenaceae), *Cistus* (Cistaceae), etc., or late action (**LSI**) in Fabaceae, *Lotus* or *Spartocytisus*, etc., for which **POLLINATION EXPERIMENTAL CROSSES** are necessary.



SSI-He
... SI ... Baker's Law and pseudo-compatibility (PSC) or punctual self-fertilization...
ISLAND colonization and catastrophes...



... SI: iii THREAT!!! in small population sizes (< alleles) < FERTILE CROSSINGS ...
POLLEN grains good predictors of phylogenetic relationships...



The most relevant innovative character of **MACFLOR** is to provide the morphological and functional knowledge the **FLOWERS** and reproductive strategies to predict the unexplored REPRODUCTIVE SUCCESS or ANOMALIES of populations (unbalanced morphs ratio, missing viable seeds...). Its results are a guidelines for the **CONSERVATION** strategies and the "reinforcement" of the most depauperate and fragmented **natural populations**... Knowledge of FLOWERS will predict the success of COLONIZATION, establishment and **MICROEVOLUTIVES** process ... specially relevant in **oceanic ISLANDS**...

>> SI: > DIVERSIFICATION or SPECIATION rates??...

Pérez de Paz *et al.*, 2017

LSI iii Traditionally IGNORED !!! with ERRORS in "presumably" SELF-COMPATIBLE ... species that are NOT