Supplementary materials, *Dichotomius satanas* (Coleoptera: Scarabaeidae, Scarabaeinae) of the cloud forest in eastern Mexico, by Julliana Barretto, Magdalena Cruz, and Federico Escobar. 2020. The Canadian Entomologist.

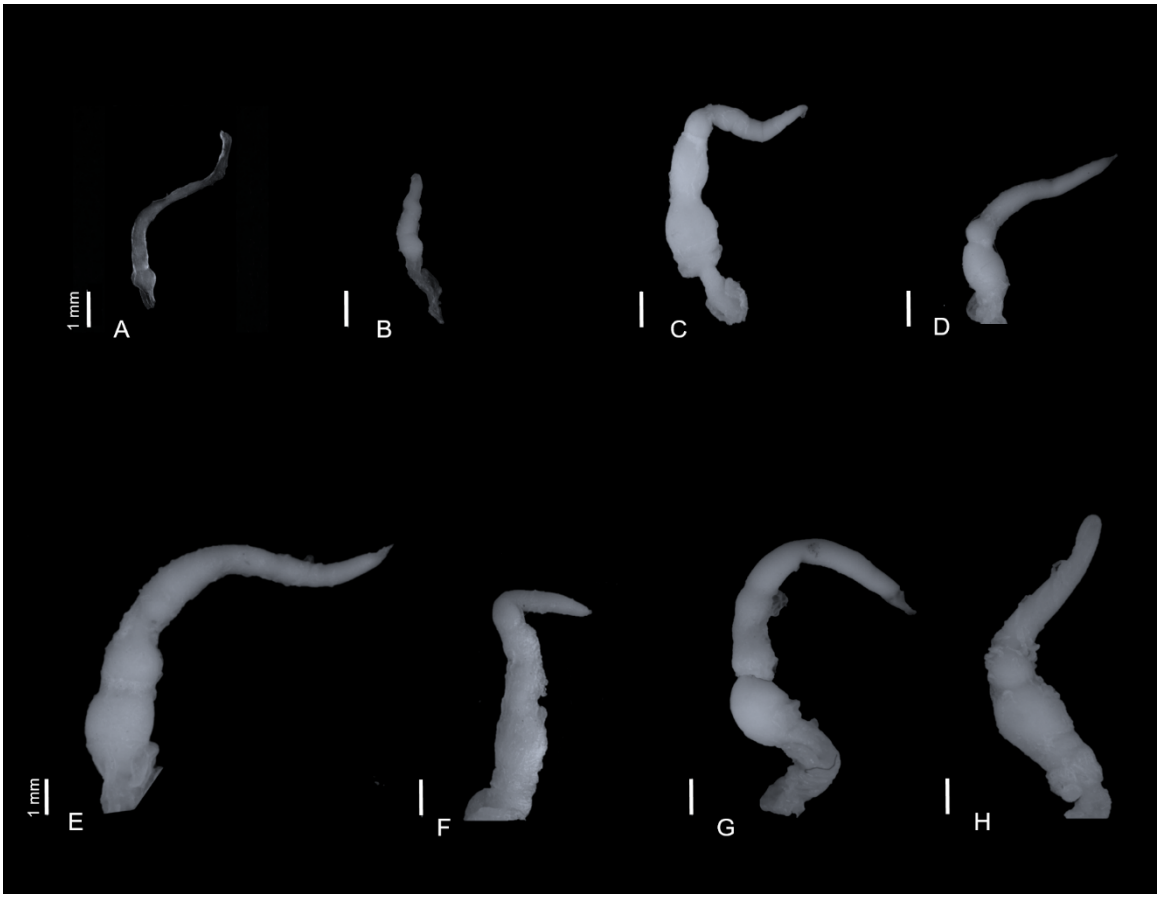
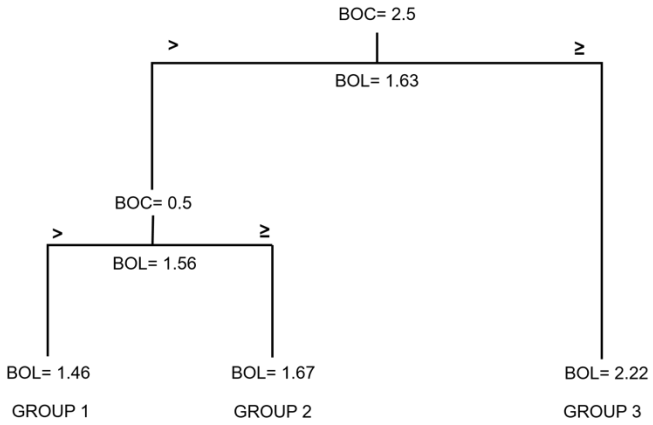


Fig. S1. Female ovaries of *Dichotomius satanas* captured between October 2015 and September 2016 in a cloud forest in Veracruz, Mexico. **A,** Ovary with basal oocyte absent; **B–H,** Variation of basal oocyte length.

Female

Predictor	%IncMSE	IncNodePurity
BF	20.88	9.85
BOC	8.95	3.16
IC	-2.58	2.65



Male

Predictor	IncMSE	IncNodePurity
BF	17.66	19.93
IC	16.51	19.07

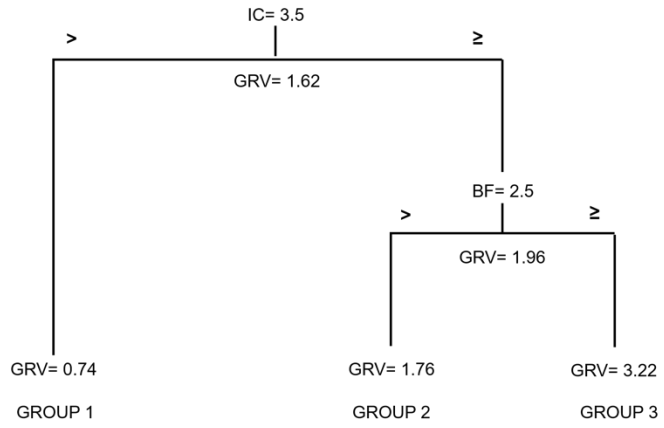


Fig. S2. Regression analysis trees of maturation states (immature, maturing, and mature) for *Dichotomius satanas* females and males, generated by the Random Forest Algorithm (Breiman 2001). The groups were formed considering the basal oocyte length (mm) and the glandular reservoir volume (mm^3) in females and males, respectively. The explanatory variables (predictors) considered were: body fat content (BF), intestinal content (IC), and basal oocyte color (BOC). Each of the tree splits (nonterminal nodes) is labelled with the variable and the values that determine the split. The terminal nodes were labelled with the split value of the basal oocyte length (BOL) and the glandular reservoir volume (GRV) for females and males, respectively. For both trees, the *importance* (%IncMSE and IncNodePurity) of each predictor is shown for the consensus tree.

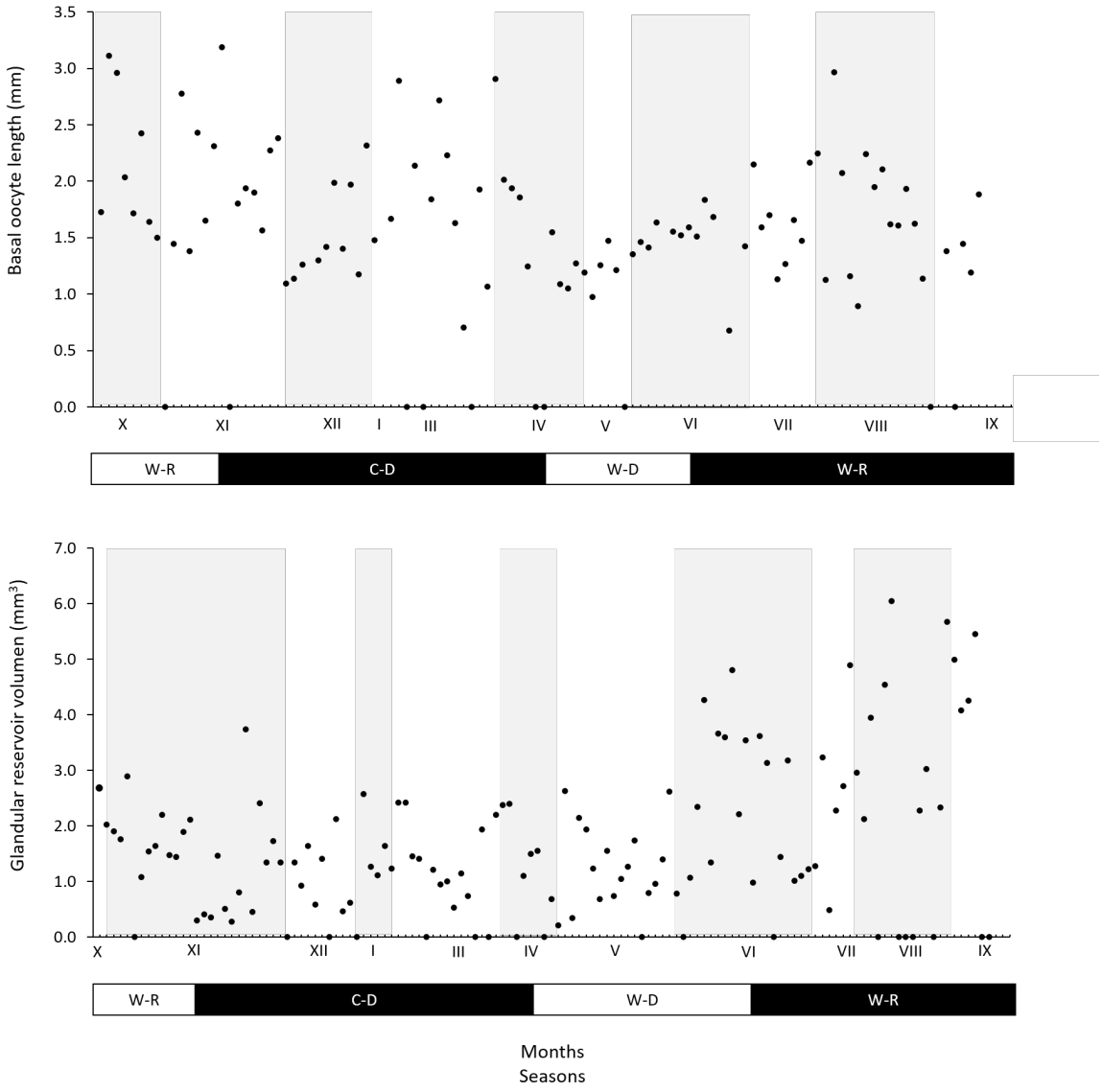


Fig. S3. Annual variation of basal oocyte length for females and glandular reservoir volume for males of *Dichotomius satanas* captured between October 2015 and September 2016 in a cloud forest in Veracruz, Mexico. Seasons: warm–rainy (W–R), cold–dry (C–D), and warm–dry (W–D).

Table S1. Generalized linear models (GLM) with a Poisson distribution for evaluating the relationship between the abundance of *Dichotomius satanas* and monthly temperature (maximum, mean, and minimum) and monthly precipitation recorded between October 2015 and September 2016 in a cloud forest in Veracruz, Mexico. The models considered abundance of all captured individuals (females + males), only female, and only male, according to maturation states (immature, maturing, and mature). Selected models are in bold font. $Total_{AB}$ = Total abundance (female + male). Maturation states: IM = immature; MG = maturing; M = mature. T_{max} = maximum temperature; T_{mean} = mean temperature; T_{min} = minimum temperature; P = precipitation.

Abundance	Maturation states	Variable	Model	P–Shapiro	*P*	AICc
All individuals (females + males)	All	Temperature	Null			149
			GLM ($Total_{AB}$ ~ Tmax)	0.93	0.54	51
			GLM ($Total_{AB}$ ~ Tmean)	0.99	0.0003	138
			GLM ($Total_{AB}$ ~ Tmin)	0.71	< 0.0	122
		Precipitation	GLM ($Total_{AB}$ ~ P)	0.49	< 0.0	122
		Temperature + Precipitation	**GLM ($Total_{AB}$ ~ Tmin + P)**	**0.94**	**< 0.0**	**120**
	Immature	Temperature	Null			116
			GLM (IM ~ Tmax)	0.61	0.38	118
			GLM (IM ~ Tmean)	0.16	0.33	118
			GLM (IM ~ Tmin)	0.28	0.01	112
		Precipitation	GLM (IM ~ P)	0.51	0.008	112
		Temperature + Precipitation	**GLM (IM ~ Tmin + P)**	**0.18**	**< 0.0**	**114**
	Maturing	Temperature	Null			77
			GLM (MG ~ Tmax)	0.58	0.57	80
			GLM (MG ~ Tmean)	0.78	0.001	69
			GLM (MG ~ Tmin)	**0.41**	**0.0006**	**65**
		Precipitation	GLM (MG ~ P)	0.17	< 0.0	68
	Mature	Temperature	Modelo Null			65
			GLM (M ~ Tmax)	0.17	0.33	67
			GLM (M ~ Tmean)	0.93	0.004	58
			GLM (M ~ Tmin)	0.62	0.002	55
		Precipitation	**GLM (M ~ P)**	**0.30**	**< 0.0**	**50**
Females	Immature	Temperature	Null			62
			GLM (IM ~ Tmax)	0.50	0.11	62
			GLM (IM ~ Tmean)	0.33	0.16	63
			GLM (IM ~ Tmin)	**0.18**	**0.01**	**58**
		Precipitation	GLM (IM ~ P)	0.90	0.08	62
	Maturing	Temperature	Null			58
			GLM (MG ~ Tmax)	0.42	0.45	60
			GLM (MG ~ Tmean)	0.39	0.01	54
			GLM (MG ~ Tmin)	**0.42**	**0.004**	**50**
		Precipitation	GLM (MG ~ P)	0.14	0.06	58
	Mature	Temperature	Null			49
			GLM (M ~ Tmax)	0.01	0.09	49
			GLM (M ~ Tmean)	0.01	0.44	51
			GLM M ~ Tmin)	0.01	0.40	51
		Precipitation	GLM (M ~ P)	0.02	0.31	51
Males	Immature	Temperature	Null			98
			GLM (IM ~ Tmax)	0.68	0.9	100
			GLM (IM ~ Tmean)	0.73	0.86	100
			GLM (IM ~ Tmin)	0.74	0.17	99
		Precipitation	**GLM (IM ~ P)**	**0.21**	**0.04**	**97**
	Maturing	Temperature	Null			55
			GLM (MG ~ Tmax)	0.53	0.98	58
			GLM (MG ~ Tmean)	0.99	0.06	54
			GLM (MG ~ Tmin)	0.98	0.05	53
		Precipitation	**GLM (MG ~ P)**	**0.27**	**0.001**	**48**
	Mature	Temperature	Null			53
			GLM (M ~ Tmax)	0.002	0.77	56
			GLM (M ~ Tmean)	0.81	0.005	39
			GLM (M ~ Tmin)	0.96	0.001	30
		Precipitation	GLM (M ~ P)	0.007	< 0.0	30
		Temperature + Precipitation	**GLM (M ~ Tmin + P)**	**0.05**	**0.01**	**25**

Table S2. Results of analysis of deviance (type II test) and Turkey test of contrasts obtained from the selected generalised linear model (interacted model) with a Poisson distribution for evaluating the effect of the state of maturation (immature, maturing, and mature) and sex on the abundance of the individuals of *Dichotomius satanas* captured between October 2015 and September 2016 in a cloud forest in Veracruz, Mexico. Bold text indicates statistically significant differences.

Analysis of deviance table.

Variable	Chi^2	df	P
State of maturation	**62.876**	**2**	**< 0.0001**
Sex	2.598	1	0.10699
State of maturation: Sex	**10.232**	**2**	**0.0060**

Tukey test contrast.

State of maturation / sex	Estimate	Std. Error	Z-value	P (>|z|)
Maturing male vs Maturing female	0.34093	0.23124	1.474	0.66879
Immature female vs Maturing female	0.04349	0.20856	0.208	0.99994
Immature male vs Maturing female	**0.62415**	**0.18473**	**3.379**	**0.00895**
Mature female vs Maturing female	**1.03407**	**0.29107**	**3.553**	**0.00490**
Mature male vs Maturing female	**0.97345**	**0.28469**	**3.419**	**0.00782**
Immature female vs Maturing male	0.38441	0.22919	1.677	0.53336
Immature male vs Maturing male	**0.96508**	**0.20774**	**4.646**	**< 0.001**
Mature female vs Maturing male	0.69315	0.30619	2.264	0.19941
Mature male vs Maturing male	0.63252	0.30012	2.108	0.27167
Immature male vs Immature female	**0.58067**	**0.18216**	**3.188**	**0.01687**
Mature female vs Immature female	**1.07756**	**0.28944**	**3.723**	**0.00255**
Mature male vs Immature female	**1.01693**	**0.28302**	**3.593**	**0.00411**
Mature female vs Immature male	**1.65823**	**0.27277**	**6.079**	**< 0.001**
Mature male vs Immature male	**1.59760**	**0.26595**	**6.007**	**< 0.001**
Mature male vs Mature female	0.06062	0.34832	0.174	0.99998