

## Notable range and altitudinal records from Cusuco National Park and environs, north-western Honduras

Thomas Edward Martin, Fabiola Rodríguez, Wilf Simcox, Iain Dickson, John Van Dort, Ernesto Reyes and Samuel E. I. Jones

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Los bosques montaños del norte de Mesoamérica albergan una rica comunidad de aves con un elevado número de endemismos, los cuales han sido poco estudiados en comparación con ecosistemas similares en otras partes de esta región. Particularmente, el bosque montano del norte de Honduras, próximo al mar Caribe, permanece poco explorado, con escasos ejemplos de publicaciones en años recientes. Un indicativo de este déficit wallaceano (falta de información biogeográfica a nivel de especie) del área puede ser observado en su exclusión de revisiones regionales sobre la riqueza de aves en bosques nublados mesoamericanos, y la falta de consolidación de áreas importantes de aves (AICAs). Esto propicia incertidumbre sobre cuales especies se encuentran en esta montaña costera, y cómo la distribución altitudinal de estas especies se diferencia de aquellas observadas en bosques montaños en las cordilleras del interior de Centroamérica. Revisamos la información colectada entre 2006 y 2014 por el programa de monitoreo ornitológico de Operación Wallacea en el Parque Nacional Cusuco y localidades colindantes en el noroeste de Honduras. Reportamos registros que representan una extensión notable de rango y altitud basado en comparaciones con datos en la literatura existente.

The highland forests of northern Central America—part of the Mesoamerican biodiversity ‘hotspot’<sup>33</sup>—support rich avian communities that display high levels of regional endemism<sup>40</sup>. However, compared to similar ecosystems elsewhere in Middle America—those of Costa Rica or Mexico, for example<sup>11</sup>—they remain poorly studied by ornithologists. The montane forests of northern Honduras near the Caribbean coast are especially under-explored, with few published data from this region. An indication of the Wallacean shortfall (lack of species-level biogeographic data<sup>28</sup>) from the

area is its exclusion from regional reviews of avian richness in Mesoamerican cloud forests<sup>11</sup>, and the lack of Important Bird Areas (IBAs) identified by BirdLife International<sup>4</sup>. This paucity of information has facilitated some ambiguity as to which species occur in these coastal mountains and how their altitudinal distributions differ from those reported from highland forests in the interior cordilleras of Central America. Here, we review data collected in 2006–14 by the long-running Operation Wallacea ornithological monitoring programme in Cusuco National Park (CNP) and its immediate environs,

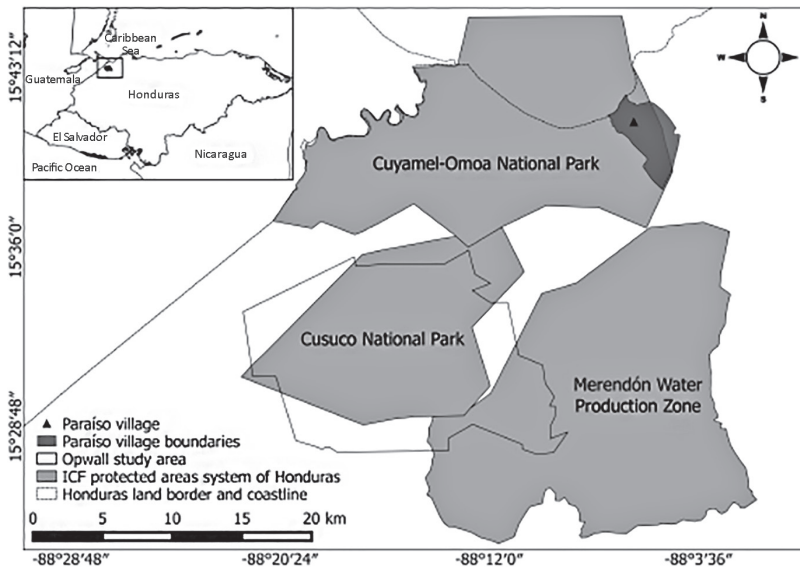


Figure 1. Location of Cusuco National Park and adjacent protected areas within Honduras and northern Central America. ‘Opwall’ = Operation Wallacea and ICF = Instituto de Conservación Forestal.

in north-west Honduras. We highlight notable distributional and altitudinal records based on information in the literature.

### Study area and Methods

CNP is a protected area in dptos. Cortés and Santa Bárbara in north-west Honduras (Fig. 1). It is located in the Sierra de Omoa, part of the Cordillera de Merendón, encompassing an altitudinal range of 500–2,242 m<sup>27</sup>. The study area comprises parts of two protected areas: most of CNP and the adjacent Merendón Water Producing Zone; additionally the nearby Caribbean lowlands include Cuyamel-Omoa National Park (Fig. 1). We also reviewed records from the coastal village of Paraíso (15°41.2'N 88°06.2'W) which lies entirely outside but close to CNP's northern border.

Vegetation classifications in CNP include cleared agricultural land and patches of second-growth moist broadleaf forest at lower altitudes (500–1,200 m), semi-arid pine-oak forest and tropical montane cloud forest at middle / upper elevations (1,200–2,000 m), and elfin forest on mountaintops above 2,000 m<sup>2,23</sup>. Despite its relatively small size, CNP supports a rich biodiversity with high levels of endemism among many taxonomic groups, especially herpetofauna<sup>41</sup>. Its biological importance is such that it was recently listed as one of Earth's top 100 'most irreplaceable' protected areas<sup>25</sup>.

Eight-week formal ornithological surveys were undertaken in CNP in June–August annually since 2006 as part of an Operation Wallacea long-term biodiversity monitoring programme<sup>38</sup>, and were preceded by informal preliminary survey work in 2004–05. The formal monitoring programme comprised two survey methods. Firstly, an extensive point count protocol whereby ten-minute unlimited-radius dawn counts<sup>3</sup> (05h30–09h30 each morning) were conducted at 129 sites located throughout CNP. These sites were spread across 28 transects of variable length. Transects each contained between two and eight sites, with a distance of 300 m separating each site. Each site was surveyed three times in the course of each field season. As of the end of the 2014 season, the survey has yielded c.571 hours of data. The second methodology comprised various mist-netting surveys conducted at six camps throughout CNP. Mist-netting effort in 2006–11 was rather opportunistic, largely aimed to address biases in species under-sampled by point counts. However, post-2012 a more constant-effort mist-netting protocol modelled on the US TMAPS programme, a tropical variant of the MAPS programme (<http://www.birdpop.org/pages/maps.php>), was adopted. More detailed descriptions of these two methodologies have been published elsewhere<sup>22,30,31</sup>. Additionally, our ornithological records were supplemented by several thousand

person-hours of opportunistic observations during the main field seasons (when ornithologists were in the field but not undertaking formal survey work). Some additional surveys were undertaken at other times of year—notably field work led by JVD to survey wintering Golden-cheeked Warblers *Setophaga chrysoparia* in CNP's pine-oak habitats<sup>24</sup>. This was undertaken in January or February for a period of five days annually in 2007–09, with a two-day survey in January 2010. Consequently the park's avifauna is now relatively well known, especially its resident species. A total of 287 species had previously been reported from CNP<sup>36</sup>, although we carefully scrutinised the previously published inventory and removed several uncertain records. This produced a more conservative park list of 266 species. A full account of species removed from the previous inventory will be provided in a future publication (Jones *et al.* in prep).

To identify notable range extensions, we compared all 266 species on our list with the distributions mapped in one of the region's widely used field guides<sup>12</sup>, the principal monograph on Honduran avifauna<sup>32</sup>, various periodical publications<sup>5,15–21,29,37</sup>, and high-quality online resources<sup>4,13,39</sup>. We also consulted the distribution maps in the national field guide to Honduras<sup>10</sup> prior to its publication. We include any range extensions reported in the latter work here, given that they had been unpublished elsewhere at the time of writing. We acknowledge that this is a limited range of material against which to compare our records—this is due to a paucity of ornithological research in the region (further highlighting the need for more information regarding regional species distributions). We defined all species detected in the park, but not currently mapped anywhere within north-west Honduras in any of our comparative sources, as 'substantial extensions' of range, and all species mapped as occurring in north-west Honduras by at least one previous source, but not within the CNP, as 'minor extensions'. We also calculated the number of observations for each species regarded as a range extension by our formal surveys (and opportunistic records for which we possessed quantitative data).

We noted our highest and lowest altitudinal records for each species on the park list, and compared these against altitudinal ranges described elsewhere. Elevations were obtainable for most records in our database as all of the long-term mist-netting and point count locations possess accurate GPS coordinates. Opportunistic sightings that could not be accurately calibrated to a nearby GPS coordinate were discarded. All species for which our data exceed the currently defined overall altitudinal ranges we report as global high- or low-altitude records. All species for which our

Table 1. Bird species records from Cusuco National Park representing substantial extensions to current ranges. Taxonomy follows that of AOU<sup>1</sup>. Species denoted <wv> are winter visitors. Species marked \* are Mesoamerican hotspot endemics<sup>9</sup> and are discussed in the species accounts. Species marked # were detected just outside the limits of Cusuco National Park on the Caribbean coast at Paraíso. Species marked † were mapped as occurring in Cusuco National Park and/or its vicinity by Gallardo *et al.*<sup>10</sup>. Species highlighted in bold are known to breed in the study area. Notations in the evidence column are as follows: C = captured (mist-netted), H = heard, P = photographed, S = sight record. # Observ column shows total number of individuals of each species detected during formal surveys and opportunistic records for which we possess quantitative data. Species marked > in this column possess further opportunistic records, but without quantitative data. Initials in the observer column are those of authors with records of each species. Species observed by four or more authors are annotated 'multiple'. The final two columns correspond to sound-recordings and photographs deposited online at Xeno-canto and the Internet Bird Collection, respectively.

Family	English name	Scientific name	Evidence	# Observ	Observers	XC voucher #	IBC voucher #
Columbidae	<b>White-winged Dove†</b>	<b><i>Zenaida asiatica</i></b>	<b>S,H,P</b>	442	<b>Multiple</b>	<b>XC192164</b>	<b>IBC319291</b>
Apodidae	<b>Black Swift†</b>	<b><i>Cypseloides niger</i></b>	<b>S,H,P</b>	<b>&gt;13</b>	<b>SEIJ, TM, WS</b>		<b>IBC319382</b>
Trochilidae	Berylline Hummingbird	<i>Amazilia beryllina</i>	S,C,P	2	WS		
	White-eared Hummingbird†	<i>Hylocharis leucotis</i>	S,C,P	26	Multiple		IBC319294
Picidae	Acorn Woodpecker†	<i>Melanerpes formicivorus</i>	S,H,C	>6	Multiple		
Vireonidae	Warbling Vireo<wv>	<i>Vireo gilvus</i>	S	>1	ER		
Certhiidae	Brown Creeper†	<i>Certhia americana</i>	S	2	JVD		
Troglodytidae	Rufous-browed Wren*	<i>Troglodytes rufociliatus</i>	S,H,P	>1	ER	XC284821	IBC320167
Cinclidae	<b>American Dipper</b>	<b><i>Cinclus mexicanus</i></b>	<b>S,H,C,P</b>	<b>&gt;4</b>	<b>Multiple</b>		<b>IBC319292</b>
Turdidae	<b>Ruddy-capped Nightingale-Thrush†</b>	<b><i>Catharus frantzii</i></b>	<b>S,H,C,P</b>	110	Multiple	XC286563	IBC319289
	Mountain Thrush†*	<i>Turdus plebejus</i>	S,H	3	ER, FR, ID		
Parulidae	Townsend's Warbler<wv>	<i>Setophaga townsendi</i>	S	2	JVD		
	Hermit Warbler†<wv>	<i>Setophaga occidentalis</i>	S	4	FR, JVD		
	Painted Redstart	<i>Myioborus pictus</i>	S	2	JVD		
Thraupidae	<b>Cinnamon-bellied Flowerpiercer</b>	<b><i>Diglossa baritula</i></b>	<b>S,H,C,P</b>	5	<b>Multiple</b>	<b>XC286566</b>	<b>IBC319290</b>
Icteridae	Spot-breasted Oriole†#	<i>Icterus pectoralis</i>	S,P	4	Multiple		
	Altamira Oriole†#	<i>Icterus gularis</i>	S	5	Multiple		
Fringillidae	Elegant Euphonia†	<i>Euphonia elegantissima</i>	S	>1	Multiple		

data exceed currently described elevation ranges for northern Central America—especially those in Howell & Webb<sup>12</sup>—we report as regional high- or low-altitude records.

Following recommendations for publicly accessible, digital inventories<sup>26</sup>, we uploaded all available vocal recordings and photographs supporting our records to Xeno-canto ([www.xeno-canto.org](http://www.xeno-canto.org)) and the Internet Bird Collection (<http://ibc.lynxeds.com>), respectively, and collated unique voucher numbers for each.

## Results

In the course of processing the data collected between 2006 and 2014, we reviewed a total of 25,781 individual bird records in our point count database and 2,772 captures in our mist-netting database, as well as opportunistic sightings

from all of the authors' personal records. From this analysis, we identified 18 species for which we believe our records represent a substantial extension to their currently described range (Table 1), and a further 23 species that we report as minor range extensions (Table 2). All of these range extensions are based on records made within the borders of CNP except Spot-breasted Oriole *Icterus pectoralis* and Altamira Oriole *I. gularis*. Both were recorded just outside the park in Paraíso village on the Caribbean coast, where they appear to be common. We also identified another ten species for which we believe our data represent new global high-altitude records (Table 3) and ten which we believe represent regional high-altitude records (Table 4). No global or regional low-altitude records were identified.

Table 2. Bird species records from Cusuco National Park representing minor extensions to current ranges. See Table 1 for legend.

Family	English name	Scientific name	Evidence	# Observ	Observers	XC voucher #	IBC voucher #
Columbidae	White-tipped Dove†	<i>Leptotila verreauxi</i>	S,H	>4	FR, TM, WS		
	<b>White-faced Quail-Dove†</b>	<b><i>Geotrygon albifacies</i></b>	<b>S,H,C,P</b>	234	<b>Multiple</b>	<b>XC286567</b>	<b>IBC319295</b>
Apodidae	Chestnut-collared Swift†	<i>Streptoprocne rutila</i>	S	1	ID		
Trochilidae	<b>Magnificent Hummingbird</b>	<b><i>Eugenes fulgens</i></b>	<b>S,H,C,P</b>	32	Multiple		IBC319944
	Sparkling-tailed Hummingbird†	<i>Tilmatura dupontii</i>	S,P	2	ER		IBC321172
	<b>Wine-throated Hummingbird†*</b>	<b><i>Atthis ellioti</i></b>	<b>S,C,P</b>	7	<b>Multiple</b>	<b>XC284822</b>	<b>IBC319308</b>
Picidae	Northern Flicker	<i>Colaptes auratus</i>	S	>3	ER, TM, WS		
Thamnophilidae	<b>Scaled Antpitta†</b>	<b><i>Grallaria guatemalensis</i></b>	<b>S,C,P</b>	4	FR, SEIJ, WS		<b>IBC318939</b>
Furnariidae	<b>Spot-crowned Woodcreeper</b>	<b><i>Lepidocolaptes affinis</i></b>	<b>S,H,C,P</b>	73	Multiple	XC284826	IBC319293
	<b>Ruddy Foliage-gleaner</b>	<b><i>Automolus rubiginosus</i></b>	<b>S,H,C,P</b>	69	Multiple		IBC319322
Tyrannidae	<b>Mountain Elaenia</b>	<b><i>Elaenia frantzii</i></b>	<b>S,C,P</b>	1	SEIJ		IBC318929
	Tufted Flycatcher	<i>Mitrephanes phaeocercus</i>	S,H,P	18	Multiple	XC284830	IBC319323
	<b>Yellowish Flycatcher†*</b>	<b><i>Empidonax flavescens</i></b>	<b>S,H,C,P</b>	871	<b>Multiple</b>	<b>XC287685</b>	<b>IBC318938</b>
Vireonidae	Blue-headed Vireo†<vw>	<i>Vireo solitarius</i>	S	2	FR, JVD		
Troglodytidae	Band-backed Wren†	<i>Campylorhynchus zonatus</i>	S,H,P	7	ER, FR, SEIJ		IBC319318
	<b>Grey-breasted Wood Wren†</b>	<b><i>Henicorhina leucophrys</i></b>	<b>S,H,C,P</b>	1,698	<b>Multiple</b>	<b>XC108449</b>	<b>IBC319305</b>
Parulidae	<b>Slate-throated Redstart†</b>	<b><i>Myioborus miniatus</i></b>	<b>S,H,C,P</b>	1,198	<b>Multiple</b>	<b>XC287624</b>	<b>IBC318927</b>
Emberizidae	White-naped Brush Finch†	<i>Atlapetes albinucha</i>	S,P	8	FR, SEIJ		IBC319273
	<b>Rusty Sparrow†</b>	<b><i>Aimophila rufescens</i></b>	<b>S,C,P</b>	37	Multiple		IBC319272
	<b>Common Chlorospingus†</b>	<b><i>Chlorospingus flavopectus</i></b>	<b>S,H,C,P</b>	2,912	<b>Multiple</b>	<b>XC108441</b>	<b>IBC318928</b>
Cardinalidae	<b>Flame-coloured Tanager†</b>	<b><i>Piranga bidentata</i></b>	<b>S,H,C,P</b>	261	Multiple	XC192157	IBC319288
	White-winged Tanager†	<i>Piranga leucoptera</i>	S,H,C,P	6	ER, FR, SEIJ	XC287849	
Icteridae	Yellow-backed Oriole†	<i>Icterus chrysater</i>	S	39	ER, FR, TM		

Fourteen sound-recording and 24 photographic vouchers were lodged in support of our distribution records (Tables 1–2). No vouchers were lodged for altitudinal records as we did not possess recordings or photographs pertaining to any of the specific individual records, nor would they represent verifiable documentation of altitude.

None of these records pertain to species considered threatened or Near Threatened by the IUCN<sup>14</sup>, although seven are of endemics that occur only in the Mesoamerican biodiversity hotspot<sup>8</sup>. We provide further information relating to these regional endemics in the following species accounts.

#### **Black-crested Coquette** *Lophornis helenae*

Fairly rare and local, typically recorded c.2–3 times per field season by a combination of mist-net captures, point count records and opportunistic observations. Global high-altitude record. Max.

altitude 1,500 m<sup>12</sup>, but TM, ER & WS caught one in a mist-net in pine–oak forest at 1,655 m on 25 June 2007. Additional records in CNP were made at 1,500–1,650 m in other areas of pine–oak forest, broadleaf cloud forest, and cultivated clearings within the park’s borders.

#### **White-bellied Emerald** *Amazilia candida*

Fairly common throughout the park and frequently recorded via mist-netting and opportunistic observations. Global high-altitude record. The literature currently defines its altitudinal range as 0–1,600 m<sup>4</sup>. SEIJ & ID trapped one at an elfin forest edge at 1,930 m on 25 June 2012. Also regularly recorded at 1,600–1,900 m elsewhere in the park.

#### **Wine-throated Hummingbird** *Atthis ellioti*

Rare in CNP, being recorded a total of seven times by our formal surveys (usually individuals

Table 3. Bird records from Cusuco National Park representing global high-altitude records. Taxonomy follows that of the AOU<sup>1</sup>. Species marked <sv> are summer visitors. Species marked \* are Mesoamerican hotspot endemics<sup>9</sup> and are discussed in the species accounts. The 'previous record' column refers to sources of these records in the References. Species marked † are also noted as occurring at or beyond these elevations in Gallardo *et al.*<sup>10</sup>. Notations in the evidence column are as follows: C = captured (mist-netted), H = heard, P = photographed, S = sight record. Notations in the observer column represent the initials of the author(s) responsible for the record.

Family	English name	Scientific name	CNP record	Previous record	Evidence	Observers
Columbidae	Grey-chested Dove	<i>Leptotila cassini</i>	1,655 m	1,400 m <sup>4,13</sup>	C	ER, WS
Trochilidae	Black-crested Coquette*	<i>Lophornis helenae</i>	1,655 m	1,500 m <sup>13</sup>	C	ER, WS
	White-bellied Emerald*	<i>Amazilia candida</i>	1,930 m	1,600 m <sup>4</sup>	C	ID, SEIJ
Ramphastidae	Keel-billed Toucan†	<i>Ramphastos sulfuratus</i>	1,640 m	1,600 m <sup>4,8</sup>	S	ID
Furnariidae	Scaly-throated Leafosser	<i>Sclerurus guatemalensis</i>	1,560 m	1,250 m <sup>4,8</sup>	S, P	SEIJ
	Ruddy Woodcreeper	<i>Dendrocincla homochroa</i>	1,940 m	1,800 m <sup>4,8</sup>	C	TM, WS
Troglodytidae	Nightingale Wren	<i>Microcerculus philomela</i>	2,015 m	1,800 m <sup>8</sup>	H	FR
	Spot-breasted Wren*	<i>Pheugopedius maculipectus</i>	1,620 m	1,300 m <sup>4,8,13</sup>	S	ER
Turdidae	Black-headed Nightingale-Thrush	<i>Catharus mexicanus</i>	2,070 m	1,800 m <sup>4,8,13</sup>	H	FR
Cardinalidae	Red-throated Ant Tanager	<i>Habia fuscicauda</i>	1,350 m	1,300 m <sup>10</sup>	C	ER

Table 4. Bird records from Cusuco National Park representing regional (northern Central America) high-altitude records. Table 3 provides a summary of all information provided and of all symbols used.

Family	English name	Scientific name	CNP record	Previous record	Evidence	Observers
Eurypygidae	Sunbittern	<i>Eurypyga helias</i>	1,565 m	1,300 m <sup>10</sup>	C	TM, WS
Furnariidae	Wedge-billed Woodcreeper	<i>Glyphorhynchus spirurus</i>	1,350 m	1,200 m <sup>13</sup>	C	WS
Tyrannidae	Ochre-bellied Flycatcher†	<i>Mionectes oleagineus</i>	1,655 m	1,600 m <sup>13</sup>	C	ER, WS
	Yellow-olive Flycatcher†	<i>Tolmomyias sulphurescens</i>	1,350 m	1,200 m <sup>8,13</sup>	C	WS
	Sulphur-bellied Flycatcher<sv>	<i>Myiodynastes luteiventris</i>	1,925 m	1,800 m <sup>8,13</sup>	S	TM
Vireonidae	Lesser Greenlet	<i>Hylophilus decurtatus</i>	1,575 m	1,500 m <sup>4,13</sup>	S	ID
Troglodytidae	White-breasted Wood Wren†	<i>Henicorhina leucosticta</i>	1,430 m	1,300 m <sup>4,13</sup>	H	SEIJ
Incertae Sedis	Bananaquit	<i>Coereba flaveola</i>	1,655 m	1,000 m <sup>13</sup>	C	ER, WS
Cardinalidae	Red-crowned Ant Tanager	<i>Habia rubica</i>	1,650 m	1,500 m <sup>13</sup>	S	ID
Icteridae	Chestnut-headed Oropendola†	<i>Psarocolius wagleri</i>	1,625 m	1,200 m <sup>13</sup>	H	ER

trapped in mist-nets). However, it was recorded on several additional occasions during recent field work not included here (SEIJ pers. obs.). Minor range extension as, while mapped as occurring in north-west Honduras<sup>4,13,32</sup>, these maps do not encompass most of CNP. Breeds in CNP as evidenced by a female with a brood patch and a male with cloacal protuberance (WS), and observations of numerous males singing on territories (SEIJ).

#### Yellowish Flycatcher *Empidonax flavescens*

Very common in CNP, with 871 records at 1,200–2,000 m. Minor range extension as current maps only indicate its presence within a very small part of the Merendón cordillera beyond the CNP<sup>4,32</sup>. Evidence of breeding regularly observed in CNP by SEIJ & WS, including females with brood patches, males with cloacal protuberances, and juveniles both trapped and observed in the field.

**Rufous-browed Wren** *Troglodytes rufociliatus*

Apparently rare in CNP, known only from one photographed by ER at c.1,300 m on 5 August 2007. Substantial range extension, current literature describing the species only from the central cordilleras of Honduras, c.70 km to the south<sup>4,10,13</sup>. However, this species was recorded relatively regularly during more recent field work not included herein, with multiple singing males heard and seen on territories at several locations (SEIJ pers. obs.).

**Spot-breasted Wren** *Pheugopedius maculipectus*

Fairly common at lower–middle altitudes in the park, being detected relatively frequently by mist-netting and point counts. Global high-altitude record. Currently reported altitudinal range 0–1,300 m<sup>4,12,13,25</sup>, and, while the majority of our records are from this range, it has occasionally been detected higher, up to 1,620 m (sight record by ER on 2 August 2006). Also recorded by JVD at higher altitudes than the current limits in Santa Barbara National Park, central-west Honduras.

**Mountain Thrush** *Turdus plebejus*

Rare in CNP. Known from only three records (a sight record by ER on 28 July 2006, and vocal records by FR & ID on 8 July 2010 and 22 June 2012), all above 1,700 m in the centre of the park. These represent a substantial extension to the species' known distribution, it being currently mapped as occurring only in the central cordilleras of Honduras, c.70 km to the south<sup>4,10,12,32</sup>.

**Discussion**

This study reports a large number of new distribution and elevational records from the mountains of north-west Honduras. Many of the range extensions are of species apparently very common in CNP, e.g. Common Chlorospingus *Chlorospingus flavopectus* (2,912 records) and White-winged Dove *Zenaida asiatica* (442 records). Other species appear to be very rare, e.g. Chestnut-collared Swift *Streptoprocne rutila* and Sparkling-tailed Hummingbird *Tilmatura dupontii*, both of which are known from single records alone. It is uncertain whether these infrequently recorded species are transient visitors, naturally rare, or under-recorded by our surveys. Further work in CNP may improve our knowledge of their status.

Several range extensions we report are substantial, e.g. for Ruddy-capped Nightingale-Thrush *Catharus frantzii* and Mountain Thrush. Several altitudinal range extensions are also notable; Bananaquit *Coereba flaveola*, for example. While this species occurs in montane ecosystems elsewhere in the Neotropics up to 2,400 m<sup>13</sup>, its upper elevational limit in northern Central America is reported to be 1,000 m<sup>12</sup>. Records from

CNP greatly exceed this, with the species recorded as high as 1,655 m.

Several reasons can be hypothesised for the fairly substantial number of novel records we have reported from CNP. Many new range records probably reflect Wallacean shortfall, considering the poorly studied nature of the mountains of northern Honduras. Our review of the literature located no other recent scientific research from these mountains other than that resulting from Operation Wallacea's biodiversity monitoring programme in CNP. That the area remains poorly explored indicates that the potential for novel records is high. Existing distribution maps also suggest a presumption by species distribution models (presumably influenced by the lack of field data) that several montane species only occur in the higher central Honduran mountains. Some of our range extensions prove this is not correct. The previously undocumented presence of other montane species is perhaps the product of assumptions that some species found in the interior cordilleras of Honduras do not reach the Caribbean slope, which many of our minor range extensions indicate is not the case.

The relatively numerous new high-altitude records we present from CNP are, at least in part, likely to stem from a lack of regional exploration, in the mountains of north-west Honduras specifically but also in Mesoamerican montane areas generally. The lack of detailed ecological data for many species in these mountains suggests that their altitudinal ranges might be inadequately known, at least regionally. This could be especially relevant with respect to seasonal upslope movements. Another factor is the coastal nature of the mountains within CNP. Milder maritime climate and the influence of Alizé trade winds on the north-facing slope of the Merendón cordillera create relatively warm conditions at middle and high altitudes in CNP, which could permit some species to persist higher than is possible in the cooler, drier mountains of interior Central America<sup>7</sup>. The influence of warmer air parcels influencing species distributions in cloud forests has been described elsewhere, albeit not for birds<sup>6</sup>. However, if local conditions do influence avian ranges on the Caribbean slope, without a more thorough understanding of the ecological determinants of avian species ranges relevant to microclimate, accurate predictions will prove challenging. These are interesting ecological questions, however, that could have a potentially important influence on our understanding of the biogeography of the northern Central American coast.

The large number of novel altitudinal records we report from CNP might also reflect the effects of climate change. Upslope elevational shifts in species distributions have been identified as one

of the major consequences of global warming in tropical montane cloud forests<sup>9,35</sup>. Such changes could represent a serious conservation concern for the park's avifauna, as continued warming and associated changes in habitat structure are predicted to severely limit suitable habitat ranges for many cloud forest endemics inhabiting Mesoamerican cordilleras in the mid-term future<sup>34</sup>.

In summary, our study contributes to an understanding of avian distributions in montane forests of north-west Honduras. Our results also suggest conservation implications for other northern Mesoamerican coastal ranges, indicating that the biological importance of cordilleras facing the Caribbean may have been under-estimated, being more species rich and supporting broader altitudinal niches than predicted previously. Such implications extend to nearby protected areas. Pico Bonito National Park, 130 km to the east, for example, covers a large (107,107 ha) part of the Cordillera Nombre de Dios and reaches altitudes of 2,480 m. Despite being one of the primary birdwatching destinations in Honduras, little formal ornithological work has been conducted there and it remains poorly known. Our results from CNP suggest that the forests of Pico Bonito, along with other mountains on the northern Honduran coast, could support richer avian communities than predicted by published range maps, and this should be considered when determining the conservation value of these poorly studied areas. We strongly advocate continued exploration of these ecosystems, as well as of the ecological determinants and mechanisms underpinning biogeographical patterns there.

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#### Thomas Edward Martin

Operation Wallacea Ltd., Wallace House, Old Bolingbroke, Lincolnshire, PE23 4EX, UK; and School of Biological Biomedical & Environmental Sciences, Hardy Building, University of Hull, Hull, HU6 7RX, UK. E-mail: tom\_martin\_2010@yahoo.co.uk (corresponding author).

#### Fabiola Rodríguez, Wilf Simcox, Iain Dickson and Ernesto Reyes

Operation Wallacea Ltd., Wallace House, Old Bolingbroke, Lincolnshire, PE23 4EX, UK.

#### John Van Dort

SalvaNATURA Fundación Ecológica, 33 Av. Sur 640 Col. Flor Blanca, San Salvador, El Salvador.

#### Samuel E. I. Jones

Operation Wallacea Ltd., Wallace House, Old Bolingbroke, Lincolnshire, PE23 4EX, UK; and London Doctoral Training Partnership, Dept. of Geography, University College London, Gower Street, London, WC1E 6BT, UK.