

Training parataxonomists for Costa Rica's national biodiversity inventory:
the experiences of the first predominantly female course (1992)

Daniel H. Janzen and Winifred Hallwachs, faculty

Department of Biology
University of Pennsylvania
Philadelphia, PA 19104

FAX 215-898-8780

and, care of

Instituto Nacional de Biodiversidad (INBio)
3100 Santo Domingo
Heredia
Costa Rica

FAX 506-36-28-16

For additional information on the INBio national biodiversity inventory and the parataxonomists, contact:

Dr. Jorge Jimenez
Director, National Biodiversity Inventory
INBio
3100 Santo Domingo
Heredia
Costa Rica

FAX 506-36-28-16, tel. 506-36-76-90

October 1992

Executive summary:

The Costa Rican National Biodiversity Institute (INBio) is about to start a 10-year total biodiversity inventory of Costa Rica. The INBio parataxonomists are rural persons vocationally trained by INBio to conduct the bulk of this inventory effort in the field. They were almost entirely male, since they were initially drawn from the pool of salaried rural employees of national parks, forest reserves and conservation NGO's. To explicitly redress this imbalance, a grant from the Liz Claiborne and Art Ortenberg Foundation to INBio provided three-year positions for 16 female parataxonomists, and two others were supported by Costa Rican Conservation Areas. The third INBio parataxonomist course, taught during the first half of 1992, therefore had 18 women and three men. The course was financed by a major grant from the National Fish and Wildlife Foundation, matched by grants from the Pew Charitable Trust, Moriah Fund, Conservation Food and Health Foundation, and Gender Office of the Swedish International Development Authority (SIDA). All 21 graduates are now at work in their respective Biodiversity Offices. INBio now has 20 female parataxonomists and 21 male parataxonomists.

The course and the students were a success from all standpoints. A substantial part of this was due to a three-month nation-wide search for candidates, followed by intense interview of 45 of the 156 course applicants. The students chosen ranged from 14 to 37 years old, 61% have children and formal schooling ranged from 1 to 12 years. They were chosen for enthusiasm, apparent intelligence, open-mindedness, having terminated formal schooling, and the degree to which they had thought out their entry into this vocation. A second very important element of course success was very intense and detailed attention to student paraprofessional development by faculty and coordinators. Third, the focus was on developing the ability of all of the students to be psychologically and technically competent to assume their vocational responsibilities, irrespective of initial weaknesses.

The female parataxonomists did differ in a variety of small ways from the male parataxonomists in the previous two courses. These are detailed in this report and are best not subjected here to facile and potentially misleading brief summary. These differences can be, and were, dealt with through small modifications in course structure, and changes in attitude by faculty and coordinators. Some of these difference will undoubtedly apply as well to regular work in later years. However, the female parataxonomists did not differ from the male parataxonomists in any manner that will weaken their overall performance as paraprofessionals and contributors to the national inventory and other INBio programs. Their different living situations - largely owing to family responsibilities - may render the pattern of their contribution sometimes different in structure from that of the male parataxonomists.

All experiences in the course lead to the conclusion that, given the same degree of course adjustment that has been necessary to accommodate the quirks of male parataxonomists, rural Costa Rican women with little formal education are an excellent resource to be developed for the paraprofessional staff that conducts a national biodiversity inventory. Equalizing the sex ratio of parataxonomists not only taps into an enormous pool of underutilized rural human resources, but is also a major step toward bringing all the special capabilities of women into the science and vocation of tropical biodiversity resource management. The course has supported what is turning out to be an excellent pilot project as to how women can move out of their very traditional, and frankly quite stultifying, roles as rural workers, and into a rural vocation with much more potential for them as individuals and for their society. We are certain that we will see many of these women make major contributions to the inventory and as future administrators, and as role-models for their children. These children are will be growing up in an environment where a complex vocation and a vocation in natural resource management are viewed as legitimate and rewarding ways to spend one's life. That is no small thing for the rural tropics.

Index

Introduction to INBio	5
Introduction to the parataxonomists	5
Introduction to scope and content of this report	6
Historical antecedents to the first female parataxonomist course	6
The third course	7
A. Locating and selecting students (September 1991-January 1992)	8
a) Finding the initial applicants	8
b) Preliminary selection of candidates.....	9
c) The final selection process.....	10
d) Attitude of the candidates about the selection process.....	12
e) Male students in the course.....	12
f) Reactions to the application process by friends and relatives.....	12
g) Contact with parataxonomists or INBio or the inventory prior to the course.....	13
B. The course itself.....	14
a) Basic course structure.....	14
b) Basic course philosophy.....	14
c) Individual tutoring.....	15
d) Subject areas covered by technical training	15
1) Why so much on insects.....	15
2) Ecology, remedial hard science, and other processes.....	16
3) Vehicles, horses, computers, budgets, administration, organizational structure, decision-making, etc.	17
C. How do male and female parataxonomists differ in technical performance?.....	18
a) Illustration and drawing, mapping and geography.....	19
b) Attitude toward the course.....	20
c) Preparation of specimens.....	20
d) Collecting specimens.....	21
e) Physical condition.....	21
f) Maintenance.....	22
g) Budgets.....	23
h) Memory for names and biological facts.....	23
i) Attention to a lecture format, note taking.....	24
j) Learning by reading.....	24
k) Computers.....	25
l) Snakes, spiders, scorpions, hairy caterpillars, etc.....	25
m) What have they seen before.....	26
D. Course sociology.....	27
a) Escape from the husband-dominant, wife-subdominant role.....	27
b) Willingness to enter into group discussions and group cohesiveness.....	28
c) Native American vs. "white" interactions.....	30
d) Indians <i>per se</i> as parataxonomists.....	30
e) Children in the course.....	31
f) Visits by husbands or boyfriends.....	32
g) On having a job.....	33

h) Parataxonomists as private collectors.....	34
i) Should women be parataxonomists?.....	35
j) What was the fate and role of the three male parataxonomists in the course?.....	35
k) Sexual aspects of the course structure.....	37
l) Age differences.....	40
m) Response to foreign versus Costa Rican staff.....	40
n) Alcohol and other drugs.....	42
o) Graduation (Appendix 4)	42
E. In closing.....	43
F. Literature Cited.....	44

Introduction to INBio

The Instituto Nacional de Biodiversidad of Costa Rica (INBio) has accepted the responsibility of conducting a national inventory of Costa Rica's wildland biodiversity. This small country of 50,000 km² is about one quarter conserved wildlands, distributed among eight Conservation Areas (Figure 1). These Conservation Areas contain about a half a million species of organisms. One of INBio's primary goals is to inventory these species so as to

- **clean up their taxonomy**, and thereby make information about them accessible to all users and realize the full inferential power of taxonomy,
- **know where they are**, so that they and the information about them can be used non-destructively by all sectors of society, and
- **begin understanding their natural history** sufficiently well that their potential uses and environmental relationships can be appreciated and developed.

INBio estimates that Costa Rica's national inventory can be conducted in ten years (beginning in 1993) and requiring an annual operations cost of approximately \$3 million/year (in today's dollars). This figure does not include the cost of the other INBio activities - those of facilitating the use of Costa Rican's wildland biodiversity by the nation and by the world.

Founded in mid-1989, INBio has now invested three years in planning, experimenting and on-the-job-training for this inventory process (as well as many other activities). It is a novel non-profit, private and publically-oriented institution that is being structured for and dedicated to the conservation of wild biodiversity through non-destructive use (Appendix 1; Aldous 1991, Gámez 1991, Hovore 1991, Janzen 1991, Joyce 1991, Raven and Wilson 1992, Reid 1991, Roberts 1992, Sandlund 1991, Tanglely 1990).

Introduction to the parataxonomists

A core activity in this short period of preparation has been the invention and fine-tuning of a staff of inventory paraprofessionals termed "parataxonomists". The parataxonomists are the primary field agents of the national inventory, currently working out of about 30 biodiversity offices scattered through the nation's eight Conservation Areas (Figure 1). The parataxonomists are the primary field collection component of a complex INBio processing system that begins with the field-caught specimen and continues through curators, the collections, the international taxonomic network, and eventual products. These products are field guides, identifications, new species descriptions, contributions to monographic revisions, cladistic analyses, species data bases integrated with GIS and other data bases, and the service of guiding users to collateral biodiversity information through the medium of a species' Latin name). The parataxonomists are rural in background, adults engaged in a lifetime (new) career of biodiversity management, and trained specifically for this vocation as an add-on to whatever school education they may have had.

It is estimated that during the decade of intense national inventory, INBio will need and maintain a standing staff of 100-200 parataxonomists. A total of 52 have been trained to date. The first two parataxonomist courses occurred in the first half of 1989 and the middle of 1990 (Janzen and Hallwachs 1992a).

Scope and content of this report

The third course, to be described here, occupied the first half of 1992. This description focuses on those aspects of the course that were strongly related to it being almost entirely made up of women.

However, this third course also differs from the first two courses in being a further step in the evolution of parataxonomist courses in general. The key and essential roles of the course coordinators, and the extremely exhausting nature of their work merit substantial analysis. The mandatory presence of a highly supportive administrative and logistic structure at INBio, and in the Guanacaste Conservation Area where the course occurs, has also been underlined by this course.

This course also benefited from intense visits by the INBio curators and international taxonomists, and substantial teaching offered by local science and parascience personnel. Journalists and political visitors also helped in their own unique ways, by highlighting non-technical aspects of the course. This report does not dwell on them, but their assistance is very gratefully acknowledged.

The question of how best to base complex paraprofessional training and motivation on a rudimentary school background is a major pedagogical question only partly resolved. These and many other pedagogical evolutionary aspects merit a full descriptive analysis that will be presented in a different report as part of an analysis of paraprofessional courses in biodiversity resource management.

Historical antecedents to the first female parataxonomist course

A basic philosophical pillar of INBio's parataxonomist program is to develop a major ability and responsibility for wildland biodiversity management within the communities of residents immediately adjacent to, or extending into, the Conservation Areas. This goal is a contribution to the national goal to decentralize the entire conservation management process. In this context, the 31 members of the first two parataxonomist courses were drawn from the rural staffs of national parks, forest reserves, and private conservation areas. At that time, essentially no INBio funding was available to hire parataxonomists. Only fully-salaried applicants could be accepted. This applicant pool was (and still is) almost entirely male. Only two women were among the 50-plus applicants; both were selected for the first course and both became (and still are) excellent parataxonomists.

However, it is self-evident that half of the resident community that must come to accept the custodianship of Costa Rica's conserved wildlands are women. Furthermore, women participate to some degree in the great majority of rural Costa Rican occupational tasks. Finally, and perhaps most important of all, it is clear that the female portion of the community contains a very large number of persons whose intelligence and enthusiasm is strongly underutilized by themselves and their society. This underutilization occurs in a countryside where family size has dropped precipitously from 7-15 children to 1-4 children within one generation, labor-intensive agriculture and small farms are rapidly giving way to an agroscape demanding a smaller number of better-trained personnel, and the (basically immigrant) resident culture has aspirations for a standard of living close to that of the "developed" world. The rural human resource has the potential to become one of Costa Rica's most powerful natural resource management technologies, and that resource is half women.

In this context, then, since 1990 the fund-raising activities of the Guanacaste Conservation Area

(GCA) (Figure 2; Allen 1988, Holden 1986, Janzen 1988, 1989, 1992a-d) and INBio have been alert to any possibility for a donation that could be used to explicitly redress the strong male bias among the parataxonomists. All generic and "wish-list" proposals for funding have contained elements that could explicitly or implicitly be used this way. In January 1991, a AAAS (Washington, D.C.) presentation on INBio was attended by a staff member of the Liz Claiborne and Art Ortenberg Foundation, who then invited INBio to provide a list of priority projects for consideration of possible funding. In August 1991 this foundation explicitly chose the funding of salary and operating expenses for ten female parataxonomists for three years as the way in which they would support INBio. The Liz Claiborne and Art Ortenberg Foundation was the first funding source to respond to an INBio request to explicitly bring rural women into the direct management process and science base for Costa Rica's biodiversity.

Then the problem became how to fund their training. The US-AID Biodiversity Support Program which had generously supported the training of the first two courses (Janzen and Hallwachs 1992a), felt that parataxonomists were no longer sufficiently novel to merit further support, and that further courses should find their primary support from other sources. The Pew-INBio teaching endowment does not generate enough funds to teach more than one course every three years.

In April 1991, the National Fish and Wildlife Foundation (NFWF) asked the GCA and INBio what was their top priority in the area of training and human development. The funding of the third basic parataxonomist course, and associated costs of establishing the resulting parataxonomists in their offices, was presented to the NFWF as this top priority. In November 1991 this foundation made an \$80,000 challenge grant to INBio, which was then matched by the Pew Charitable Trust, the Moriah Fund, the Food, Health and Conservation Foundation, and the Swedish International Development Authority to complete the course budget (Appendix 2). This grant was for the year of 1992, beginning with six months of the course and a six month establishment period. Most of the faculty cost for the course was donated by the University of Pennsylvania (Janzen) and W. Hallwachs, as was the case for the two previous parataxonomists courses as well.

As an INBio formal course, the course received essential and very great unbudgeted direct support from the INBio staff and institutional structure. An enormous amount of logistic and psychological support for the course was also contributed by the staff of the Guanacaste Conservation Area (GCA; Figure 2), and therefore by the government of Costa Rica and all the other sources of support for the GCA.

The third course

The course has three major phases: location and selection of students (September 1991-January 1992), the formal course (January-June 1992), and establishment of parataxonomists into a working program (July-December 1992). The course has two major and inextricably intertwined themes. First, there is the basic training of parataxonomists. This activity is under continual evolution and evaluation as the biodiversity management situation in Costa Rica evolves and as all of us learn more about how to construct the rural vocation of biodiversity management in general, and biodiversity inventory specifically. The second theme is that of explicitly moving rural women from the vocation of "housewife" and "housewife-to-be" to the vocation of biodiversity inventory specifically and biodiversity management in general. The descriptive analysis presented here for the third parataxonomist course, containing 18 women and 3 men, deals with both of these themes. These are separated here as much as possible for the convenience of the reader, but it is necessary to emphasize that in real life they are concurrent and mutually influential. It is equally important to stress that much of what will be "the tradition of women

parataxonomists and their training" is still in the future, to be discovered by this on-the-job learning process.

A. Locating and selecting students (September 1991-January 1992)

a) Finding the initial applicants. The course coordinator (Sr. Carlos Chaves) and the coordinator of the INBio parataxonomists (Srta. Maria Marta Chavarría) sought out the female applicants for the course (see later for male participants). Chaves was a parataxonomist in the first course (1989) and had displayed exceptional production, responsibility, initiative, and individual teaching ability in his daily work. He is in his early 40's.

Chavarría was the first "protoparataxonomist" and spent 1986 and 1987 by herself inventorying moths at the OTS (Organization for Tropical Studies) La Selva Biological Station as part of the pre-INBio NSF-supported "Moths of Costa Rica" project, with additional support from OTS. After graduating from the University of Costa Rica, she worked for years as a volunteer at the Museo Nacional de Costa Rica, with extensive hands-on experience in both entomology and botany. She is a specialist in taxonomy of Costa Rican Gesneriaceae. At the end of the first parataxonomist course in July of 1989, she became the parataxonomists' field coordinator for the newly forming INBio and has played a highly significant role in the success of the parataxonomist program. She is in her early 30's.

They divided the country into its northern (Chaves) and southern (Chavarría) halves, and spent September-November traveling by car, bus and foot to small communities on the margins of the seven mainland Conservation Areas (Figure 1). Chaves spent nearly full-time at this and Chavarría interwove it with her other exhausting field responsibilities of coordinating and facilitating the working parataxonomists. Both Chavarría and Chaves were dedicating 60-70-hour work weeks to this task.

It was initially planned that the students would be sought and interviewed by a combination of the course coordinator and INBio's parataxonomist coordinator. However, the parataxonomist coordinator stayed with the course and became co-coordinator, and served as an outstanding example of a Costa Rican woman who is completely comfortable and productive in the field.

The areas to search for students were chosen for a) proximity to large wildland areas not already covered by parataxonomists working out of an established Biodiversity Office, b) being fully rural, and c) representing habitats not yet being sampled by the INBio inventory process. Additionally, the National System of Conservation Areas (SINAC) (includes the Costa Rican National Park Service, National Forest Service, National Wildlife Refuges, National Wildlife Service) was notified officially in San Jose, and informally in the field, that any female staff members were welcome to apply. These administrations were also asked to please be alert for local female residents who should be encouraged to apply. Costa Rican non-government conservation organizations were likewise notified.

In the field, Chaves and Chavarría explained the opportunity for the course and subsequent employment to individual housewives, schoolteachers, and local leaders. By the end of the three-month period, they concluded that the most effective means was ask a prominent person in the community to invite a small number of potential candidates to a meeting. At any conversation, they handed out an 11-page detailed description of the course and parataxonomist's responsibilities, with a two-page application form attached. No level of formal education was required (the actual applicants, and the final candidates selected for the course, ranged from having less than one year of gradeschool to having completed high school). In all

conversations, and in any written material, it was explicit that only women from rural communities would be considered. Furthermore, at first implicitly and later explicitly, it was made clear that no one would be considered who was currently in formal schooling (gradeschool, high school or university). It was deliberately decided that the only successful candidates would be those who had firmly terminated their formal education.

b) Preliminary selection of candidates. The only applicants that were to be considered were those who returned the application form to INBio by 1 December. However, several outstanding candidates were also considered whose application forms arrived as late as the first week of January, and one candidate was chosen by her community and personal interviews without detailed examination of her application form.

156 application forms arrived at INBio in time to be considered by the next stage. At least another 20 applications arrived late or never arrived owing to confusion as to the proper mechanism to get them to INBio, an inopportune change in INBio telephone numbers by the telephone company late in the selection process, and the somewhat chaotic situation for the delivery of written communications in the rural Costa Rican countryside. For example, it is commonplace for a rural resident to ask some other traveler to deliver something to an office in the San Jose area. However, a certain fraction of these anticipated deliveries are not completed, for a multitude of reasons. Equally complicating is that most rural Costa Ricans do not have telephones or effective mailing addresses.

Of these 156 applicants, only six were persons already employed by or working in some aspect of Costa Rica's conservation or natural resource management system. Two of these were chosen for the course (Sra. Hazel Gutierrez, the cook at the Sirena Biological Station in Corcovado National Park, and Sra. Elba Guadamuz, the wife of the Sector Caretaker, El Hacha, Guanacaste National Park).

No system was employed to notify an applicant that the application form had actually been received, largely because such was not expected in Costa Rica and because it would have been very time-consuming to locate the applicant. Many applicants did, however, double-check that their application had arrived.

Chavarría and Chaves then each independently ranked the applications from best to worst. The upper portions of each rank list were then compared and found to be very similar. The top 40 persons of the two lists in common were invited to come to INBio in December for an individual interview of a half hour or more by Chavarría and Chaves. The goal was to narrow the pool to about 25 applicants. The interview stressed and evaluated on the basis of

- a) personal level of enthusiasm for the opportunity,
- b) physical/conceptual skill at grouping individuals of pinned insects into morphospecies,
- c) intelligence and level-headedness when confronted with the novel circumstance of INBio and the interview (for some candidates this was only their first or second trip to the capital city, San Jose), and
- d) their willingness to be open-minded and not affronted about a series of questions such as how many abortions they had, how would they handle child care as a working woman, and why had they left school.

The evaluation was not based on whether they had answers to these situations and questions but rather whether their reactions to them suggested that they were ready to take on a pioneering responsibility at a personal, social and professional level. The simple desire for "a job", even if intense, or for "an educational opportunity" was important but not sufficient for acceptance.

Again, Chavarría and Chaves evaluated the interviewees independently. There was virtually no disagreement as to the best candidates. The top 25 were chosen for a subsequent individual interview by Janzen and Hallwachs in the Guanacaste Conservation Area in early January 1992.

c) The final selection process. The goal of the second interview in the GCA was to match the candidates to the ten funded positions made available by the Liz Claiborne and Art Ortenberg Foundation grant mentioned earlier, plus accept any additional persons already supported by salary lines from other institutions, and of equal quality and potential.

The 25 applicants were notified of these second interviews in the first few days of January, and arrived individually at the GCA between 3 and 8 January (for a course start date of 23 January). Most were accompanied by friends and/or family members at the interview. One was interviewed at the INBio facility near San Jose because of the difficulty of coordinating a visit to the GCA (she lived nearly two days travel from INBio at that time of year). This final interview process was made especially difficult by the problems of communicating rapidly with someone in rural Costa Rica, where the most common method is to pass a message along a chain of acquaintances or relatives from a centrally located telephone, or announce it on one of the sectorial radio programs.

The willingness to travel from some remote portion of rural Costa Rica to the equally remote GCA was also a test of the candidate. For almost all candidates, this route was over roads and bus routes unknown to the interviewee and in a portion of the country never before visited by the interviewee (only four of the candidates had ever been in or near the GCA). For 13 of the 18 finally selected, this was the longest trip they had taken in their lives.

Sra. Gerardina Gallardo is a special case worthy of individual description. Gerardina was one of three candidates chosen to apply by her indigenous indian community (at Amubri in the Talamanca Indian Reserve in southeastern Costa Rica near the Panama border, a full day's travel from INBio). This choice process was slow and complex, and once taken could not be readily communicated (owing to the only means of communication being a single radio telephone that is (hopefully) answered by passersby). When it was realized that no representative of that portion of the indigenous community had become incorporated into the final interview process, owing to the absence of application forms at INBio, Chavarría and an INBio curator went to Amubri and conducted the final interview and choice on site.

The interviews at the GCA lasted about an hour and focused on

- a) reactions to the very new environment of the GCA,
- b) enthusiasm for what was being described as the task and opportunity,
- c) the amount of planning and forethought that had gone into thinking about how to handle family and personal relationships with respect to the upcoming six month course in the GCA and future work,
- d) questions that they had about all of this,
- e) certainty that they had terminated their formal schooling,
- f) apparent intelligence, and
- g) open-mindedness.

The interview took the opportunity to stress that while they were being selected and trained to work as parataxonomists in the area they came from (lived), it was definitely possible that upon graduation those without family responsibilities might have to be assigned to some different area (in fact this has turned out to be true for only one person, to date). However, this and similar admonitions and warnings were not

effectively absorbed, in great part due to the (highly evident) desire that all of these second interviewees expressed for getting into the course. Also, the final interview was not a time for this kind of mental absorption, given the extremely high tension associated with the interview. One interviewee was so keyed up that she did not even see an adult male Virginia opossum that walked almost across her toes, while she was seated with her feet directly in front of her, in the middle of the interview.

For nearly all, these interviews for the course were the first time that they had been formally interviewed for anything in their life. Their working class subculture is not one based on public job searches and subsequent distribution of job opportunities according to an open comparative evaluation of merit and potential.

The easiest candidates to eliminate were those found, upon close questioning, to be still in formal schooling (gradeschool headed for high school, high school with an application into one of Costa Rica's universities). The course made an initially subconscious and then later explicit policy decision to not be responsible for interrupting the formal education trajectory of any rural woman. This act automatically eliminated some highly motivated self-starters, but since there were already too many of these for the positions available, it probably did not hurt the overall output. On the other hand, this was extremely difficult to explain to some of the candidates, people who viewed acceptance in the parataxonomist program as a logical reward for all the effort that they had put into formal schooling to date.

Other candidates were eliminated for being "short course junkies" or for being found to be focused on the course purely as a source of family income. One unsuitable interviewee appeared uninvited, apparently having been manipulated into appearing by well-meaning foreign associates.

However, it proved impossible to reduce the number of highly appropriate female candidates below 18, with two of these being on government payrolls (one from the Guanacaste Conservation Area and one from the Osa Conservation Area). Rather than arbitrarily and blindly cut six highly suitable candidates, it was decided to convert the better part of the operations budget in the Liz Claiborne and Art Ortenberg grant into salary lines, increase the number of students in the course from 15 to 21 (18 women and the three males, see below), and bet on somehow finding a replacement for these operations costs in the future. The students are described in Appendix 5.

Seen coldly, it was possible to argue that a small number of the students would in fact drop out (none did) during the course or in the months immediately following (none have). Such overbooking is still viewed as reasonable, but given the excellent pool of talent available in rural Costa Rica, is likely to generally result in operations cost overruns. By some internal corner-cutting in the basic course budget and very generous course operations subsidy by the GCA, the course itself was able to sustain this increase in enrollment without exceeding its formal budget. However, this act also does leave INBio with the task of raising the additional operational costs for these female parataxonomists from late 1992 onward.

Once the interview process was terminated at the GCA, a final selection was immediately made and from 12-20 January, the successful 18 women were notified and simultaneously told to appear in the GCA on Sunday, 26 January, to begin the course on 27 January 1992. It had been originally planned to conduct the preliminary selection process in September-December 1991, do the final interviews in the first week of January, and start the course in the second week of January. However, this portion of course planning involved not only national communication and travel, but substantial support activity and coordination by INBio, the GCA and Costa Rica's conservation system overall. The period from about 15 December to about

15 January is a period of relative administrative chaos and inactivity (Christmas and New Year). It is simply impossible to conduct and coordinate closely-timed national level plans at this time of year - extensive holidays, work backlogs that they create, and a general feeling that new initiatives are best left for the new year rather than started toward the end of the terminating year.

When notified of acceptance in the course, the women were reminded that the course would have a full-time child-care person who lived with the course, and that children were welcome from the first day.

d) Attitude of the candidates about the selection process. All candidates appeared to view the selection process as a test of their own value as much as an opportunity. In Spanish, the usual phrase for 'getting a job' is to 'win', and many candidates spoke of "winning the competition" as an end in itself. This was particularly marked in the candidates of in their late 'teens. Chavarría and Chaves were very sensitive to this phenomenon and highly attuned to which of the rejected candidates were most vulnerable to suffering a serious blow to their self-esteem. They discussed and carefully thought out how to express acceptance or rejection to individual candidates, and sometimes drove for several hours in order to deliver the news in person.

e) Male students in the course. There were also three male parataxonomists admitted to the course owing to prior INBio commitments. One, Sr. Freddy Quesada, had been a technical assistant on the NSF-supported "Trichoptera of Costa Rica" (PI, R. Holzenthal, University of Minnesota) and was given parataxonomist training by INBio in anticipation of his new INBio-supported assignments as the Trichoptera fauna became well-inventoried. He currently serves as a site-rotating INBio parataxonomist specializing in Trichoptera, and a stimulus for Trichoptera collecting by the parataxonomists at the biodiversity offices he visits. The training of the other two male parataxonomists, Sr. Ronald Vargas and Sr. Danilo Brenes, was an explicit INBio contribution to the NSF-supported "Inventory of the arthropods of La Selva" (PI, R. Colwell, University of Connecticut). Their cost to INBio terminated at the end of the formal course, since their inventory activities are now part of this micro-geographic inventory within the national biodiversity inventory.

These three males thus became part of the course owing to commitments made by INBio prior to the knowledge that there would be the opportunity for a female course, rather than as an explicit effort to have some male members. However, as will be discussed later, the presence of male members was in fact both instructive and salutary in many unanticipated ways, just as two women in the first parataxonomist course (1989) were also instructive and salutary (though difficult for them). It is a complex question as to just what are the various optimal compositions of paraprofessional courses such as this one. More empirical information from subsequent courses is definitely needed on this topic.

f) Reactions to the application process by friends and relatives. It became clear during the interviews, and also during the course itself, that each successful applicant had discussed the opportunity and participation in it quite extensively with friends and relatives. An in-depth study was not made of this phenomenon, but some evident aspects are worth mentioning. Most noticeable were three cases where one or both parents were strongly opposed and the daughter and/or another parent expended considerable energy in obtaining permission. Associated with this, and in retrospect, it is clear that part of the interview process at the GCA contained an element of brief visual inspection of the GCA by friends and relatives. Was it a physically safe location? Were the living facilities acceptable (buildings, living conditions, attitudes of on-site personnel)? Since the interviews took place in the Janzen-Hallwachs living room/laboratory/clutter, it appeared to us also that our "tin-roofed hut" (to quote an English

journalist) said something friendly and positive to the candidates. Chaves' friendly attention was also a major contribution.

On several psychologically difficult occasions during the course, students commented that "if I had understood it would be this difficult, I would not have applied". At times it was clear that the "I" in that sentence referred to close relatives as much as the student. Whether comments such as this are hyperbole, they do reflect the extreme difficulty of transmitting to the candidates what they are getting into, when the opportunity and vocation is totally foreign to their personal experience as a member of Costa Rican society. The course also involves a gender role-shift that is not common in their subculture. In other words, for example, they had all seen Costa Rican women employed with a salaried and complex responsibility, but only three of the 18 women had ever experienced it.

Parents and friends had a quite difficult time evaluating the situation in detail, since it also fell well outside of their experience. However, associates almost universally saw it as "an opportunity" not to be passed up. At the same time, these persons also assumed that the person being trained would return to her local biological and social environment, and not have to rupture family and friend relations over the long run.

There was no evident indication of a husband's resistance to a wife's participation in the course at the time of interview. However, such resistance would probably have been most manifest in preventing the potential applicant from applying in the first place (several cases were reported). The course participants do not, therefore, represent any kind of evaluation of the overall degree of intra-family resistance to a wife or daughter moving into this vocation, or into a non-home vocation. During the course itself, husbands did have difficulties with some of the schedules but public responses by wives tended to be "This is good for me. He will have to learn to live with it", followed by a diversity of manipulations of schedules by the wife so as to keep the husband from being too aggravated with the wife's behavior. We use the word "wife" here to encompass any kind of pair-bonding, since there were about as many different kinds of pair-bonds as there were participants.

It should be noted that while women with salaried responsibility are commonplace in Costa Rican urban areas, they are much less common in the agropastoral landscape (except in schools, hospitals and office/store administration).

Finally, in considering the willingness of women in Costa Rica's working-class rural society to move into parataxonomist positions, it need be remembered that at least 93% of Costa Rica is occupied by descendants of immigrants arriving in successive waves from Europe, China and the Caribbean between about 1520 and 1970, with a strong overlay of immigration from other Latin American countries. For such people, moving into a new part of Costa Rica or a new vocation, or even a role usually occupied by the opposite sex, tends to represent the (easier) modification of geographic relationships rather than (more difficult) rupture of deeply set ethnic bonds.

g) Contact with parataxonomists or INBio or the inventory prior to the course. One student was the wife of a parataxonomist from the second course. Thirteen had observed parataxonomists at work collecting because a Biodiversity Office was in the vicinity of her home, had voluntarily been an apprentice to a parataxonomist, or had worked with collectors. However, in only three of these cases had the contact been sufficiently great that the student had learned actually how to do some actual collecting or specimen preparation.

B. The course itself.

a) Basic course structure. The course begins with two months of intense work as a group at two of the major biological stations in the GCA, followed by five weeks of independent work (in association with 1-2 established parataxonomists) at a Biodiversity Office far distant in kilometers and biology from "home", followed by another two months of intense work as a group at three of the major biological stations (Figure 2) in the GCA. Once graduated, their next six months of truly independent work at a "home" Biodiversity Office are being closely monitored in explicit feedback sessions at INBio every 2-3 months, and with visits in the field by the parataxonomists' coordinator, occasional visits by the Director of the national inventory, and visits by the INBio curators.

The two month periods of intense work in the GCA are in the form of 8-14-day blocks of full-time total immersion, followed by 4-5 days of free time to return home. Travel two and from the GCA used up about two of these days for nearly all students, except those three from the vicinity of the GCA. The mid-course "independent" period was scheduled individually by the students, either as one long field period of 28 days (elected by most students) or two shorter periods with a break in the middle.

We attach a copy of the course schedule for the first two months to give an idea of the detailed daily activities (Appendix 3). In general, the course ran from 7 am to about 9 pm, with 1-2 hours free at lunch and 1 hour free at dinner (it started out terminating at 7 pm, but was moved to the longer day in the second month because it became evident that the students could handle it). However, on many nights a given small group of students went to some field site and set out lights that were tended all night to collect the insects that arrived. These students slept out on the ground or in abandoned farm buildings.

The report on the first two (male) parataxonomists courses contains ample commentary on the course and the parataxonomists, and should be read as a companion to this report, which does not attempt to repeat the bulk of the material presented there. However, this third course represents further evolution in all aspects of the course and the parataxonomist. It is these changes and additions that are stressed here.

b) Basic course philosophy. The single course goal is, and always has been, to generate a body of people that are capable of happily living in a very rural, isolated and wildland area while conducting a biodiversity inventory of that area. This vocational life must be guided by self-direction and by sporadic and sparse guidance, directives and feedback from a more centralized national inventory process (INBio). A constraint is that this goal must be achieved rapidly, with rural working-class residents with little formal education and virtually no education in biology, and with minimal operating budgets.

The basic parataxonomist course therefore has both a technological and a sociological philosophy. In the first two courses, the stress was on technological competence to carry out an intense biodiversity inventory, and on sociologically positioning a person to be a low-supervision and highly responsible staff member who is driven by understanding the institutional goal of a national inventory. This means de-emphasis of motivation by wages, direct daily supervision, peer pressure, union regulations and the host of other motivations that traditionally drive male members of the rural workforce (see the final report on the first two parataxonomist courses for elaboration). In this third and female course, the stress was on these two things plus a third. This third is the art and science of moving from outside the paid workforce to becoming a salaried member of society, with all of the associated responsibilities and freedoms - and doing this while balancing the parataxonomist's job with whatever homemaker and typically women's roles

continue after the course. In practice, and for the purposes of this report, however, it was not possible to separate these two sociological areas either in training or analysis both because they very strongly influence each other and because they become synonymous on many occasions.

The technological aspects of being a parataxonomist were, as expected, relatively easy and straightforward for the students and the faculty at the time of the course. However, after the course, these technological aspects still need substantial further polishing, both through self-directed learning and direct feedback from INBio staff. The other two areas, involving far more than learning new technical skills, were the easiest in the somewhat protective environment of the course, and highly heterogeneous in difficulty and complications after the course.

The training in the course was partly done by explicit explanation and partly by invisible planning, without explicit explanations until after the fact, if at all. As faculty we learned very quickly that openness as to the reasons for a classroom manipulation or structure were not appreciated or of great interest. There was a strong preference demonstrated for invisible manipulation, with the consequences being viewed as happy accidents. For example, a fast learner on some point would rather teach a slow learner by finding herself accidentally paired up with a slow learner, than be told that the fast and slow learners were being paired to form an apprentice-mentor relationship. This was in large part because class-members were generally resentful of other class-members who were better than they were at something, and quite resistant to being taught by a better performer. Equally asymmetrical, the better students did not necessarily enjoy teaching a poorer performer. On the other hand, the students were at times remarkably open to completely new ideas that acted on the course as a whole. That is, they readily accepted the course as a microcosm with a new set of rules such as a de-emphasis on extreme cleanliness.

c) Individual tutoring. Because of the students' lack of familiarity with the activities that make up being a parataxonomist and the heterogeneity of students' backgrounds, much more time was spent in individual tutoring in this course than in the two previous courses. This tutoring was particularly intense during the first half of the course. The women students were very receptive to tutoring unless it was done with a disparaging attitude by an inexperienced tutor; pride did not appear to be a problem. It is possible that several students would have left the course without individual attention to the areas in which they felt particularly weak or unconfident. The best students were also 'tutored' in advanced topics.

d) Subject areas covered by technical training.

1) Why so much on insects? This course, as was the case with the first two courses, used insects as the primary teaching tools, as well as stressed entomological collecting and inventory techniques. There are several reasons:

a) Insects presently contain the single largest group of un-inventoried organisms in Costa Rica. Mites and microbes may be nearly as speciose and are even more poorly known, but since virtually all work with them is done by means of a microscope and laboratory, they do not lend themselves to quick association with a field inventory by the (initially) non-biologist. They also do not lend themselves to the present-day primitive field conditions of nearly all Costa Rican Biodiversity Offices. Mite inventory is a logical next (specialized) step once a parataxonomist is settled into the vocation.

b) Insects are large enough to be seen and manipulated and understood easily, and they are extremely diverse. They also lend themselves to being teaching examples in explaining virtually all ecological, taxonomic and evolutionary processes (mimicry, predation, parasitization, sibling species, hybrids, individual variation, phenotypic plasticity, history of taxonomy, keys, cladistics, etc.).

c) In the GCA there are large numbers of insect individuals and species present at all times, which is extremely important for a hands-on full-time vocational course. Insects can be quickly found, often relate to what the student has seen before in life, and can be collected and mauled without significant negative impact on the very biodiversity that the Conservation Area is set up to sustain.

d) The collecting and inventory methodologies for insects are very diverse and easily lend themselves to teaching maintenance, routines, scheduling, repeatability, reliability, statistics, error evaluation, etc.

e) An insect's intricate body, durability of form and color after death, and mounting and storage techniques (mounted on pins, stored in a box) lends it to repeated examination and reinforced learning by the student, identification with what the student has personally accomplished ("her own insect collection"), evaluation by faculty (an experienced entomologist can tell with a glance at a box of several hundred insect what the student has been spending her time on), and specimen exchange among students.

f) Costa Rica's national vertebrate biodiversity inventory is essentially complete except for small snakes and a few lizards/salamanders/frogs in very inaccessible or very special habitats. More site-specific vertebrate inventory requires learning them species by species and inventorying them primarily through sightings, rather than collecting. While the parataxonomists are taught how to collect and preserve small vertebrates in alcohol, additional and more local INBio vertebrate inventory will require more advanced and site-specific training than the basic course has the time to offer.

g) The art and science of plant collection, and plant biology, are briefly but intensely covered in the basic course, and continued by the parataxonomists during their first year of general work. However, for them to make a serious contribution to the national plant inventory, which is already 80%-plus completed, they require detailed and site-specific further feedback and collecting guidance at their individual Biodiversity Offices rather than more emphasis in the course.

h) The art and science of inventory in other less tractable groups (nematodes, fungi, algae, Crustacea, diatoms, other Protista, mites, spiders, microbes) is briefly discussed but not treated in detail in the basic course, both owing to a shortage of time and because serious work in these groups requires specialized instruction by specialists as an add-on to the basic training, as well as specialized on-the-job feedback.

2) Ecology, remedial hard science, and other processes. Throughout the course, ecology and evolutionary processes are touched on, discussed, and examples made available in a multitude of ways. One of the many reasons why the course needs to be so long is that new concepts need time to germinate and work their way through the student's memory. Mimicry and its relations to "what is a species" are easy enough to explain and grasp. However, they become more complex and time-consuming when used to introduce genetics, natural selection and polymorphism. These latter three concepts, in turn, relate to many real-life experiences that the student has had, but it takes time and rumination to make the connections. The course is both building a framework and hanging on it old memories and new facts/ideas.

The introduction to ecology that is received by the parataxonomists is also the first step in preparation for the eventual more ecologically-oriented tasks that will come to them as the national inventory nears completion. This ecological emphasis is already screaming for attention as administrators attempt to "steal" the parataxonomists for other conservation activities ("paraecologists" are on the short-list of upcoming INBio inventions). Ecology is also part of what makes the inventory "fun", what converts a bug on a pin to a real thing with a curiosity-inducing natural history.

However, the course also has to walk a fine line by emphasizing that the parataxonomists, today, do have the very explicit goal of doing the inventory. There is a danger of parataxonomists getting side-tracked into the great open-ended morass of more enjoyable but lower priority (at this moment, for these persons) activities of Victorian natural history, biodiversity prospecting, ecological monitoring,

conservation of threatened species, etc. The reader is cautioned to understand that the course and the phenomenon of parataxonomists fully recognize the need for MUCH work in this area, but by people whose time and training is specialized in that direction, rather than as a distraction from the basic inventory. There is frequent confusion between the goals of the parataxonomist program and a university education; the parataxonomist program is oriented to the goal of the national inventory and facilitating biological literacy in rural areas.

Taxonomy is, for several reasons, a major topic throughout the course, both as the human social activity of identifying what one is working with, and as a reflection of real biological processes that are evident in taxonomic relationships. First, taxonomy is a major tool of the supervision-free inventorier - if you don't understand the units you are gathering, it is very hard to do quality gathering. Second, taxonomy is quickly and easily understood by the complete novice, thereby generating an essential and self-motivating sense of confidence in an area that appeared to be absolutely incomprehensible at the beginning. Simply learning a long string of complex Latin names for familiar objects is a major teaching tool. Third, taxonomic principles and understanding are very useful street tools for organizing one's own life vis a vis the large and unknown vocation into which the parataxonomist suddenly finds herself projected, a vocation where one cannot afford to treat each event as unique. One can arrive at the concept of a "generic drug" from many different directions.

Since these students begin the course with not only no background in biology, but also virtually no background in hard science, the course contained much "remedial" science. This "remedial" aspect of the parataxonomists' background needs to be continued throughout their on-the-job training, but owing to their very pragmatic orientation (both personally and in the nature of their job), it cannot be done well by treating it as an isolated topic. The chemistry of secondary compounds, for example, has to arrive through examples of plant defenses, horrible chemicals excreted by insects, tanning of leather, etc., rather than through a course in organic chemistry. On the other hand, once they have had some pragmatic exposure of this sort, then the stage is set for very short (1-2 hours) short courses in that organic chemistry which is very directly related to the macrophenomena they know about. Here, then, phenols become a reality as those "things" that cause tanning in leather and inhibit gut enzymes in caterpillars. Enzymes become a reality as those "things" that break down food in the gut. But the faculty have to constantly remind themselves that the parataxonomists are not graduate students headed for a Ph.D., and that random learning in itself is not their number one priority in life. This is vocational training.

3) Vehicles, horses, computers, budgets, administration, organizational structure, decision-making, etc. Any parataxonomist, irrespective of sex or origin, needs a major upgrading with respect to organizational and technical capability with the machinery and systems that are associated with being a free-standing inventorier. The parataxonomists, drawn from working-class society in a low-income developing country, for the most part do not have first-hand experience with vehicles, computers, budgeting, designing administrative hierarchies, etc. In the current course, no female parataxonomist arrived knowing how to drive a car and only two had barely learned how to drive a motorcycle; four could not ride a bicycle. Only five were experienced users of horses. None had ever touched a computer though twelve could type. None understood the administrative structure of a government unit such as a national park. More than half did not know what is a government ministry, and only five knew what was the Ministry of Natural Resources, Energy and Mines (MIRENEM). None had ever managed more than about \$300-\$500 in personal funds, but all understood the concept of reimbursement for expenses in one form or another.

Driving lessons and practice for cars, motorcycles and bicycles, and computer use and practice lessons, were interwoven with all course activities throughout the course. It is intended that by the end of 1992, all of those where motorcycles are major necessary means of transport will have their motorcycle licenses and working motorcycles; at the time of this writing three are doing so and motorcycles have been ordered. Practice in horse use was concentrated at one GCA Biodiversity Office, on the understanding that once established in their individual Biodiversity Offices, those who would be using horses would advance on use and care of horses through daily practice. Horse lessons gave a chance for some of those with no previous experience with bicycles or vehicles to regain their relative status in the course, through their becoming faculty and stuntpersons during these lessons. Use of chainsaws was straightforward and served as a confidence-building exercise even more than an essential technical skill. Computer use will not arrive at the majority of the Biodiversity Offices for several years, but maintenance-level activity with computers will continue at the feedback workshops held periodically at INBio. Initial fear of computers was largely overcome through having them first computerize their own personal statements made on their own application forms for the course, followed by abstracting/copying natural history information from the book *Historia Natural de Costa Rica*.

The students have spent their lives being buffeted by only dimly perceived administrative and bureaucratic structures. They began the slow process of coming to understand a vocation where they have both more control over where they are in these structures, and directly influence the structures. Participatory democracy in course planning and course structure was itself a novel, unsettling, and occasionally brutal process. The micro-bureaucratic structures of their families and neighbors were not found to work very well when thrust on a group of total strangers with unknown and unanticipated sympathies, weaknesses, sensitivities, goals, etc. For example, so-called "open group discussion" of a given course problem was often found to have murderous side effects in a microcosm where the individual's goal was to get ahead and survive, rather than work as a team. The technologies of social advance in a pluralistic, academic and/or institution-based society were found to work only partially in a group of strangers drawn from a hierarchical, autocratic, working-class and/or family-based society - and then only with MUCH modification. This was made particularly complex by the fact that the parataxonomists were simultaneously learning

- more about how upper levels of their own society functions
- ways of thinking that are foreign to their society as a whole (a working-class person with professional obligations, responsibilities and opportunities), and
- a developed-world way of thinking thrust into a developing country.

For example, the simple-sounding administrative technology of putting preventative maintenance on a priority par with daily action has an amazing number of ramifications at the level of the working-class in a developing country. Equally, giving a working-class member access to, and expecting responsibility for, the mores of the decision-making class in a developing country also has an amazing number of technological and philosophical side effects.

C. How do male and female parataxonomists differ in technical performance?

We expected differences between the male and female parataxonomists, but many of those expected did not appear, and many unexpected did appear. A course like this needs to be especially prepared with flexibility and reserve energy to deal with this phenomenon. Below we briefly discuss some of these differences in female and male parataxonomists, especially those that are most pertinent to future courses. We emphasize that we have just one female parataxonomist course and two male parataxonomists courses

for comparison.

The two male parataxonomist courses were extremely different in style, attitude, enthusiasm, drive, learning speed, etc. Some of these differences were clearly due to the chance selection of applicants. Some were also due to a different applicant pool in the two cases, and some due to the course structure itself. Here we try to restrict ourselves just to those comparisons that should be relatively immune to the inter-course variation generated by these three causes.

The students and the circumstances of this first female course may not be fully representative of later female courses. The students were strongly motivated to be pioneers, and were fully aware of being "first". Like the students in the first parataxonomists course, they took pride in that they were breaking ground for those coming later. In addition, the faculty, coordinators, and other interactors were aware of the novelty of this course and its role as a pilot project.

a) Illustration and drawing, mapping and geography. Early in the course, each student was asked to draw the leg of an insect of their own choosing, in detail and to scale. When this exercise was performed in a male course it generated a wide range of drawing quality, from adequate to something that looks like it was produced by a professional biological illustrator. The entire course of 18 women produced drawings that were worse than the worst drawing from a male course. This was particularly startling because Costa Rican art courses are full of women, and they do excellent work. Subsequent drawing exercises during the course led to some improvement, but what appeared to remain extremely difficult was proportionality and shading. This is clearly an area that will begin earlier in the course, and be more omnipresent. The importance is not in that a parataxonomist needs to be a biological illustrator, but rather that care in observation and reporting is clearly critical.

When the course turned to reading and using topographic maps, it was found that the same difficulties with drawings applied also to distances, symbols, coordinates and other geographical/spatial traits. It was also discovered that the female parataxonomists (with one exception) could not make useful sketch maps showing the location of their own homes and other landmarks. A correlate was virtually no education with maps or interest in constructing them. Concepts such as the same scale applying everywhere on the map, North being at the top of the map, topographic contours representing a third dimension, or the shortest air distance from site to site were completely new to many students. It was also discovered that they had extremely little geographic sense of cardinal directions and the location of geographic points (such as "Close your eyes and point to San Jose". Disaster.) Many did not know in what direction the moon rises. This led to exercises in the field of making landscape drawings, pacing off distances, estimating distances, etc.

There are human biology studies indicating that women are genetically poorer than males at geographic orientation. What is noteworthy in the context of the rural male and female parataxonomists is that their pre-parataxonomist lives relate to this dichotomy. The rural male spends a good deal of time striking out over long distances to accomplish a variety of microgeographic tasks (locate a horse, fix a fence, fight a wildfire, etc.). In contrast, the rural female's life is often very local, restricted to the immediate vicinity of the house or a route to other houses or market. Children do not generally run free (away from roads and trails) in rural lowland Costa Rica, where poisonous snakes, scorpions, urticating caterpillars, wasps, and stinging ants provide hazards for curious toddlers. Community traditions of rural areas frequently hold that an unaccompanied woman in an isolated place may invite inappropriate attention from men, so that exploration is strongly discouraged. A rural female uses roads, trails, horses on trails and buses to move

between permanent locations like markets, home, relatives, neighbors, etc. Men do as well, but also move freely through the unorganized part of the countryside.

This dichotomy is also reflected in the style of collection by men and women parataxonomists. If a batch of men is turned loose for a given period on a site, almost instantly the men are very widely dispersed, covering much ground, climbing high ridges, lost down some river canyon, etc. Initially they spend much time moving and little time collecting. If a batch of women is turned loose in the same place, they move slowly into the novel habitat, cover the same habitat thoroughly, and initially spend little time moving and much time collecting. Both styles have much to be said for themselves in an inventory, but both are different sampling techniques that need to be taken into account when preparing parataxonomists to inventory an area.

b) Attitude toward the course. The woman students in this course viewed the faculty, staff, and work with an attitude closer to that of school students than was the case with male parataxonomists in this and previous courses. This clearly reflected their school histories of surviving through being alert to the verbal and nonverbal communications of authority figures. They focused more strongly on narrow class requirements and exam outcomes - despite much discussion by the faculty of an exam as learning tool - than did the males, who seemed to recognize that performance in a work situation counts for more than performance in a class situation.

The younger women particularly reacted to the group as schoolmates more than as work mates. The living conditions of the course, with female students housed together in bunkbeds, four to a room, were new to the female parataxonomists. The first nights, and many others, they stayed awake talking most of the night, stimulated by each other's company and the events of the day. While groups of men also stay up often until one or 2 am, telling jokes and talking, the phenomenon was much more intense with the women.

The technical functioning of the course as a whole was based on a very different group dynamic than in the men's courses. There were numerous very painful one-on-one conflicts between course members. Nevertheless, there was also more sense of family than in the male courses. One person's visible distress from disease or injury could cost the attention of the whole course for hours. Interpersonal support for mental distress, however, was frequently limited to close friends, since it often involved a conflict between two course members. Visible emotions ran much higher in day-to-day life than in the male courses. However, it was also conspicuous that in the last days before graduation, deliberate efforts were made by the students to bring peace to quarreling members.

c) Preparation of specimens. Parataxonomists of either sex are initially extremely heterogenous as to how rapidly and thoroughly they learn specimen preparation techniques. Part of this heterogeneity is introduced by the fact that working class Costa Ricans of either sex by-and-large do not wear glasses even when they are clearly needed. Cosmetic and cost considerations, coupled with a non-reading life-style, are the cause. While the course quickly fits everyone with glasses that needs them, if you have grown up never dealing with small objects because your eyes did not allow it, then at the age of 35 it is difficult to learn to do so. Also, some of the parataxonomists are old enough that their sight is tending towards age-generated far-sightedness. However, after all of this is said, we definitely received the impression that the women paid more attention to detail in insect mounting, learned faster to mount small insects, and demonstrated more flexibility when routines were changed. The women seemed generally more patient. Perhaps most indicative of all, well over half the class both expressed enjoyment at mounting very small insects and have continued to show it with the large numbers of small insects brought in as they work

independently after the course. Likewise, there is a much stronger clamor by the female parataxonomists to have a stereomicroscope in their biodiversity offices than there ever was by the male parataxonomists when they first set up their offices.

However, the heterogeneity in specimen preparation skill is enormous in both sexes, and it would be a very large mistake to assume - as many do - "that women will be better at it than are men". For example, while the women were very eager to mount small non-moths (e.g., beetles are glued to the tip of a small paper triangle on an insect pin), the male parataxonomists as a group learned faster and were overall more careful in the mounting of microlepidoptera than were the women parataxonomists. However, the men learned this skill from two female faculty members that they enjoyed very much. The story gets very, very complex.

Preparation of biological specimens is a matter of patience, care and speed. We were left with the impression that the female students are more resistant to moving up the speed scale than were the male parataxonomists. Related to this, the students of the third course were more willing to spend long, successive hours in specimen preparation without "a break" than were the males. On the other hand, if a break was scheduled or "permitted", it was participated in just as thoroughly as was the case with the males. Males are definitely more openly rebellious against uncomfortable schedules of specimen preparation (and collecting) than were the females. This trait is correlated with the explicitly subdominant position occupied by these women throughout much of their social lives.

d) Collecting specimens. As with specimen preparation, there is enormous heterogeneity among both the male and female parataxonomists in initial and developed ability to collect insects, plants and just about anything else. From the very beginning, the women have a higher proportion of small things in their collections. Males have a higher proportion of fast things in their collections. We were left with the definite impression that a female parataxonomist, wandering through the forest and general collecting insects on her own, for example, is driven by what might best be termed "curiosity rules". Male parataxonomists are driven by "hunting and sports rules". The women displayed an incredible memory for where each individual insect was collected and what it was doing. It was as though the object itself was of more interest than was the act of acquiring it.

On the other hand, the women seemed more resistant to absorbing specialized instructions as to how to best treat specimens once captured. It quickly became clear that at the very beginning there should have been an intensive workshop on this subject, rather than treating it piecemeal as the course progressed and new situations appeared. The male parataxonomists seemed to more readily absorb a miscellany of new (and sometimes contradictory) spontaneously delivered instructions about specimen preparation but were noticeably more rigid in later modification of these rules.

e) Physical condition. In general, the women were in poorer physical condition than the men, at least with respect to the physical traits that come with semi-gymnastic fieldwork. Operating a kitchen and rural home is grueling but in a different way than operating a cowpony or chainsaw. Also, many of the women had not personally experienced the kinds of brutal wounds that are part of field work, and so were unaccustomed to personal behavior that speeds recovery. They were also plagued by the uncertainty of not knowing from personal experience that a broken bone does in fact heal, but takes time. In contrast, the women did not display any greater frequency of colds, general malaise, visible depression, anxiety, etc. than we were accustomed to from the male parataxonomists (though they did express these ailments in different ways).

For obvious social reasons males arrived at the courses better prepared for vehicles, horses, chainsaws, etc. than did women. However, in the training process we saw no difference in the rate of learning about them. What we did encounter was greater physical fragility among the women with respect to bruises, wounds, broken bones, burns, etc. (many of which were acquired in learning how to use these devices or in soccer games in the late afternoons). We do not mean to imply by this that they were complainers. The students who normally lived many hours from medical attention displayed great stoicism and goal-directedness despite injury.

The parataxonomist coordinator noted that the women students in this course asked for pills much more frequently for treatment of colds and pains than did male parataxonomists. It wasn't clear whether they were sick more often than were students in previous courses, or more oriented toward treatment by pills. In addition, menstrual pain and irregularities, and bladder infections, disrupted student lives, and required access to the first aid kit and professional medical care.

f) Maintenance. Cleanliness was a much larger issue in a woman parataxonomist course than in the two male courses. For men, cleanliness is largely a pragmatic issue. For a rural woman, it is a test of worth. Being called piglike or lazy was treated as one of the harshest taunts that a person could give. However, overall, the women displayed considerably less individual and group spirit and performance than did men in previous courses in the daily maintenance of the group working space, with respect to laboratory neatness, organization of supplies and miscellaneous small equipment, preventative maintenance, etc. There were a few individuals who were absolute neatness-demons when it came their day to clean up the teaching lab in the evening, but as the course moved on even these persons quickly relaxed on this trait.

Part of the change in behavior was a reaction to the staff and faculty stressing that time and effort spent on cleanliness is not the primary goal of a parataxonomist. However, there was more to it than that. It appeared to us that the general problem was a very strong resistance to take responsibility for messes created by others (i.e., those who are not family members), and a general willingness to live in a world where one's own personal things were very widely scattered within the general working site. It was as though each person subconsciously treated the laboratory and dormitory as their house, with items scattered throughout. This creates chaos among 21 people. Male parataxonomists, perhaps associated with their history of prior living in semi-public dormitories, bunkhouses, boats, hotels, etc. tended to keep their individual things more in one place and accept the concept of working toward "workplace neatness". As yet another contrast, however, a male parataxonomist would never think of voluntarily mopping the laboratory floor, while several female parataxonomists showed by their comments that they were constantly aware of the state of the floor, and mopped whenever it was their turn to clean.

In the first 2-week session, the dormitory and clothes were washed daily by the students' own initiative, to the degree that the GCA administrators began to worry about the area's water resources. However, the condition of the dormitory at different stages of the course was highly variable. At times considerable effort was put into cleaning it, but the effort was not put in at the end of a session before leaving. When the course packed up to leave a field station, the difference between this course and previous ones was particularly marked. Women had to be dragooned into doing the group packing, and the faculty ended up sweeping the floors after the course had left on a number of occasions. In previous courses the students always did all of the closing down of a course visit to a GCA biological station.

Personal neatness was, however, a totally different story. Male parataxonomists arrive with a small

amount of clothing, use it much, wash it occasionally, and take their laundry "home" to someone else to do; they convert to the "field biologist clothing ethos" very rapidly (though they paid special attention and even ironed their clothes for travelling). The female parataxonomists arrived at the course with enough clothing for a new outfit every day (or twice a day), and for the first several weeks began their day at 3-4 am by doing laundry and being sure that it was out in the sun to dry during the day. While some adjusted very quickly, for others it required the five full months of the course to gradually work the clothing routine down to a few sets of clothing for 6-12 days, washing it just when dirty, and wearing mud-splattered clothes. This was made yet more complex because women are more anatomically prone to discomforting consequences of living in sweat- and dirt-ridden clothing in hot environments.

This topic is a serious problem because the female parataxonomists come from a social system where a major part of their social fitness is based on their appearance, and this means that a very substantial amount of time and mental energy is invested in their appearance. Attempting to maintain all aspects of this while living in a wildland Biodiversity Office, and while conducting field work, is both impossible and extremely expensive in time and mental energy. It also stops one from working in the rain, walking long distances in the mud, climbing trees, etc. It is much to the credit of the women parataxonomists that they gradually learned to reconsider the "appearance question", but it also required that the course religiously not reward appearance-directed behavior, and explicitly draw positive attention to those first pioneers willing to show up at the beginning of a field exercise in mud-splattered clothing.

Motorcycles, car battery chargers (for the lights run as insect traps), computer back-up discs, tool boxes, and many other items used by the parataxonomists require small amounts of compulsive and regular daily or hourly maintenance. Learning this by pure trial-and-error can be very expensive in dollars and time. The female parataxonomists were not high achievers at learning to avoid this error, and future courses will need to address this question more explicitly than did this course. Males were much better at it, probably because it is a traditional part of work-place routines.

It will be important to examine how the female parataxonomists "on the job" in their Biodiversity Offices contrast with the males on maintenance traits. The particular Costa Rican situation is made even more complex by the fact that the parataxonomists' field coordinator, Maria Marta Chavarría, is by nature and self-training a very high achiever in maintenance and planning.

g) Budgets. At the level of personal expenses and honesty about them, the male and female parataxonomists were not distinguishable. There were the expected number of impeccably honest individuals and those who pushed, for example, the "food and transport reimbursable" system to the limit of good taste. We were impressed by the virtual total lack of errors in summations of batches of receipts and the relative lack of complications generated by inter-student borrowing and requests for funding advances.

h) Memory for names and biological facts. All parataxonomists show a particular enthusiasm for learning names of organisms, anatomical parts, processes, etc. However, the female parataxonomists displayed this enthusiasm to a higher level. On the other hand, their ability to retain Latin names appeared to be lower on average than was the case with the male parataxonomists.

On average, the female parataxonomists had less formal schooling than did the male parataxonomists. Much of name-learning involves capacity to manipulate and store long strings of unfamiliar letters, something that is a huge element of the rote learning and memorization process characteristic of much Costa

Rican schooling. Given that Spanish speakers without much formal education are phonetic spellers, the learning and then correct spelling of essentially nonsense syllables was very difficult to master (recognition of many Latin cognates requires a relatively rich vocabulary). Some of the female parataxonomists performed absolutely heroic feats of name-learning, considering that they had only a few years of gradeschool as background, many years before.

Part of name learning is associating the name itself with pattern-recognition for the object to be named. As mentioned earlier with drawing and mapping, the female parataxonomists were weaker in pattern recognition and manipulation than were the male parataxonomists. For example, it was only with considerable practice that some of the female parataxonomists came to be able to quickly recognize a given moth whether it was upside-down or right-side up. In retrospect, practice in this area should have been an earlier and more omnipresent part of the course. These kinds of skills are essential for an inventorier, owing to the necessity of knowing a very large number of species from memory and by sight.

1) Attention to a lecture format, note taking. This course was an explicit ongoing experiment in lecture format, lecture duration, importance of note-taking, speed of delivery, time of day for a lecture, whether to use transparencies, questioning during or after a lecture, etc. This was in contrast to the two previous courses, where the students very quickly decided that they liked the format of 1-2 hour lectures on a single topic. The female parataxonomist course had continual problems with these variables, and a single fully satisfactory lecture climate was never achieved.

The extreme heterogeneity in formal education and educational attitude, something that could occur in either a male or female course, was clearly in part responsible for this difficulty. Fast delivery kept the attention of some but made it impossible for others to either follow or take notes. Half the class went to sleep in an evening lecture, and the other half of the class went to sleep in a morning lecture. Lectures with slides produced so much input stimuli for some that they found it impossible to keep their attention on the lecture topic, while others could not take notes in the dark. On the other hand, a lecture without slides left some totally lost because they could not visualize France, agoutis or a glacier. We were left with the impression that the male parataxonomists tended to view the lectures as "a job" or "a task" that they were therefore preprogrammed by their lives as employees to "do". For the female parataxonomists, the lectures were as much a mind-blowing excursion into outer space, as an opportunity for organized extraction of information. And a group of people has a much more heterogeneous response to an excursion than to a job.

The "job atmosphere" enters into this in yet another way. The male parataxonomists came to see the course as vocational training from the very beginning (once they decided that they were not expected to be "collecting robots"). And, they already know what a vocation is and what is a job. As male members of the working class, they have been trained to that from day one. Lectures themselves are simply one more routine to be learned, like how to put a tire on a tractor. They don't ask "what for", they just do it. The female parataxonomists were, however, just coming to learn about this thing called "a job" that they have lived next to all their lives, but not had. When we gave a lecture about, for example, the extinct megafauna that once roamed Costa Rica's habitats, there was a more short-lived startle response (WOW) than an assimilation response, and there was a more calculated "but will I have to inventory megafauna, and if not, why do I have to learn this" response. Since the self-provided answer is "no, I won't be inventorying them because they are extinct", then the temptation to go to sleep, daydream, wonder what is that plant in the kodachrome slide, etc. gets a toehold.

j) Learning by reading. Costa Rica has as high percent literacy as does any developed country. However, being able to read does not mean that it is part of your life, especially when you live in a TV society (almost every Costa Rican household has a TV or access to one) and when books have never been part of the daily trappings of your society as a whole. The entire set of books in all of the houses of all of the students in any of the three parataxonomist courses could be put in one small suitcase.

The art of reading and extracting this or that portion of the contents (especially as opposed to memorizing some small thing to regurgitate in class) for later use or analysis, or for adding to other information, an art hammered into us from before school, had not been part of the female parataxonomists' lives. This was also generally true for the male parataxonomists; some, however, had had experience reading legislation (as law enforcement officers) and some had a few years of university experience.

It quickly became clear that handing out reprints, written essays, etc. was not a useful way to convey information. However, receiving information this way is clearly a major part of the life of a parataxonomist, and remedial training in this area has to become a part of all future courses from the very beginning.

On the other hand, again underlying the heterogeneity present in the course and students, we found them almost universally eager to learn natural history of a particular taxon by reading about it in a textbook and attempting to memorize whether it was a herbivore, carnivore, volant, etc. This is of course a hold-over from their formal schooling, and creates the maddening effect of a parataxonomist wanting to learn about the biology of a family of wasps by reading about it rather than watching the one, for example, that is building a nest in the corner of the room where one is doing the reading. Male parataxonomists were not so inclined to do this, and did display strong curiosity over the living object in hand or nearby, in opposition to reading about it (this stood in contrast to parataxonomist behavior when collecting in the field, as mentioned earlier).

For all courses, text in Spanish rather than English, and appropriate high-quality illustrations, greatly increased the chance that a book would be used.

k) Computers. The third parataxonomist course set out explicitly to improve on the training in computer use, as compared with the previous two courses. This course had three available computers rather than one, and a structured schedule of individual use. Whether related to this schedule, the female parataxonomists definitely took to their computer learning assignments with greater willingness and diligence than did the male parataxonomists. -The women were less inclined to be openly rebellious about an imposed daily schedule than were the men, who loved an excuse to deviate from a schedule. We saw no indication of differences in absolute learning rate among male and female parataxonomists, though the men were definitely much more curious about how the machines work, as machines, than were the females.

All parataxonomists (and most biodiversity workers in general in Costa Rica) have shown the same distressing resistance to maintaining backup discs and other kinds of computer maintenance.

l) Snakes, spiders, scorpions, hairy caterpillars, etc. When confronted with snakes, spiders, scorpions, urticating caterpillars, etc., the male parataxonomists display both bravado and the calmness that comes with experience. Abject terror is rare among the males, and when present can be worked down to non-expression with a small amount of explanation and familiarization.

The female parataxonomist responses ranged from absolute terror to complete genuine nonchalance. Different organisms generated quite different responses from the same person. It was quite startling to find a given person to be terrified of a hairy caterpillar and not bothered at all by a snake, or to find someone who quickly learned to handle a large spider but never became comfortable with holding a snake.

There was very little effort by one person to help another conquer a given response, and the women were as inclined as were the men to use a fearful object to tease or dominate another person. On the other hand, the women were much more willing than were men to leave one of their peers in peace while she is experiencing a terror reaction to a novel animal. Additionally, on a number of occasions a female student asked us in private to help some other student get over a fear of something.

However, in all cases, patient explanation, and one-by-one and one-on-one non-teasing movement of the animal from the faculty to student hands was capable of virtual total elimination of the panic/fear response, at least during the course circumstance. Respect/fear remained, as it should have. The elimination of the panic/fear response with animals, as well as with other objects (chainsaws, motorcycles, cars, sleeping out at night, etc.), was a very important part of the course - not so much for pragmatic reasons (though these are crucial) but as a way of building the independence that comes with self-confidence and seeing that obstructionist fears, even life-long ones, can in fact be overcome.

The female parataxonomists were particularly receptive to abandonment of panic through patient and friendly elimination of ignorance about the animal. For some, the assurance that an individual snake was in fact non-poisonous removed much of the panic reaction. The same applied to hairy non-urticating caterpillars and spiders that do not bite humans. For many, it was very effective to place a large calm colubrid in a thin cloth bag and have the person feel, measure and discuss the invisible snake through the bag, held on the lap, for a long time before opening the bag and having the person deal directly with the snake.

Speaking of poisonous snakes, the female parataxonomists instantly took to wearing leather "below the knee" leggings ('polainas') in the field, whereas the male parataxonomists required (and sometimes still do) substantial coercion. This is in great part because many of their male associates spend their lives in the forest (or at least on trails in the forest) without wearing leggings. Our argument to them was that "we are not investing all this effort in you to see you on a morgue slab full of viper venom".

m) What have they seen before. In the male parataxonomist courses, a conspicuous phenomenon was that throughout lectures and laboratory exercises, one could frequently refer to common plants and animals in the Costa Rican countryside as a reference point for color, behavior, size, speed, phenology, etc. If one said "The Pieridae are those bright yellow butterflies that sit in clusters on muddy roads", everyone knew instantly what Pieridae are and had a mental hook on which to hang each further piece of information about them. It was extremely commonplace for a male parataxonomist to describe some wild organism that he had noticed for years but never had a name for, and was never able to relate to anything else. Once inserted into Linnean taxonomy, this life-long observation became a powerful hook and tool for him to learn more taxonomy and more natural history.

In the female parataxonomist course we were by-and-large stripped of this teaching aide. Yes, they are rural women, but for almost all it was as if the rural environment had always been a hazy blur, a sort of visual Muzak. You could not, for example, say "Now, everybody has noticed that all of a sudden the countryside is dotted with yellow-flowered trees; that is an example of the members of one species of tree

using a weather cue to flower synchronously". You could not say it because only 1-2 members of the class will have made this observation, if at all. You could not say "remember that your horse has upper front teeth and your cow does not, and that is why". 95% of the women in the class had never noticed what they saw when they looked in a cow or a horse's mouth, if they ever had. We got all the way to the end of the course and we suddenly discovered that only 4 out of 18 women could answer the question of "Does the course vehicle use diesel or gasoline?"

What it boils down to is that you notice what matters to you, and in the life of a Costa Rican rural woman, the details of the visual environment outside of the home and the exact route between sites of importance make very little difference. On the other hand, if you are a male worrying about where is your lost horse, when the rainy season will start and germinate your rice, where can you shoot a wild bird, what tree is a tree poacher likely to want to steal out of your forest, etc., then those environmental details (cues, clues) are very important. You are taught from childhood to pay attention to them, from playing on a soccer team to smelling an upwind wildfire.

This means that the rural female parataxonomist is entering a much more foreign world in becoming a parataxonomist than is a rural male parataxonomist, even if both come from exactly the same farmstead and have the same education and general "life experience".

D. Course sociology.

Much of what has been said to this point has a major sociological component. However, there are other aspects of the course that have very little to do with the students being *parataxonomists*, or *parabiologists*. They have more to do with group dynamics and would apply equally to just about any paraprofessional training. In this context it is worth repeating that a major aspect of the course is beginning to move from being purely working-class to being a decision-maker, an executive and personally responsible for planning one's own day to day activities. The urgency of the inventory effort, the resources available, and the need for Costa Rica to take charge of its own biodiversity destiny is simply not compatible with the working-class traditional mindset of being a closely supervised and semidistrusted worker in a crew, without a mandate for initiative or responsibility. The age of "biodiversity management by foreign consultant, vicarious or otherwise" has to gradually wind to a halt.

a) Escape from the husband-dominant, wife-subdominant role. 61% of the female parataxonomists in this course have children (total of 26 children), one is a grandmother, and 39% are living in some kind of tight pair-bond with a male (Table 1). While they all entered the course with the full blessing and encouragement of partner, children, friends, parents, etc., none of these people really understood what this course would imply. The parataxonomist has gone through six months of intense personal evolution while the associates have been both absent and "standing still". To quote one husband near the end of the course "My wife no longer does what I tell her to do". To quote another, ".....you mean she has left the ACG and gone to the graduation without telling me?" To quote a brother "We have not heard from her for days. What do you mean she is on leave?"

Near the end of the course, when confronted directly with the question of "How are you going to manage a situation where your husband expects you to come back and do all the housewife and mother things", the answers ranged from "well, I have to manipulate him like everything else" to "if he doesn't like it, he can move out". These are brave comments, but the reality of throwing out the husband and leaving her holding the two children and the house to manage, while also being a parataxonomist, is another thing. Time will

tell. Four months after the course all are still working and all are still in approximately the same relationship as when they graduated.

In one-to-one conversations with the female parataxonomists, it was clear that each had devised her own actual and anticipated individual solution to the general problem, and was very much aware of the problem. In group discussions of this problem, and of the related one of how to deal with unfriendly or obstructive administrators of Conservation Areas, the general response by all was an unwillingness to discuss the matter in public or a statement to the effect of "only time can tell and we hope that INBio will be supportive in the months after the course" (which it has been, at considerable administrative cost). There were clearly some women who lived a public nonchalance to family conflict with her job, and probably had a much rougher time of it at home. We felt that the female course was much more supportive of these problems than were the two male courses.

Prior to the course it was anticipated that societal re-entry would be difficult, owing to rejection by neighbors who did not approve of women taking on male occupations. However, as we got to know the students and their individual circumstances better, this never surfaced as an anticipated problem. In one case, the net social worth of the woman clearly rose and she has paired up again with her estranged husband. In another case the increase in social worth led to the wife effectively ejecting her "worthless" (and physically violent) husband in favor of the "new" life being offered to her and her two children. In two other cases, the training clearly gave both women increased leverage in their community, leverage that has apparently enabled them to suppress sexual harassment that had been a problem.

It should be recognized that all but four of the female parataxonomists had already broken out of the classical nuclear family mode and/or not yet gotten into it. Of these four, one husband is a parataxonomist, one is a school teacher, and one is a Sector Caretaker in the GCA. The fourth is an unusually supportive ranch manager. That is to say, the examination of the societal re-entry problem by using the experiences of this course is very complicated by the fact that virtually the entire course neither left nor re-enters a classical husband-wife-mother-neighbors swirl of interactions.

b) Willingness to enter into group discussions and group cohesiveness. In a course that is both total immersion in the subject matter and involves a major evolution of personal life-style and social situation, the male parataxonomists' courses had accustomed us to a great deal of self-help group discussion driven by both the students and by a positive response to explicit scheduling for it. However, we found that group discussions succeeded in this course less frequently, and required more analysis, care in timing, and presentation planning. At certain times, particularly in regard to the common enemy of exams and grading, group discussions were effective in drawing subgroups of the course into cohesion. But public events did not resolve conflicts between members. An open forum to present and have responses to different points of view also was not effective. Fear of exposure to other members of this course, direct fear of other members of the course, and awareness that many members had little or no interest in helping another to get through difficult problems inhibited discussion. Group discussions often turned, seemingly unconsciously, into trials since it was very difficult to get individuals to "agree peaceably to disagree" and to entertain a collection of opposing views on a given topic. However, the female students responded much more positively than did the males to conflict resolution in small groups with a mediator from either the student body or the faculty-staff.

It is hard to avoid the conclusion that the penalties for loss of face in public were very great. This effect was not nearly as plainly displayed among the male parataxonomists, though in retrospect it was

clearly there. In the first male course, virtually the entire course body did belong to one social unit - they were all employees of a national park or Conservation Area of one sort or another. In the second male course, most did likewise and the others were notably silent. The female course had, as noted before, a different group dynamic - a sort of family, but a family with strong internal rivalries and tensions. The 2-4 person friendship groups that formed during the course were noted for periodic civil war and fractures.

It was particularly striking that administrative groups (e.g., six persons chosen alphabetically out of a list to put a light up in the forest and collect moths from it) almost never formed a cohesive working team. Group members repeatedly did not take on a list of carefully explained collective responsibilities, unless supervised (e.g., leave the vehicle clean after using it, clean all killing bottles and leave in a bucket for the next person, sweep out the lab at night, etc.). Instead, there were certain individuals who were very responsible and simply took it upon themselves to do it; if you made the administrative error of not including such a person in a group, chaos reigned. This was also true for the first two courses, but less so.

Overall though, the interpersonal friction was relatively lighthearted and everything eventually got done, albeit with a substantial investment of energy by faculty and course coordinators.

What leavened the situation was that the nature of inter-person conflict was very, very different from that encountered with the male parataxonomists. With the males in the first two courses, visible conflict was serious and deeply rooted. It had to be dealt with, and fast. They were not inclined toward attempted homicide, but they were inclined to form deeply-rooted resentments that lasted many months and were very disruptive to group activity. We were very fearful of such a pair ending up operating out of the same biodiversity office. In at least three cases personal animosity has been instrumental in forcing relocation of male parataxonomists.

At the beginning of the female course, we quickly discovered that the female parataxonomists immediately had public and very visible disagreements, expressed in many ways. Based on our experiences with the two male courses, we immediately went into administrative strategies to gradually lower the pressure and pull peace back into the group. We were, however, quickly driven crazy by this because these conflicts disappeared as fast as they appeared, and by the time our administrative solutions were in place, quite different conflicts had appeared and the worst of enemies were happily working together on something. There were at least three conspicuous causes. First, as soon as two female parataxonomists blew up at one another, their friends (of the moment) went into overdrive in two- and three-way conversations aimed at calming, solving, resolving, etc. Sometimes the formula involved coming to one of us and asking for an action, but often it did not. Second, when this method did not work for some reason, and some parataxonomist was about ready to go ballistic, she would come and unload on one or both of us, or the course coordinators. The first event rarely happened, and the second event never happened with the male parataxonomists. Third, we discovered that many of the conflicts were extremely environment-specific. It was commonplace to see one person do something appalling to someone else in a lab full of people (and clearly create a very negative response), and then a few hours later encounter the two of them by themselves happily sharing some task or reward.

Two- to four-member friendships and support groups did form during the female course, groups that have persisted after the course and display themselves in the form of knots of people and discussions at feedback meetings at INBio. The same took place in the male parataxonomist courses. However, once graduated, there seem to be substantially more "ignore-the-other-as-a-nonperson" one-on-one

interactions among female parataxonomists than there are among the male parataxonomists.

Again, it should be emphasized that many of the differences between the female and the two males courses may be largely due to the female course being constituted of absolute strangers with no working experience in common, while both male courses had a very cohesive bond generated by the large number of civil servants who had worked in some aspect of conservation protection.

c) Native American vs. "white" interactions. The Costa Rican population has Native American roots blended in with many other origins. However, Native Americans as an ethnic group not only occupy only a very small fraction of Costa Rican territory and are highly assimilated into European culture, but have been explicitly held on the margins of Costa Rican society for centuries.

However, we were not prepared for the intensity of the social rejection initially leveled at the two Native American female parataxonomists by the other Costa Ricans. The "whites" initially refused to learn their names, refused to offer assistance to them, and refused to learn from them. The two Native Americans, being from opposite sides of the country and different cultural and language groups, also did not display solidarity as a pair of persons. As the course progressed, the strangeness gradually wore off on both sides. This came about through the multitude of happy accidents that occur in any lengthy field course and through an explicit effort by both Native Americans and several whites. We also applied a large number of administrative tricks to bring them together and simply refused to treat the Native Americans in any other way than they were - smart, enthusiastic, determined, sympathetic and (very conveniently) model citizens in their calmness with their less considerate neighbors.

We do not by this mean to say that the Native Americans became culturally homogenized into general Costa Rican society during the course. For example, as will be mentioned below, they expressed very different attitudes about sexual mores. They continued to test the boundaries of the administrative system in a different way, and they continued to react very differently to many technical details of the course.

d) Native Americans per se as parataxonomists. We have encountered a widespread romantic reaction to "indigenous people as parataxonomists", with the world as a whole acting as though knowledge of nature is a genetic trait. For all people, knowledge of nature depends on whether you have been raised in it and in what way. Both of the Native American female parataxonomists reflected exactly their upbringing in nature, or to be more precise, their lack of upbringing in nature. Both come from forest-edge farmsteads, and return to them as their own Biodiversity Offices. However, their pre-course level of understanding of the wild nature both near and far from their homes was as impoverished as is that of other Costa Rican occupants of rural farmsteads.

However, they were outstanding in a robust cheerfulness about the difficult physical conditions associated with field work, a cheerfulness that they shared with the few other Costa Ricans in the course who came from equally isolated farmsteads.

Both Native American students demonstrated a course handicap clearly derived from their social upbringing, and that was that a wide variety of words used in Costa Rican urban society at large (e.g., right angle, parallel, perpendicular, symmetrical, alternating current, union regulations, national parks, names of many foods and fruits, etc.) were not part of their vocabulary and needed to be explained. It was striking that while a Native American rural Costa Rican originates in a non-mechanical and non-national level society, and thus acquires the associated of vocabulary as an externality, the other rural Costa Ricans have

the broader vocabulary acquired from parents or neighbors moving frequently among rural areas, towns and cities.

Costa Rican Native American parataxonomists automatically attract a problem of interaction between the their communities and those based on immigrant societies. They were recruited as individuals at the level of their community, as the logical persons to begin the process of inventory of the territory that their own social groups control. As they become competent contributors to the national inventory, they automatically become part and parcel of the entire process of putting biodiversity to work for society. Their specimens help define species distributions and increase overall biodiversity knowledge. This information is all "public domain". But whose "public"? Native American Costa Ricans are certainly not alone in feeling marginalized by Costa Rican society as a whole and world society as greater whole.

INBio has taken the public policy decision to not conduct any biodiversity prospecting or similar potentially commercializable activities in any areas where Native American groups are actually or potentially living or working, until there is a clear pathway to insure that these groups are full participants. There is an on-going conflict in Costa Rica between the decentralized unit (Native American Reserve, Conservation Area) and the central government, as to who controls the areas. Until this situation is sorted out, the INBio policy with the inventory of Native American Reserves is that it should all be done by Native American parataxonomists by themselves or working with others, and that the specimens should lead only to inventory in the broadest sense (clean up the taxonomy, document a species' presence in Costa Rica). This policy renders the activity of the two Native American parataxonomists fundamentally different from the activities of the other INBio parataxonomists because they will experience in the field only a subset of those interactions with other biodiversity managers that will be experienced by other parataxonomists.

e) Children in the course. It was anticipated that there would be some to many female parataxonomists for whom participation in the course would be very difficult unless they could bring their children. A local ex-gradeschool teacher was therefore employed full-time to be available to offer full-time care for any children that were brought to the course. Costa Rican schools were on vacation during the first 1.5 months of the course, so children could be brought without jeopardizing school attendance. Also, school-age children were likely be very dependent on parents for care at that time.

During the first course session, no one brought their children. This was clearly because they wanted to inspect the situation before doing so. In subsequent sessions, 1-7 children were present during all but one session, with a given parent bringing different children at different times. When children were not with the course, they stayed with neighbors or relatives (where some went to school), just as they apparently had on other occasions. In one case, at the mother's request, the course paid a neighbor to take care of the children rather than bring them to the course.

The option of being able to bring children was very important to the course. Nevertheless, in only two cases did individual children stay with the course for more than a single session, and no mother brought more than two children at a time. There seemed to be several reasons for this. One was the comfort of the children. The very different climate, absence of familiar relatives and family members, different food, and being required to wear shoes (often ill-fitting) all day were difficult for the children. In two cases, there was a subtle but palpable reaction on the part of the gradeschool teacher and of some other course members against the mothering skills, feeding habits, and hygiene of the children (particularly lice) that made a psychologically uncomfortable situation for the mother. In addition, the presence of children meant that the

mother used free time doing the children's laundry and taking care of them in the evenings. There was a clear perception that children were eating into time that the mothers would rather have had for themselves.

Otherwise, the children were not disruptive to the course for several reasons. First, the full-time teacher did a generally good job of playing with them and caring for them. Second, the course laboratory, and all the field work, was out of sight of the course dormitory and therefore the children were not tempted to chase after their mothers. Third, rural Costa Rican children are generally very good about doing what they are told to do (at this age, at least). Fourth, the mothers did not make a fuss about their children, and clearly felt that it would be inappropriate to bring them to the lab or in the field. However, toward the end of the course it was in fact found that one "problem child" ceased to be a problem when allowed to accompany his mother in the lab and field; it was striking in this case that the solution was slow to appear because the mother thought that it would be inappropriate to ask for permission to do this, despite the fact that we had suggested it on earlier occasions.

The children that stayed at home were not evident sources of problems for the mothers in the course, nor did we hear of problems being caused by the absence of mothers. However, when the children fell ill at home under other persons care, mothers were clearly distracted by the event. Some mothers expressed very strongly that they missed their children while in the course. It was clear that much time and energy was contributed to the course by spouses, parents and neighbors.

Two parents brought older children to be with the course as a beneficial experience for the children. They were not a problem in any way.

f) Visits by husbands or boyfriends. At the beginning, all students were told that they were welcome to have their spouses come to visit at course expense for a few days. If they were to stay longer, then we would have to arrange some kind of contribution to help with food costs. The visits were in fact very few and very brief, and no charge was made. We had the distinct impression that neither wives nor husbands encouraged these visits. It must be remembered, however, that for most of the male partners, to visit during the course would probably cost at least one if not more days off of work, something that is difficult to arrange and frowned upon by working-class employers. Also, students almost always went home during the 4-5 "free days" between intense working sessions.

However, early in the course an unfortunate incident may also have affected this aspect of the entire course. Two husbands showed up on an afternoon (after traveling all the way across Costa Rica by bus), and we told the course coordinator to find a room for them, automatically assuming that it would be a private room for each and their wives. No complaints were heard, but we discovered to our horror a month later that he had put them in bachelor quarters some 15 km away from the course dormitory and the wives had stayed put in the dormitory! This course coordinator comes from a subsector of society where it is viewed as normal for husbands and wives to be separated for three week periods as part of the employment routine, so it apparently never occurred to him what was wrong. Needless to say, this event sent a very unfortunate message to the wives and husbands in the course. Once everyone understood that cohabitation with visiting spouses was perfectly acceptable to the course, there were no further problems with visitors.

In the one case where a husband came to stay for a long period, he was a parataxonomist and was put to work as an instructor in the course.

g) On having a job. It will be many months before it is clear how the female parataxonomists take to having a "proper" salaried job. In the case of the two women in the first parataxonomist course, one was already out in the working world before she became a parataxonomist. In the case of the other, we asked her husband what he thought of his wife having a job (and in fact earning more than he did). He replied that the job was fine as long as she did not neglect her other duties (the increased income for the family was not viewed as a problem), and it was acceptable for her to earn more than him "because she had more years of school than he did". (However, today, this person finds it acutely embarrassing that she is the sole breadwinner; he is currently out of a job).

However, there are some indications from the course as to how they will react to being salaried employees. As we have alluded to on several occasions above, it is not instinctively obvious to them that they are being paid a salary to produce a given product, and that there is a full social obligation connected with receiving that money every month. It was not clear how, in the course, to really prepare them for this. What they did in the course was because it was expected of them in the course, because of peer pressure, because of the faculty and coordinators acting as foremen, etc. They came into the course with much work ethic but no job ethic.

It was clear in discussions and many small actions that serious consideration was given to the question of which is easier - working this way for a paycheck and an (as yet) only dimly perceived social goal of a national inventory, and taking care of a family, or striving to attract and hold a paycheck-generating device (otherwise known as a working man) and taking care of a family. As the course wore on, the enthusiasm about the social goal increased with better understanding, and the diverse intellectual richness of being a parataxonomist began to really be appreciated. We are certain that this enthusiasm about a salaried job is reinforced by the high male unemployment rate in Costa Rican rural areas, the permanently low salaries for them (in all but two cases the female parataxonomists earn a higher salary than their male partners), and the very large number of fatherless families in society at large.

It was quite striking that we were asked at the end of the course by three family-free young female parataxonomists "What would I do if I marry a man who lives in a city or other site of very low interest for the biodiversity inventory?" Our reply was "we will deal with that at the time", given that trained human resources can be used in many ways in a national biodiversity inventory. However, the course and the job are structured in general on the assumption that the female parataxonomist is not likely to "marry into a city", so to speak.

A male parataxonomist automatically takes on an obligation of continuing to work as a parataxonomist by virtue of the investment in his training; this job ethic is widespread in Costa Rica. And since few males get more than one kind of training, they are strongly encouraged by the circumstance to stay with the job. Female parataxonomists, on the other hand, always have an alternative employment potentially at hand and potentially competing with their new "job". In this context it was quite striking that one female parataxonomist was quite explicit about becoming a parataxonomist because she was bored with living on her government widow's pension. In the job applications, many mothers stated that they were very interested in becoming a parataxonomist because it would give them a body of knowledge to pass on to their children; we have never seen such a comment in a male application form.

The mid-course independent work experience and accounts after the course suggest that in many cases the work itself has become part of the social and family routine of the salaried parataxonomists. Children, brothers, and fathers have been mentioned as participating in collecting activities and are eagerly learning

mounting techniques, names, and biology eagerly. That is, the salaried work is more broadly social than is a traditional working-class job (though this is only possible because the work is done out of the home as a simultaneous Biodiversity Office). However, in at least one case the work is viewed as potentially disruptive to one member of the family, and the salaried work to be done in isolation. The male parataxonomists frequently pass information to work-mates, school children, and apprentices but there seems to be little or no home involvement in most cases.

(Female) parataxonomists who are staying on the job largely through an interest acquired through the course, and through subsequent feedback from INBio and the inventory process, are a very different body of people to motivate than are male parataxonomists who view "having a job" as "normal" (and therefore desirable) and who very much fear losing that job. It was clear in the course and it is clear after the course that intellectual stimulation, a sense of purpose and accomplishment, and a sense of approval from peers will be extremely important in keeping the female parataxonomists successful. Yes, their salary will matter, but probably not play nearly as large a role in the parataxonomist-INBio interaction as is the case with the males. In Costa Rica, as elsewhere, the concept of "salary" and its personal significance is strongly molded to the other traits of male rather than female roles.

It was particularly striking to see what the female parataxonomists did with their first salaries. They found themselves in the awful situation of having to divide a highly valuable and readily partitionable resource among many competing sinks. Salaries were hidden from mates and relatives, spent compulsively on long-desired objects (sometimes followed by regret at discovering the object was not in fact all that desirable), used to resolve long-standing medical problems, stolen by mates, contributed to the family pot, and simply saved. That is to say, nothing different than what a batch of male parataxonomists do with their salaries

h) Parataxonomists as private collectors. If any kind of parataxonomist course were to be given in the US, one would find that one or more of the students had in fact had a collection of insects, shells, plants, etc. as a child or teenager. Furthermore, by the end of the course one would find that one or more of the parataxonomists was struggling with the question of can he or she have her own private collection as well as what he or she does for work. None of this has appeared in any of the three parataxonomist courses.

Part of the answer lies in the observation that private natural history collecting as a whole is virtually absent from the strongly Latino portion of Costa Rican and tropical American countries. Three million North Americans or Europeans, dumped on top of Costa Rica's very rich biodiversity, would be liberally sprinkled with private natural history collections.

Part of the answer lies in the course itself, where from the beginning it is stressed that all the material collected is part of the national inventory.

However, there is something more complex. In the first two parataxonomist courses, there was not a single incident whereby someone was concerned that "their insects" had been requisitioned by someone else. Part of this was due to the fact that for the first parts of the course all specimens were pooled after mounting. But also there appeared to be no sense of possessiveness about the specimens. In the female course, there were numerous cases where different people accused or suspected other people of "stealing" their insects (as nearly as we can tell, all were mistaken). We became quite alert to the case where someone examines an insect and mistakenly (or temporarily) parks it in someone else's box of insects.

Part of this possessiveness phenomenon was clearly generated by a desire to use specimens as a self-attached star of achievement, by a group of people for whom direct and explicit approval by "the boss" (faculty and coordinators) was deemed a highly valuable resource. The irony in this was that quite simultaneously there was a strong within-course "trade" in specimens (all from the same site) among collectors. This again indicated that specimens had a value in the micro-economy of the course. This all occurred in a course atmosphere where it had been flatly and very publically announced that all 21 members of the course would graduate, and that all members of the course receive the same salary. This also occurred in an atmosphere where an apparent under-achiever would be loudly and approvingly cheered when she unexpectedly surmounted an obstacle.

The long and short of it is that male and female parataxonomists compete in very different ways, and for quite different resources.

i) Should women be parataxonomists? The extant parataxonomists were not polled on this question until after the Liz Clairborne and Art Ortenberg Foundation grant was obtained, though some of them knew of our on-going interest in bringing women into the parataxonomists' world. Grumbles about the two women in the first course remained minor, though initially the male parataxonomists lost few opportunities to be obnoxious to one or both women in these courses, and both women had to use the usual array of (largely) submissive devices required for female survival in male workplaces.

However, when funds for the female course became available, the extant parataxonomists were asked what they thought and the general reaction was highly negative. There was a widespread feeling that the students would be mollycoddled (gentler work schedules, better equipment, more attention), and not as much would be expected of them as had been expected of the male parataxonomists. Some stated that the female parataxonomists would be more productive, and thereby result in more pressure on the male parataxonomists to produce more.

In fact the course did more or less successfully walk the knife edge of demanding much yet taking into account those areas of human sexual dimorphism that are real. Women bear children and conduct most of the child care/family administration; many aspects of the course were modified to take this into account. Women are strong and have great stamina, but there are some physical tasks that demand someone who weighs more than 40 kg. However, the more explicit thought that is put into the psychology of this course, the more dividends there will be from future courses, male or female. It is clear that the first two courses did suffer a bit more of the "stiff upper lip" and "let's just tolerate it" than was necessary or even beneficial.

We expected more of the women parataxonomists than we did initially of the men, and the women produced more in many ways. Future courses will expect more of both.

At the upper levels of INBio administration, and more externally yet, there were no negative reactions to female parataxonomists and many highly positive ones. Professional jealousy of the parataxonomists, and crass union protectionism, is rampant in the Costa Rican community of university-graduate biologists. However, there has been no special vilification or aggression levied against the female parataxonomists as contrasted with the male parataxonomists.

j) What was the fate and role of the three male parataxonomists in the course? The three male parataxonomists were present as a historical accident. Two are married with children and

one is a young bachelor. As a happy accident, they ranged from very quiet to moderately extroverted, from timid to very assertive, and from mildly "macho" to extremely considerate. The course had ample opportunity for the expressing of virtually every kind of possible public female-male interaction that is expected (when women are in an overwhelming majority).

We deliberately dispersed the three males among working groups. We talked to and with them explicitly in private and public as to the key opportunity that they had to be either a hinderance or very positive influence. Early in the course their different views (from those of the women) on working, relaxing, diligence, criticism, motivation, television programs (the women did not have a history of any interest in nature programs), examinations, etc. were a frequent starting point on discussions of their present and future lives as paraxonomists. The course attempted to walk the fine line between molding the female students into a new vocation and honoring/accepting them as women. Throughout the course, the males' different views and reactions served as an extremely valuable (unconscious as well as conscious) reminder and point of reference as to ways that the course needed modification from original plans (which were largely based on experience with the two previous courses). This was particularly so for DHJ, who had had the most experience with field courses, but no prior experience with an environment where females are in the majority. For example, thinking about how these three males came to view "having a job" as a normal and highly desirable state of being was very helpful in molding the course so that it attempted to deal with the question of "why should a woman take a parataxonomist 'job' when she already has a full-time position, employment and paycheck?". This question was at the base of much of the force, direction and success of reward, punishment, motivation, peer pressure, faculty pressure, family pressure, etc. throughout the course.

The three male parataxonomists at first rebelled against being treated the same as were the women, but at least the "task-like" activities (making coffee, cleaning up the laboratory, doing laundry) became quickly treated as course assignments rather than role reversal. The initial fierce discussions as to who was bossing who disappeared, at least in part because the course as a whole did not approve of them and because a dominant male often found himself in a circumstance where he received no approval from his peers, who at any given moment could be purely women. While the males did "get a taste of what it is like to be a minority member in their own culture", the course was not fully aimed at generating in-depth understanding of this phenomenon but rather toward building the female parataxonomists' capacity and self-confidence to where they would be better able to survive and function as minority members in their society.

As the course moved into the second and later months, these particular three males got very much into the spirit of being token males and accepted their role as bridges between male and female roles. For example, we feminized their first names, used the feminine gender in referring to the group of parataxonomists (in Spanish, correct grammar is masculine gender if there is any male present), and openly blocked their taking leadership roles. At graduation, the three males good-spiritedly wore corsages on their suits. During the course, the males received a very large reward for this behavior in the form of collaboration from the women students, though quite frankly we think that this often went unrecognized by the males.

Throughout the course the men were quartered in rooms or buildings separate from those of the women and their families. This was done as much to give the men social and mental free-space as to uncomplicate the women's lives.

It is our impression that the easiest kinds of parataxonomists courses will be those that are single-sex, but there are clear disadvantages to the students in a single-sex course. A single-sex course will also do little to advance the major diversification of the biodiversity workplace that is brought about by achieving a roughly equal sex ratio among the staffs of INBio and the Conservation Areas. Finally, we feel that it is much better for the female parataxonomist to learn how to work with male associates, and for male parataxonomists to learn how to work with female associates, during the explicit learning experience of the course rather than leave this critical element for on-the-job training after the basic course.

k) Sexual aspects of the course structure. It would neither have been possible nor desirable to have attempted to teach the course as though it was a purely female event isolated from society. The full-time faculty and two course coordinators were (deliberately) two males and two females. Toward the end of the course, the male course coordinator was substituted by two new (one male and one female) young co-coordinators. Visiting faculty were (unavoidably) mostly male. The GCA field stations have a very large number of male staff members (which is beyond the control of the course) but far more female staff members than are encountered in Costa Rica's other Conservation Areas. The graduated female parataxonomist works in a social environment that is dominated by working-class males. There will be a large number of administrative interactions with a sexual component in their future workplace lives.

Until the last month of the course, the male coordinators quartered with the males and the female coordinators quartered with the females. During the last month, the three co-coordinators chose to move out of the dormitories and into tents pitched together. The full-time faculty lived a few hundred meters away, but encouraged and sought strong communication with all students throughout the course.

Prior to the course, the problems that would be caused by sexual interactions between students and GCA staff members were discussed with the directorate of the GCA. The GCA directorate asked the GCA staff to not view the female students as potential targets for sexual advances. This polite and non-disruptive distance was maintained with moderate success from the viewpoint of the course staff, but appeared to begin to break down during the last month of the course.

In the first week of the course, the three male students were told that during the course, personal relationships with the women were to be strictly professional. With some minor transgressions that were explicitly discussed, these three students were largely successful in maintaining this position throughout the course. However, two errors initially occurred. First, it was assumed, rather than discussed, that the women would understand the need for this policy this as well. During the last 1-2 months of the course substantial energy was expended in attempting to cause the women to understand the importance of this policy for the learning process in the course. This understanding among the women could probably have been more easily achieved had it been an explicit element from the beginning.

Visiting faculty and staff were also informed, with general but not absolute success, that there were to be only professional interactions with the students during the course. In practice, difficulties appeared in the definition of "during the course" and what is a "professional interaction". Is it a professional interaction when several visiting scientists go off on their own and have their own party with some of the students? It is certainly a part of normal scientist-scientist interaction throughout the world, yet in the context of the course it generated second-order interactions that were not helpful. It is neither legitimate nor desirable to place restrictions on behavior during the 4-5 day "breaks" when students left the GCA to visit family and friends. However, "turning off" these interactions when the students return to the course is not easy or simple, to put it mildly.

The need for strictly professional interactions among students and among students and faculty was not based on some arbitrary moral standard per se. Rather, it is an explicit recognition that the course is a hurricane of readjusting 21 different ways of viewing the world into a parataxonomist's vocational mind set (a parataxonomist course is far more heterogeneous in social and personality traits than is a university-level field course). This hurricane occurs in a larger social context of gradients among students and staff from

- working class to administrator,
- little to much formal education
- very poor to quite wealthy,
- young teenagers to mothers with five children,
- cattleman's province to rainforest province,
- rural farmstead to small town, and
- decentralized rural administrations to highly centralized urban administrations.

Strong differences of social and administrative opinion between and within the parent institutions (GCA, INBio, SINAC) also constituted a complex overlay on all of these gradients.

Attempting to manage professional training among these gradients and simultaneously create a tradesperson heretofore absent from the society in six months is extremely complex. If one allows the emotion-charged (and potentially full-time) element of sexual interactions, husband-hunting and wife-hunting, this will be sufficiently distracting to quite effectively destroy the learning capacity of two to many people for days to months. This did occur on several occasions. The situation is yet further exacerbated by the fact that any given interaction is seen through 25-plus different staff and student minds owing to the very public nature of the course, thereby creating irreconcilable sets of legitimate yet conflicting factions and viewpoints.

The female parataxonomists' response to sexual harassment of themselves and others was extremely heterogeneous among people and circumstances, and varied strongly with source. This heterogeneity of reaction was also true of course staff. Sexual harassment is extremely culture-based in its definition, form of expression, and impact. The course was in effect a mosaic of at least 10 Costa Rican microcultures and two US cultures (academic and general). We attempted to keep course focus on attempting to reduce or eliminate those activities that interfered with learning how to be a parataxonomist, rather than attempt to deal with sexual harassment per se as a socially undesirable event. Even in the most extreme case, to be discussed briefly below, a case of severe sexual harassment did not lend itself to a clear definition of what, if any, were appropriate steps for the course to take.

Prior to the course, the male course coordinator was explicitly told by the male faculty that the course staff would simply and absolutely have to avoid any sexual or "falling in love" interactions with the students. The coordinator said that he understood and could abide by that. He is a grandfather and one of the very best, very most responsible of the parataxonomists. He also comes from the cowboy and farm laborer subculture. What the faculty overlooked was the fact that the course coordinator a) had no wife or girlfriend, b) was personally driven to "16-hours-a-day, 31-days-a-month" dedication to the course, c) comes from a subculture where "honoring what the boss dictates" is not pursued with absolute rigidity no matter what the topic, and d) intellectually heard but did not emotionally understand the concept of "leaving a student in peace to get on with being a student". As a consequence, course faculty depended totally on the course coordinator's statement of agreement made before the course, and took no steps during the course to

aid him in sticking to the agreement.

The course coordinator made an (initially undisclosed) extremely aggressive and very unwelcome sexual advance on a student in the second week of the course. This caused the student to remain substantially distracted, distant from a variety of learning experiences, fearful for her reputation, and progressively more self-insecure as both a student and future parataxonomist. Following disclosure of the event by the student in the fourth month of the course, and simultaneous disclosure of another event of what may be broadly termed serious sexual harassment by the same course coordinator, the decision was taken to immediately remove the course coordinator from the course. The matter was substantially complicated by the fact that the course coordinator was doing an excellent job on other aspects of the course, strongly appreciated and respected by most students and staff, and living in a swirl of persons who were themselves uncertain as to their positions on many social mores.

The student finally expressed her major concerns in the format of doubts about her own ability and performance in the course, since the coordinator alleged that he had gotten her admitted to the course and was keeping her in it (which was totally false). She was also very angry at his having made inappropriate comments about her appearance in front of new acquaintances. As in many other similar cases everywhere in the world, these concerns and the individual and specific circumstances of the situation, were quickly overlooked in official and unofficial reactions to the disclosures, and in reaction of third parties to recast the circumstances according to their own agendas.

Over the next two months this situation led to the course coordinator also being fired from the GCA, where he had been a parataxonomist for three years. There were numerous discussions throughout this two month period among and between the directorates of both employers (the ACG and INBio), the students in the course, the course staff, and more peripheral participants. These discussions revealed strongly held and culturally-based differences of opinion as to a) whether he should have been removed from the course, b) whether she should have reacted as she did, c) whether he should have been fired as a parataxonomist, d) who had the right to fire him from either post, and e) who actually bears the responsibility for an event such as this one. While it is best to attempt to plan for such events before a parataxonomist course, this particular event demonstrated very clearly that many of the sources of conflict were not known or appreciated to the antagonists until an actual event brought them into focus.

The departing course coordinator was replaced by the act of the other female course coordinator assuming yet more responsibilities, and by employing two other GCA parataxonomists (male and female) as co-coordinators as well. This generated a subsequent set of problems associated with their own learning of how to be teachers/coordinators, with their being brought new into a course that was by then functioning as a relatively cohesive social unit, and with their being skeptical as to whether "female parataxonomists" were "a good thing". In addition, they were comparatively young and inexperienced in teaching and in human interactions. The situation required additional adjustment by the female parataxonomist, who had survived in the previous very male atmosphere of parataxonomists (experiencing frequent sexual comments and heavy attention - both welcome and unwelcome) through sheer grit. She was both scornful of and threatened by women who could afford to be more feminine while also being parataxonomists. The female students understood her antagonism, but not the history behind it, and so she again was isolated from the group. However, she worked successfully to slowly overcome this with many students.

This array of unanticipated events led to some discussion of anticipated problems of female parataxonomists working in a workplace that is populated almost entirely by males. However, the general

reaction by the students was that each would solve these problems in their own way, according to their own way of dealing with the world. It needs to be remembered that most of the students in the course had already come to their own methodology of dealing with female-male interactions in society at large. One of the few generalities to appear in these discussions was expressed in the comment that "The only thing I fear in the forest is meeting a man". This comment is especially revealing since virtually all of the (male-dominated) discussion of female parataxonomists before the course centered on whether they would be mollycoddled, whether they were capable of doing field work, whether they could integrate this activity with their traditional home-keeping role, etc.

During the course, and after a few months by the female parataxonomists on the job, it is clear that the most difficult challenges are not technical, but rather swirl around two basic questions. How can a working class woman become a paraprofessional in a social environment where sexual propriety is generally maintained by group-based social conventions (ranging from chaperones to foremen to job assignments) rather than individual behavior? How can a woman be a full-time vocational employee in a social environment where just by virtue of being a woman she already has an additional full-time occupation? Only further courses, and further job experiences, coupled with much planning, will give more answers to these two questions for the area of Costa Rican biodiversity inventory and management.

It is important to stress here that, due to the large number of applicants, many of the women accepted in this course enjoyed unusually supportive circumstances. In addition, in the cases previously mentioned in which the job becomes part of the family rather than a lone activity, a new work-structure is being created that resolves part of this issue. A woman who is working with her family and has family approval is at much less risk of community disapproval than one who is working on her own or suffers the disapproval of traditional family members.

l) Age differences. Four of the students in the course were over 30, and the eldest child of each was a teenager. One was a grandmother. It was evident that the older women not only had different day-to-day responsibilities and experiences than did the young ones, but that they also came from a different generation. While there was also a generation break in the earlier courses, this one had more apparent tension in it. The bulk of the course viewed three of the older members as set in their ways and negatively judgmental. Younger students were convinced that they were sexually jealous of the attractiveness of the younger women. On the other hand, the older students viewed the younger ones with a somewhat jaundiced parental eye, as somewhat irresponsible and spoiled, and not making full use of the opportunity.

Nevertheless, the presence of experienced older women was important to the stability of a course such as this. It potentially saved female parataxonomy from being viewed as a socially fringe activity, only for the young and adventurous ready to do a daring new thing.

m) Response to foreign versus Costa Rican staff. Parataxonomists of either sex, in courses, and after courses, definitely respond differently to foreign and Costa Rican staff members. There appear to be several different causes.

First, the parataxonomist course and the vocation is clearly a hybrid of (at least) two macrocultures - US (developed world) science professionalism and Costa Rican (developing world) working-class. The faculty tend to represent the former, irrespective of their nationality, and the students clearly represent the second. However, foreign staff obviously have a different relationship to Costa Rican working class members than do Costa Rican staff. The foreign staff member has a very strong tendency to value scientific

capacity in the student very highly (and be oblivious to most other traits); the Costa Rican staff member has a very strong tendency to value social characteristics highly, and not view scientific capacity as of over-riding importance.

Second, throughout Costa Rican society there is a strong manifestation of "No one is a prophet in his own land". A concept expressed by a foreign scientist often has much greater impact than does the exact same concept expressed by a Costa Rican. Costa Rican students are at times even more susceptible to this disease than are scientists. An additional complexity is introduced by the characteristic behavior of respectfully agreeing in public with virtually anything said by a foreign scientist, but silently misunderstanding or disagreeing. This discordance is generally not visible to the visiting foreign scientist, but becomes very visible when at some later date the student has to act on the information or concept.

Third, the normal staff-student relationship in any course is a balance of power. The Costa Rican student does not see the foreign staff member as someone with whom she or he has much negotiating power. As a consequence she is generally inclined to either be highly cooperative or politely evasive (and see above). With a Costa Rican staff member, however, any given staff-student interaction is almost always a complex negotiation. There are elements that extend far beyond the particular interaction and the course. Since the employer of the students is the same institution that offers the course, and since one of the course coordinators is also the overall parataxonomist coordinator, these conflicts of interest are amplified yet farther.

Fourth, the Costa Rican student can fool the naive foreign staff member into making an ill-advised decision by presenting seemingly easy choices as a way of getting personal support from that faculty member. The Costa Rican staff member, on the other hand, may quickly understand the complex implications of making a decision, and thus be much less easily manipulated by the Costa Rican student. This situation is made yet more complex by the fact that much of what a foreign staff member has to offer in a parataxonomist course is to legitimize ways of thinking about subjects that are firmly entrenched taboos in Costa Rican society. For example, a trained parataxonomist's time is valuable and not a resource to be wasted, but both the parataxonomist and the Costa Rican upper-class have an unconscious response that working-class hours are extremely cheap and therefore "what is all the hurry, anyway". A discussion of this problem and possible solutions virtually never appears without the stimulus of a foreign scientist.

Fifth, foreign staff are present in large part because they know a great deal about the subject matter and philosophy of the course. The Costa Rican staff, both full-time and visiting, in general are at a lower level of technical development on both parameters. In this particular course, however, several of the coordinators were very knowledgeable technically, but had very little experience in motivating students to learn or change. The automatic outcome is that the students, students who are not inclined to be considerate of or even aware of the feelings of the Costa Rican staff, tend to rank the foreign staff higher than the Costa Rican staff in a wide variety of interactions. It is particularly important in this context to note that working-class persons are generally uninterested in the feelings and egos of upper-class persons; this is particularly difficult for upper-class persons when they are "putting themselves out" to elevate working-class persons into their "own" professional stratum. In this context, the US faculty originates in a home society where the elevation of a working-class person to professional status is viewed as a highly acceptable way to spend one's time; the Costa Rican staff member is in a society where such elevation is less enthusiastically greeted in all sectors. Callousness by students toward Costa Rican staff quite easily

generates the unconscious (and more rarely, conscious) response of "why am I pouring my energy out on these ingrates?" Future Costa Rican full-time faculty will find this phenomenon particularly difficult to deal with.

n) Alcohol and other drugs. No drinking of alcoholic beverages was allowed in the course, either during working sessions or termination festivities. Groups were also not allowed to "go to town" in the evenings and therefore be "out of the course". After the first two weeks of the course, the course ran continuously from 7 am to 8-10 pm, except for a two hour break in mid-day and one hour break at dinner. The two-hour mid-day break was, however, also used for car and motorcycle driving lessons. In the two male parataxonomist courses we made the error of allowing the course to be free after meals, which led to a substantial amount of partying that appeared to significantly lower the effectiveness of the course.

There were only three smokers in the course. The smokers were generally very unobtrusive about smoking owing to a general Costa Rican disapproval of smoking, and an awareness of smoking's bad effects.

Other drugs (except for coffee and tea) were strictly prohibited and apparently not used during the course.

o) Graduation (Appendix 4). The calendar date of graduation was initially chosen in the context of the next logical step following termination of course activities. However, it well illustrates the kind of problem that can unexpectedly appear in a course of this nature. A parataxonomist course graduation is a major and highly positive political event for INBio and for the forces of conservation management in Costa Rica overall. As such, invitees include numerous political figures of importance to the entire conservation process. Additionally, in the previous two courses nearly all of the parataxonomists were both male and government employees. As such, they were also the primary working member of a family group, and the family activity schedule was distorted around his schedule.

In Costa Rica, if an event is to be attended by major political figures, it needs to be on a work day and not during a major sporting event (soccer games are virtually always on Sunday). Male parataxonomists in government employ, for whom graduation is also another working day, have had no problem with this scheduling. And a visit to graduation by immediate dependent relatives (non-working wife and children, retired parents) is not a great problem. In this tradition, graduation for the third course was long-scheduled for a Monday by the US faculty and approved by Costa Rican decision-makers with an eye on political aspects.

However, shortly before the end of the course it was the students themselves and the INBio director who pointed out that this graduation would be very much a family affair. It is quite striking that when female parataxonomists say "family" it is a much more inclusive word than when a male parataxonomist says "family". It became imperative to move it to a Sunday, a day when working class families, relatives and friends can be present without jeopardizing their jobs and income. By having it on Sunday morning, they can spend Saturday traveling from very distant parts of Costa Rica to a central graduation (at INBio) and have Sunday afternoon to return. This in turn implies a major cost of staying at a hotel Saturday night, and restaurant meals in travel. These costs were unambiguously part of the course expenses, since the course budget is for whatever will generate a fully functional parataxonomist. Full family participation in the graduation exercise is an essential element of full parataxonomist family support "on-the-job". On the other hand, this did generate the phenomenon of strongly reduced political attendance at the graduation, a phenomenon that has a cost for the social budget of the parataxonomists and the political budget of INBio.

E. In closing

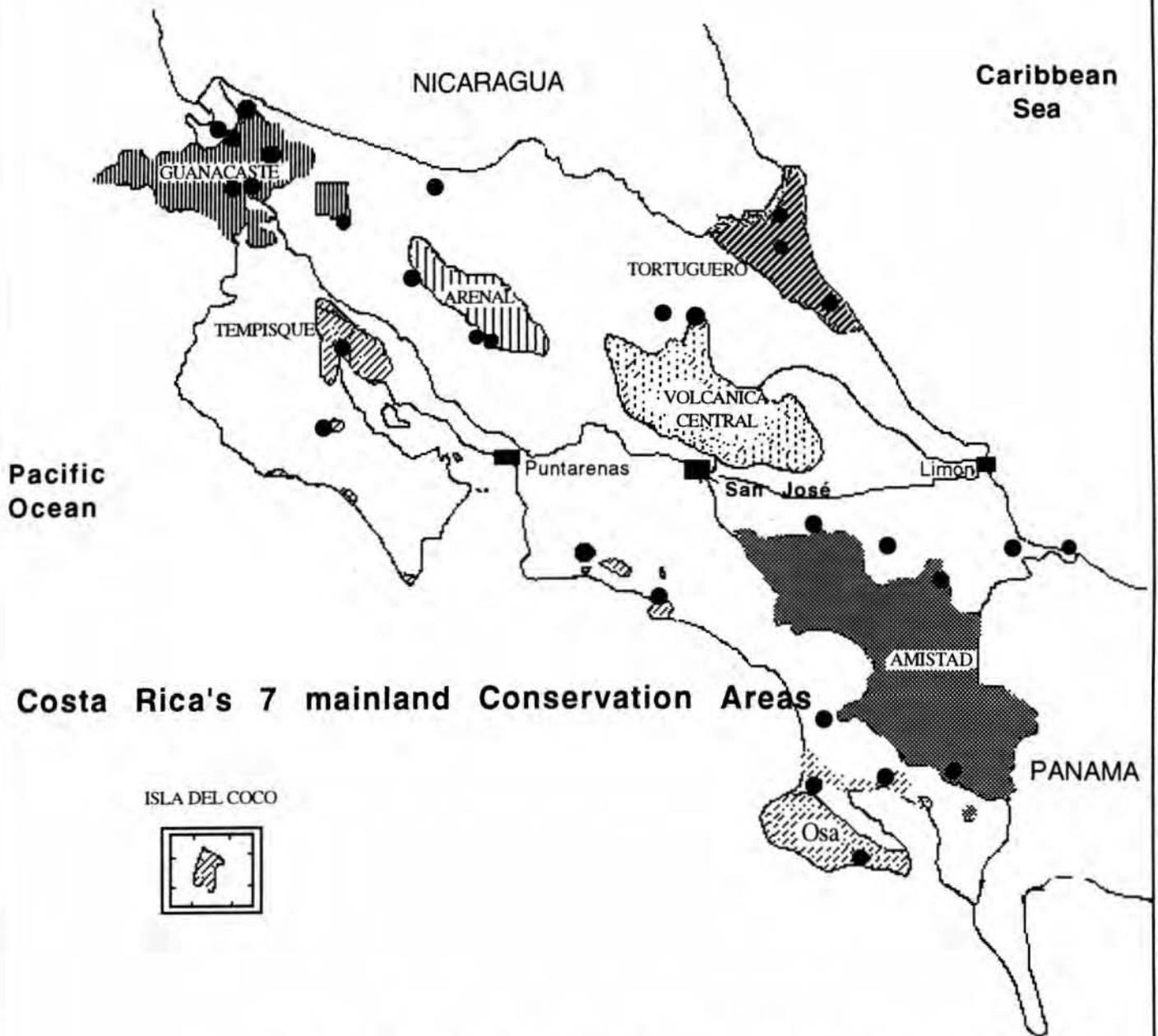
As stated initially, this description has focused on those aspects of the third parataxonomist course that were strongly related to it being almost entirely made up of Costa Rican rural women. This third course also differs from the first two courses in being a further step in the evolution of parataxonomist courses in general. However, this pedagogical evolution merits yet further descriptive analysis that will be presented later as part of an analysis of paraprofessional courses in biodiversity resource management.

F. Literature cited

- Aldhous, P. 1991. 'Hunting license' for drugs. *Nature* 353:290.
- Allen, W. H. 1988. Biocultural restoration of a tropical forest. *BioScience* 38:156-161.
- Gamez, R. 1991. El Instituto Nacional de Biodiversidad de Costa Rica: poniendo la biodiversidad a trabajar sostenidamente para la sociedad. *Biodiversity* 7 (1&2):86-88.
- Holden, C. 1986. Regrowing a dry tropical forest. *Science* 234:809-810.
- Hovore, F. T. 1991. INBio: by biologists, for biologists. *American Entomologist* 37:157-158.
- Janzen, D.H. 1988. Guanacaste National Park: Tropical ecological and biocultural restoration. In *Rehabilitating damaged ecosystems*, Vol. II, J. Cairns, Jr., ed., CRC Press, Boca Raton, Florida, pp. 143-192.
- Janzen, D. H. 1989. El eslabon entre la conservación y el desarrollo sostenible: Maribel Gámez Mata. *Revista de Filosofía Universidad de Costa Rica* 27:333-337.
- Janzen, D. H. 1991. How to save tropical biodiversity. *American Entomologist* 37:159-171.
- Janzen, D. H. 1992a. A dry tropical forest ecosystem restored. *Earth Summit Times*, Issue 28, April 1, 1992. NY Daily News, PO Box 1475, Grand Central Station, New York, NY 10163. 1 p.
- Janzen, D. H. 1992b. On conserving Costa Rica's tropical forests. *Calypso Log* 19(4):14-15,22.
- Janzen, D. H. 1992c. The neotropics. A broad look at prospects for restoration in Central and South America raises some basic questions about methods, about goals, and about the restorationist's role in evolution. *Restoration and Management Notes* 10:8-13.
- Janzen, D. H. 1992d. A south-north perspective on science in the management, use, and economic development of biodiversity. In: *Conservation of biodiversity for sustainable development*. Eds. O. T. Sandlund, K. Hindar and A. H. D. Brown, Scandanavian University Press, Oslo. pp. 27-52.
- Janzen, D. H. and W. Hallwachs 1992a. Costa Rica's national biodiversity inventory: the role of the parataxonomists and the experiences of the first two parataxonomist training courses, 1989 and 1990. Final report to US/AID, 42 pp.
- Janzen, D. H. and W. Hallwachs 1992b. La restauración de la biodiversidad tropical: experiencias del Area de Conservación Guanacaste y posibles aplicaciones en México. In *México ante los retos de la biodiversidad*. J. Sarukhan and R. Dirzo, compilers. Comisión Nacional para el Conocimiento y Uso de la Biodiversidad, Mexico. pp. 243-250.
- Joyce, C. 1991. Prospectors for tropical medicines. *New Scientist*, Oct. 19:36-40.
- Lewin, R. 1988. Costa Rican biodiversity. *Science* 242:1637.

- Raven, P. H. and E. O. Wilson. 1992. A fifty-year plan for biodiversity surveys. *Science* 258:1099-1100
- Reid, W. V. 1991. The spice of life. *The Economist Newspaper*. Letter to the Editor. 14 September 1992
- Roberts, L. 1992. Chemical prospecting: hope for vanishing ecosystems? *Science* 256:1142-1143.
- Sandlund, O. T. 1991. Costa Rica's INBio: towards sustainable use of natural biodiversity. Norwegian Institute for Nature Research (NINA). Notat 007:1-25.
- Tangley, L. 1990. Cataloging Costa Rica's diversity. *Bioscience* 40:633-636.

Figure 1.



Costa Rica's 7 mainland Conservation Areas

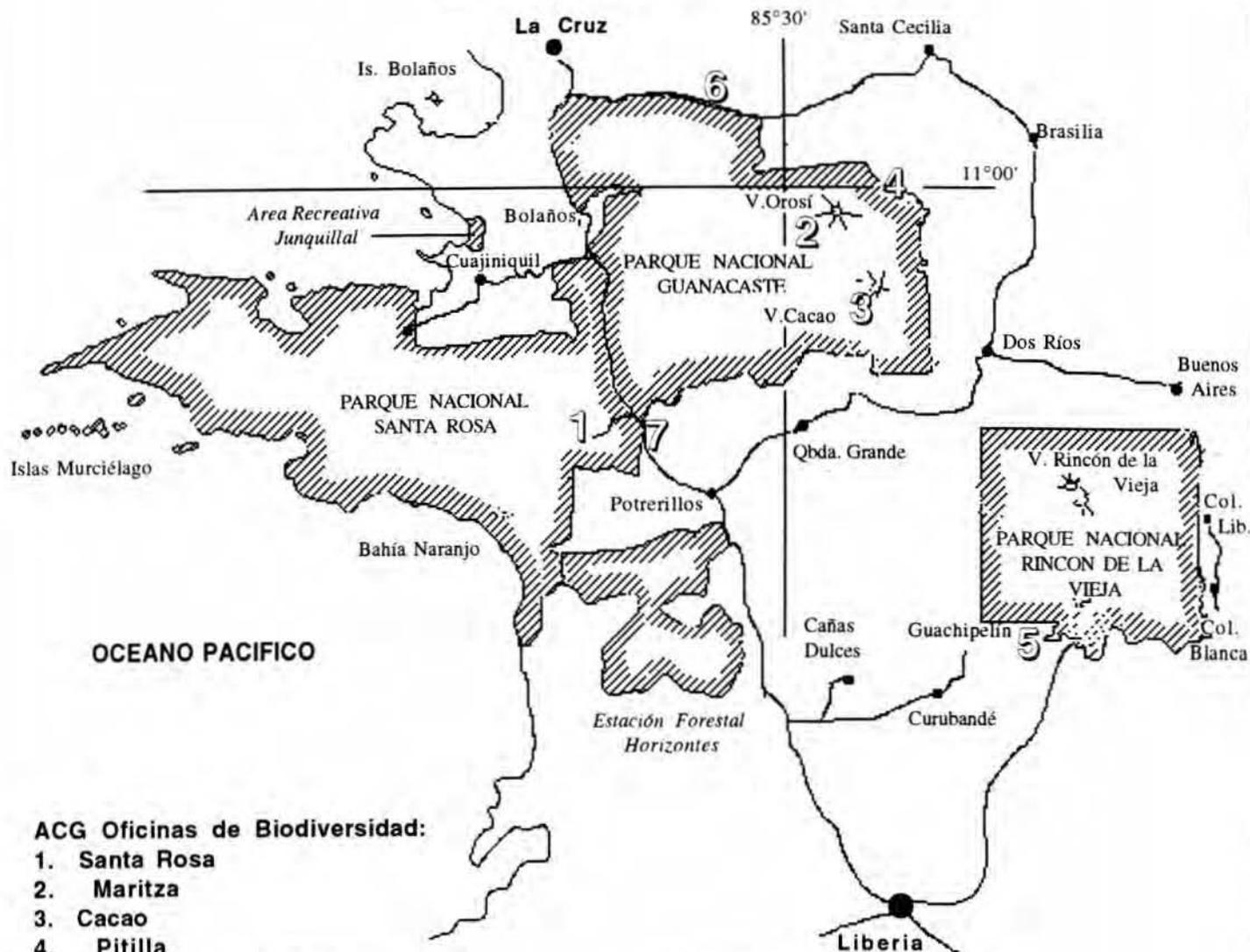
- The 29 Biodiversity Offices as of September 1992
INBio-MIRENEM biodiversity inventory collaboration

Ministry of Natural Resources, Energy and Mines (MIRENEM)

September 1992

Figure 2.

Area de Conservación Guanacaste



ACG Oficinas de Biodiversidad:

1. Santa Rosa
2. Maritza
3. Cacao
4. Pitilla
5. Rincón (Las Pailas)
6. Los Almendros
7. Finca Jenny

	Area de Conservación Guanacaste
	Ciudades
	Carreteras



 Area de Conservación Guanacaste

setiembre 1992

What is INBio, the National Biodiversity Institute of Costa Rica?

Biodiversity in Costa Rica

About 25% of Costa Rica consists of wildlands conserved for their biodiversity and its uses. These wildlands contain about half a million species of wild plants, animals and micro-organisms, and all their genes, habitats, and interactions. This is at least 95% of all the biodiversity that has occupied Costa Rica in modern times. These organisms and their natural histories are distributed from the nearly desert very dry forest habitat in the northwest to the very wet rain forest habitats of the remainder of Costa Rica lowlands, to 3000-plus meter tall mountain ranges. This biodiversity - about 4% of that of the terrestrial world - is a major renewable natural resource, a potentially powerful engine for intellectual and economic development.

The Costa Rican landscape does not consist of conservation on the one hand, and production on the other hand. Costa Rica consists of two major kinds of land use: agroecosystems that produce one set of products and wildlands explicitly maintained for another set of products. Both land uses require planning, investment, national legislation, personnel, specialization, research, marketing, and full incorporation in national life.

INBio

The National Biodiversity Institute (INBio) is a non-profit and private Costa Rican institution dedicated to the conservation of this wildland biodiversity through facilitating its nondestructive intellectual and economic uses by national and international society. INBio operates under the assumption that a developing tropical society will conserve a major portion of its wild biodiversity only if this area can generate enough intellectual and economic income to pay for its own upkeep and also make a contribution to the national economy proportional to its area.

Costa Rica's history of several decades of classical conservation has provided the raw materials for biodiversity conservation through non-destructive use. The next steps are to determine what these raw materials are - through direct and detailed inventory - and to facilitate their use by all sectors of society.

Why a new and national Biodiversity Institute?

Only by understanding biodiversity can we protect it, manage it, and help society use it without destroying it. Today we understand only a minute fraction of Costa Rica's species and how they interact. What do they eat? What do they make? Where are they? How fast do they replace themselves? Who else do they depend on? How can we grow them? How tolerant are they of perturbation? Where else can they grow? These and many more management and production questions require a very focused, on-site, day-in and day-out examination of the biodiversity in a country's conserved wildlands. And that examination will only be carried forth with care, enthusiasm, dedication and perseverance by the people of the nation where this biodiversity lives.

This knowledge constitutes a kind of language, a local biodiversity literacy. These are Costa Rica's unopened books, written in strange languages. For Costa Rica's socioeconomic survival, and for Costa Rica's mutualism with the rest of the world, these books need to be opened and the languages learned. This cannot be done for Costa Rica by some foreign power.

For decades various government and private institutions, both national and international, have been conducting portions of Costa Rica's biodiversity research and development with limited resources and as part of a different mandate. INBio has accepted the responsibility of being an institution that focuses solely on facilitating and

integrating these past efforts with a massive new and highly goal directed effort. INBio anticipates being able to conduct its national biodiversity inventory within a decade of receiving its first inventory funding, and to continue organizing and using the information generated by the inventory into perpetuity. This requires an organization that has great single-mindedness of purpose and is not distracted by other major functions.

It is clear to all that Costa Rica's biodiversity is only a portion of the biodiversity of the Mesoamerican Isthmus. It is likely that one day INBio will de facto expand to facilitate the appearance of INBio-like efforts in this region, or to be pulled by the region into becoming Mesoamerican in scope. But for the present, it is clear that INBio's mandate needs the energy of a national geographic and political focus to be successful.

INBio's history: private, non-profit and for the public interest

On 5 June, 1989, a Presidential Executive Decree established the INBio Planning Commission, with representatives from different government agencies, institutions of higher education, and conservation NGO's. This Commission recommended that INBio be created as a non-profit private organization for the public good. The existing government framework did not seem appropriate for many of INBio's tasks - such as the large and complex inventory, publicizing Costa Rican diversity, promotion of non-destructive use of biodiversity by the commercial world, networking internationally with a multitude of other biodiversity management institutions, urgency of planning and fund-raising, and the critical need for an organizational flexibility specifically designed to handle the very rapidly expanding field of biodiversity management.

The INBio Association was legally registered on 26 October 1989. It is governed by an Assembly of Founders and a Board of Directors. Many of INBio's activities involve close and harmonious integration with many other public and private institutions, both Costa Rican and foreign. INBio functions by "planning by doing", which sometimes gives the impression of haste and disorder. But this is simultaneously the mark of an institution that has fully accepted the responsibility of keeping abreast of a very rapidly expanding field and also recognizes that the "conservation of wildland biodiversity through use" must prove itself in the next few years, or the war will be lost.

INBio's Divisions

- The Division of National Biodiversity Inventory

The INBio inventory of Costa Rica's biodiversity builds on a long history of specialized inventory of fauna and flora by national and international researchers. It is intended to encompass all taxa and will involve very broad participation. The basic field work will be conducted by a small army of lay people trained into the vocation of inventorier - the parataxonomist - under the feedback, planning and guidance of the staff of INBio curators working with a network of national and international curators and taxonomic specialists.

The first goal is to accumulate the specimens necessary to clean up the taxonomy of Costa Rica's biodiversity in both a national and international context, and to come to know at least one site of occurrence in Costa Rica for a given organism. "Taxonomic cleanliness" will take the form of identified reference collections, field guides and electronic identification services such as expert systems. Starting simultaneously and continuing into the longterm, the inventory will establish species' ranges in more detail and begin the process of understanding their natural history and other properties.

The parataxonomists come from many different sources, both private and government. They work out of

Biodiversity Offices located in a network scattered across the country's habitats and conserved wildlands. Specimens and other field data flow into INBio, where they are processed into the collections of the National Biodiversity Inventory, the National Biodiversity Information Management System, and out into the international network of taxonomists and collections. All information on the identities, geographic distributions, and natural history are in the public domain and will be freely networked with the world-level exchange system for biodiversity information.

- The Division of Biodiversity Prospecting

INBio aggressively seeks out commercial users of biodiversity, and some users who do not yet know that they have a use for biodiversity. The goal is to facilitate the flow of Costa Rican wildland biodiversity information into the commercial research and development process, resulting in a financial return to the management costs for the conserved wildlands and an (eventual) serious contribution to the GNP as well.

The recent landmark contract between INBio and Merck, Inc., is an example of this. Research samples collected in government-owned conserved wildlands are managed under a specific agreement with the Ministry of Natural Resources, Energy and Mines (MIRENEM). These samples are passed to the commercial user under contract, who in turn pays INBio's costs - and therefore indirectly the conserved wildlands' costs - for species identifications, sample collection, sample preparation, voucher collections, data management, training, administration, etc. Ten percent of all fees paid by the commercial user are paid directly into MIRENEM's budget. Half of any royalties will go directly to MIRENEM; the other half will be used to maintain the INBio process.

At present, biodiversity prospecting is focused on the search for interesting chemicals produced by plants, insects and micro-organisms, that may be of use to the pharmaceutical and medical industry. Expansion is anticipated in areas such as pesticides and other industrial chemicals, and in the search for interesting genes. Costa Rica's conserved wildlands are in effect an enormous library that we are just beginning to learn how to read.

The biodiversity prospecting and research process is carried out both in Costa Rican institutions, and in collaboration with foreign institutions of higher education and companies. The process emphasizes training Costa Rican personnel for the field work of deciding what to sample and how to sample it, and the laboratory work of sample preparation, chemical isolation, and screening.

- The Division of Biodiversity Information Management

INBio's biodiversity information (specimen data, literature and field data) is growing rapidly, and when coupled with relevant supporting information such as topographic maps, soil maps, climate data, land use, and much more, the data package is extremely complex. This data package requires a capacity of analysis, management, presentation, distribution and integration not yet achieved by any set of biodiversity users anywhere in the world. INBio is now bringing cutting edge technology in GIS and data base management development to bear on this challenge. The basis of this are a new collaboration with Intergraph Corporation of Huntsville, Alabama, USA, and close companionship with many ongoing efforts at computerizing and networking biodiversity information. This effort will seek out promising new technologies, including artificial intelligence and field data collection devices such as GeoPositioning Systems.

INBio's goal is to become extremely capable in information management for its own internal function, and also to be able to present information in appropriate formats for an extremely wide range of users throughout society. In addition, INBio accepts the responsibility of adjusting its user interface to the user's level of computer literacy

(which may be extremely limited) and aggressively making potential system users aware of what INBio has to offer.

- The Division of Biodiversity Information Distribution

As yet, only a small fraction of society (ecotourism companies, university researchers, some visitors to conservation areas, people who have been in contact with INBio's parataxonomists) is aware of the potential industry in biodiversity. In order to spread biological literacy quickly and generate appreciation of what biodiversity information can offer, INBio is aggressively distributing biodiversity information to all levels and walks of life. This distribution comes about through offering natural history and taxonomic information to schools and universities, commenting on commercial development of conserved wildlands, working with legislators, being a member of policy-making commissions and symposia, training staff of conservation areas, producing hard copy field guides and other kinds of biodiversity literature, holding national and international planning meetings, etc.

A country that puts its biodiversity to work for society

By conducting a national biodiversity inventory and diligently distributing the resultant information to all sectors of society, Costa Rica will be the first tropical country to deliberately set out to put its natural biological wealth to intellectual and economic work for society. As we pursue this effort, we will develop local abilities that we will share with other tropical countries near and far. In this manner, we confront the gravest threat of this and the next century - the potential loss of the extraordinary biodiversity of the tropics. Simultaneously we promote the development of a society whose ethical and moral values will be rooted in respect for nature and the wise management of natural resources. In the process, society will be raised to a new level of biological literacy, a knowledge that at present is dangerously close to being lost.

For more information, contact

Dr. Rodrigo Gámez
Director General
INBio
3100 Santo Domingo
Heredia
Costa Rica

Telephone 506-367690; FAX 506-362816

November 1992

Tax-deductible contributions are desperately needed to support the training and operations of the Costa Rican parataxonomists and curators. They may be sent to the INBio fund, The Nature Conservancy, Latin American Program, 1815 N. Lynn Street, Arlington, VA 22209.

Table 1. Final distribution of funding for 1992 new female parataxonomists at INBio.

A. Course costs, one full year:

National Fish and Wildlife Foundation	\$80,000
Pew Charitable Trust	\$50,000
Moriah Fund	\$15,000
Conservation, Food and Health Foundation	\$10,000
Gender Office, Swedish International Development Authority (SIDA)	<u>\$24,326</u>
<u>Total</u>	\$179,326

B. Salaries, benefits and partial costs of Biodiversity Office establishment for female parataxonomists 1992

Liz Claiborne and Art Ortenberg Foundation	\$100,000
Government of Costa Rica (Conservation Area administrations)	\$10,399

C. Total direct cost for 18 women parataxonomists (training and operations) and establishment of 13 Biodiversity Offices

\$289,725

Notes:

- a) all overhead and other support costs were met by INBio from institutional funds; course faculty costs likewise were donated.
- b) the course also produced three male parataxonomists as a byproduct but their office and operations costs are not included in the above figures.

Table 2. Projected and actual expenditures of the budget for the 1992 parataxonomists course funded by the National Fish and Wildlife Foundation \$80,000 matching grant and four other sources (Table 1). See Table 3 for detailed breakdown of expenses by month.

	Projected	Actual cost
A. Personnel (salaries and benefits)	\$35,000	\$12,629.29 <u>1/</u>
B. Living costs	\$46,026	\$45,636.39
C. Travel during the course	\$29,200	\$36,801.79 <u>2/</u>
D. Equipment and supplies for the course	\$24,900	\$27,731.08 <u>3/</u>
E. Set up materials for the Biodiversity Offices	\$44,200	\$56,656.48 <u>4/</u>
F. Total direct costs	\$179,326	\$179,455.03

Footnotes:

1/ \$23,000 underspending in this category was achieved by elimination of the honorarium for course faculty (\$7,000), by donation of course coordinator salaried time by the Guanacaste Conservation Area (\$4,000), by donation of course coordinator salary by the INBio administration (\$9,000), and by course faculty taking on unpaid responsibilities that should have been salaried out. This underspending was necessary to cover the greater-than-anticipated expenses in categories C, D, and E.

2/ \$8,000 over-run in travel costs was due to greater-than-anticipated rental costs for course vehicles, greater-than-anticipated public transport costs (to their homes) by students during the breaks between intense course sessions, and greater-than-anticipated operations costs for INBio vehicles in July-December.

3/ \$3,000 over-run in course equipment and supplies was due to unanticipated rises in the cost of insect pins, a major cost in a course that focuses on insects as a teaching tool, and in operations that are focused on this major group of uninventory organisms (see also this major item in the 1993 budget being submitted to the Liz Claiborne and Art Ortenberg Foundation).

4/ \$12,000 over-run in the cost of setting up the Biodiversity Offices is due to the need to construct more rooms and buildinglets than anticipated for the female parataxonomists at their own homes and at the government facilities in the Conservation Areas.

Table 3. Monthly breakdown of direct costs by categories, Third Parataxonomist Course, 1 Jan 1992 to 31 Dec 1992, INBio (see Table 2 for category totals). Financed by National Fish and Wildlife Foundation, Moriah Fund, Conservation, Food and Health Foundation, Pew Charitable Trust, and Swedish International Development Authority (SIDA). INBio accounts 023, 024, 037, all figures in US dollars.

	<u>Jan</u>	<u>Feb</u>	<u>Mar</u>	<u>Apr</u>	<u>May</u>	<u>Jun</u>
A. Personnel (salaries and benefits) ^{1/}	664.99	873.79	762.03	658.23	785.05	1,085.83
B. Living costs	6,971.67	1,914.44	7,282.79	7,797.77	811.87	10,269.51
C. Travel during the course	1,427.88	8,519.53	4,672.94	4,222.45	1,240.43	7,940.79
D. Equipment and supplies for the course	9,041.09	2,176.34	4,778.68	258.67	1,077.55	867.26
E. Set-up materials for the Biodiversity Offices	18,872.76	3,329.00	2,124.92	3,474.23	2,750.64	4,514.47
F. Total direct costs	39,978.39	16,813.10	19,621.37	16,411.34	6,665.53	24,677.92
	<u>Jul</u>	<u>Aug</u>	<u>Sep</u>	<u>Oct</u>	<u>Nov</u>	<u>Dec</u>
A. Personnel (salaries and benefits)	816.20	808.63	1,536.31	1,445.13	1,596.52	1,596.52
B. Living costs ^{2/}	3,799.12	2,034.76	4,004.21	750.25		
C. Travel during the course ^{2/}	2,966.16	2,279.16	340.13	1,710.21	1,482.24	
D. Equipment and supplies for the course ^{2/}	2,168.16	3,046.42	1,384.59	2,932.33		
E. Set-up materials for the Biodiversity Offices ^{2/}	8,405.36	2,542.28	9,501.81	1,141.02		
F. Total direct costs	18,154.87	10,711.24	16,767.04	7,978.93	3,078.76	1,596.52

Footnotes:

^{1/} The parataxonomists' coordinator is maintained here throughout the twelve months as an absolutely essential cost.

^{2/} These costs for November-December were absorbed by the INBio core administration budget for amounts approximating the expenses for October, owing to exhaustion of the course budget and to avoid delaying or reducing field operations.

Table 4. Original budget for the third parataxonomist course, January-June 1992 (see Table 2 for actual expenditures).

Budget

A. Personnel (salaries and benefits)

1. Costa Rican course coordinator/teaching assistant, full time ^{1/}	\$10,000
2. Costa Rican parataxonomist coordinator, full time ^{2/}	\$12,000
3. Day care center operator and children facilitator, 1/2 yr ^{3/}	\$6,000
4. Janzen and Hallwachs, 5 month full time, U. of P. contribution ^{4/}	-----
5. Janzen, 1 month full time, summer salary and benefits ^{5/}	\$7,000
Total salaries and benefits	\$35,000

B. Living costs

1. Room and board and station use fees in AC Guanacaste, \$13/person/day; 19 persons X153 days X13 =	\$37,791
2. Costa Rican course coordinator, living costs in the field for a total of 184 days at \$15/day	\$2,760
3. Costa Rican parataxonomist coordinator, living costs in the field for a total of 365 days at \$15/day	\$5,475
Total living costs	\$46,026

C. Travel during the course

1. Rental and operations costs of two Toyota Safari field vehicles for travel during the entire six month course, \$1,800/vehicle per month, including diesel, insurance and unlimited kilometers	\$21,600
2. Miscellaneous bus and car travel by parataxonomists within Costa Rica during the course	\$3,000
3. Coordination travel by course coordinator and parataxonomists coordinator during the course and the year	\$3,000
4. Two round trip airfare for Janzen CR-US	\$1,600
Total travel	\$29,200

D. Equipment and supplies for the six month course

1. Minor equipment and expendable supplies (insect nets, bottles,
gas cylinders for drying ovens, light traps, insect pins,

headlamps, variety of field guides (books), xeroxes of lists, glue, envelopes, plastic bags, buckets, flashlight batteries, insect boxes, newspaper for plants, alcohol, car batteries, formalin, cork, computer paper, computer disks, plastic containers, gas lamps, extension cords, scissors, magnifying glasses, forceps, furniture, etc.)	\$15,000
2. 2 MacIntosh computers for training and work in course	\$2,400
3. Dissecting microscopes and fiber optic lights:10 provided by INBio, and five more requested by this budget, \$1,500 each set	\$7,500
Total minor course equipment	\$24,900
E. Set up materials for the Biodiversity Offices	
1. Expansion to absorb the 17 new parataxonomists (remodeling, additional furniture, additional minor equipment, increased supplies for one year); average of \$1,000/person per office	\$17,000
2. One tax-free motorcycle for each new parataxonomist, \$1,600 each	\$27,200
Total set-up materials	\$44,200
F. Total direct costs	\$179,326
G. Contribution available from Pew teaching endowment for direct costs ^{5/}	-\$53,067
K. Amount sought from the National Fish and Wildlife Foundation	\$126,259

Footnotes:

1. This person (Sr. Carlos Chaves) works full time as a course coordinator and teaching assistant during the course. Beginning in July, he will work full time for the remainder of the year as a roving councilor/facilitator helping with the re-entry and adjustment of the women to being simultaneously parataxonomists - real working members of the community - and wives/mothers. Past experience with this cultural system predicts that such extra effort will be absolutely necessary if these new parataxonomists are to prosper and develop in their rural environment. Chaves is a 40-year old grandfather, former union labor leader, highschool graduate, and one of the

very best parataxonomists.

2. This person (Srta. Maria Marta Chavarria) is the traditional science facilitator and coordinator for the parataxonomists. She has 2 years of experience in this role, and focuses on the direct science and administration of all INBio parataxonomists in the field. Owing to her unique position of having been both a parataxonomist and coordinator of them, she will work with the course and also do her usual coordinating, and then once graduation has occurred, focus heavily on the new parataxonomists. Chavarria has a degree in biology from the University of Costa Rica, is the national specialist on Gesneriaceae, and an excellent field biologist with full respect of all the (largely male) parataxonomists.

3. Janzen, the technical executor of this project, spends the entire spring semester (January-May) in Costa Rica on University of Pennsylvania salary; the university views this course as a legitimate use of his academic time. His wife, Winifred Hallwachs, has always co-taught the parataxonomist course with him.

4. One month summer salary (June) is sought here because a NSF grant covers Janzen's other month of summer salary.

Appendix 3. Detailed course schedule for 26 January - 11 March for the third parataxonomist course, 1992 (INBio).

23 enero 1992

Horario detallado para el Tercer Curso de Inventario Nacional, INBio: Sesiones I, II, III
26 enero hasta 11 marzo 1992. Cede en Area Administrativa y Estación Maritza, ACG

Sesión I

26 enero 1992

Entrada de 21 participantes, Carlos Chaves y Maria Marta Chavarría, coordinadores del curso, más Ercilia Cortés Júnez (de Cañas Dulces, Guanacaste), quien es la persona encargada del cuidado y desarrollo de los niños de las participantes del curso.

Todo el curso se aloja en Santa Rosa, y comen ahí mismo. Es posible que unos pocos participantes lleguen el sábado 25 enero, dado la incertidumbre del transporte.

Los tres etiquetadores del INBio (dos mujeres y un hombre) entrarán para participar solamente en la primera sesión. Ellos se hospedarán en Poco Sol (por falta de campo en Santa Rosa), pero comerán en Santa Rosa.

La mayoría de participantes llegarán a la entrada de Santa Rosa en transporte público, pero Maria Marta traerá algunos con ella además de los etiquetadores del INBio el día 26 enero.

En la tarde y después de la cena, todos los participantes disponibles trabajarán en la confección de muchos frascos de cianuro para matar insectos y confeccionar las listas de tareas (en el laboratorio/aula a la par del comedor).

Cena a las 6:00 pm en el comedor.

27 enero 1992

Desayuno cualquier hora después de las 6 am, para estar en la aula (a la par del comedor) listos para trabajar a las 7 am (hora exacta).

7:00-9:00 am. Charla (con preguntas): "Que estamos haciendo?"

1. Que es el curso? Que esperamos de Uds. durante el curso?
2. Que es un parataxónomo o parataxónoma?
3. Cuáles son las responsabilidades y oportunidades de un parataxónomo o parataxónoma?
4. Que es el INBio? Que es el SINAC?
5. Que es un Inventario Nacional?
6. Como se relaciona el INBio, SINAC, un Area de Conservación, y un parataxónomo o parataxónoma?
7. Como se relaciona todo esto a Costa Rica y su futuro?
8. Como se relaciona todo esto a su futuro?
9. Porque este curso es principalmente para mujeres?

9:00-9:30 am. Cafecito

9:30-10:00 am. Computo I. Introducción a lo que es una computadora Macintosh.

10:00-12:00 am. Ejercicio de laboratorio/campo. Qué es la planta "cornizuelo" (Acacia collinsii) y cuáles son las hormigas (Pseudomyrmex) que viven adentro de las espinas del cornizuelo?

Entrega de herramientas básicas.

12:00-1:00 almuerzo

1:00-3:00. Ejercicio de laboratorio/campo. Cornizuelo y sus hormigas, continuación, utilizándolas como ejemplo para discutir "Que es taxonomía?", "Que es una especie", "Que es un genero", "Que es una familia" y "Que es un orden?" Que es la ciencia? Que es la red internacional de taxónomos?"

3:00-3:30 cafecito (Carlos y Ercilia la encargada de niños van a Liberia para comprar suministros para facilitar sus tareas educativas con los niños).

3:30-4:00 Computo 2. Introducción a lo que es una computadora MacIntosh, continuación.

4:00-5:00 Charla. El ciclo de vida de una mariposa, en detalle.

5:00-6:00 libre y para finiquitar detallitos.

6:00 cena (después de la cena, finiquitar más detallitos todavía).

7:00 reunión de todos para discutir como tratar a visitantes, periodistas, etc.

A repetir cada noche:

En la noche toca a una persona mantener el aseo en la aula/laboratorio (vea lista).

En la noche toca a una persona escribir un breve resumen en la computadora sobre que hicimos durante el día (vea lista).

28 enero 1992

7:00-9:00 am. Charla con preguntas "Cuántas especies de organismos hay en Costa Rica, y cuál es el estatus de conocimiento taxonómico de ellos?" Es decir, porque estamos actualmente muy enfocados en el trabajo con insectos? "Qué es un nombre científico, como es establecido, y cuál es el proceso para identificar un organismo?"

9:00-9:30 am. Cafecito

9:30-10:00 am. Computo 3. Práctica y comentarios sobre las computadoras.

10:00-12:00 am. Caminata como grupo al bosque en búsqueda de insectos y acostumbrándose a los materiales de recolecta (redes, etc.).

12:00-1:00 almuerzo

1:00-3:00. Ejercicio de laboratorio/campo como montar insectos.

3:00-3:30 cafecito

3:30 Un grupo de cinco personas va a Agua Buena para poner las luces y coleccionar mariposas y otros insectos durante la noche (regresan a Santa Rosa para desayunar)

3:30 Un grupo de seis personas va a Otilio/Gongora para poner las luces y coleccionar mariposas y otros insectos durante la noche (regresan a Santa Rosa para desayunar).

3:30 El resto de los participantes (10) practicarán

manejar una motocicleta (vea lista de citas)
 manejar un carro (vea lista de citas)
 manejar una computadora (vea lista de citas)
 manejar una motosierra (vea lista de citas)
 poner la montura en un caballo (vea lista de citas)

6:00 cena

29 enero 1992

7:00-10:30. Laboratorio: Preparación de los insectos capturados durante la noche (café entremezclado)

10:30-12:00 Charla: "Cuáles son los ordenes de insectos y su historia natural?"

12:00-1:00 almuerzo

1:00-3:00 Laboratorio/charla: "Anatomía de un insecto"

3:30 Un grupo de cinco personas va a Agua Buena para poner las luces y coleccionar mariposas y otros insectos durante la noche (regresan a Santa Rosa para desayunar).

3:30 Un grupo de cinco personas va a Otilio/Gongora para poner las luces y coleccionar mariposas y otros insectos durante la noche (regresan a Santa Rosa para desayunar).

3:30 El resto de los participantes (11) practicarán
 manejar una motocicleta (vea lista de citas)
 manejar un carro (vea lista de citas)
 manejar una computadora (vea lista de citas)
 manejar una motosierra (vea lista de citas)
 poner la montura en un caballo (vea lista de citas)

6:00 cena

30 enero 1992

7:00-10:30. Laboratorio. Preparación de los insectos capturados durante la noche (café entremezclado)

10:30-12:00 Charla: "Cuáles son las familias de mariposas nocturnas y su biología"

12:00-1:00 almuerzo

1:00-3:00 Charla: "Que es la evolución?"

3:30 Un grupo de cinco personas va a Agua Buena para poner las luces y coleccionar mariposas y otros insectos durante la noche (regresan a Santa Rosa para desayunar).

3:30 Un grupo de seis personas va a Otilio/Gongora para poner las luces y coleccionar mariposas y otros insectos durante la noche (regresan a Santa Rosa para desayunar).

3:30 El resto de los participantes (10) practicarán
 manejar una motocicleta (vea lista de citas)
 manejar un carro (vea lista de citas)
 manejar una computadora (vea lista de citas)
 manejar una motosierra (vea lista de citas)
 poner la montura en un caballo (vea lista de citas)

6:00 cena

31 enero 1992

7:00-10:30. Laboratorio: Preparación de los insectos capturados durante la noche (café entremezclado)

10:30-12:00 Charla: "Qué son los insectos parasíticos y su biología"

12:00-1:00 almuerzo

1:00-3:00 Charla: "Como se reproducen las mariposas (con lujo de detalle) (migración, diapausa, tasas de crecimiento, biología de pupas, número de huevos, donde ovipositar, etc.)?"

3:30 Un grupo de cinco personas va a Agua Buena para poner las luces y coleccionar mariposas y otros insectos durante la noche (regresan a Santa Rosa para desayunar).

3:30 Un grupo de cinco personas va a Otilio/Gongora para poner las luces y coleccionar mariposas y otros insectos durante la noche (regresan a Santa Rosa para desayunar).

3:30 El resto de los participantes (11) practicarán
 manejar una motocicleta (vea lista de citas)
 manejar un carro (vea lista de citas)
 manejar una computadora (vea lista de citas)
 manejar una motosierra (vea lista de citas)
 poner la montura en un caballo (vea lista de citas)

6:00 cena

1 febrero 1992

7:00-10:30 Preparación de los insectos capturados anoche (café entremezclado)

10:30-12:00 Charla: "Qué determina el número de especies de organismos en un país o habitat"

12:00-1:00 almuerzo

1:00-6:00 Dividirse en cuatro grupos (vea lista) e ir caminando a pie a cuatro diferentes sitios en Santa Rosa para coleccionar insectos con enfoque en mariposas diurnas.

6:00 cena

2 febrero 1992

7:00 (o más temprano)-1 pm (regresa), mitad del curso sale para Agua Buena y la mitad para

Otilio/Gongora para coleccionar insectos diurnos con enfoque en mariposas diurnas.

1:00-2:00 almuerzo

2:00-6:00 pm. Laboratorio montando insectos coleccionados ayer (congelados) y hoy.

3 febrero 1992

7:00-9:00 am. Charla: "Las familias de mariposas diurnas y su biología"

9:00-9:30 cafecito

9:30-10:00 am. Computo 4. Práctica y comentarios sobre las computadoras.

10:00-12:00 am. Laboratorio: "Práctica identificando entre especies de mariposas, y un examen sobre las familias de mariposas y unos ordenes de insectos".

12:00-1:00 almuerzo

1:00-3:00 Laboratorio: Anatomía de insectos con práctica en dibujo.

3:00-3:30 cafecito

3:30 Un grupo de cinco personas va a Agua Buena para poner las luces y coleccionar mariposas y otros insectos durante la noche (regresan a Santa Rosa para desayunar).

3:30 Un grupo de cinco personas va a Otilio/Gongora para poner las luces y coleccionar mariposas y otros insectos durante la noche (regresan a Santa Rosa para desayunar).

3:30 El resto de los participantes practicarán
 manejar una motocicleta (vea lista de citas)
 manejar un carro (vea lista de citas)
 manejar una computadora (vea lista de citas)
 manejar una motosierra (vea lista de citas)
 poner la montura en un caballo (vea lista de citas)

6:00 cena

4 febrero 1992

7:00-10:30. Laboratorio: Preparación de los insectos capturados noche (café entremezclado)

10:30-12:00 Laboratorio: "Mapas, etiquetas, croquis, bases de datos, computarización de datos"

12:00-1:00 almuerzo

1:00-3:00 Charla: "La biología de organismos en islas ecológicas"

3:00-3:30 cafecito

3:30 Un grupo de cinco personas va a Agua Buena para poner las luces y coleccionar mariposas y otros insectos durante la noche (regresan a Santa Rosa para desayunar).

3:30 Un grupo de cinco personas va a Otilio/Gongora para poner las luces y coleccionar mariposas y otros insectos durante la noche (regresan a Santa Rosa para desayunar).

3:30 El resto de los participantes practicarán
 manejar una motocicleta (vea lista de citas)
 manejar un carro (vea lista de citas)
 manejar una computadora (vea lista de citas)
 manejar una motosierra (vea lista de citas)
 poner la montura en un caballo (vea lista de citas)

6:00 cena

5 febrero 1992

7:00-10:30. Laboratorio: Preparación de los insectos capturados anoche (café entremezclado)

10:30-12:00 Charla: "Insectos que son depredadores de semillas y su biología "

12:00-1:00 almuerzo

1:00-6:00 Dividirse en cuatro grupos (vea lista) e ir caminando a pie a cuatro sitios diferentes en Santa Rosa para coleccionar insectos con enfoque en mariposas diurnas.

6:00 cena

6 febrero 1992

7:00 am Laboratorio: Preparación de insectos capturados el día anterior, acomodar los insectos colectados durante esta sesión, revisión de la biología de estos insectos, salir medio día.

Sesión II

11 febrero 1992

Entrar a Santa Rosa.

12 febrero 1992 (Daniel y Winnie tienen que ir a México para cinco días)

7:00 am (horario todavía para determinar):

posible: red de golpe, trampas de todos tipos, expediciones de día a sitios misceláneos, de noche a Miravalles, mucho experiencia en preparación de insectos, epifitas?, empezar aprendiendo unos plantas del bosque seco?

13 febrero 1992 para definir

14 febrero 1992 para definir

15 febrero 1992 para definir

16 febrero 1992 para definir

(Daniel y Winnie regresan a Santa Rosa tarde en la noche)

17 febrero 1992

7:00-12:00 Laboratorio: revisión de los insectos capturados desde el 11 al 16 de febrero (cafecito entremezclado)

12:00-1:00 almuerzo

1:00-3:00 Charla: "Costa Rica como proyecto piloto para el manejo de la biodiversidad de México"

3:00-3:30 cafecito

3:30-6:00 Recolecta de arañas en el campo, trabajando individualmente.

6:00 cena

7:00-9:00 Recolecta de arañas en el campo de noche, trabajando individualmente.

18 febrero 1992

7:00-9:00 Charla: "La biología de los artrópodos que no son insectos (arañas, alacranes, Amblypigidae, ácaros, garapatos, etc.)"

9:00-9:30 cafecito

9:30-10:00 Examen sobre ordenes de insectos colectados hasta el momento

10:00-12:00 Laboratorio: Separando insectos pequeños con microscopio en muestras mezcladas

12:00-1:00 almuerzo

1:00-4:00 Laboratorio: Separando insectos pequeños con microscopio en muestras mezcladas

4:00-6:00 Revisión de la capacidad de todos en el manejo de montura, moto, carro, motosierra, computadora, y retroalimentación donde sea necesario.

6:00 cena

19 febrero 1992

7:00-9:00 Charla. "La biología de Rothschildia lebeau, y la biología de Sphingidae y Saturniidae"

9:00-9:30 cafecito

9:30-10:00 Examen sobre ordenes de insectos colectados hasta el momento.

10:00-12:00 Laboratorio: Separando insectos pequeños con microscopio en muestras mezcladas

12:00-1:00 almuerzo

1:00-4:00 Laboratorio: Separando insectos pequeños con microscopio en muestras mezcladas (cafecito entremezclado)

4:00-6:00 Poniendo "trampas vivas" para roedores en el bosque.

6:00 cena

20 febrero 1992

6:00 am, recolectando las trampas para roedores.

7:00 desayuno

8:00-10:00 Charla "La biología de Liomys salvini, un roedor del bosque seco"

10:00-11:00 Regresar los roedores vivos al bosque después de revisarlos en busca de insectos ectoparasíticos

11:00-12:00 Charla "Los grupos principales de mamíferos y su biología"

12:00-1:00 almuerzo

1:00-3:00 Charla: continuación de "Los grupos principales de mamíferos y su biología"

3:00-3:30 cafecito

3:30-6:00 Laboratorio: Separando insectos pequeños con microscopio en muestras mezcladas

21 febrero 1992

7:00 am Laboratorio: revisión de la biología de los insectos colectadas hasta la fecha, acomodar lo que hay, salir medio día.

Sesión III (Estación Maritza)

26 febrero 1992

Llegar a Santa Rosa durante el día e irse directamente a la Estación Maritza en la falda oeste de Volcan Orosí. Las personas que lleguen tarde a Santa Rosa llegarán en la noche a Maritza.

27 febrero 1992 hasta 10 marzo 1992

Recolecta intensiva de insectos de todos los tipos por todos los métodos, con discusión diaria de la biología y taxonomía de ellos. Entremezcladas habrán charlas de 1-2 horas de largo sobre los siguientes temas y otras de oportunidad, dependiendo de la disponibilidad de las personas:

"Un día en la vida de un cazador Africano"

"La megafauna extinta de Costa Rica y su relación con el presente"

"La biología del árbol Ateleia herbert-smithii en el ACG"

"La biología del guapinol (Hymenaea courbaril) en Costa Rica"

Repetido cada noche:

En la noche le toca a una persona mantener el aseo en la aula/laboratorio (vea lista)

En la noche le toca a una persona escribir un breve resumen en la computadora sobre que hicimos durante el día (vea lista)

11 marzo salir de Estación Maritza para Santa Rosa y salir en días libres.

16 marzo entrar al INBio en Santo Domingo de Heredia

17 marzo - 22 marzo inclusivo, trabajo en el INBio. Horario para definir.

23 marzo - salir para trabajo individual por un mes (sitios para discutir).



Tico Times Photos/Julio Lainez



PROGRAM designer Janzen presents diploma to new para-taxonomist Ana Maria Reyes, graduating class poses (right): important new skills for rural Ticos.

INBio Grads Pioneer New Field to Aid Nature

By GORDON DURNIN
(First in a Series)

HIDDEN down a small dirt road in Santo Domingo de Heredia, beside a paint factory, is the National Institute for Biodiversity (INBio). On most days, a few administrators and curators work quietly behind a din of final-touch construction, sorting and filing one of the largest collections of plants and insects in the world.

But last Sunday, the scene was different: it was a graduation.

There were corsages and ties, families and friends, a podium and a P.A. system, but it was humble stuff for a ceremony marking the heady progress of one of the most important environmental projects on the planet.

ALSO unique to this group were its one black and two native women.

"I'm definitely the first from Limon to become a para-taxonomist. Most people don't know what that means, but I think that being black and a woman doing this is important," said Carla Taylor, who will be working in the Gandoca-Manzanillo area on the Atlantic coast, near Puerto Viejo.

Sary Rojas of Rey Curro, Boruca and Gerardina Gallardo of Amubri, Talamanca said that their communities will welcome and support their efforts, pointing out that indigenous peoples have lived in harmony with nature for thousands of years.

THE graduates said that what they found most difficult about the course was being on their own.

pairs, and then on their own. Now they'll roam by themselves for hours at night through anything."

Back at the station, Janzen, Maria Marta Chavarria and Chavez helped the students sort their catches. Already they were experts in the delicate process of mounting the insects on pins and placing them in the styrofoam bottoms of the boxes that were to join INBio's collection.

BEHIND rows of microscopes and creaking chairs, there was a constant sibilance of conferring whispers. Insect anthologies were consulted. Some students sat blank-faced in concentration, lips moving silently over the pronunciation of the Latin names in order to assign them to memory.

"We teach biological literacy," explained

specimens, sending what cannot be identified to other experts elsewhere in the world. To date, INBio has discovered many new plant and insect species, and found others that previously had been thought only to exist elsewhere.

Until INBio came up with the idea of the para-taxonomist, collecting was a slow process.

"The most important thing was being in the field (with the para-taxonomists)," noted Dr. Chris Thompson, from the Smithsonian Institution in Washington, D.C. "If I'd been down here by myself and I looked at what I collected, it would have been disappointing. But then I compare it to what all the para-taxonomists did and it was so much more, and I suddenly realize the possibilities of this group."

Appendix 4

"WE are pioneers, a family sharing the dream of knowing and understanding the wealth of nature so that we can preserve it, without sacrificing the world in which we live," said Rodrigo Gamez, general director of INBio, in his address to the graduates.

Others spoke, and then the 18 women and three men of this class of para-taxonomists were called, one by one, to receive their diplomas.

Para-taxonomists are the footsoldiers of INBio's ambitious campaign to collect and name the entire inventory of flora and fauna found in Costa Rica -- the first step in understanding the intricate biological relationships in Costa Rica's forest areas. The information derived from this effort, believes INBio, will lead to discoveries that will benefit humanity, making forest preservation an economic imperative.

SUNDAY'S ceremony marked the third group to graduate from INBio's innovative experiment. Like their predecessors, these students all came from rural Costa Rica, the sons and daughters of campesinos. Most had not completed secondary school and had rarely ventured out of their communities. Yet these qualities make them particularly suited to the work of para-taxonomy.

"These people have lived in the countryside all of their lives. They are accustomed to it. The alternative is to have graduate biology students do the work, but for them, going into the field is always a penalty. For the campesino, this kind of work is an elevation in status," explained Dr. Daniel Janzen, designer of the para-taxonomy course, whose MacArthur Foundation grant was used to get INBio off the ground.

And 90 percent of this group was female.

"It is important that women be given the opportunity to enter into this field. Conservation is the responsibility of both genders," noted Maria Marta Chavarria, who oversaw the screening of course participants.

"It was the first time I had been away from my family, and that was hard," said 14-year-old Katie Flores, the youngest graduate.

For six months, the students were subjected to intense classroom and fieldwork on techniques for collecting and sorting plants and insects by family, genus and species. The course moved from Santa Rosa National Park in Guanacaste throughout the country to the various kinds of forests and habitats found in Costa Rica.

LOOKING back to their start in March at the Maritza Biological Research Station, it was easy to see how much the students had accomplished. Carlos Chavez, one of the first to graduate as a para-taxonomist, gave them a lecture on a certain leaf-eating beetle, which became the inspiration for an afternoon of searching. Awkward in their snake-proof leather legwear, armed with butterfly nets and glass jars impregnated with sodium-cyanide, the group slowly began to pluck beetles from the underside of the leaves of bushes and undergrowth in the cloud forest.

"They learn very quickly," said Chavez. "They're not afraid like they were at first. We slowly moved them from the buildings at the station, 100 meters at first, then deeper and deeper into the forest. They began in large groups and then moved to working in

Janzen. "The forest is like a library. To the illiterate, a library is just a bunch of paper, and unfortunately, most people are illiterate. We act as if there is a paper shortage, and so we are destroying the library.

"INBio hopes to quickly teach people that there are books in the library to be read, written in many languages and containing important and little-known information that could be useful for our future."

INBio's efforts have attracted funding from such diverse sources as Norway, the World Bank, the World Wildlife Foundation and the business world. The training and first three years of salaries for the women in this course are being paid by the Liz Claiborne (maker of women's cosmetics) and Art Ortenberg Foundation.

AT INBio headquarters, taxonomists with a higher degree of training further sort the

"They're as good in the field as I am," added Dr. Monty Wood, who teaches at Carleton University in Canada. "They instinctively know where to go to find good stuff, and they seem to be a lot quicker on their reflexes. But most importantly, they have good eyes, adapted not only for catching in the field, but for seeing the differences in the specimens."

INBIO'S goal is to know the entire biological inventory of Costa Rica by the year 2000. And it hopes that other tropical countries will establish similar institutes to accomplish the same.

(Next Week: The life of a para-taxonomist)

**INSTITUTO NACIONAL DE BIODIVERSIDAD
AREA DE CONSERVACION GUANACASTE
UNIVERSIDAD DE PENNSYLVANIA**

Otorgan el Presente Diploma de Aprovechamiento a:

Sony Rojas Leiva

Por haber cumplido exitosamente el

**CURSO DE INVENTARIO DE BIODIVERSIDAD
1992**

Realizado en el Area de Conservación Guanacaste
del 26 de enero al 28 de junio de 1992 (1.100 horas)

Este curso se realizó gracias a la colaboración de:

**LIZ CLAIBORNE & ART ORTENBERG FOUNDATION; SWEDISH INTERNATIONAL DEVELOPMENT AGENCY;
NATIONAL FISH AND WILDLIFE FOUNDATION; MORIAH FUND; THE NATURE CONSERVANCY;
CONSERVATION, FOOD AND HEALTH FOUNDATION; PEW CHARITABLE TRUST**

Santo Domingo de Heredia, 28 de junio de 1992

DR. RODRIGO GAMEZ
Director General

MSc. JOHNNY ROSALES
Director

DR. DANIEL JANZEN
Profesor de la Unidad

Para-Taxonomists Probe for Treasure

By GORDON DURNIN

(Second in a Series)

THE climb from Santa Cecilia to Pitilla is enough to make anyone realize that, at times, jeeps are anachronistic. Horses, preferred by those who live and work there, are a far more efficient means of transportation.

Pitilla is the park station base of National Institute for Biodiversity (INBio) para-taxonomists Petrona Rios, 26, and Calixto Moraga, 19. Even in March, when the so-called road is relatively dry, four-wheel drives often fail the test and local farmers are known to make extra cash hauling unfortunate victims out of axle-deep mires.

At higher elevations, where the mists of Cerro Orosilito begin to lap at the remains of the cloud forest and the edge of pastures abandoned to Guanacaste National Park, the trail becomes a little easier to navigate. There, time seems to stand still or even march backwards.

THE entrance to the station's rustic wooden ranch house is marked by a small National Park sign of familiar gold letters against brown.

Petrona and Calixto are not around to give their greetings. Most of their day is spent in the forest, visiting insect trap lines.

At Pitilla, the entire INBio project takes on a very different dimension from the white walls, fluorescent lights, computers and lab coats at the institute's buildings in Santo Domingo de Heredia. Politics and the rhetoric of high theory are somehow humbled by the quiet and meticulous daily work of the para-taxonomist.

"For me, the best part of the job is collecting. It's very interesting to empty a trap and see something new that I've never seen before and maybe no one else has either," says Petrona.

BOTH she and Calixto are alumni of the first group of para-taxonomists trained by INBio. They have worked at the Pitilla station for more than two years. Their knowledge of the trails leading from the station is intimate, as they spend 22 days of each month walking them. They have developed a deep understanding of the area's rhythms and cycles.

Logbooks and hundreds of boxes have been filled with their daily finds of insects, each carefully mounted on pins, labeled and sorted by genus and species.

A typical day begins at dawn in a simple kitchen where coffee is brewed and *gallo pinto* cooked over an open gas range. Then, in khaki uniforms supplied by the National Park Service, the two briskly head off through the dew up the steep slope of the volcano.

AN hour's climb in silence brings them to the buttress roots of a massive tree. Calixto says something, and the two begin to work. He peels away some flaking bark and plucks beetles off the tree trunk.

Petrona busies herself with a short-handled net frantically scuffing and sweeping dead leaves from the ground. Stopping, she jiggles her catch until a dozen bugs are buzzing and crawling in the net's tip. She closes the end with her hand and dumps the rest of the leaves and twigs back onto the ground.

Then, from her waist-pouch she takes out a jar, quickly emptying the doomed mass into poisonous fumes. A couple of quick turns of the lid seals their fate. Farther along, near a swamp, is a series of dishes filled with water and another collection of dead insects.

CALIXTO explains that a small drop of detergent eliminates the surface tension that would normally allow these insects to walk on the water.

"They sink to the bottom and drown," he says.

After a few more stops, the trail winds back to the ranch house, where lunch is prepared.

THE conversation drifts to the paradoxical presence of don "Nacho," an old campesino who farms using the traditional slash-and-burn method, very much inside the national park.

"We see him all the time," explains Calixto. "He passes by and we say, 'hello.'"

Petrona chuckles and adds, "There's nothing anyone can do about him. A lot of people have told him that it's against the law to be doing what he's doing. But after a while they left him alone. It would be a difficult thing to have to put him in jail."

THE early afternoon is spent along another set of trails, patiently netting flying insects from flowering bushes and emptying the jar at the end of a tent-like trap that sits unobtrusively in the shade trail-side.

As the sun descends, the para-taxonomists head back to sit at tables on the ranch-house porch, where they peer through microscopes and carefully stir steady-handedly with tweezers through petri dishes loaded with thousands of tiny insects, looking for whole, solid specimens for mounting. The larger beetles, bees and flies are baked at low heat for drying in an old oven.

Talk is, as always, minimal, dealing with Latin names and what is left to do. Petrona leaves to wash some clothes. Calixto works a while longer and then starts to cook dinner.

THIS evening it is Petrona's turn to set



PARA-TAXONOMISTS
 Petrona and Calixto sort their finds: work is hard, but important.

Photo courtesy CONICIT

up the lights at the night traps and, after eating, she straps a large car battery onto a harness. Lifting it onto her back, she tromps into the dusk air.

Later, in the soft glow and hiss of naphtha lanterns, the pair pore over the books and exercises for their correspondence courses. Calixto is finishing secondary school and complains about his weakness in mathematics. Petrona is completing her first year of university, and says she plans on teaching in the future. Outside, the hush of the night air is broken by a chorus of whining cicadas.

At some point they catch a couple of hours of sleep, before it is time to get up and collect at the night traps -- white sheets hung to reflect battery-powered fluorescent lights.

WHILE the hours are long and irregular, neither Petrona nor Calixto is given to complaining.

"There is always something new to find. It's never a routine," says Calixto.

Beyond their regular collecting duties, Pitilla's para-taxonomists also help train new INBio students. In addition, they take a group of selected primary school students

from Santa Cecilia out every month for a field trip to learn about the art of collecting and naming plants and insects. But the lessons go deeper than that, instilling a sense of urgency for forest conservation.

BIOLOGIST Roberto Vargas, the school-teacher architect of the Santa Cecilia children's project, is complimentary.

"What Petrona and Calixto are doing will last a long time," he says. "Calixto is from Santa Cecilia. He is greatly respected by the children. They are seriously talking about becoming biologists and para-taxonomists."

The two also must play host to an increasing number of foreign journalists who come to visit the idyllic mountain refuge. No one, to date, has been disappointed after a visit to Pitilla. Whether such knowledge-seekers are a burden or not, both Petrona and Calixto acknowledge the importance of spreading INBio's message.

"It may be that one day we will find something that will help cure cancer or other sicknesses. We don't know. But I hope so," says Petrona.



Indonesian Institute of Sciences
(LIPI)



Ministry of State
for Population and Environment (KLH)



**JOINT STATEMENT ON COOPERATION AND SHARED IDEALS
BY THE INDONESIAN INSTITUTE OF SCIENCES AND THE
MINISTRY OF STATE FOR POPULATION AND ENVIRONMENT
OF THE REPUBLIC OF INDONESIA, AND THE
NATIONAL BIODIVERSITY INSTITUTE
OF THE REPUBLIC OF COSTA RICA**

1. The Ministry of State for Population and Environment (KLH) and the Indonesian Institute of Sciences (LIPI) of the Republic of Indonesia, and the National Biodiversity Institute of the Republic of Costa Rica (INBio) extend to one another mutual respect and the recognition of their shared commitment to the principle of sustainable economic development based on the conservation, study and wise use of biological diversity.
2. It is hereby agreed between LIPI and INBio that formal and informal contact at all levels between LIPI and INBio will be welcomed and encouraged, in order to explore the applicability of the biodiversity management techniques developed in each country to assist in the sustainable development of the other.
3. The scope of such contacts between LIPI and INBio as stated in Paragraph 2 shall include the following to the extent that resources permit: regular communication on matters of shared interest; exchange visits; joint training activities; consultations on the reciprocal protection of national property rights to biodiversity assets in the framework of the Global Biodiversity Convention; and discussions on planning, research and development issues related to biodiversity management.
4. To enhance this relationship, LIPI and INBio agree to seek the cooperation of their respective governments, international agencies and other sources of assistance in taking such measures.

Signed this 30th day of October 1992 in Jakarta, Indonesia.

Prof. Dr Samaun Samadikun
Chairman
Indonesian Institute
of Sciences

Dr Rodrigo Gamez Lobo
Director General
National Biodiversity
Institute of Costa Rica

Witnessed by:

Prof. Dr Emil Salim
Minister of State for
Population and Environment
Republic of Indonesia

Appendix 5. Participants in the 1992 female parataxonomist course (INBio)

	<u>Age</u>	<u>Education</u>	<u>Married?</u>	<u>Children</u>	<u>Occupation</u>
Sary Rojas Leiva Rey Curré AC Amistad	21	6	single	2	homemaker, indigenous artist 6-236-215
Gladys Rodríguez Ramírez Tierras Morenas; Reserva Forestal Tenorio AC Arenal	23	1	married	2	homemaker, farmer 5-246-108
Katty Francisca Flores Herrera Caño Negro Centro RVS Caño Negro	14	6	single		housework, 2-522-016
Zobelda Fuentes Alvarado Finca Buen Amigo; San Luis, Monteverde AC Arenal	20	11	single	1	research assistant, Arenal C A 6-237-538
Marla Isabel Ortiz Campos La Virgen de Sarapiquí AC Cordillera Volcanica	35	9	free union	5	homemaker, nature guide, La Selva 4-128-942
María de los Angeles Enríquez Barra Honda; 6 kilómetros de la Admin. AC Tempisque	37	10	single	2	homemaker, coffee picker 5-151-970
Priscilla Campos Sanabria Grano de Oro de Turrialba AC Amistad	22	6	married	2	homemaker 3-309-357
Carolina Cano Cano Quebrada Grande de Liberia, Guanacaste AC Guanacaste	20	8	single		housework 5-296-856

Appendix 5. Participants in the 1992 female parataxonomist course (INBio)

	<u>Age</u>	<u>Education</u>	<u>Married?</u>	<u>Children</u>	<u>Occupation</u>
Kattya Lorena Martínez Sequeira Playuelas los Chiles, Frontera Norte RVS Caño Negro	23	6	single		housework 2-445-455
Dunia Gricela García García Quebrada Grande de Liberia, Guanacaste AC Guanacaste	16	7	single		housework; voluntary assistant, GCA 5-0288-0197
Ada Luz Marin Alpizar Rancho Quemado de Osa ACOSA	32	8	married	5	homemaker, farmer 1-514-158
Ana Hazel Gutierrez Montenegro Puerto Jiménez ACOSA	35	8	single	1	cook, Corcovado National Park, Osa CA 6-123-937
Ronald Vargas Castro Finca Chaves, Parcela#14, Sarapiquí AC Cordillera Volcanica	28	12	married	2	farmer 1-600-359
Danilo Brenes Madrigal Barrio Cristo Rey, Puerto Viejo, Sarapiquí AC Cordillera Volcanica	27	8	married	1	research assistant 4-136-268
Elba Ester López Guadamuz Estación El Muerto, ACG AC Guanacaste	22	8	free union	2	homemaker, research assistant, GCA 5-251-712
Rosa María Guzmán Adanís INVU de Tárcoles, Puntarenas Reserva Biol. Carara	17	11	single		housework 2-496-511

Appendix 5. Participants in the 1992 female parataxonomist course (INBio)

	<u>Age</u>	<u>Education</u>	<u>Married?</u>	<u>Children</u>	<u>Occupation</u>
Gerardina Mayela Gallardo Ramírez 500 m de la Radioemisora Voz de Talamanca AC Amistad	20	6	single	2	homemaker 7-100-339
Flor Vianey Araya Mena Sardinas AC Tortuguero	25	6	free union	2	homemaker, farmer 2-422-711
Freddy Antonio Quesada Quesada San Ramón AC Arenal	26	10	single		research assistant, INBio 2-408-279
Karla Eloisa Taylor Martínez Parque Nacional Tortuguero AC Tortuguero	19	12	single		nature guide, Tortuguero C A 7-155-995
Marianella Segura Castillo Rancho Quemado de Osa ACOSA	20	11	married		homemaker, vol. res. assist. 4-154-825