

Morphological variability of the “Caribbean hidden anemone” *Lebrunia coralligens* (Wilson, 1890)

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Abstract *Lebrunia coralligens* is among the most common sea anemone species found inhabiting in coral reefs environments along the Caribbean Sea and Gulf of Mexico. This species exhibit two distinct morphotypes characterized mainly by differences in the location of vesicles on its pseudotentacles. The morphology and cnidae size ranges between representatives of the two morphotypes, as well as with those from specimens of its congeners *Lebrunia neglecta*, were compared to identify taxonomic distinctions that would enable separation of the morphotypes into different species. Statistical variability in specimens and cnidae size ranges was found between the two morphotypes, but a greater variability was found when compared with cnidae size ranges of *L. neglecta*. These results suggest that pseudotentacular form and cnidae size differences are due to broad phenotypic plasticity within *L. coralligens*. In addition, results also suggest that quantitative comparisons of cnidae could reinforce the taxonomic distinction of closely related species as *L. coralligens* and *L. neglecta*.

Keywords Actiniaria · Intraspecific variation · Cnidocysts · Morphotypes · Coral reefs

Introduction

Lebrunia coralligens (Wilson, 1890) is one of the most common sea anemone species inhabiting coral reefs of the Caribbean Sea and Gulf of Mexico (González-Muñoz et al. 2012, 2013; Fautin 2013). Like all other species included in Aliciidae Duerden, 1895, *L. coralligens* possess vesicles that contain micro and macrobasic *p*-amastigophore nematocysts (Crowther 2013). These vesicles are attached to branching outgrowths of the column, known as pseudotentacles, as also occurs in other genera within Aliciidae as *Triactis* Klunzinger, 1877 and *Phyllo-discus* Kwietniewski, 1897 (Carlgren 1949). Pseudotentacles of *Lebrunia coralligens* are unbranched or dichotomously branched (at most 2–3 times), and this species possess no more than 48 mesenteries (commonly 24–48). *Lebrunia neglecta* (= *L. danae*) Duchassaing de Fombressin and Michelotti, 1860, the only congener of *L. coralligens*, present dichotomously branched pseudotentacles (which branch between 4 and 12 times), and possess more than 48 mesenteries (commonly between 96 and 120) (Crowther 2013). However, two morphotypes of *L. coralligens* have also been reported regarding the position of vesicles on the pseudotentacles: one morphotype possessing single round terminal vesicles (Fig. 1a), while another possessing one or two vesicles but on the oral side of pseudotentacles (Fig. 1b) (Crowther 2013; González-Muñoz et al. 2016).

Despite the importance of the pseudotentacular shape as a distinctive taxonomic character to separate species within the genus *Lebrunia* Duchassaing de Fombressin and Michelotti, 1860, the differences exhibited by the two morphotypes of *L. coralligens* have not been fully analyzed to evaluate the potential separation in two species.

In a recent revision of genus *Lebrunia*, Crowther (2013) found molecular evidence that supports the monophyly of

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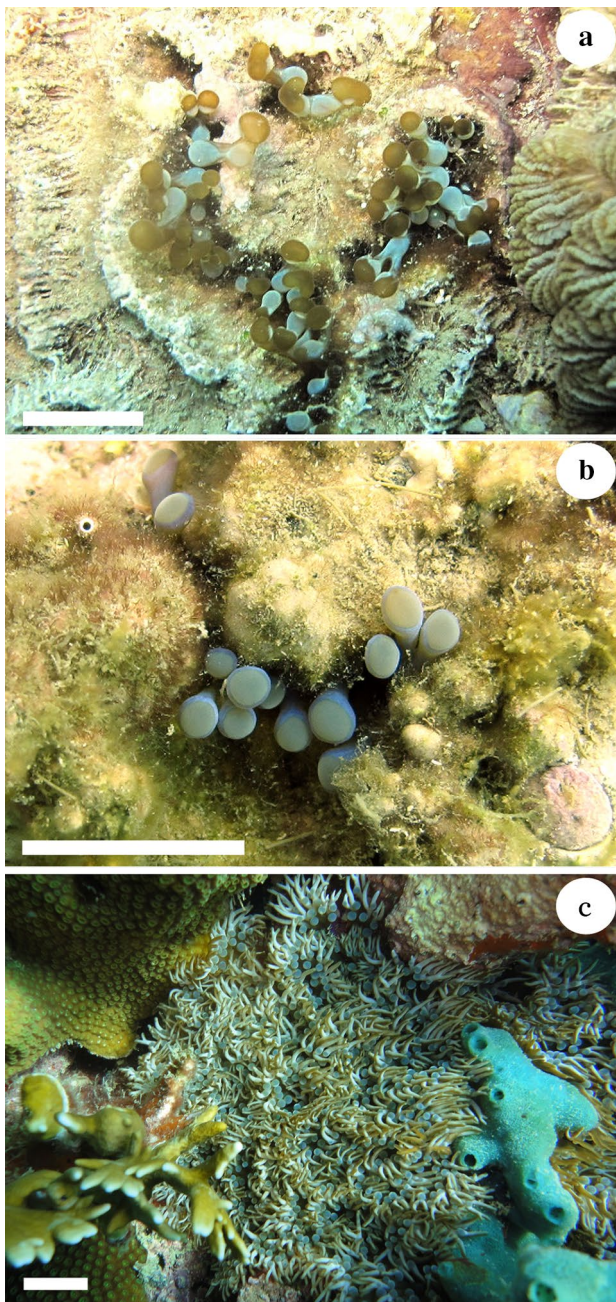


Fig. 1 Field photographs of the two morphotypes of *Lebrunia coralligens* and *L. neglecta*: **a** *L. coralligens* Brown morphotype; **b** *L. coralligens* Blue morphotype; **c** *L. neglecta*. Scale bars 10 mm

the genus. However, her molecular results did not support separation of two species within *Lebrunia*, neither for the two morphotypes within *L. coralligens*. Because the molecular markers currently available for sea anemones usually do not have enough resolution to determine species-level relationships (Hellberg 2006; Daly et al. 2010; Crowther 2013), the analysis of morphological characters could be

an alternative to distinguish between intra and interspecific variability.

Although cnidae size alone is not generally considered a specific taxonomic diagnostic character due to its variability within conspecific individuals (Fautin 1988, 2009; Acuña et al. 2003, 2004; Acuña and Garese 2009; Garese et al. 2016), several studies suggest that quantitative analyses of cnidae size could help to distinguish between morphotypes or species when correlate with other morphological or ecological characters (Allcock et al. 1998; Watts and Thorpe 1998; Manchenko et al. 2000; Watts et al. 2000; Acuña et al. 2003; Martínez-Baraldés et al. 2014).

In the present study, we examined external and internal morphology, as well as cnidae size variability, on representatives of the two morphotypes of *Lebrunia coralligens* and compared them to representatives of *L. neglecta* to identify morphological and cnidae distinctions that would enable corroboration of the broad phenotypic plasticity of *L. coralligens* or, according to the magnitude of this plasticity, evaluate if it merits separating the morphotypes in two species.

Materials and methods

We catalogued the two pseudotentacular morphotypes of *Lebrunia coralligens* as follows: Brown morphotype: specimens with brown boxing-glove like pseudotentacles with one or two oval vesicles on the oral side of the pseudotentacle (Fig. 1a); Blue morphotype: specimens with blue capitate pseudotentacles with a single round terminal vesicle (Fig. 1b). Ten specimens (five per morphotype) were collected in Isla Verde reef (19°13' 26"N, 96°05'56"W) of the Veracruz Reef System in the Gulf of Mexico in 2012 (Fig. 2). Specimens of both morphotypes were found in the same area, inhabiting inside narrow fissures of living or dead coral heads, at 3–6 m depth, in the back-reef zone. Five additional specimens of *Lebrunia neglecta* (Fig. 1c) were collected from Puerto Morelos reef (20°55'50.7"N, 86°49'24"W) in the Mexican Caribbean (Fig. 2). Collections were conducted by hand, snorkeling or SCUBA diving, and using a hammer and a chisel. Collected specimens were transferred to the laboratory and maintained in an aquarium. Specimens were relaxed in a 5% MgSO₄ seawater solution and fixed in 10% seawater-buffered formalin. Measurements of column height, as well as pedal and oral disc diameter were obtained from fixed specimens. Fragments of selected specimens of some of the Brown and Blue morphotypes were dehydrated and embedded in paraffin. Histological sections 6–10 mm thick and stained with hematoxylin–eosin (Estrada-Flores et al. 1982) were prepared to examine their internal anatomy.

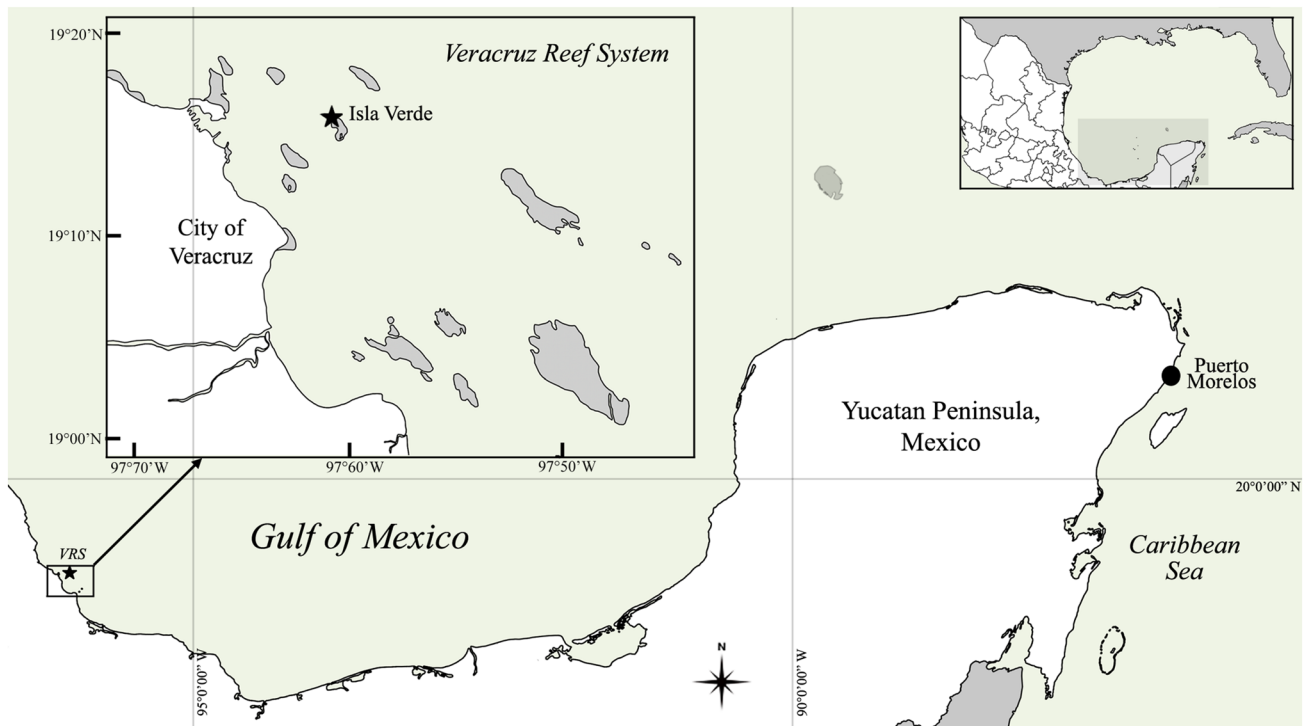


Fig. 2 Map of the southern Gulf of Mexico and Mexican Caribbean indicating the localities sampled in this study. *Black star* indicates location where specimens of *Lebrunia coralligens* were collected; *black dot* indicates location where specimens of *L. neglecta* were collected

The variability of sizes between the Brown and Blue morphotypes of *Lebrunia coralligens* (i.e., pedal and oral disc diameter, column height), and a number of pseudotentacles and tentacles were analyzed using a permutational MANOVA procedure (Anderson 2001; McArdle and Anderson 2001) following González-Muñoz et al. (2015); data were standardized and normalized prior to analyses.

Measurements of cnidae size capsules were obtained from all specimens (a total of 15 individuals). Five squash

preparations were obtained from the main tissue types (1 mm^3) of each specimen. We analyzed cnidae from the actinopharynx, mesenterial filaments, column, pseudotentacles, and tentacles. From each squash preparation, the length and width of 30 undischarged capsules (replicates) of each cnidae type present were haphazardly measured using DIC microscopy 1000 \times oil immersion (following Williams 1996, 1998, 2000). Cnidae type terminology follows Östman (2000), and the cnidae observed were

Table 1 Morphological measurements of the two morphotypes of *Lebrunia coralligens*; all measurements are in millimeters

Morphotype	<i>od</i>	<i>ch</i>	<i>pd</i>	<i>ps</i>	<i>te</i>	<i>me</i>
Brown morphotype						
1	3	4	5	6	44	46
2	3	4	7	5	46	44
3	3	4	6	6	44	35
4	2	4	6	6	43	–
5	2	3	4	6	42	26
Blue morphotype						
1	3	3	4	6	44	48
2	3	2	4	6	48	48
3	3	3	4	6	47	–
4	3	3	4	6	44	36
5	2	5	3	6	48	46

od oral disc diameter, *ch* column height, *pd* pedal disc diameter, *ps* number of pseudotentacles, *te* number of tentacles, *me* number of mesenteries

Fig. 3 Cnidocysts of genus *Lebrunia* per tissue type. *Bs* basitrichs, *Mi* microbasitic *p*-amastigophores, *Ma* macrobasitic *p*-amastigophores, *Sr* spirocysts. Categories from small to large size-classes were indicated with consecutive roman numerals. Scale in μm

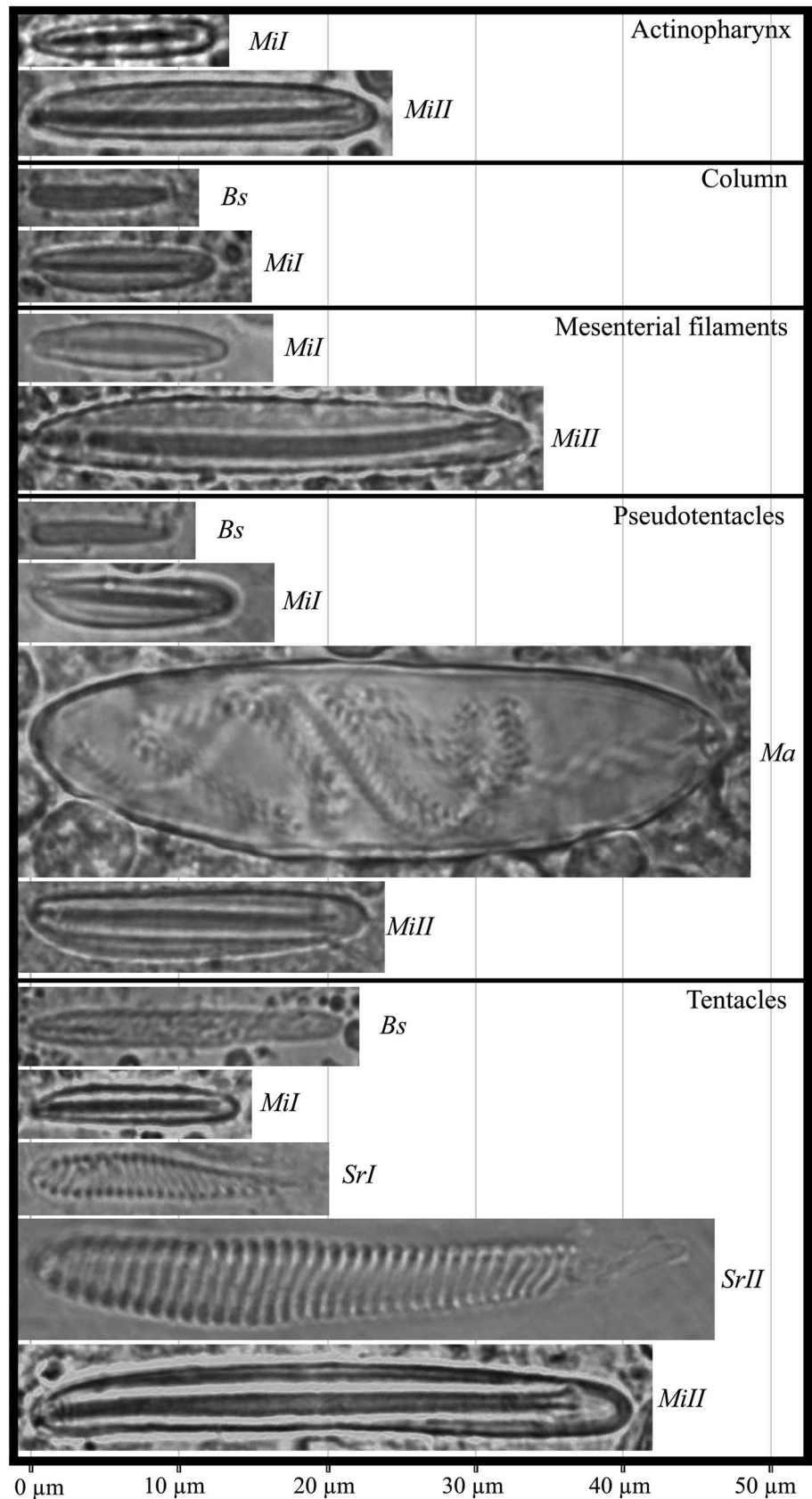


Table 2 Statistical descriptive parameters for the cnidae size of Brown and Blue morphotypes of *Lebrunia coralligens*, and *L. neglecta*

Tissue	Cnidae category	Range Length × Width (Max–Min)	Length (mean ± sd)	Width (mean ± sd)	N
<i>Lebrunia coralligens</i> Brown morphotype					
Actinopharynx	<i>Mil</i>	(9.73–15.78) × (2.35–3.87)	12.28 ± 1.30	3.08 ± 0.31	150
	<i>Mill</i>	(21.35–36.06) × (3.52–6.13)	27.43 ± 3.02	4.58 ± 0.45	150
Column	<i>Bs</i>	(8.42–13.11) × (1.85–2.97)	10.53 ± 0.90	2.26 ± 0.21	150
	<i>Mil</i>	(10.16–17.05) × (2.68–4.85)	13.25 ± 1.32	3.64 ± 0.47	150
Mesenterial filaments	<i>Mil</i>	(10.30–17.50) × (2.44–4.65)	13.25 ± 1.54	3.28 ± 0.47	150
	<i>Mill</i>	(26.07–43.23) × (4.25–8.79)	35.33 ± 3.06	5.85 ± 0.74	150
Pseudotentacles	<i>Bs</i>	(8.09–14.03) × (1.64–2.84)	10.56 ± 1.34	2.13 ± 0.20	150
	<i>Mil</i>	(10.59–17.36) × (2.65–4.73)	13.36 ± 1.28	3.30 ± 0.35	150
	<i>Mill</i>	(16.88–35.15) × (3.69–6.73)	21.55 ± 2.98	4.48 ± 0.50	150
	<i>Ma</i>	(40.73–67.74) × (11.01–21.35)	54.18 ± 5.73	16.85 ± 1.63	150
Tentacles	<i>Bs</i>	(18.81–30.78) × (1.98–3.72)	24.53 ± 2.29	2.54 ± 0.29	150
	<i>Sr</i>	(11.63–26.08) × (2.21–4.59)	17.56 ± 3.09	3.36 ± 0.42	150
	<i>Mil</i>	(11.46–22.60) × (2.74–4.48)	16.12 ± 2.38	3.45 ± 0.38	150
	<i>Mill</i>	(20.63–58.11) × (4.23–6.95)	40.62 ± 10.43	5.44 ± 0.55	150
<i>Lebrunia coralligens</i> Blue morphotype					
Actinopharynx	<i>Mil</i>	(9.24–15.62) × (2.34–3.86)	11.91 ± 1.39	2.90 ± 0.29	150
	<i>Mill</i>	(18.44–37.43) × (3.57–6.38)	27.06 ± 3.16	4.76 ± 0.54	150
Column	<i>Bs</i>	(7.74–11.57) × (1.71–2.75)	9.69 ± 0.76	2.11 ± 0.18	150
	<i>Mil</i>	(9.90–17.19) × (2.25–4.52)	13.16 ± 1.38	3.36 ± 0.43	150
Mesenterial filaments	<i>Mil</i>	(10.02–16.98) × (2.14–4.17)	12.56 ± 1.34	2.90 ± 0.40	150
	<i>Mill</i>	(23.24–42.04) × (4.21–7.02)	33.48 ± 3.91	5.51 ± 0.59	150
Pseudotentacles	<i>Bs</i>	(7.71–14.01) × (1.64–2.50)	10.22 ± 1.28	2.05 ± 0.17	150
	<i>Mil</i>	(10.50–14.96) × (2.23–3.49)	12.94 ± 1.10	2.81 ± 0.24	150
	<i>Mill</i>	(15.39–32.99) × (2.64–5.53)	19.68 ± 3.62	3.63 ± 0.59	150
	<i>Ma</i>	(37.39–56.53) × (10.69–15.08)	46.20 ± 3.74	13.18 ± 0.93	150
Tentacles	<i>Bs</i>	(19.83–31.02) × (1.76–2.97)	24.74 ± 2.06	2.25 ± 0.21	150
	<i>Sr</i>	(12.21–23.97) × (2.26–4.56)	17.56 ± 2.71	3.31 ± 0.43	150
	<i>Mil</i>	(11.07–28.77) × (2.24–5.14)	19.81 ± 4.10	3.74 ± 0.62	150
	<i>Mill</i>	(30.83–58.52) × (4.16–6.66)	43.99 ± 6.23	5.50 ± 0.52	150
<i>Lebrunia neglecta</i>					
Actinopharynx	<i>Mil</i>	(10.67–22.49) × (2.69–4.81)	14.98 ± 1.96	3.45 ± 0.37	150
	<i>Mill</i>	(28.41–52.14) × (3.84–6.11)	38.48 ± 4.88	5.08 ± 0.47	150
Column	<i>Bs</i>	(7.34–11.92) × (1.93–3.32)	9.29 ± 0.83	2.42 ± 0.24	150
	<i>Mil</i>	(9.31–22.86) × (2.25–5.82)	16.82 ± 3.42	4.12 ± 0.71	150
Mesenterial filaments	<i>Mil</i>	(9.67–17.84) × (2.42–4.29)	12.47 ± 1.41	3.30 ± 0.45	150
	<i>Mill</i>	(29.80–60.26) × (4.64–7.98)	45.96 ± 6.73	6.06 ± 0.59	150
Pseudotentacles	<i>Bs</i>	(6.79–14.42) × (1.82–2.81)	9.49 ± 1.51	2.20 ± 0.18	150
	<i>Mil</i>	(12.49–20.15) × (2.69–5.56)	15.00 ± 1.55	3.59 ± 0.46	150
	<i>Mill</i>	(20.31–37.69) × (3.61–6.11)	26.58 ± 3.71	4.95 ± 0.47	150
	<i>Ma</i>	(43.20–87.74) × (14.04–22.88)	69.73 ± 7.63	17.47 ± 1.64	150
Tentacles	<i>Bs</i>	(11.08–23.39) × (2.36–4.15)	16.82 ± 2.26	3.23 ± 0.29	150
	<i>SrI</i>	(17.75–33.66) × (2.79–4.71)	24.53 ± 3.5	3.55 ± 0.37	150
	<i>SrII</i>	(32.61–54.59) × (4.09–8.01)	41.89 ± 4.66	5.85 ± 0.71	150
	<i>Mil</i>	(12.61–25.14) × (2.79–4.63)	17.74 ± 2.72	3.52 ± 0.38	150
	<i>Mill</i>	(39.03–95.94) × (5.01–8.81)	73.04 ± 13.67	7.08 ± 0.74	150

Measurements of length and width range in micrometers. Categories from small to large size-classes were indicated with consecutive roman numbers

Bs basitrichs, *Mi* microbasal *p*-amastigophores, *Ma* macrobasal *p*-amastigophores, *N* total number of cnidocysts measured, *Sr* spirocysts

Table 3 Percentage of the variation explained by the two principal components of cnidae data (length/width) of all types of cnidae in each type of tissue; data from all specimens examined of both morphotypes of *L. coralligenes* and *L. neglecta*

Source	Actinopharynx			Column			Filament			Pseudotentacle			Tentacle		
	<i>Mil</i>	<i>MiII</i>	<i>Bs</i>	<i>Mil</i>	<i>Mil</i>	<i>MiII</i>	<i>Bs</i>	<i>Mil</i>	<i>MiII</i>	<i>Ma</i>	<i>Bs</i>	<i>Sr</i>	<i>Mil</i>	<i>MiII</i>	
PC1% of variation	84	78.2	57.5	91.2	70.1	77	56.7	81.3	88.5	83.5	81.6	75.6	90.7	91.2	
PC2% of variation	16	21.8	42.5	8.8	29.9	23	43.3	18.7	11.5	16.5	18.4	24.4	9.3	8.8	

Categories from small to large size-classes indicated with consecutive roman numbers

Bs basitrichs, *Mi* microbasic *p*-amastigophores, *Ma* macrobasic *p*-amastigophores, *Sr* spirocysts

identified as basitrichs (*Bs*), microbasic *p*-amastigophores (*Mi*), macrobasic *p*-amastigophores (*Ma*), or spirocysts (*Sr*). Categories from small to large size-classes were indicated with consecutive roman numbers.

Cnidae samples were ordered in a bi-dimensional space using Principal Component Analysis (PCA). Differences in ordination were statistically compared in couples between samples of the Brown and Blue morphotypes, Brown morphotype and *L. neglecta*, and Blue morphotype and *L. neglecta*, respectively, as well as differences of each specimen within each data set. Statistically descriptive parameters were compared among individuals. The normality of length size distribution was tested for each cnidae type using a Shapiro–Wilks test ($\alpha = 0.05$). If normality was confirmed for both data sets to be compared, an ANOVA was carried out to compare the cnidae length sizes among specimens. In cases with non-normal distribution, a Generalized Linear Model (GLM) with gamma errors and inverse link function was applied, following Garese et al. (2016), and using the R program (R Development Core Team 2008). The model form was:

$$g(\text{length}) = \beta_0 + \beta_1(\text{data}) + \varepsilon$$

Then, a *t* test for β_1 coefficients of the model was performed to evaluate differences between morphotypes and species.

Results

Morphological examination

Oral disc diameter and column height measurements range similarly in all specimens examined regardless the morphotype (Table 1). Similarly, the number of tentacles ranged from 42 to 48 in all specimens from both morphotypes, and almost all specimens possess six pseudotentacles, except from one specimen of the Brown morphotype which present only five. The pedal disc

diameter range of the specimens from the Brown morphotype (4–7 mm) was higher than those from the Blue morphotype (3–4 mm). Statistical analyses applied to these data found significant variation between the Brown and Blue morphotypes ($pseudo-F=0.022$). Transversal sections of *Lebrunia coralligenes* were obtained only from four specimens of the Brown morphotype and four specimens of the Blue morphotype, and the number of mesenteries ranged between 26 and 48 in specimens of both morphotypes (Table 1).

Cnidom of *Lebrunia coralligenes* and *L. neglecta*

We measured 420 cnidae capsules per each specimen of *Lebrunia coralligenes* and 450 cnidae per each specimen of *L. neglecta*, to a total of 6450 capsules. The cnidom of both species of *Lebrunia* includes basitrichs, microbasic *p*-amastigophores, macrobasic *p*-amastigophores, and spirocysts (Fig. 3). We found the same four types of cnidae, distributed in 14 categories regarding the size-class and tissue location, in all samples of *L. coralligenes* examined, regardless of morphotype. *Lebrunia neglecta* share the same cnidom of *L. coralligenes* (Table 2). However, *L. neglecta* possess two size-classes of spirocysts, both constantly observed in all the five specimens examined for this species (Fig. 3). *Lebrunia coralligenes* only presents one size-class of spirocysts, in all the ten specimens examined regardless of morphotype, which are comparatively of the same size-class of the smaller spirocysts of *L. neglecta* (Table 2). Thus, only capsules of the *Sr I* category of *L. neglecta* were compared with the spirocysts of the two morphotypes of *L. coralligenes*.

PCAs ordination analyses of cnidae

The PCA ordination of samples from all tissue types showed that the first principal component explained 56.7–91.2% of the variability of the cnidae length size depending on the type of tissue being analyzed (Table 3).

The percentage of variation explained by the second principal component was low in almost all categories of cnidae (from 8.8 to 29.9%), except in the basitrichs from column and pseudotentacles in which the percentage of variation was relatively high (42.5–43.3%) (Table 3). The ordination analyses showed that samples from the two morphotypes of *Lebrunia coralligens* overlapped in almost all the cases (Figs. 4a–h, 5c–f), except from the samples of micro- and macro-basic *p*-amastigophores from the pseudotentacles (Fig. 5a–b), in which a relatively separation between samples of the morphotypes is somehow evident. Samples of seven cnidae categories of *L. neglecta* clearly overlapped with the corresponding samples of both morphotypes of *L. coralligens* (Figs. 4a, c, e, g–h, 5a, e); but however, the other seven categories of cnidae only overlapped partly or scarcely with the samples from *L. coralligens* (Figs. 4b, d, f, 5b–d, f).

ANOVA and GLMs analyses

In the comparison between the Brown and the Blue morphotypes of *Lebrunia coralligens*, normal distribution were confirmed in five of the 14 categories of cnidae examined (Table 4). ANOVA analyses applied to these five categories showed significant variation between the Brown and Blue morphotypes in three categories (Table 4). The GLMs applied for the other nine size categories of cnidae in which normal distribution was not confirmed showed significant variation between the morphotypes in seven of the nine categories of cnidae (Table 4). Overall, significant variations were found in 10 of the 14 cnidae categories between the two morphotypes of *L. coralligens* (Table 4). We found significant variation in all categories of cnidae in pseudotentacles and filaments, while in the other tissues, a significant variation was found in at least one cnidae category.

In the comparison between Brown morphotype and *Lebrunia neglecta*, normal distribution was confirmed for both data sets only in basitrichs from tentacles, whereas in the comparison between the Blue morphotype and *L. neglecta*, normality was confirmed in four cases (Table 4). The ANOVAs and GLMs analyses applied for these comparisons showed a strong significant variation in all cases between both morphotypes of *L. coralligens* and *L. neglecta* (Table 4).

Discussion

Size of specimens and pseudotentacular, tentacular, and mesenterial number did not exhibit any clear particular

pattern that could be exclusively associated with any morphotype of *Lebrunia coralligens*. However, statistical analyses applied to anatomical measurements data found significant variation between the Brown and the Blue morphotype. This result was influenced in most cases by the longer pedal disc diameter exhibited by the Brown morphotype. Although adding more specimens to this analysis surely helps to a better understanding of the size variation in both morphotypes, pedal disc diameter is not a taxonomic character, it depends on the size of the specimen. In addition, all studied anatomical measurements overlapped completely or partially. Thus, we consider that there are no other anatomical distinctions between the Brown and Blue morphotypes, aside from pseudotentacular shape, that could be taxonomically relevant.

Regarding cnidae size analyses, significant variation was found in 10 of the 14 cnidae categories between the two morphotypes of *Lebrunia coralligens*. Significant variability was found in cnidae from all tissues sampled, in at least one cnidae category. However, it is notable that a significant variation of all cnidae categories was found precisely in the pseudotentacles, the structure distinctive between morphotypes, although also in the mesenterial filaments.

The variation between *Lebrunia neglecta* and each of the two morphotypes of *L. coralligens* was much greater and present in all cnidae categories. The values of associated probability are much lower when comparing any of the two morphotypes of *L. coralligens* with *L. neglecta*, than between each other. Thus, although there are significant differences in cnidae size between the Brown and Blue morphotypes, the differences are much greater when comparing any of these morphotypes to the cnidae of *L. neglecta*.

Overall, our results suggest that differences in pseudotentacles, both in shape and cnidae sizes, in addition to cnidae size ranges variation in other tissues, are due to broad phenotypic plasticity within *L. coralligens*. The cause of this intraspecific variability is unknown, but might be related to specific adaptations to the surrounding environment or to an early speciation process.

In addition to the taxonomic characters proposed by Crowther (2013) to distinguish *L. coralligens* from *L. neglecta*, we found that these two species could also be distinguished by cnidae size range (when are statistically examined) and by the possession of one size category of spirocysts in the former, and two size categories of spirocysts in the later.

Finally, our results concur with the previous studies suggesting that cnidae examination and statistical analyses of cnidae (as long as the approach is robust and well supported by a significant volume of data) could be very

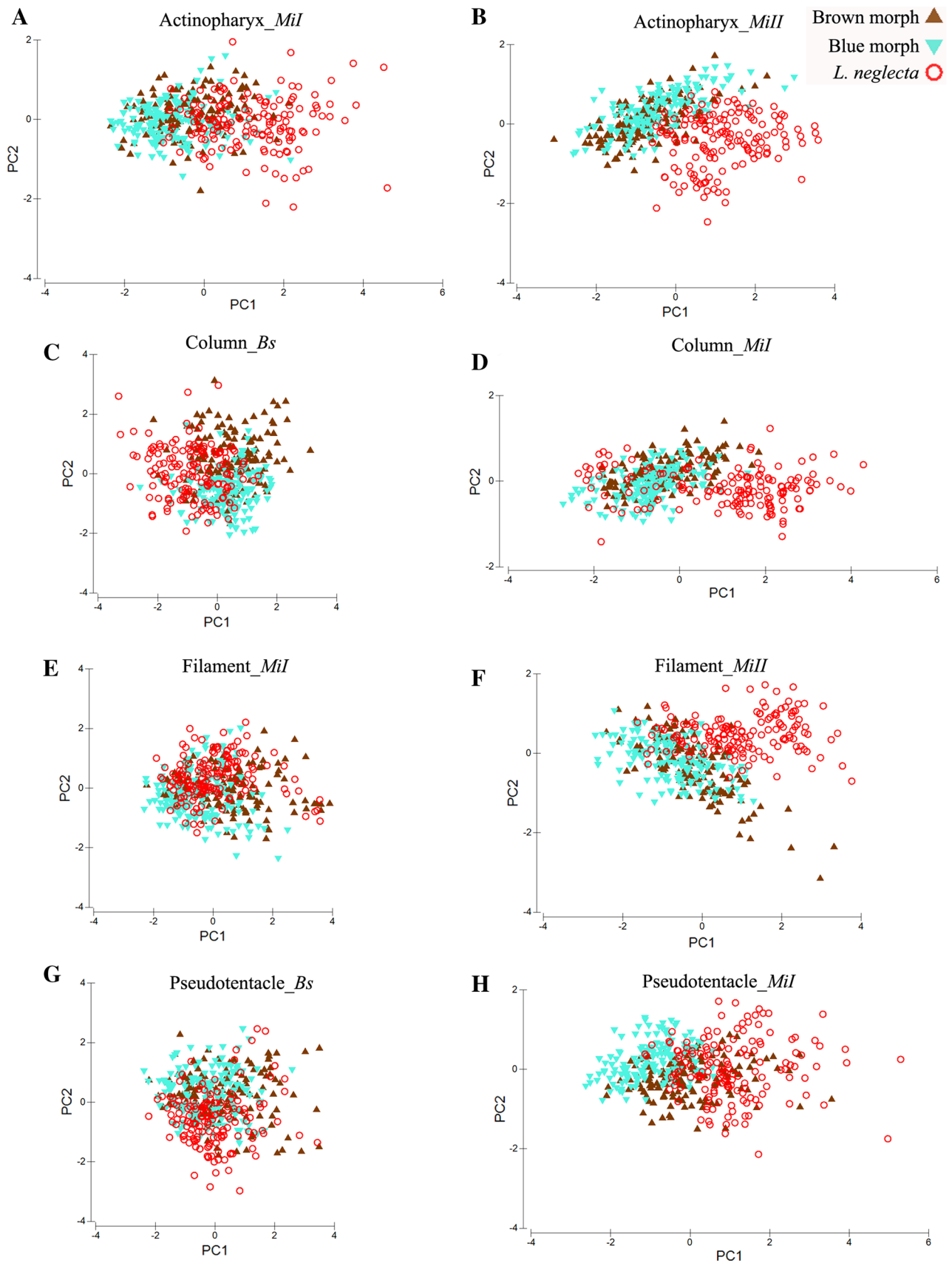


Fig. 4 Principal component analyses of cnidae data (length/width) of all types of cnidae in each type of tissue; data from all specimens examined. *Brown triangles*, cnidae of *Lebrunia coralligens* Brown morphotype; *blue inverted triangles*, cnidae of *L. coralligens* Blue morphotype; *red circles*, cnidae of *L. neglecta*. *Bs* basitrichs, *Mi* microbasic *p*-amastigophores. Categories from small to large size-classes were indicated with consecutive roman numbers

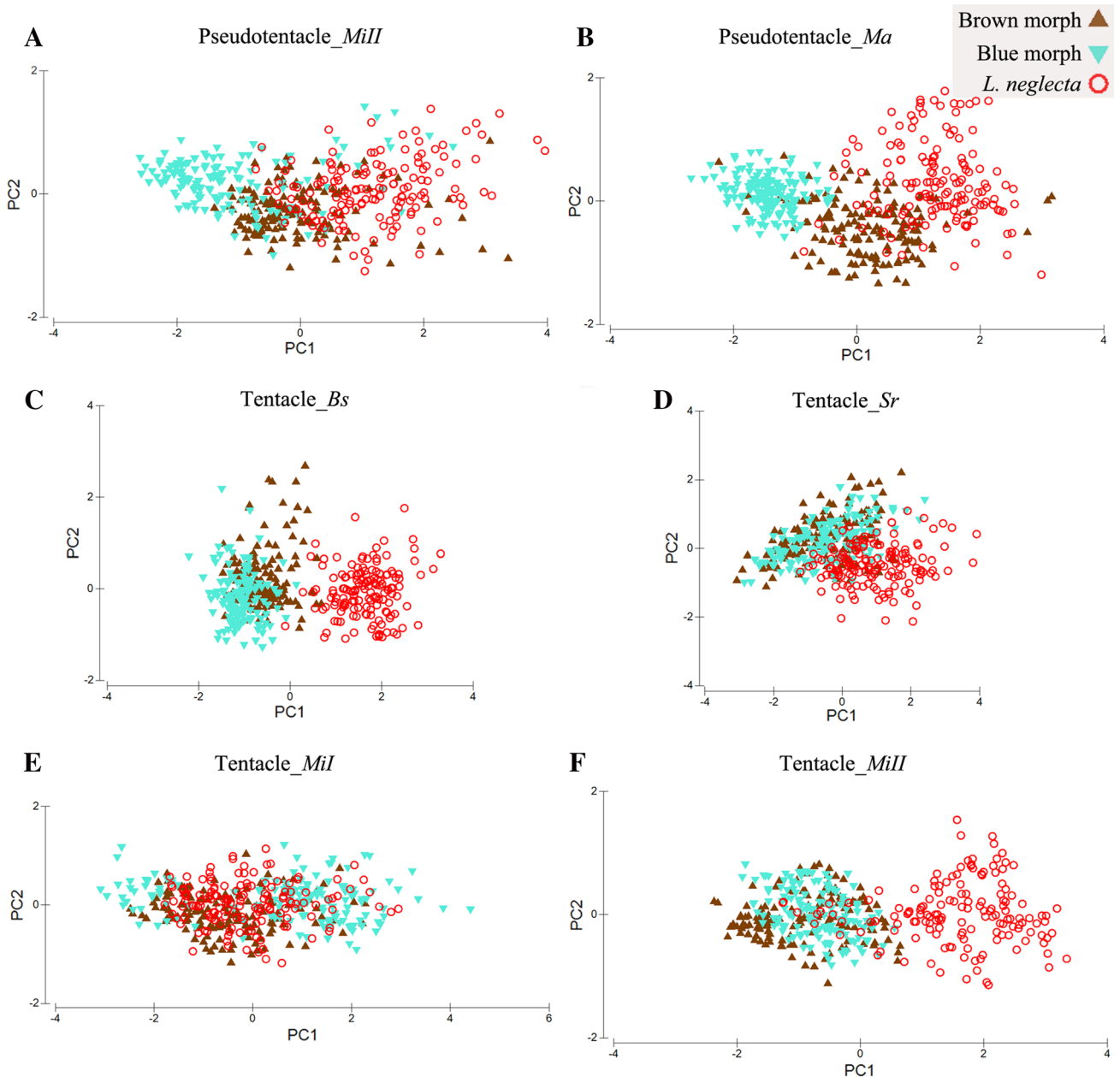


Fig. 5 Principal component analyses of cnidae data (length/width) of all types of cnidae in each type of tissue; data from all specimens examined. *Brown triangles*, cnidae of *Lebrunia coralligens* Brown morphotype; *blue inverted triangles*, cnidae of *L. coralligens* Blue

informative and useful to distinguish closely related sea anemone species, and even to clarifying intraspecific and interspecific variation within sea anemone species (Allcock et al. 1998; Watts and Thorpe 1998; Manchenko et al. 2000; Watts et al. 2000) but also in other anthozoans

morphotype; *red circles*, cnidae of *L. neglecta*. *Bs* basitrichs, *Mi* microbasic *p*-amastigophores, *Ma* macrobasic *p*-amastigophores, *Sr* spirocysts. Categories from small to large size-classes were indicated with consecutive roman numbers

Table 4 Probability associate with pseudo-*F* values obtained through restricted permutations of the residuals of ANOVA or GLM models applied to the similarity matrices (Euclidian distance) calculated from length cnidae data sizes

	Tissue	Cnidae categories	<i>L. coralligens</i> Brown morpho-type vs <i>L. coralligens</i> Blue morphotype		<i>L. coralligens</i> Brown morpho-type vs <i>Lebrunia neglecta</i>		<i>L. coralligens</i> Blue morphotype vs <i>Lebrunia neglecta</i>	
			ANOVA	GLM	ANOVA	GLM	ANOVA	GLM
1	Actinopharynx	<i>Mil</i>	–	0.018*	–	2.20e–16*	–	2.00e–16*
2		<i>MiII</i>	–	0.307	–	2.20e–16*	2.20e–16*	–
3	Column	<i>Bs</i>	–	2.00e–16*	–	2.20e–16*	2.56e–05*	–
4		<i>Mil</i>	0.474	–	–	2.20e–16*	–	2.00e–16*
5	Filament	<i>Mil</i>	–	5.31e–05*	–	3.70e–10*	–	3.03e–02*
6		<i>MiII</i>	8.35e–06*	–	–	2.20e–16*	–	2.00e–16*
7	Pseudotentacles	<i>Bs</i>	–	0.0285*	–	1.00e–12*	–	8.47e–08*
8		<i>Mil</i>	–	0.00201*	–	2.20e–16*	–	2.00e–16*
9		<i>MiII</i>	–	2.56e–06*	–	2.20e–16*	–	2.00e–16*
10		<i>Ma</i>	2.20e–16*	–	–	2.20e–16*	–	2.00e–16*
11	Tentacle	<i>Bs</i>	0.4045	–	2.20e–16*	–	2.20e–16*	–
12		<i>Sr</i>	–	0.989	–	2.20e–16*	2.20e–16*	–
13		<i>Mil</i>	–	2.00e–16*	–	1.16e–07*	–	3.22e–07*
14		<i>MiII</i>	0.0007881*	–	–	2.20e–16*	–	2.00e–16*

Categories from small to large size-classes were indicated with consecutive roman numbers

Bs basitrichs, *Mi* microbasic *p*-amastigophores, *Ma* macrobasic *p*-amastigophores, *Sr* spirocysts

*Significant values

as scleractinian corals (Martínez-Baraldés et al. 2014; Addamo et al. 2015).

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All applicable international, national, and/or institutional guidelines for the care and use of animals were followed.

Informed consent Informed consent was obtained from all individual participants included in the study.

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