



Four putatively new species of *Apistogramma* (Cichlid) from Colombia, found in hobbyist collection, identified using integrative approach

Patryk Jaworski, Joanna Grabowska, Tomasz Mamos

Corresponding author email: patryk.jaworski@edu.uni.lodz.pl





Cichlids

- model species
- complex behaviour
- high interest of aquarists



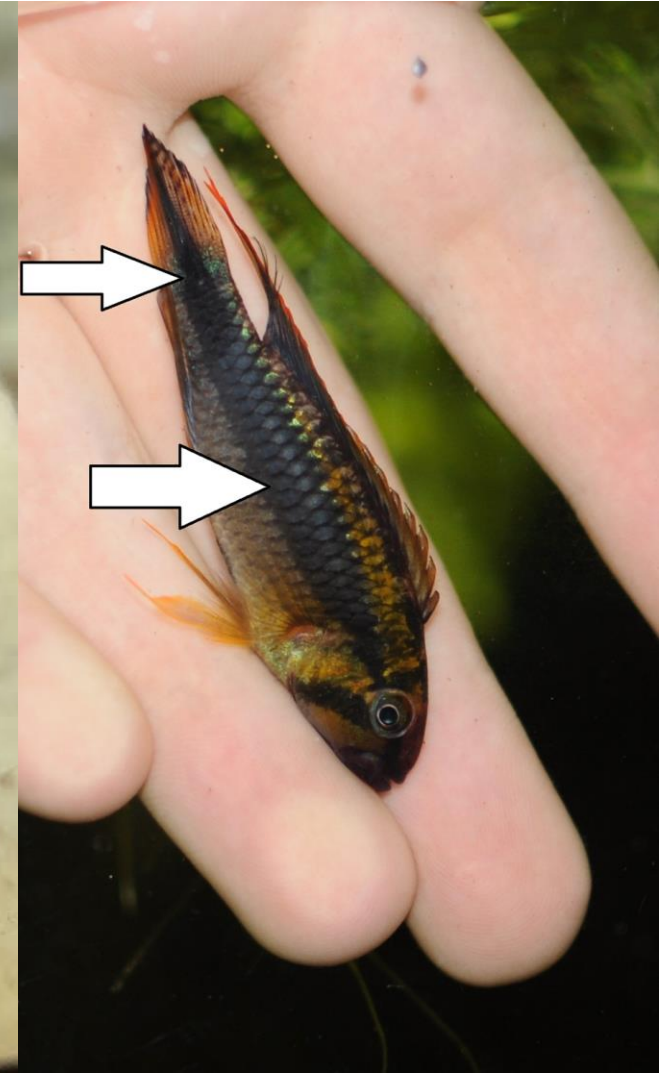
Apistogramma

- more than 100 species (~400 spec?)
- difficult identification
- coloration patterns differ depending on the “mood”
- sexual dimorphism



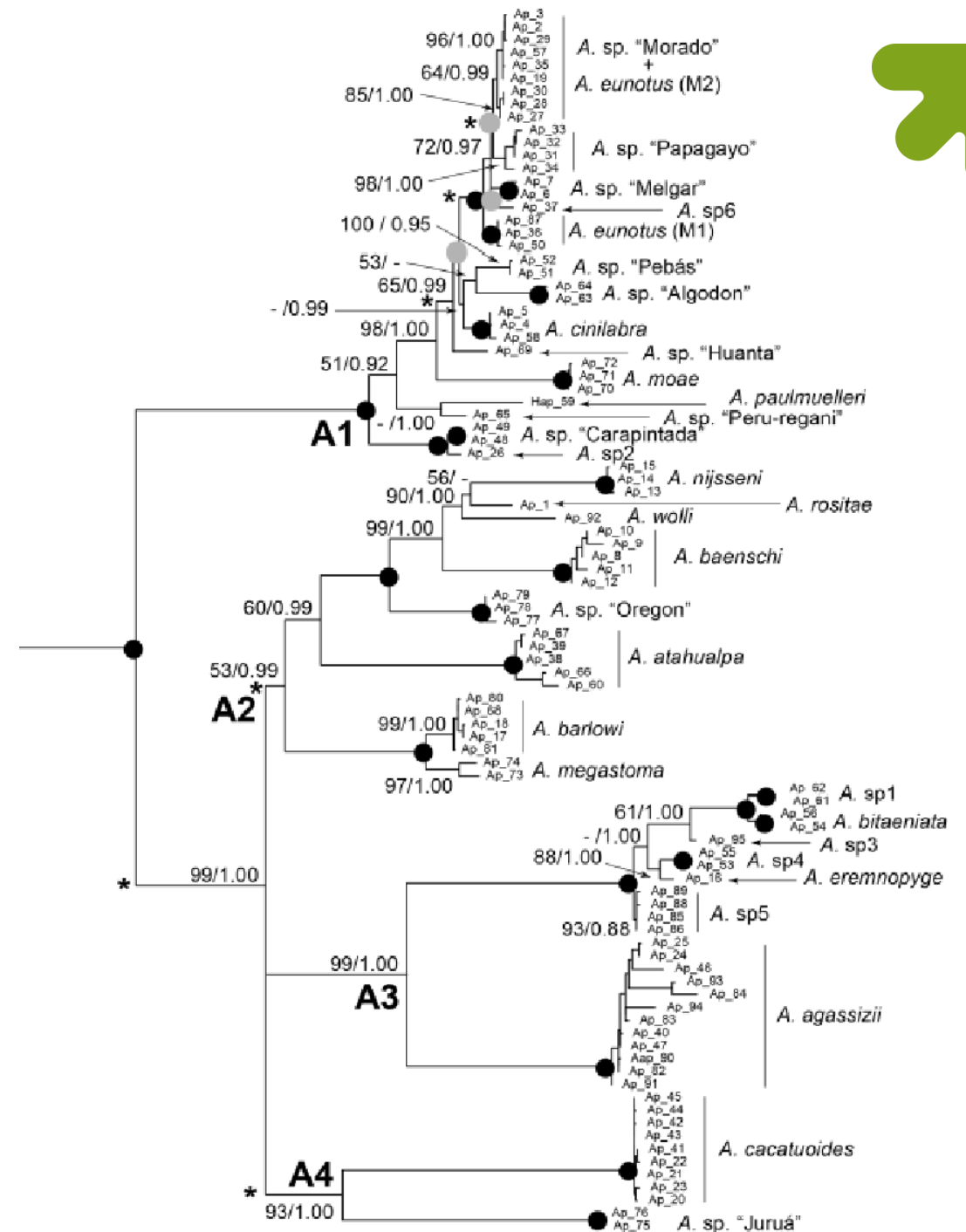
Introduction

- polychromatism present in most species
- black markings (lateral band, vertical bars) used for identification



Introduction

Tougard, C., García Dávila, C. R., Römer, U., Duponchelle, F., Cerqueira, F., Paradis, E., Guinand, B., Angulo Chávez, C., Salas, V., Quéroutil, S., Sirvas, S., Renno, J.-F. 2017. Tempo and rates of diversification in the South American cichlid genus *Apistogramma* (Teleostei: Perciformes: Cichlidae). PloS one 12, e0182618.



Goal:

Description of putatively new species of *Apistogramma* based on integrative approach

- molecular
- morphological
- behavioural



Material and methods

Material

Fish obtained from a private collection

Origins: Colombia – by-catch, legally exported to Europe

Optimal condition:

- 23 to 26°C
- 5.0-6.5 pH
- gH and kH <1
- conductivity <80uS/cm
- appropriate tank decor



Methods

Morphology:

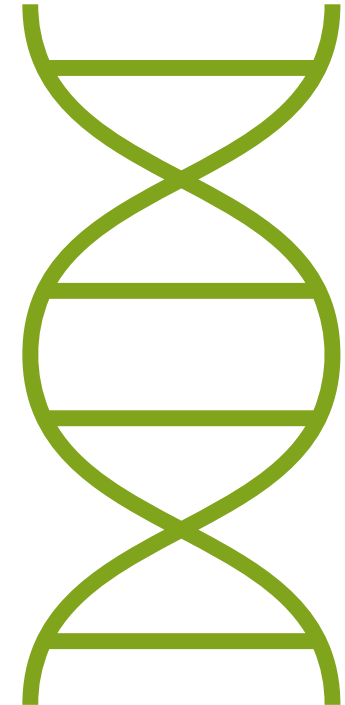
- lateral band
- shape and position of caudal spot
- coloration of the abdominal side of the body

Behaviour:

- fights for dominance
- mating

Molecular:

- amplification of COI, cytB, Tmo-4C4 for candidate species
- 3-6 specimens per putative species
- phylogeny reconstruction
- distances calculation



Results

Initial observations

Four groups distinguished based on morphological variation:

- *Apistogramma* sp. “D37”
- *Apistogramma* sp. “D18”
- *Apistogramma* sp. “D36”
- *Apistogramma* cf. *personata*



Results

Apistogramma sp. "D37"

- slightly elongated and mildly deep body
- dorsal fin low, rays of similar length with rounded membranes
- rounded caudal fin
- zipper-like lateral band with contiguous oval caudal spot
- seven vertical bars from dorsal to ventral edge, spreading to a base of dorsal fin
- up to 6 round spots with jagged edge on lateral band during brood care in females
- suborbital stripe forming thick V-shaped spot on gill cover, sometimes reduced only to a vertical spot
- shiny blue markings in the head area are small and usually separated
- lack of pectoral spot typical for alacrina complex





Results

Apistogramma sp. "D18"

- slightly elongated and mildly deep body
- dorsal fin low, rays of similar length with rounded membranes
- rounded caudal fin
- wide zipper-like lateral band with clearly contiguous round caudal spot
- Seven vertical bars rarely presented, usually visible only in the form of dorsal spots sometimes spreading over the dorsal fin
- visible anal spot, pectoral spot and round lateral spot during brood care in females
- suborbital stripe forming thick V-shaped spot on gill cover
- shiny blue markings in the head area quite large and merge into longitudinal patterns
- abdominal stripes sometimes visible, usually reduced to a single dots





Results

Apistogramma sp. "D36"

- deep body
- high dorsal fin with sharply ended separated rays
- lyrate caudal fin
- Slim zig-zag shaped lateral band contiguous to rectangular caudal spot with rounded edges
- Seven vertical bars are rarely presented, usually visible only in the form of dorsal spots spreading to a base of dorsal fin
- up to six square-like spots on lateral band and chin stripe during brood care in females
- Preorbital stripe and wide suborbital stripe usually visible
- shiny blue markings in the head area form hardly visible longitudinal patterns



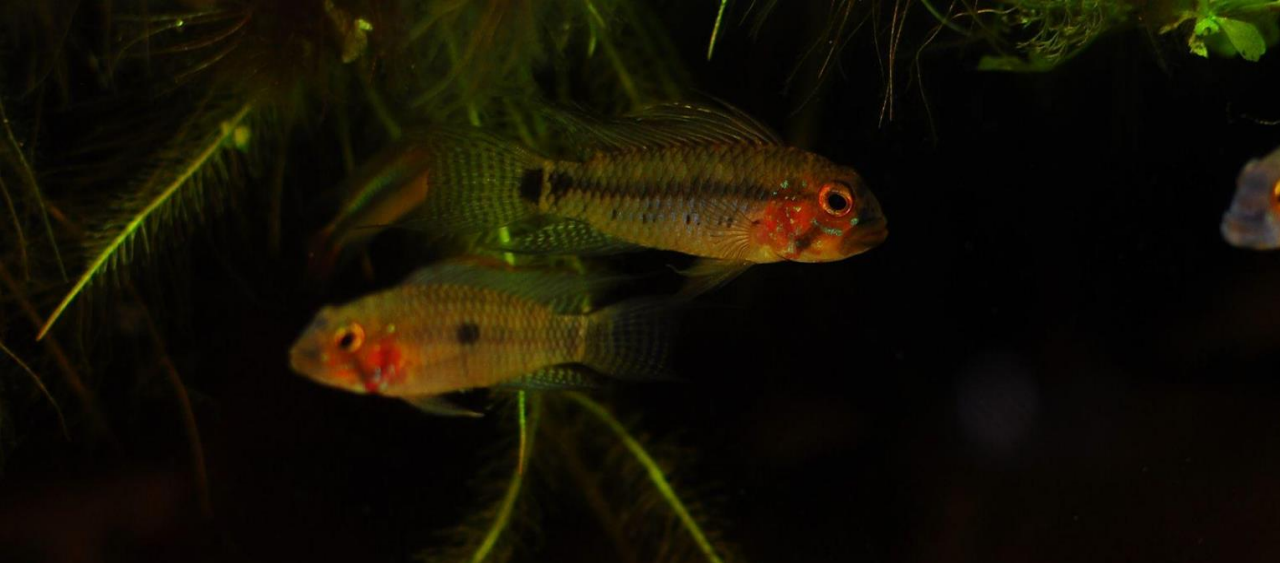


Results

Apistogramma cf. personata

- elongated body
- high dorsal fin with sharply ended separated rays
- lyrate caudal fin on which males present vertical rows of small dots
- Straight lateral band often widening into a spot on a 7th bar visibly separated with big rectangular caudal spot, lateral spot often presented
- Seven vertical bars are rarely presented, sometimes abdominal streaks and dorsal spots spreading over the dorsal fin are visible
- clearly visible suborbital stripe, lateral band spot, caudal spot and dorsal spots during brood care in females
- Suborbital stripe and postorbital stripe usually visible
- shiny blue markings in the head area are sparse and quite narrow forming strip under the eye
- Massive lips in males
- Rear edges of the scales are darker creating a net-like pattern



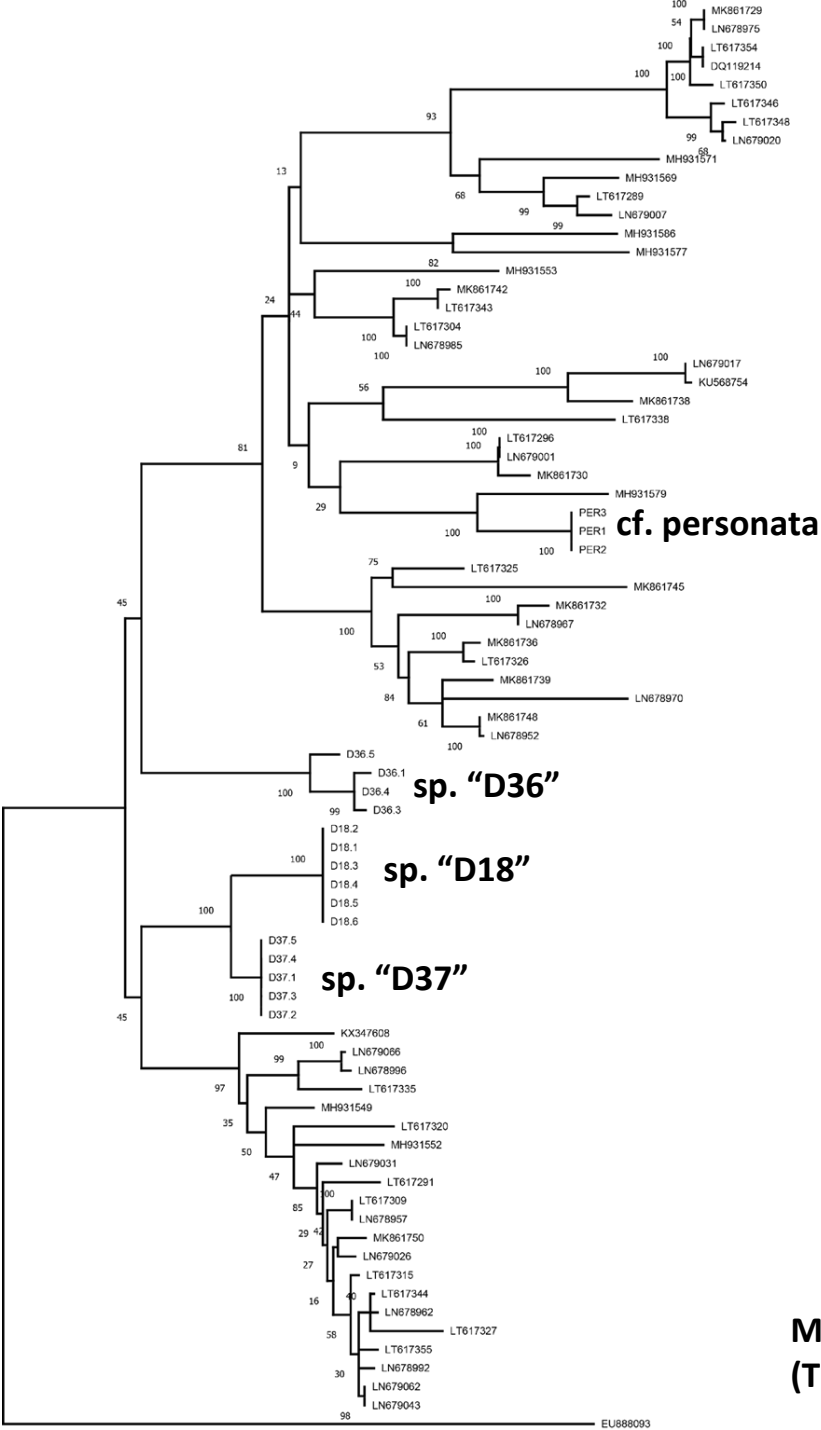


Results

Molecular studies:

Kimura 2-parameter distance
between four putative species

	PER	D37	D18
D37	0.18		
D18	0.19	0.06	
D36	0.18	0.13	0.15





Conclusions:

- Integrative prove for four new species
- Molecular analysis can speed up identification of previously unknown species
- Crucial in preservation of biodiversity
- Prevention of possible hybridization – preservation of species



Next steps

- Detailed metrical and meristic features examination
- SEM observations of pharyngeal teeth
- Multigene phylogeny
- Molecular clock dating
- Ancestral states reconstruction using morphological traits
- Analysis of putative one more species

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