

Understanding local people's use of time: a pre-condition for good co-management

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Summary

Development of management plans collaboratively with local people (e.g. co-management) is now an important means of protected area conservation. Yet formal protected area managers often need more specific information about the local people with whom they want to co-manage resources. We propose wider use of a method, which we describe, for studying time allocation, as an early step in the co-management of conservation areas. Use of time allocation data in co-management is illustrated from a conservation project in Danau Sentarum Wildlife Reserve (DSWR) in West Kalimantan, Indonesia. Data from spot observations were analysed at three levels, namely those of 'macro-categories' (production, reproduction and leisure), an intermediate level (e.g. agriculture and food preparation), and that of individual activities (such as fishing, collection of forest foods and hunting).

In the DSWR, the allocation of time differed according to gender, ethnicity and seasonality, throughout the year of the study. Our experience suggests that knowledge of such patterns of behaviour can help conservation area managers to understand local people's needs and desires better, improve managers' rapport with local people, and make better cooperative plans with local people.

Keywords: West Kalimantan, Indonesia, conservation, shifting cultivation, fishing, gender, seasonally flooded forests, Iban, Melayu

Introduction

The question of how to manage conservation areas effectively has plagued many managers and researchers (e.g. Western & Wright 1994; Claridge & O'Callaghan 1997), and many alternative approaches have been discussed. One such approach is collaborative co-management which is designed to manage conservation areas in close cooperation with local people. Claridge (1997b, p. 19) defines co-management as '... the active participation in management of a resource by the community of all individuals and groups having some connection with, or interest in, that resource.' Another definition is that of Fellizar (1993): 'a process by which

people themselves are provided the opportunity and responsibility to manage their resources, define their needs, goals and aspirations and make decisions affecting their well-being.'

Great hopes have been pinned on such collaborative management but unrealistic expectations are common in development and conservation circles. 'Integrated rural development,' 'farming systems research and development,' 'sustainable agriculture,' and now 'criteria and indicators for sustainable forest management' have each been heralded as a saviour of one kind or another. All of these approaches, although valuable advances in approaches to world improvement, have fallen short in some respects or others.

The interest in collaborative management derives from the recognition that many conservation areas are already inhabited by people who may have resided in the area for a very long time (e.g. Kemf 1993; Pimbert & Pretty 1995). The morality of evicting them has long been questioned, as has the efficacy of doing so (e.g. Turnbull 1972). Besides the potential for adversely affecting already marginalized people, 'fence and fine' approaches to conservation (Wells *et al.* 1992) have often proved impossible to enforce.

Despite the growing recognition that integrated conservation and development projects (ICDPs) have their limitations (e.g. Wells 1997), we remain convinced that working with local people in conservation areas is both ethically justified and is, pragmatically, the approach most likely to succeed; it may just be a little harder than initially thought. We agree with Pimbert and Pretty (1995, p. 44) in their call for new concepts, values, methods and behaviour that can help conservation managers work cooperatively with local people and build on existing systems for management of protected areas. To this end, we explain the main elements of the approach we took in trying to manage the Danau Sentarum Wildlife Reserve (DSWR) in West Kalimantan, Indonesia.

DSWR comprises a group of lakes and a seasonally flooded forest, located some 700 km up the Kapuas River from Pontianak, the provincial capital of West Kalimantan, Indonesia (Fig. 1). The lakes area (about 80 000 ha) was chosen as a wildlife reserve in the early 1980s (Giesen 1987) because of its unique flora and fauna and its comparatively good condition. When formal management began in 1992, under a joint British-Indonesian conservation project, local people did not realize that they lived in a wildlife reserve. The primary purpose of the project was to develop a management plan for the Reserve, built on the idea of co-management, which could serve as a pattern for other con-

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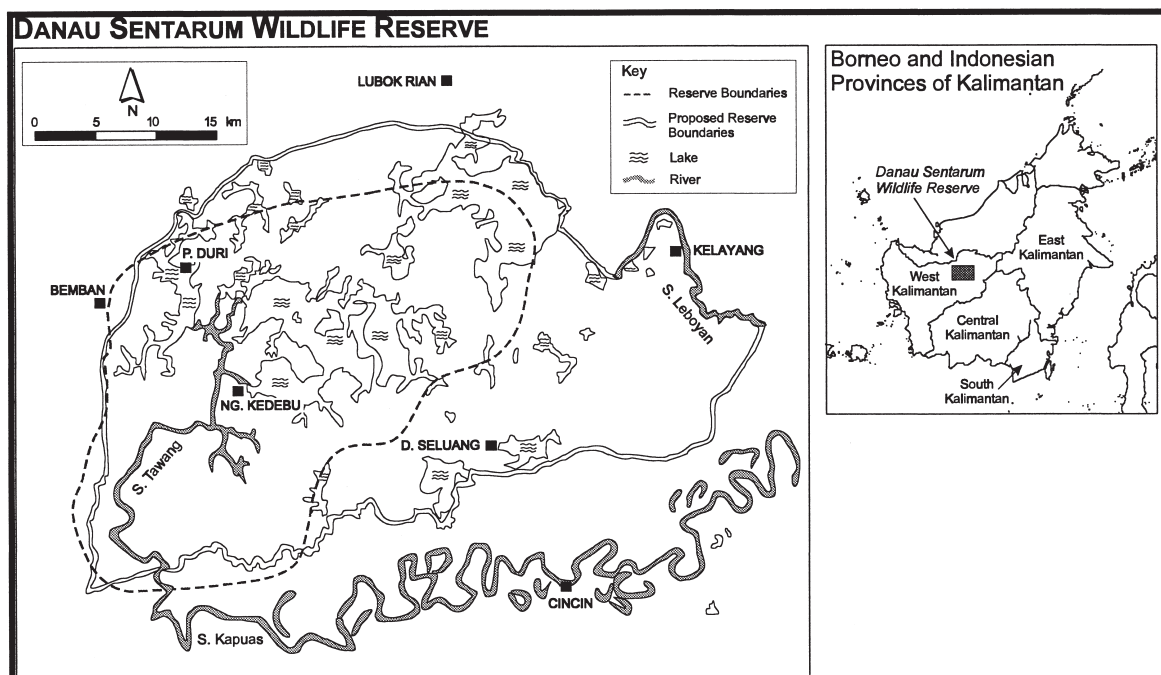


Figure 1 Map of the study area.

servation areas. Recently there has been a concerted effort by researchers, managers and some Indonesian officials to expand the boundaries, to the north and east of the core reserve, to include more areas where animals seek refuge from annual flooding and the drier areas where orangutans have been found to proliferate (Meijaard *et al.* 1996; Russon *et al.* 1996; Erman & Sudrajat 1997). This larger area would expand the DSWR to 197 000 ha.

Our initial management approach included learning how local people were using resources. What local resources were they using, how dependent were they on these resources, what indigenous management strategies did they possess, and what seasonal, ethnic and gender variation was there?

Two main ethnic groups use this larger area; the Muslim Melayu fisherfolk who live mostly in the core of the original Reserve, and the Christian/animist Iban Dayaks who are swidden cultivators and live largely in the surrounding hills. The Melayu typically have close relations with larger towns on the Kapuas, of which they are legal inhabitants. People from these larger towns have traditionally come into the lakes area in large numbers to fish during the dry season, when fish are most accessible (Dudley 1996a, b). Those who reside within the Reserve have a complex system of rights and responsibilities associated with their residence there (recorded in Harwell 1997); and there are indigenous management strategies on which the conservation project has tried to build (Claridge 1997a).

The Iban have resided in the surrounding hills for centuries (Wadley & Kuyah in press), and have long-established traditional systems of tenure and use rights, some seasonally extending down into the lakes area. Where the Melayu exter-

nal orientation is toward the Kapuas, the Iban look to nearby Malaysia, where they have deep cultural, social and economic ties. Iban men regularly go to Sarawak and Brunei for better wage-labour opportunities (Wadley 1997a). The Iban are important to the DSWR management, since: (1) hunting is an important part of their traditional system and provides important nutritional supplements to their diet; (2) they inhabit and practise a form of swidden cultivation in the lakes catchment area which incorporates forest and other resource management; and (3) they have a significant potential to affect the DSWR management.

Two studies, shown in Table 1, conducted by Giesen in 1986 and by Aglionby in 1994, have estimated local population sizes, primarily based on the reports of village leaders within the DSWR core area. J.C. Aglionby and R. Dennis (personal communication 1995) reported a substantial dry season increase in the DSWR population to 8055. Wadley examined Sub-district census data from 1988 and 1995, for the exclusively Iban areas of Batang Lupar, to the northwest and west of the Reserve.

House to house censuses conducted in 1992 suggested a very mobile population (Colfer & Wadley unpublished data). *De jure* population pyramids, reflecting those who are considered community members (though not necessarily in the community at the time of the census) for the two communities differed substantially (Fig. 2). Both had a discrepancy between their *de jure* and *de facto* populations, showing considerable flow into and out of the communities. The general direction of the movement differed. The Ng. Kedebu' population nearly doubled, to 199, during the busy fishing season when water was low. On the other hand, the number of

Table 1 Population size, density and growth in and around the DSWR. Population data for DSWR core in 1986 from Giesen (1987); density computed by Colfer. DSWR core–Melayu density in 1994 computed by Aglionby and Whiteman (1996); population data and growth rates from J.C. Aglionby and R. Dennis (personal communication 1995). Batang Lupar density computed by Wadley.

<i>DSWR core – Melayu</i>	1986	1994
Population	3000	6575
Density (persons/km ²)	3.5	6.4
Growth (%)		41
<i>Batang Lupar – Iban</i>	1988	1995
Population	2252	2357
Density (persons/km ²)	2.3	2.4
Growth (%)		5

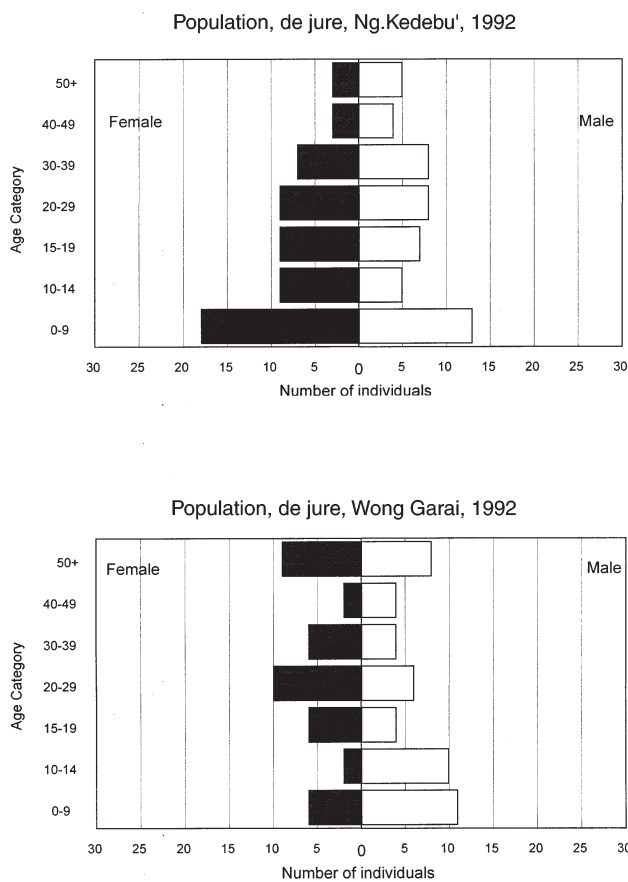


Figure 2 Population pyramids for Ng. Kedebu' and Wong Garai, 1992 (dry and rainy season).

people who claim Wong Garai as their home was larger (87) than those who normally reside there (71), reflecting the Iban custom of *bejalai*, or circular labour migration. Iban mobility is particularly noticeable on a day-to-day basis because those who leave are adult men.

Learning about local people and their involvement with their resources may be useful for conservation area managers

in a number of ways. First, managing cooperatively with local people requires access to them. Gaining access to them is much easier if managers can plan new activities at times when local people are not otherwise engaged, or in conjunction with ongoing activities. Since the use of time often differs along ethnic and gender lines, knowledge of allocation of time by gender, season and activity can be very useful. Managers planning change will also have to take into account people's allocation of time for reproductive and leisure activities.

Managers also need to understand the division of labour in local communities and where people spend their time. This can tell an outsider whether to approach men or women, about matters pertaining to a particular aspect of co-management. It can suggest areas of concern for conservation, existing areas of indigenous skills and knowledge that might enhance conservation goals and income generation. Further, it can prevent outsiders from making incorrect assumptions based on their own cultural ideas about gender roles and reduce mistakes that can have potentially negative impacts on project planning and implementation.

Inter-ethnic variation in time use may be another critical issue for managers to understand. Knowing people's investment of time and schedule of activities can alert managers to proposals that are unlikely to work or to new activities such as crafts that need to be interwoven with a seasonal round. The allocation of time to different activities also reflects cultural differences in values and beliefs that must be taken into consideration in co-management.

In this paper, our purpose is to present the material in such a way that the methods can potentially be used by people who are not social scientists in other areas where co-management is a goal. Our interpretation and conclusions can be used as a template for others to interpret comparable results in other areas.

Methods

Our two main study villages were Nanga (Ng.) Kedebu' and Wong Garai. Ng. Kedebu' is a Melayu village on the edge of the Tawang River. It contains a mixture of houses on stilts, raft homes and boat homes. The subsistence base is dominated by fishing, fish processing and marketing, and close ties are maintained with a 'mother village' on the Kapuas River. It claims a territory covering 7054 ha (70.54 km²). Wong Garai is a longhouse (which is similar to a condominium) composed of 13 apartments, situated within the P.T. Militer timber concession, about 6 km northeast of Lubok Rian. The community claims a community territory of approximately 24 km² in a patchwork of forest succession, agricultural fields and preserved forest areas. Communities and concessionaires are given pseudonyms, to protect their privacy and honour their trust.

The time allocation studies (TAS) we conducted were based on spot observations at scheduled times. This method followed Johnson (1975, 1978), and has been used also by Colfer (1981), Colfer and Yost (1987), and Tripp (1982).

Table 2 Melayu and Iban division of labour (production, reproduction, leisure) by gender and age group in Ng. Kedebu' and Wong Garai in 1992–93 with results of χ^2 analyses: * = $p < 0.05$, ** = $p < 0.01$.

Age group	Activity	Ng. Kedebu'			Wong Garai		
		Female	Male	χ^2	Female	Male	χ^2
0 to 9	Production	7	12	2.70	9	13	0.10
	Reproduction	88	67	0.09	45	75	0.00
	Leisure	154	120	0.04	111	186	0.00
10 to 14	Production	22	24	2.49	8	41	0.31
	Reproduction	62	32	1.74	24	71	2.02
	Leisure	44	32	0.05	21	107	0.77
15 to 19	Production	30	63	11.31**	53	43	0.27
	Reproduction	28	3	20.47**	88	59	0.25
	Leisure	23	16	1.34	47	35	0.00
20 to 49	Production	128	204	12.75**	187	252	28.81**
	Reproduction	134	26	80.30**	160	33	59.35**
	Leisure	60	114	13.40**	94	71	0.18
Above 50	Production	12	30	3.98*	99	116	3.79
	Reproduction	24	13	6.63**	82	48	5.64*
	Leisure	14	21	0.21	65	57	0.02

Methodological issues have been addressed by Baksh (1989, 1990a, b) and Colfer (1994).

The schedule involved a rotation of all community households, through the hours of the day (0700 to 2000 hours), on alternate days, throughout the year. The rotating schedule was an amendment to Johnson's (1975, 1978) randomized schedule, because we wanted to minimize the occasional repeat visits to the same household since this might potentially annoy busy people. On a given day, the interviewer checked the schedule, identified the household to be visited and the required hour. The interview occurred at any time within the scheduled hour. During the scheduled visit, the activities of each household member were recorded, along with his/her location and demographic data such as age and sex. Other data of interest to the researcher or manager could easily be added, as long as the interview schedule did not become burdensome. Colfer and Wadley were involved in early interviews, gradually passing responsibility to local assistants, with ongoing supervision.

The Melayu data were collected between November 1992 and December 1993 by Colfer and Sahar, a community resident, in Ng. Kedebu'. The same study was conducted by Wadley (with the assistance of the family of Abit anak Gue', longhouse residents) in the Iban community of Wong Garai from December 1992 to November 1993.

Based on previous experience with this method, we first categorized the activities at three levels. The lowest level involved coding each of the 254 activities observed. The second, intermediate level was adapted from Johnson (1975; we used eating, cooking, childcare, relaxation, hygiene, visiting, education, maintenance/repair, hunting/fishing, agriculture, wage labour, and forest product collection). In the final coding level we divided the data into three 'macro-categories,' namely production, reproduction and leisure.

The term 'reproduction' is used here to refer to those activities that 'reproduce' human life, including biological and social reproduction (including activities such as cooking, repairing, childcare, care of the sick, cleaning and studying). This usage may be unfamiliar to biological scientists, but is common in social science.

We first analysed the macro-categories, to determine broad differences in the allocation of time by gender (all ages), by ethnic group and by season. In a second analysis, we selected those second-level categories that pertained directly to natural resource management, namely maintenance/repair, fishing/hunting/foraging, agriculture, wage labour, and forest product collection. For these analyses, we extracted the productive adult observations (aged 15–49) as the most relevant for involvement in co-management. Again we looked at gender, ethnicity and season.

In a final analysis, we selected specific activities directly related to DSWR management issues. In doing this, a small number of observations pertained to more than one of our categories and we counted those in both categories.

Results

Production, reproduction and leisure

Both males and females were involved in productive activity, although adult men were more so in both ethnic groups (Table 2). Women had more reproductive responsibilities than did men, and this was more pronounced amongst the Melayu than the Iban. Significant gender differences ($\chi^2 > 3.84$) only emerged as children approached adulthood for both ethnic groups, though the Iban differentiation began later.

Another issue that affected people's use of natural resources in the DSWR area was seasonality, and the most important aspect of seasonality related to water levels (Fig.

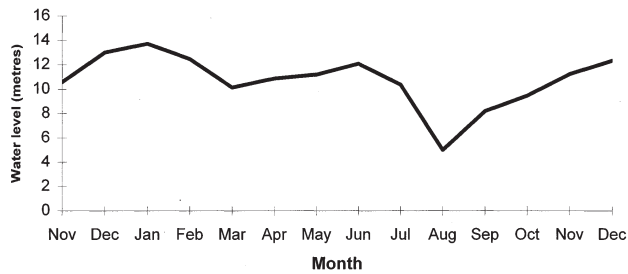


Figure 3 Water level at Bukit Tekenang, September 1992–December 1993.

peak for men only. This was not associated with a reduction in farm work but rather with preparing for the new farming year.

Almost all of the Melayu observations involved fishing rather than hunting. There was a high level of Melayu involvement in fishing during the months of low water levels (July, August and September), when the fish were easier to catch (Fig. 6). Both sexes were involved throughout the year, with the exception of November 1992 and June 1993. Figure 6 suggests consistently higher involvement of men than women.

Iban men and women were both observed hunting, fishing and collecting forest foods during December and January. Men's involvement in hunting was low and fairly constant

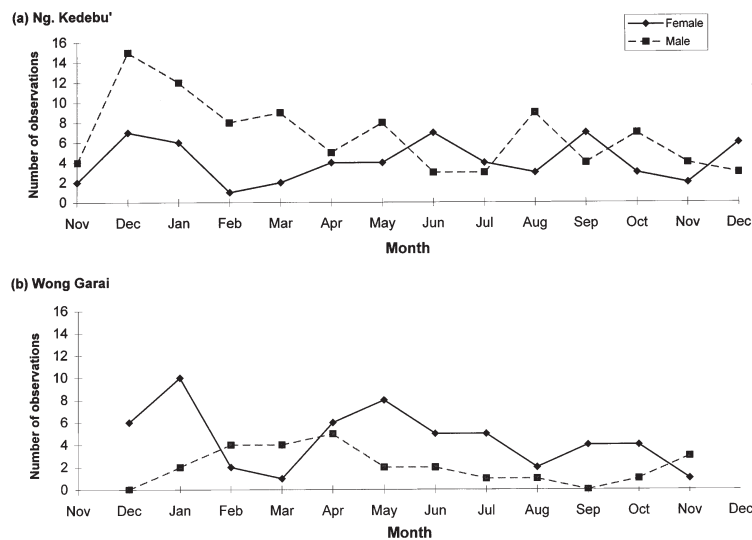


Figure 4 Adult maintenance/repair in Ng. Kedebu' and Wong Garai, 1992–93.

3). Certain activities (e.g. transport of goods) were difficult when water levels were low. Melayu involvement in fishing, for instance, increased at low water levels because of the ease of fish capture; and Iban agricultural activities decreased prior to the dry season.

A focus on gender, ethnicity and seasonality

December 1992 was the year's high point for maintenance and repair activity amongst the Melayu (Fig. 4). For this series of activities, Melayu men and women seemed to alternate in dominance throughout the year, with men particularly active in December and January. Much of the Melayu activity in this category involved repairing or making fishing equipment.

Maintenance and repair activities for the Iban included building field huts, making and repairing fish traps, and making a variety of mats and baskets. The peak of Iban women's repair and maintenance activity in January came during a slack period in swidden work (Fig. 5) when they were finished with weeding, and were preparing mats and baskets for the coming harvest. In April, both men and women were busy with maintenance and repair; whereas May represents a

throughout the year (Fig. 6). Fishing peaked again in July and August, involving both men and women but dominated by men.

Agricultural activity (Fig. 5), dominated by women, was minimal amongst the Melayu. In contrast, Iban women were active in agriculture throughout the year with peak activities occurring in February during the rice harvest, in May during the initial cutting of vegetation for the new farming year, and in October during the first weeding of the hill swiddens (agricultural fields) and the planting of the swamp swiddens. Those Iban men who remained in the community (and those who returned temporarily from wage labour journeys) were most active in July through to September during which time they were felling and burning the trees, planting the hill swiddens, and preparing the swamp swiddens for subsequent planting. The low point for both men and women was in June (Fig. 5), the month in which the harvest rituals occurred.

The Melayu had a much lower involvement in wage labour than the Iban; there were wage labour peaks in January and during the busy fishing season in July–August (Fig. 7). The upsurge during the dry months went along with a generally higher level of economic activity at this time. There

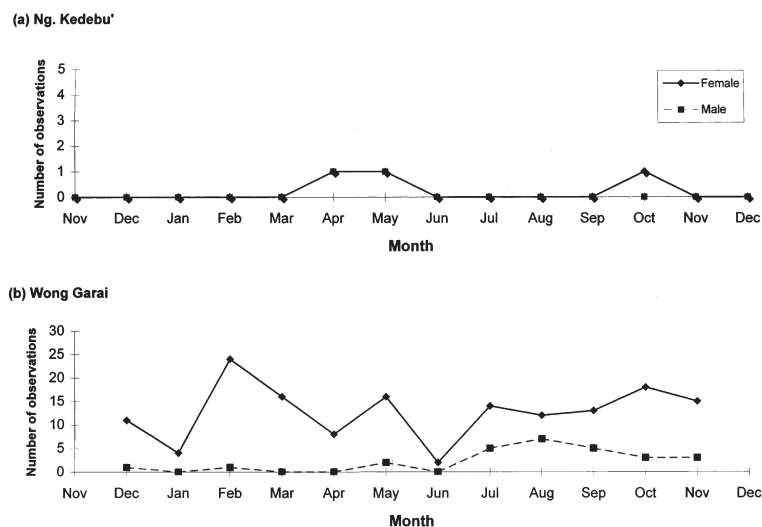


Figure 5 Adult agriculture in Ng. Kedebu' and Wong Garai, 1992–93.

were more people in the lakes area, and these peaks in wage labour involvement were responses to improved markets for goods (such as making and selling snacks). Men and women were almost equally involved. Female observations peaked in January, and to a lesser extent in April, males in February/March and July/August (Fig. 7).

Iban males were far more involved in wage labour, normally at a distance, than were females, and this high level explains their absence (or under-representation) from some other activities.

Collection of forest products (other than foods) peaked amongst the Melayu during the months of high water (Fig. 3) when food was scarce, and constituted an alternative source of funds for those in need (Fig. 8). Both men and women were involved, with men marginally more so. The two major Melayu forest products collected were firewood and rattan. Both of these are used commercially, the former for processing fish and the latter for sale to timber concessionaires. In a June 1996 visit, local people explained that sale to concessionaires had ceased, reflecting local fears that supplies would be exhausted if rattan continued to be harvested for sale.

The Iban apparently spent less time on collection of forest products (Fig. 8) than did the Melayu, although the fact that forest products were often collected while doing something else (such as agriculture) means that there was probably an under-representation of this activity in the data. The peak of male activity was in February and March, involving cutting of lumber in the forest exclusively. At that time there was a government programme for village rehabilitation (*pe-mugaran desa*) in which Wong Garai was supplied with money to fuel chainsaws and cut lumber to finish a new long-house.

Natural resource management/use

In this context, we include the data from all age groups. The

observations discussed below represent 26% of the Iban data set (all ages, both genders) and 38% of the Melayu set.

Non-timber forest product (NTFP) harvesting was done by both males and females. Amongst the Melayu, the most important products, as indicated by time allocation, were rattan and bamboo. The difference between Iban female (10%) and male (7%) involvement in NTFP collection was not statistically significant. Amongst the Iban, males dominated in wood collection.

Fishing was the dominant use of natural resources by the Melayu, with males almost twice as involved as women. Fishing constituted a comparatively small part of the Iban involvement in natural resource use, with 3% of the observations involving males and 2% involving females.

Melayu males and females were minimally involved in agricultural activities; fish culture was a little more important, and in a June 1996 visit we found that Melayu fish culture had increased sharply. Amongst the Iban, agriculture was a much more significant use of natural resources, accounting for 35% of the female observations, and 16% of the male.

The collection of forest foods occurred in both communities, but at a low level.

Hunting, an activity that was not recorded amongst the Melayu, although it does occur, accounted for 2% of Iban male time spent on natural resource use and management activity.

Discussion

Gender, reproduction, and natural resource use

Some TAS results pertaining to adult reproductive behaviour, not presented above, are important for a manager to bear in mind. For instance, Melayu were observed eating most frequently during October, the month in which fishing

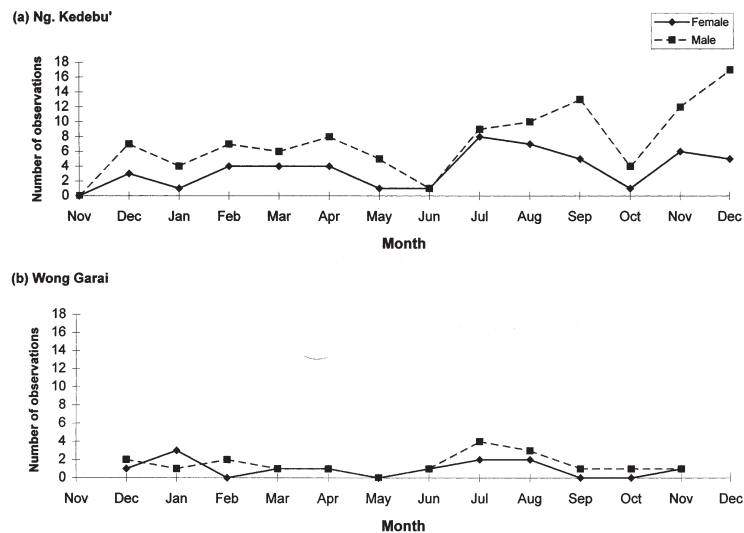


Figure 6 Adult fishing and hunting in Ng. Kedebu' and Wong Garai, 1992–93.

was bad and food was scarcest, perhaps because they had time on their hands, and were thus easily observable in the village. Income generation activities may be best focused on this period of time (both because of time availability and because of need).

Cooking, an activity dominated by women in both ethnic groups, peaked in December (Christmas festivities for the Iban; renewed availability of fish for the Melayu). Increased cooking activity often reflects conviviality which may in turn provide opportunities for extension efforts or rapport building by formal managers with local people.

Childcare was an almost exclusively female activity amongst the Melayu; it was more balanced, but still female dominated, amongst the Iban. The busy fishing season seemed to reduce the amount of time spent by adult Melayu women on childcare. This suggests that income generation efforts and adult extension meetings might best be scheduled at other, less busy times. Conservation awareness campaigns directed at children might be welcome during this time, serving a dual function of childcare and education.

Male relaxation reached a sharp peak in June and July (before the 1993 floods receded), a pattern not reflected in the female observations which remained at a lower level. Iban relaxation was inversely related to time spent on agricultural activities for both sexes. Again, this free time might be available for co-management and awareness activities.

Hygiene activities, such as bathing, washing floors and dishes, was a female dominated activity (more so amongst the Melayu than amongst the Iban). Efforts to improve water quality (reduce *e coli* bacteria; decrease the amount of soap in the water) might be more successful if aimed at women (another source of the pollution in the DSWR is said to be from wood preservation chemicals applied by timber companies).

Melayu visiting activities peaked in February 1993, when almost everyone returned to their home village on the Kapuas

River for *'Idul Fitri*, a celebration marking the end of the Muslim fasting month. Travel was common amongst both ethnic groups and both genders, throughout the year. Managers need to be attuned to local holidays, which can be used positively (e.g. for awareness) because many people may gather together, or negatively (e.g. required work parties or conflict resolution meetings) because people may be irritated to have outsiders interfering with their ceremonies and family get-togethers.

Adult educational observations were notable by their near absence amongst the Melayu, in marked contrast to the Iban, amongst whom more women were occupied in educational activities than men. Colfer heard complaints amongst the Kenyah, another Dayak group from Long Segar, East Kalimantan, during a June 1997 visit that young Kenyah men did not want to pursue their education, in contrast to young Kenyah women who were quite interested to do so. Managers simply need to know the educational proclivities of the different groups, since local affinity or distaste for education should influence how awareness materials and motivational approaches are conceived. In the DSWR case, the lack of availability of educational opportunities is one reason for low educational involvement. During a 1996 visit, Colfer found the women of Ng. Kedebu' enthusiastically participating in a government-sponsored literacy drive where literate community members taught the illiterate twice a week.

In a more refined analysis, also reflecting gender, ethnic and seasonal differences, we focused on maintenance/repair, fishing/hunting, agriculture, wage labour, and forest product collection. For these analyses we selected observations of adult behaviour, believing that adult behaviour has the greatest potential for impact on the management of natural resources on a daily basis. Observations of adults are also more likely to be accurate than are those of children.

Agriculture has been problematic for local people in the heart of the Reserve because of unpredictable flooding (Fig.

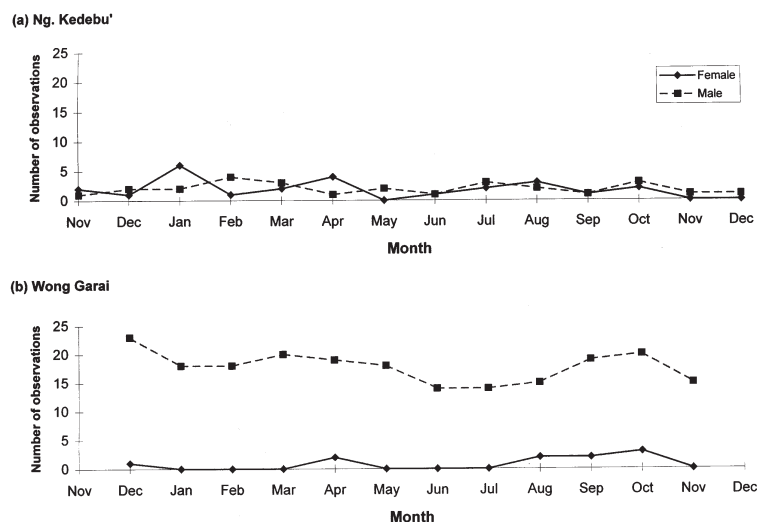


Figure 7 Adult wage labour in Ng. Kedebu' and Wong Garai, 1992–93.

5) (Colfer & Noveriawan 1993; Colfer *et al.* 1993b). In some cases this problem was surmounted by use of floating gardens (Colfer *et al.* 1993a), but agricultural activity remained minimal. The Iban, on the other hand, living along the Reserve periphery, depend on agriculture for a significant proportion of their livelihoods (Colfer *et al.* 1993c; Wadley 1997a, b).

The Iban have a complex form of 'integral shifting cultivation' which includes hill, swamp and floodplain swiddens, various tree groves, forest reserves and use of the forest as a source of many of life's needs. Warner (1991) provides an excellent, general account of this kind of system and how it relates to forests. Dove and Kammen (1997) discuss the Kantu' system (another ethnic group immediately to the west of the DSWR) and how their swidden system is conceptually and managerially integrated with the surrounding forest. The importance of this farming system is reflected in our data. In June, July and August, many Wong Garai men returned home to participate in the harvest rituals and to clear fields for planting.

Within the DSWR context, people regularly pick up forest foods en route to or from their fields or during breaks in other subsistence activities. So the small percentage of time devoted to collection of forest foods in both communities is probably an underestimate. The forest is always close at hand.

The recorded observations pertaining to agriculture, a topic dear to Dayaks' hearts, almost certainly resulted in the under-reporting of NTFP collection (Fig. 8); the same problem exists amongst the Kenyah (Colfer *et al.* 1997a). A considerably greater variety of products is actually collected by the Iban than emerged in this study (e.g. Colfer *et al.* 1997c; Wadley *et al.* in press).

The four peaks in Iban women's forest product collecting activity (Fig. 8) reflect common endeavours; February is a period of (1) low agricultural demands, immediately before the harvest (most of the weeding has been done) and (2) a

period of preparation for the upcoming harvest. Women would at this time have some time to collect forest foods and be collecting materials for making mats and winnowing trays for harvesting and processing the rice; in April, women were collecting *kulan* (*Pandanus* sp.) fibres from the lakes, in June, they were taking advantage of the lull in farming to tap rubber and gather forest foods to feed guests during harvest rituals; and in August, there was a fruiting of *illipe* nuts (*Shorea* spp.) which the women collected and sold on the market.

The high percentage of time spent by Melayu women harvesting wood (20% of these observations) is unusual in Kalimantan's forests, and derives from women's responsibility for collecting firewood for use both in domestic cooking and in fish processing. For comparison, Kenyah women in East Kalimantan were observed spending 2% of their time on forest product collection (the category that includes collecting or harvesting wood) in 1979–80, based on the same method (Colfer 1981). Melayu men were also involved in this activity (12% of these observations), as well as in the harvesting of large trees. Firewood tended to be collected from trees killed by the seasonal inundation of the area. In a previous, partial analysis, of the wood designated as 'waste' vis-à-vis 'living' (or freshly cut) in Ng. Kedebu', 72% was 'waste' wood (Colfer *et al.* 1993d).

The active involvement of Melayu women in fishing was clearly demonstrated in these data; this has also been observed in the lakes area by Malvestuto (1989) and Pollnac and Malvestuto (1992). The fact that Iban men and women were both observed hunting, fishing and collecting forest foods during December and January may be related to shortage of food at this time. This period was immediately before the harvest when the previous year's rice had been depleted and labour requirements were low.

The Iban peak in fishing in July and August may be related to the traditional fishing rights of Iban (and Banuaka')

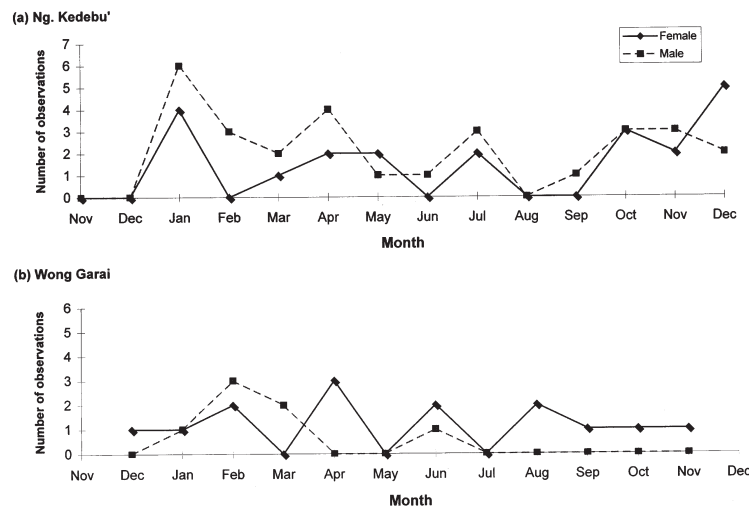


Figure 8 Adult forest product collection in Ng. Kedebu' and Wong Garai, 1992–93.

Labian, or Maloh Dayaks, *cf.* Sandin 1967) to take advantage of the low water levels in the lakes, when there is better fishing.

The smaller number of Iban fishing observations may be partially related to declining numbers of fish. Local people have noted declining fish stocks upstream in recent years and blame it on population growth both within the Wong Garai territory and overfishing in other, downstream communities. In 1994, several Wong Garai households built fish ponds to make up for the decline in fish stocks. A similar attempt in Bemban, an Iban community to the NW of the Reserve, was also observed in 1992 (Colfer, unpublished data). Kelayang Iban, on the eastern border of the DSWR, were experimenting with fish cage culture in July 1996, but this could be a problem for the local capture fisheries (Aglionby 1995*b*; Dudley 1996*a, b*).

Management implications at the DSWR

The study reported here, and others, served as a prelude to a subsequent, critical step, initiated in early 1993, namely planning and working collaboratively with local people (Colfer *et al.* 1996; Wickham 1997). Managers need to understand what local people must give up or change, if suggestions for improved management require people's time. Co-management is always difficult and efforts to integrate it into existing behaviour patterns as much as possible make it a little easier.

An early step was to divide the DSWR residents into groups by river systems and organize inter-village meetings, with the intention of developing mutually reinforcing fishing regulations (Colfer *et al.* 1996). The project evolved to include smaller village groupings, project support in the enforcement of traditional regulations (also evolving), income generation activities in paper making, marketing of honey and traditional weaving of baskets.

This study helped us to realize that there was a peak of leisure time activities in June in Wong Garai (coinciding with the annual harvest rituals). The February peak in Ng.

Kedebu' coincided with the Muslim 'Idul Fitri celebration (which changes from year to year); but the December peak in leisure activities is recurrent, due to high water and a common reduction in fishing success at that time of the year. Comparisons of these seasonal human patterns provided useful planning guidance for us as managers.

The following brief 'story' documents how some of these findings were used in the DSWR. Colfer's and Wadley's studies were planned to contribute to the evolving co-management of the DSWR. In cooperation with other team members, Colfer could use the new information, such as the importance of fisheries for the Melayu and of agriculture for the Iban, to help determine project direction. Soon the importance of women's roles in both fishing and, to a greater degree, fish processing emerged, suggesting that they should be involved in co-management of the fishery. Later, we noted the abilities of Iban women to weave beautiful blankets, baskets and mats, and this made us think of possible income-generating activities. The dependence of the Iban on forest-related activities, and their involvement in hunting, suggested that here was an opportunity and an imperative to work with them on related wildlife conservation issues. Similarly the involvement of the Melayu in fisheries prompted us to begin collaborative planning with them on how to sustain that resource more effectively. The seasonal variation in fishing success became clear through these kinds of data, suggesting the need for alternative sources of income during slack times. The project followed up on some of these leads (some also suggested by Dudley & Colfer 1993; Peters 1993, 1994; Aglionby 1995*a, b*; Claridge 1997*a*; Wickham 1997) by:

- working with local fisherfolk on community management areas, codifying their informal management strategies and regulations (Harwell 1997), and mapping their traditional areas (Dennis *et al.* 1998).
- encouraging women in several communities to weave bas-

kets, mats and other goods, and helping to market them (Wickham 1997).

- working with local communities to enhance the sustainability of rattan production, by enrichment planting and community rattan nurseries (Wickham 1997).

Wider uses and shortcomings of the TAS Method

We have presented TAS results from three levels of analysis, all of which provide useful information from the standpoint of co-management. The highest level (macro-categories) provides a manager with a broad understanding of the division of labour amongst productive, reproductive and leisure activities, from the perspectives of ethnicity, gender and season. This broad overview is critical in planning co-management activities with local people, to ensure that unnecessary conflicts between local people's existing patterns and suggested management improvements are minimized.

Managers need to be aware of local people's allocation of time and natural variation (such as water levels for fisherfolk and rainfall for swidden cultivators in and around the DSWR) and regularly refer to this kind of information in their planning if they want to avoid conflicting time, energy and resource needs. Managers can also use their specific knowledge of the kinds of products grown, nurtured and collected from the forest by local people to provide them with ideas for suitable management strategies. The fact that managers will be able to speak knowledgeably about local patterns of resource use (including gender and ethnic differences, locations of activity, and kinds of plants and animals desired and used) will also help them in their relationships with local people. Experience has shown that such expressions of interest in and respect for local knowledge of the surroundings go a long way in enhancing co-management. Managers and other outsiders more typically exhibit disdain or, at best, paternalism, towards people residing in conservation areas. For co-management to succeed, attitudes of mutual respect and interest must be developed.

When using the TAS Method, there are a couple of shortcomings, for which we have developed no practical solution, that should be borne in mind. Firstly, when individuals are away at the time of the TAS visit, only their general intent when they left home (e.g. tapping rubber, fishing) can be recorded, rather than what they are actually doing at the exact time specified for observation. This results in under-reporting of subsidiary activities. Secondly, people's propensity, particularly women's, for doing more than one thing at a time complicates coding. Involvement in dual activities may reduce the actor's freedom to change either one of the activities and thus may reduce his/her flexibility to become involved in tasks the conservation area manager may hope to accomplish.

Concluding remarks

In our view, successful co-management requires a number of things from managers. One essential pre-condition is a willingness to see management as involving all relevant local

stakeholders. The conservation area manager who wants to be successful in co-management must recognize the different, but equally important, knowledge, experience and goals of local people. In this endeavour, an attitude of acceptance and openness to local people's ideas is very important.

Building on our TAS results, we found gender, ethnicity and seasonality to be important in the DSWR context (and others; see Colfer 1981, 1994; Colfer & Yost 1987; Sigman *et al.* 1989). We emphasized gender because we have found that it is often difficult to learn about women's activities (Colfer *et al.* 1997b) but the importance, both for general human well-being and for successful forest management, of knowing what they do needs emphasis.

In the context of conservation management, ethnicity often reflects different uses of natural resources, which in turn have different implications for conservation. The cultural differences we found between Melayu and Iban in the DSWR have profound implications for their impacts on and uses of natural resources. Effectiveness of conservation area management can be increased substantially by improving understanding of such human differences.

Seasonal variation in people's patterns of behaviour is also important for a conservation area manager to understand. Given seasonal variation in resource availability, there may be a period when people would welcome extra income-generating opportunities; conversely people may be less available for conservation activities at certain times. This is supported in the DSWR by a variety of simple facts that would have been difficult to access without some mechanism such as the TAS.

A simple method such as a TAS can go a long way toward clarifying the normal daily activities of people residing in and around a conservation area. The process of gathering the information can be as informative as the results. Day to day exposure to rural people's realities can provide the understanding of the local cultural and material context that is so important in effective co-management. For a manager of a reserve or conservation area this method provides an ideal (and not particularly time-consuming) entry point for getting to know local people, establishing good rapport with them, and ensuring regular contact and communication.

Data analysis is easy and since the results are quantitative in nature, they serve as excellent report material and evidence for convincing donors, supervisors and collaborators of the rationale for particular courses of action.

We recognize that co-management is difficult, and suggest use of this method can help make co-management a reality.

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References

- Aglionby, J.C. (1995a) The establishment of a field level management structure for Danau Sentarum Wildlife Reserve, West Kalimantan: the first years 1994–95 [sic]. In: *The Economics and Management of Natural Resources in Danau Sentarum Wildlife Reserve, West Kalimantan, Indonesia: a Collection of Papers*, pp. 27–32. Bogor, Indonesia: Wetlands International/PHPA/ODA (Indonesia–UK Tropical Forestry Management Programme, Project 5: Conservation).
- Aglionby, J.C. (1995b) The rearing of fish in cages: an appropriate activity for Danau Sentarum Wildlife Reserve? In: *The Economics and Management of Natural Resources in Danau Sentarum Wildlife Reserve, West Kalimantan, Indonesia: a Collection of Papers*, pp. 69–85. Bogor, Indonesia: Wetlands International/PHPA/ODA (Indonesia–UK Tropical Forestry Management Programme, Project 5: Conservation).
- Aglionby, J.C. & Whiteman, A (1996) The utilisation of economic data for conservation management planning: a case study from Danau Sentarum Wildlife Reserve. Unpublished report. Pontianak, Indonesia: Conservation Project, Indonesia–UK Tropical Forest Management Programme: 26 pp.
- Baksh, M. (1989) The spot observation technique in time allocation research: part 1. *CAM Newsletter* 1(2): 1–3.
- Baksh, M. (1990a) The spot observation technique in time allocation research: part 2. *CAM Newsletter* 2(2): 6–7.
- Baksh, M. (1990b) The spot observation technique in time allocation research: part 3. *CAM Newsletter* 2(3): 4–5.
- Claridge, G. (1997a) Community-based conservation management at Danau Sentarum Wildlife Reserve (West Kalimantan, Indonesia): lessons learned from the Indonesia–UK Tropical Forest Management Programme, Conservation project and guidelines for the future. Consultancy report. Bogor: Indonesia–UK Tropical Forest Management Programme: Project 5 – Conservation, ODA, Wetlands International – IP: ix + 122 pp.
- Claridge, G. (1997b) What is successful co-management? In: *Community Involvement in Wetland Management: Lessons from the Field*, pp. 19–24. Incorporating the Proceedings of Workshop 3: Wetlands, local people and development, of the International Conference on Wetlands Development, held in Kuala Lumpur, Malaysia, 9–13 October 1995. Kuala Lumpur, Malaysia: Wetlands International.
- Claridge, G. & O'Callaghan, B., eds. (1997) *Community Involvement in Wetland Management: Lessons from the Field*, pp. 19–24. Incorporating the Proceedings of Workshop 3: Wetlands, local people and development, of the International Conference on Wetlands Development, held in Kuala Lumpur, Malaysia, 9–13 October 1995. Kuala Lumpur, Malaysia: Wetlands International.
- Colfer, C.J.P. (1981) Women, men and time in the forests of East Kalimantan. *Borneo Research Bulletin* 13(2): 75–85.
- Colfer, C.J.P. (1994) Time allocation studies: a methodological note. In: *Tools for the Field: Methodologies Handbook for Gender Analysis in Agriculture*, ed. H.S. Feldstein & J. Jiggins, pp. 163–71. West Hartford, CT, USA: Kumarian Press.
- Colfer, C.J.P. & Noveriawan, H. (1993) Study 1: terrestrial vegetable gardens in Ng. Pengembung and Bukit Tekenang. In: Conservation sub-project quarterly report and attachments, June 1993, ed. R.G. Dudley & C.J.P. Colfer. Bogor, Indonesia: Asian Wetlands Bureau.
- Colfer, C.J.P. & Yost, R. (1987) Time allocation study. In: *Tropisols Technical Report 1985–1986*, pp. 159–62. Raleigh, NC, USA: North Carolina State University.
- Colfer, C.J.P., Amoi & Suriansyah, B. (1993a) Study 2: floating gardens. In: Conservation sub-project quarterly report and attachments, June 1993, ed. R.G. Dudley & C.J.P. Colfer. Bogor, Indonesia: Asian Wetlands Bureau.
- Colfer, C.J.P., Wadley, R.L. & Suriansyah, B. (1993b) Study 3: a recordkeeping study of terrestrial gardening in Wong Garai, Ng. Pengembung and Empaik. In: Conservation sub-project quarterly report and attachments, June 1993, ed. R.G. Dudley & C.J.P. Colfer. Bogor, Indonesia: Asian Wetlands Bureau.
- Colfer, C.J.P., Wadley, R.L. & Zulkarnain, E. (1993c) Study 4: rice cultivation among the Iban of Wong Garai. In: Conservation sub-project quarterly report and attachments, June 1993, ed. R.G. Dudley & C.J.P. Colfer. Bogor, Indonesia: Asian Wetlands Bureau.
- Colfer, C.J.P., Wadley, R.L., Suriansyah, B. & Widjanarti, E. (1993d) Study 7: use of forest products in three communities: a preliminary view. In: Conservation sub-project quarterly report and attachments, June 1993, ed. R.G. Dudley & C.J.P. Colfer. Bogor, Indonesia: Asian Wetlands Bureau.
- Colfer, C.J.P., Wadley, R.L. & Widjanarti, E. (1996) Using indigenous organizations from West Kalimantan. In: *Indigenous Organizations and Development*, ed. P. Blunt & D.M. Warren, pp. 228–38. London, UK: Intermediate Technology Publications.
- Colfer, C.J.P., Peluso, N. & Chin See Chung (1997a) *Beyond Slash and Burn: Building on Indigenous Management of Borneo's Tropical Rain Forests*. New York: New York Botanical Gardens.
- Colfer, C.J.P., Wadley, R.L., Woelfel, J. & Harwell, E. (1997b) From heartwood to bark: gender issues in sustainable forest management. *Women in Natural Resources* 18(4): 7–14.
- Colfer, C.J.P., Wadley, R.L., Harwell, E. & Prabhu, R. (1997c) Inter-generational access to resources: developing criteria and indicators. Working Paper No. 18 (August). Bogor, Indonesia: CIFOR.
- Dennis, Rona, Puntodewo, Atie & Colfer, C.J.P. (1998) Fishermen, farmers, forest change and fire. *GIS Asia Pacific (February/March)*: 26–30.
- Dove, M. & Kammen, D.M. (1997) The epistemology of sustainable resource use: managing forest products, swiddens, and high-yielding variety crops. *Human Organization* 56: 91–101.

- Dudley, R.G. (1996a) The fishery of the Danau Sentarum Wildlife Reserve, West Kalimantan, Indonesia: fishery analysis. Unpublished report to Wetlands International, Bogor, Indonesia: 65 pp + appendices.
- Dudley, R.G. (1996b) The fishery of the Danau Sentarum Wildlife Reserve, West Kalimantan, Indonesia: management considerations. Unpublished report to Wetlands International, Bogor, Indonesia: 27 pp.
- Dudley, R.G. & Colfer, C.J.P. (1993) Conservation sub-project quarterly report and attachments (June). Unpublished report. Bogor, Indonesia: Indonesia Tropical Forestry Management Project, Asian Wetlands Bureau/PHPA.
- Erman, Andi & Sudrajat, Iwan (1997) Inventarisasi Satwa Liar, Wilayah Kerja Kampung dan Hutan Adat Daerah Utara Sekitar Kawasan Suaka Margasatwa Danau Sentarum [Wildlife inventory, community work areas and protected forest areas to the North of Danau Sentarum Wildlife Reserve]. Unpublished report. Pontianak, Indonesia: PHPA, Wetlands International & ODA.
- Fellizar, F., Jr (1993) *Community-based Resource Management: Perspectives, Experiences and Policy Issues*. Laguna, Philippines: ERMP College: 152 pp.
- Giesen, W. (1987) Danau Sentarum Wildlife Reserve – inventory, ecology and management guidelines. Bogor, Indonesia: World Wildlife Fund report for the Indonesian Directorate General of Forest Protection and Nature Conservation (PHPA): 284 pp.
- Harwell, E. (1997) Law and culture in resource management: an analysis of local systems for resource management in the Danau Sentarum Wildlife Reserve, West Kalimantan, Indonesia. Unpublished report, Bogor, Indonesia: Wetlands International – Indonesia Programme: 68 pp.
- Johnson, A. (1975) Time allocation among the Machiguenga. *Ethnology* 14(2): 301–10.
- Johnson, A. (1978) In search of the affluent society. *Human Nature* 9 (September): 50–9.
- Kempf, E. (1993) *The Law of the Mother: Protecting Indigenous Peoples in Protected Areas*. San Francisco: Sierra Club Books: 296 pp.
- Malvestuto, S. (1989) Research and development strategies for the Kapuas river fishery in West Kalimantan, Indonesia: an unpublished project proposal. Unpublished report. Jakarta: USAID: 42 pp.
- Meijaard, E., Dennis, R. & Erman, Andi (1996) Orang utan conservation in and around the Danau Sentarum Wildlife Reserve, West Kalimantan: management implications. Jakarta: Indonesia–UK Tropical Forest Management Programme and International MOF – Tropenbos Kalimantan Project: 21 pp.
- Peters, C.M. (1993) Forest resources of the Danau Sentarum Wildlife Reserve: observations on the ecology, use and management potential of timber and non-timber products (field report I). Unpublished report. Bogor, Indonesia: AWB – The New York Botanical Garden.
- Peters, C.M. (1994) Forest resources of the Danau Sentarum Wildlife Reserve: strategies for the sustainable exploitation of timber and non-timber products (field report II). Unpublished report. Bogor, Indonesia: AWB – The New York Botanical Garden.
- Pimbert, M.P. & Pretty, J.N. (1995) *Parks, People and Professionals: Putting "Participation" into Protected Area Management*. Gland, Switzerland: WWF, IIED, and UNRISD: 63 pp.
- Pollnac, R.B. & Malvestuto, S.P. (1992) Biological and socioeconomic conditions for development and management of riverine fisheries resources in the Kapuas and Musi Rivers. In: *Contributions to Fishery Development Policy in Indonesia*, ed. R.B. Pollnac, C. Bailey & A. Poernomo, pp. 31–3. Jakarta: Central Research Institute for Fisheries, Agency for Agricultural Research and Development, Ministry of Agriculture/USAID.
- Russon, A., Erman, A. & Sinaga, P. (1996) Nest-count survey of orangutans (*Pongo pygmaeus pygmaeus*) in and around the Danau Sentarum Wetlands Reserve, West Kalimantan, Indonesia [draft]. Unpublished report. Bogor, Indonesia: Wetlands International: 23 pp.
- Sandin, B. (1967) *The Sea Dayaks of Borneo Before White Rajah Rule*, p. 84. Lansing, MI, USA: Michigan State University Press.
- Sigman, V., Colfer, C.J.P., Wilson, K., & Yost, R. (1989) Indonesia farm-based research in the Tropsoils project, Sitiung. In: *Working Together: Gender Analysis in Agriculture*, vols. 1 & 2, ed. H.S. Feldstein & S.V. Poats, pp. 135–64 (vol. 1) and pp. 144–69 (vol. 2). Harford, CT, USA: Kumarian Press.
- Tripp, R.B. (1982) Time allocation in Northern Ghana: an example of the random visit method. *The Journal of Developing Areas* 16(3): 391–400.
- Turnbull, C. (1972) *The Mountain People*. New York: Simon and Schuster: 309 pp.
- Wadley, R.L. (1997a) Circular labor migration and subsistence agriculture: a case of the Iban in West Kalimantan, Indonesia. Ph.D. dissertation, Arizona State University: 284 pp.
- Wadley, R.L. (1997b) Variation and changing tradition in Iban land tenure. *Borneo Research Bulletin*: 28: 98–108.
- Wadley, R.L., Colfer, C.J.P. & Hood, I.G. (in press) Sacred forest, hunting, and conservation: an Iban case from West Kalimantan. In: *Sacred Places and Biodiversity Conservation*, ed. G.N. Appell & L. Sponsel: 30 pp.
- Wadley, R.L. & Kuyah, F. (in press) Iban communities in West Kalimantan. In: *An Encyclopedia of Iban Studies*, ed. V.H. Sutlive, Jr. Kuching, Sarawak: The Tun Jugah Foundation: 20 pp.
- Warner, K. (1991) *Shifting Cultivators: Local Technical Knowledge and Natural Resource Management in the Humid Tropics*. FAO Community Forestry Note 8, Rome: 80 pp.
- Wells, M. (1997) Indonesia ICDP study: interim report of findings. Jakarta, Indonesia: World Bank (January).
- Wells, M., Brandon, K. & Hannah, L. (1992) *People and Parks: Linking Protected Area Management with Local Communities*, p. 1. Washington, DC, USA: World Bank, World Wildlife Fund, and USAID.
- Western, D. & Wright, R.M., eds. (1994) *Natural Connections: Perspectives in Community-Based Conservation*. Washington, DC, USA: Island Press: 581 pp.
- Wickham, T. (1997) Case Study No. 5: Community-based participation in wetland conservation: activities and challenges of the Danau Sentarum Wildlife Reserve, West Kalimantan, Indonesia. In: *Community Involvement in Wetland Management: Lessons from the Field*, ed. G. Claridge & B. O'Callaghan, pp. 157–78. Incorporating the Proceedings of Workshop 3: Wetlands, local people and development, of the International Conference on Wetlands Development, held in Kuala Lumpur, Malaysia, 9–13 October 1995. Kuala Lumpur, Malaysia: Wetlands International.