

law<sup>12</sup> demonstrate that bacterial lipopolysaccharides (LPS) are degraded very rapidly. A substantial bacterial contribution to C<sub>org</sub> in petroleum source beds can, thus, only be expected if bacteria contain recalcitrant constituents or if remineralization is cut short by temperature, removal of necessary micronutrients, or some similar factor.

So far, the presence of recalcitrant bacterial components in sediments has not been shown, despite the preliminary data concerning the presence of polar resistant organic material in a specific group of pathogenic bacteria<sup>6</sup>. The lack of preserved organic matter in ancient stromatolites derived from bacterial communities in contrast to their contemporary equivalents indicates that such recalcitrant bacterial components are not important. Further, independent carbon isotope analyses of pyrolysates of kerogens of diverse origin are pertinent for two reasons. First, they indicate that contributions from 'hopane-synthesizing bacterial' (cyanobacteria, heterotrophic and methanotrophic bacteria) are minor<sup>13</sup>. Second, they indicate that contributions from resistant algal biopolymers are dominant<sup>1</sup>.

In our paper, we concluded<sup>1</sup> that "net contributions of bacterial biomass are

often small" and acknowledged "the undoubted importance of bacterial reworking of sedimentary organic matter". We have avoided any "sweeping generalizations", but we do recommend a sweeping re-evaluation of the belief that bacteria are quantitatively important sources of organic carbon in carbonaceous sediments.

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considered extinct by Rabor survive at Tabunan, as well as the four taxa he found extant<sup>6</sup>. So seven of Cebu's endemic birds survive, twice the number predicted by the species - area relationship. Does this support Budiansky's views that such theoretical predictions are incorrect, and that deforestation does not cause species extinctions?

It does not. Cebu's remaining endemic birds survive in only 15 km<sup>2</sup> of forest. The latest Red Data Book<sup>7</sup> lists the island's two endemic species, the Cebu flowerpecker and the black shama (*Copsychus cebuensis*), as 'threatened'. The same criteria<sup>7</sup> indicate that we should also consider Cebu's five extant endemic subspecies to be 'threatened'. Thus all seven of Cebu's remaining endemic taxa have at least "a high risk of extinction in the medium-term"<sup>7</sup>. This is considerably more serious than the prediction of the species - area relationship that 3.3 species should survive. So Cebu's endemic birds are indeed "committed to extinction"<sup>1</sup>. Our discoveries thus herald both good and bad news.

The good news is that there is still hope, even for species written off as extinct like the Cebu flowerpecker. If this rediscovery is possible, surely other 'extinct' species survive elsewhere. The bad news is that we have no breathing space. To save the Cebu flowerpecker and the island's other endemic taxa will require considerable effort. The Philippine Wetland and Wildlife Conservation Foundation Inc. has initiated a project for conservation on Cebu, but it is very short of money. Unless this situation changes in the immediate future, the Cebu flowerpecker will rejoin the list of birds that have become globally extinct, with no hope of rediscovery.

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## Extinction and conservation on Cebu

SIR — Heywood *et al.*<sup>1</sup> argue that predicted extinction rates are higher than those observed because of the time lag before we lose species "committed to extinction". Budiansky<sup>2</sup> suggests instead that the predicted extinction rates are "simply wrong". Our ornithological fieldwork on the island of Cebu, in the Philippines, supports the argument of Heywood *et al.*

Cebu retains 15 km<sup>2</sup> of dipterocarp forest, 0.3% of its original cover<sup>3</sup>. In the 1950s, Rabor<sup>4</sup> failed to record nine of the ten bird taxa then considered endemic to Cebu. He concluded that deforestation had caused the extinction of these birds. Dickinson *et al.*<sup>3</sup> considered an additional four taxa to be endemic, of which three are extant. Nevertheless, Cebu appeared to be a textbook application of the species-area relationship to predict extinctions following habitat destruction<sup>5</sup>. We can rewrite  $S = c(A)^{0.25}$ , where  $S$  is the number of taxa,  $A$  the area and  $c$  a constant, as  $S_{\text{new}} = S_{\text{original}} (A_{\text{new}}/A_{\text{original}})^{0.25}$ . For Cebu,  $S_{\text{new}} = 14(15/5,088)^{0.25} \approx 3.3$ , matching Rabor's finding that four out of 14 endemic taxa had survived.

In 1992, we discovered the Cebu flowerpecker (*Dicaeum quadricolor*), considered extinct since 1906 (ref. 3) in a tiny (2 km<sup>2</sup>) forest patch at Tabunan<sup>6</sup>. We have also found that two of the subspecies



Very little rainforest remains in the Philippines.