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On the effectiveness of Parks

Jerome K Vanclay[1]

Bruner *et al.*[2] examined the effectiveness of parks in the tropics, drawing on survey data to support their contention that parks 1) have been effective; 2) need more support; and 3) should remain a central component of conservation strategies. Their conclusions remain equivocal.

They focused on 520 parks in areas categorised as "partly natural" or "human dominated", established at least 5 years, and exceeding 5000 hectares. "Directors of conservation organizations and protected area agencies helped identify a representative" subset of 82 parks. A further 5 of 15 conservation areas in Laos, and six parks from outside the original sphere of interest were included in the study, bringing the total sample size to 93. A questionnaire was used to gather information on conditions within and surrounding the park. Only one response was obtained for each park. "Park managers or park staff constituted 56% of respondents…". Nine of the parks in the sample receive "some level of support from Conservation International" (the organization that conducted the survey). Correlations suggest that the 11 supplementary samples and the nine CI-supported parks do not differ from the general trend of park effectiveness ($r = -0.16, P = 0.06$ and $r = 0.05$, $P = 0.3$ respectively), but there is no way to test for bias in the selection of a "representative" subset or amongst respondents completing the survey. Respondents are not identified in the data file, so it is not possible to examine if park managers differed from researchers in their views on park conditions. More critically, it is not clear whether responses reflect respondent opinions, or whether a genuine attempt was made to gauge the incidence of fire, clearing, grazing, hunting and logging within and surrounding the parks. Because of these deficiencies, the data should be considered anecdotal rather than substantive.

Bruner *et al*. presented analyses suggesting that the incidence of clearing, grazing and burning is lower, and the abundance of game and commercial tree species is higher within parks than in the adjoining 10-km wide surroundings. These differences are attributed to the effectiveness of parks, but may be due to other factors (e.g., natural features and cultural traditions that discourage disturbance). A more parsimonious suggestion is that apparent differences may have always existed, or may be area-dependent (a 10-km buffer represents twice the median park area). The data suggest that park creation tends to reduce clearing and/or foster regrowth within the protected area (paired $t=1.8$, $P=0.03$), but do not offer reliable insights into current clearing patterns because the survey employed different categories for clearing within and surrounding parks (viz. 0, 1–5, 6–10, 11–20, 21–40, 41+% and 0–10, 11–30, 31–50, 51–70, 71–90, 91–100% respectively).

Bruner's index of park effectiveness involved rescaling the clearing data from 6 onto 4 categories. Re-scaling categorical data in this way involves subjectivity, results in a loss of information, and is not necessary to examine correlations. I computed an alternative index of effectiveness by averaging the (unadjusted) difference between values (of clearing, burning, hunting, logging and grazing) reported inside and outside parks[3]. The resulting index offers better insights into relative, but not absolute performance of parks (i.e., if all risks are equal, with 8% clearing both within and surrounding a park, my index will be $[3–1 + b_i – b_o + h_i – h_o + l_i – l_o + g_i – g_o]/5 = 0.4$ because clearing has different scales). My assertion that responses

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denoted "not applicable" and "not available" both denote missing values, resulted consistently in fewer degrees of freedom than reported by Bruner *et al*. Rather than use Spearman's rank correlations, I plotted all the possible predictors against park effectiveness and selected appropriate transformations to linearize any trend. Correlations obtained in this way differ substantially from those reported in Table 2; significant correlations and selected departures from Bruner's findings are reported in the table below. It is noteworthy that a park's budget (whether total, national or donor; its recent increase or decrease; and whether absolute or per unit area) is not significantly correlated with effectiveness in this study or in Bruner's study.

Predictor variable	Transform	r	P	n	Bruner's r_s
Local Educators per 100 km^2	Log(X+1)	0.35	0.003	60	—
Area under contested ownership	—	–0.31	0.008	56	–0.15
Demarcation of border	—	0.28	0.01	59	0.21
Guards per 100 km^2	Log(X+1)	0.27	0.02	56	0.27
Logging deterrent	Sqrt(X)	0.19	0.1	46	0.24
Clearing deterrent	Sqrt(X)	0.24	0.07	35	0.27
Compensation for damage	—	0.05	0.4	57	0.20
Budget	Log(X+1)	–0.02	0.5	33	–0.01
Legal inhabitants	Log(X+1)	–0.20	0.07	53	—
Years established	Log(X)	–0.01	0.5	66	—

The data in the table above are not orthogonal, and several variables seem to reflect the same trend (e.g., the correlation between local educators and guards is 0.58). A stepwise regression approach suggests that only two variables are relevant, local educators and demarcation:

$$\text{Effectiveness} = 1.7 \text{ Log } (L.edu+1) + 0.2\ Demarc - 0.25$$

where *L.edu* is the number of local staff (full-time equivalents per 100 km^2 of park area) working primarily on educating and building awareness in local communities about the park's goals and mission, and where *Demarc* has six categories (0–10, 11–30, 31–50, 51–70, 71–90, 91–100%) indicating the percentage of the park border that is clearly identifiable. Standard errors for these parameters are 0.5, 0.06 and 0.25 ($P<0.001$, $P=0.001$, $P=0.3$) respectively. This implies that parks are more effective if local people know that they are there, and know why they are there. It supports the contention that tropical parks are effective, and that differences within and surrounding parks may be due to the establishment of a protected area. It is regrettable that the anecdotal nature of the underlying data detracts from this finding

To conclude:

The evidence in support of Bruner's first conclusion is equivocal. In the opinion of respondents, conditions within parks are better than in their surrounds. Parsimony begs whether these apparent differences have always existed, or could be an artefact of sampling (i.e., selection of the parks; design and conduct of the survey; comparing with surrounds larger than the parks in question).

There is no evidence to support Bruner's second conclusion that increased support will improve effectiveness of parks. This lack of evidence prevails despite the fact that any personal bias on the part of directors involved in selecting the sample, and managers involved in completing the survey may have contributed to a more favourable (i.e., pro-park) result than a more rigorous survey might indicate.

Bruner's third conclusion remains untested. His data and analyses shed no light on the relative efficacy of protected areas versus other conservation initiatives. Since both land and financial support for conservation are limited, the issue is not whether parks are good, but whether parks are better than the alternatives. There are several alternatives that could be examined, but a 10-km band around a park is not an informative alternative. In terms of conserving habitat, a better test would be a comparison of habitat quality within protected areas versus that in community managed areas and in other multiple-use initiatives. In terms of conserving species, a comparison of the performance (both in terms of success and cost) of protected areas versus ex-situ conservation efforts may be more relevant.

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[1] A.G. Bruner, R.E. Gullison, R.E. Rice & G.A.B.da Fonseca, 2000, Effectiveness of Parks in Protecting Tropical Biodiversity, *Science* **291**:125-128.

[2] My thanks to Aaron Bruner for providing a copy of his data and making this analysis possible.