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ECOLOGIA DEL TROPICO AMERICANO



Una Bibliografía Parcialmente Anotada



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PROGRAMA COOPERATIVO PARA EL DESARROLLO DEL TROPICO AMERICANO IICA-TROPICOS

Turrialba, Costa Rica
1974

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ECOLOGIA DEL TROPICO AMERICANO

Una Bibliografía Parcialmente Anotada

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PROGRAMA COOPERATIVO PARA EL DESARROLLO DEL TROPICO AMERICANO IICA-TROPICOS**

**Turrialba, Costa Rica
1974**

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TABLA DE CONTENIDO

	Pág.
INTRODUCCION	iii
Ecología General	1
Ecología Animal	11
Ecología Humana	21
Ecología Vegetal	27
INDICE DE AUTORES	55
INDICE GEOGRAFICO	59
INDICE DE MATERIAS	60



INTRODUCCION



INTRODUCCION

El manejo racional de la producción y el aumento de la productividad plantea uno de los retos más interesantes del Trópico Húmedo Americano, donde recién se inician los estudios de los problemas ecológicos existentes.

Existen esfuerzos dispersos que no están siendo debidamente utilizados. Es necesario lograr una planificación ecológica que ayude a apresurar el desarrollo. Hasta hace muy poco no se habían fomentado estudios integrados para la utilización de los recursos renovables y no renovables del ecosistema amazónico, con toda su gama de complejos problemas, agravados por el subdesarrollo. Estos estudios permitirán establecer nuevos principios para la utilización racional de los recursos disponibles.

Las actividades agrícolas, ganaderas y forestales, están supeditadas en buena parte a condiciones ecológicas y sólo se podrá lograr el máximo de productividad si se desarrollan en un medio ecológico apropiado.

En la Reunión Técnica de Programación sobre Investigaciones Ecológicas para el Trópico Americano realizada en 1973, en Maracaibo, Venezuela, bajo el patrocinio del Programa Cooperativo para el Desarrollo del Trópico Americano - IICA-TROPICOS, y de la Facultad de Agronomía de la Universidad del Zulia, se comprobó la necesidad de disponer de personal idóneo en ecología, entre los profesionales del Trópico Americano, para lo cual se recomendó la realización de Cursos de Ecología con énfasis en las actividades agropecuarias y se constató, también, la necesidad de una ágil y amplia difusión del material bibliográfico existente sobre la materia.

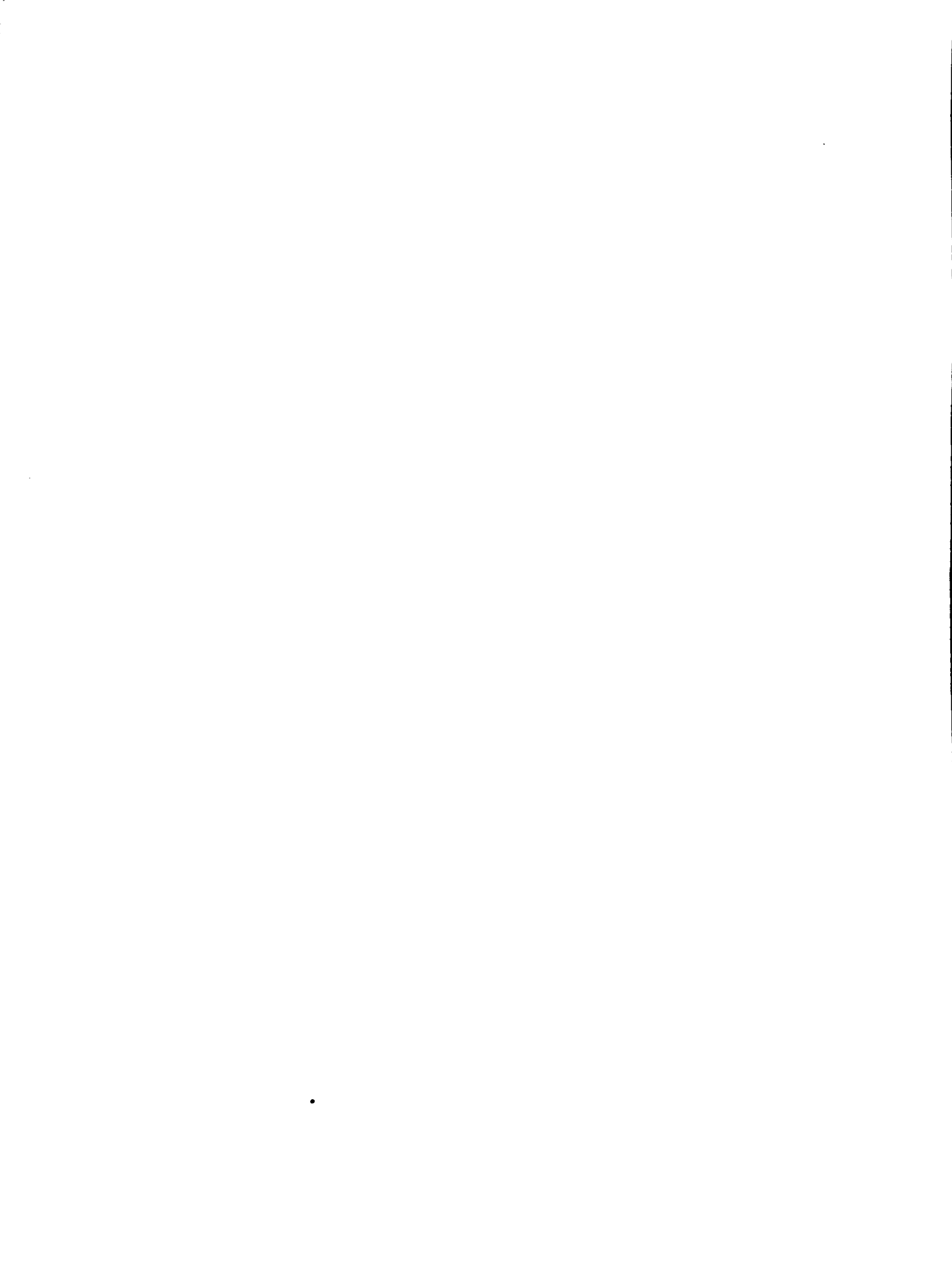
La compilación de esta bibliografía por parte de la Unidad de Documentación del IICA-TROPICOS, que no pretende ser completa, tiene como objetivos principales: a) ser una contribución a los Cursos de Ecología, b) divulgar las experiencias realizadas sobre ecología aplicables al trópico.

La selección del material se hizo principalmente en fuentes primarias y material bibliográfico existente en la Biblioteca del IICA - CIDIA. Se incorporaron diferentes tipos de publicaciones, libros, folletos, tesis, artículos de publicaciones periódicas y trabajos presentados a reuniones, congresos etc. Se reunieron 304 referencias correspondientes al período 1969-1974. Se reproducen los resúmenes que acompañaban a los trabajos y algunas reseñas de libros sobre el tema.

Turrialba, Costa Rica
Junio 1974

DOCUMENTACION E INFORMACION AGRICOLA

1. Colección de referencia de la Biblioteca Conmemorativa Orton. 2 ed. 1967.
2. Publicaciones periódicas de la Biblioteca Conmemorativa Orton. 1964.
3. Tesis de la Escuela para Graduados 1947-1968; resúmenes. 2 ed. rev. y ampl. 1969.
4. Redacción de referencias bibliográficas; normas oficiales del IICA. 2 ed. 1972.
5. Directorio de bibliotecas agrícolas en América Latina. 1964.
6. Catálogo de publicaciones periódicas de la Biblioteca Conmemorativa Orton. 2 ed. rev. y ampl. 1970.
7. Estado actual de bibliotecas agrícolas en América del Sur; resultados de una encuesta personal. 1966.
8. Administración de bibliotecas agrícolas. 1966.
9. Guía de publicaciones periódicas agrícolas de América Latina. 1966.
10. Bibliografía de bibliografías agrícolas de América Latina. 2 ed. rev. y ampl. 1969.
11. I Mesa Redonda sobre el Programa Interamericano de Desarrollo de Bibliotecas Agrícolas, Lima. 1968.
12. Contribuciones del IICA a la literatura de las ciencias agrícolas. 2 ed. rev. y ampl. 1972.
13. Directorio de siglas en ciencias agrícolas. 2 ed. 1971.
14. Guía básica para bibliotecas agrícolas (ed. en portugués y español). 1969.
15. II Mesa Redonda sobre el Programa Interamericano de Desarrollo de Bibliotecas Agrícolas, Bogotá. 1969.
16. Recursos de bibliotecas agrícolas en América Latina. 1969.
17. 2000 libros en ciencias agrícolas en castellano. 1969.
18. III Mesa Redonda sobre el Programa Interamericano de Desarrollo de Bibliotecas Agrícolas, Río de Janeiro. 1969.
19. Publicaciones periódicas y seriadas de América Latina. 1971.
20. Índice Latinoamericano de tesis agrícolas. 1972.
21. Trópico americano: situación de los servicios bibliotecarios y documentación agrícola. 1972.
22. 3000 libros agrícolas en español. 1973.
23. Bibliografía sobre frijol de costa (Vigna sinensis). 1973.
24. Sistema Interamericano de Información para las Ciencias Agrícolas-AGRINTER: bases para su establecimiento. 1973.
25. Bibliografía sobre especies de la fauna silvestre y pesca fluvial y lacustre de América Tropical. 1973.
26. Bibliografía sobre plantas de interés económico de la región Amazónica. 1974.
27. Bibliografía sobre sistemas de agricultura tropical. 1974.
28. Bibliografías Agrícolas de América Central: Panamá. Suplemento. 1974.
29. Bibliografía sobre catastro rural en América Latina. 1974.
30. Índice latinoamericano de tesis agrícolas. Suplemento no. 1, 1968-1972. 1974.





ECOLOGIA GENERAL



E C O L O G I A G E N E R A L

- ACOSTA-SOLIS, M. Humboldt y la naturaleza ecuatoriana. *Flora (Ecuador)* 12(41-46): 14-88. 1969. (1)
- BENACCHIO, S. Investigaciones ecológicas de Venezuela. *In Reunión Técnica de Programación sobre Investigaciones Ecológicas para el Trópico Americano*, Maracaibo, Venezuela, 1973. Informe. Maracaibo, IICA-TROPICOS, Facultad de Agronomía, Universidad del Zulia, 1973. p. irr. (IICA. Informes de Conferencias. Cursos y Reuniones. Documento no. 8). (2)
- _____. Investigaciones ecológicas en los tropicos húmedos en Venezuela. *In Seminario sobre Ecología Tropical*, Itabuna, Brasil, 1972. Informe. Turrialba, Costa Rica, IICA-TROPICOS, 1974. (En prensa). (3)
- BLAIR, F. Problemas ecológicos da América Latina. *Lavoura (Brasil)* 74:14-17. 1971. (4)
- BOUGHEY, A. S. Comparative readings in ecology. Belmont, California, Dickenson Press, 1969. 390 p. (5)
- BOVBJERG, R. Ecology as a primary discipline of the biological sciences. *BioScience* 20(13):749-750. 1970. (6)
- CALDERON U., C. y FIGUEROA Z., R. Estudios ecológicos en la Amazonia peruana. Proyecto: "Desarrollo Económico Integral del Area Amazónica Madre de Dios Inambary". *In Seminario sobre Ecología Tropical*, Itabuna, Brasil, 1972. Informe. Turrialba, Costa Rica, IICA-TROPICOS, 1974. (En prensa). (7)
- CAMPUZANO, G. y AREVALO, A. Situación de la investigación ecológica en el Ecuador. *In Reunión Técnica de Programación sobre Investigaciones Ecológicas para el Trópico Americano*, Maracaibo, Venezuela, 1973. Informe. Maracaibo, IICA-TROPICOS, Facultad de Agronomía, Universidad del Zulia, 1973. p. irr. (IICA. Informes de Conferencias. Cursos y Reuniones. Documento no. 8). (8)
- CARVALHO, J. F. DE. O problema da poluição ambiental. *Brasil Florestal* 2(5):27-28. 1971. (9)
- CLAPHAM, W. B. *Natural ecosystems*. New Jersey, MacMillan, 1973. 256 p. (10)
- The only introductory ecology text to adequately emphasize both biotic and abiotic component of the ecosystem, this book is useful both as a core volume or a supplement.
- All the various components of ecosystems are described, analyzed, and related to one another to promote an understanding of the ecological consequences of mans tampering with the environment. Following this discussion, the author shows the movement of energy and materials through the living and non-living aspects of the ecosystem, demonstrating how this flow keeps the ecosystem operating. He then concentrates on the living portion of the ecosystem, reflecting the importance of the non-living portions of the environment to these structures through coverage of population ecology and community ecology.
- Utilizing this background in ecological patterns, he thoroughly covers terrestrial and aquatic ecosystems, showing how these patterns operate togw together. Finally, the author uses the broad foundation he has provided in the working of natural ecosystems to analyze ways in which an outside pertubation (such as man) can alter the system. Thus the text as a whole starts with the total ecosystem, shows how its constituent parts work, and concludes with the total ecosystem.
- Although the approach is basically descriptive, the experimental bases for concepts are considered and ample references to the original literature are included. There are

many maps, charts, tables, drawings, and photographs.

This text provides a conceptual foundation for approaching the overwhelming, but very real problems of overpopulation and pollution. It establishes an adequate, synthesized framework that gives students a basis for further studies, particularly studies of human ecosystems.

Constants: Components of the Ecosystem. Flow and Cycle Environmental factors and populations. Niche and Community. Aquatic Ecosystems. Terrestrial Ecosystems. Resiliency and fitness of the Ecosystem. —(BioScience 22(11):638. 1972).

CODDINGTON, A. The economics of ecology. New Society, 1970. p. 595. (11)

Sums up the shortcomings of current economic concepts and concludes that economic thought is in the main ill-suited to dealing with ecology. —(BLOCK, D. Environmental aspects of economic growth in less developed countries an annotated bibliography. s.l., D.C. OECD, 1973).

COLLIER, B. O. Dynamic ecology. Englewood Cliffs, New Jersey, N. J., Prentice-Hall, 1973. 528 p. (12)

An examination of the basic principles governing the structure and dynamics of ecological systems.

Emphasizes major ecological problems and critically examines the approaches and conclusions of important studies directed at these problems. Uses statistical methods, mathematical modeling, and computer techniques approaches to ecological problems. Ideal for use in general ecology courses by upper division or beginning graduate level students. —(B. O. C.).

CONNELL, J. H., MERTZ, D. y MURDOCH, W. Readings in ecology and evolution. New York, Harper and Row, 1970. 500 p. (13)

COOMBS, H. C. Natching ecological and economic realities. Economic Record 1972:1-17. (14)

The clash between economics and ecology over economic growth reflects the fact that the two disciplines measure man in limited, though different, ways.

Discusses the economic characteristics of an ecologically acceptable economic system; would such an economy be a static or non growth system; could a system of this kind meet human needs? The author concludes that such a system would require a less aggressive and less acquisitive man. —(BLOCK, D. Environmental aspects of economic growth in less developed countries. An annotated bibliography. s.l., D.C. OECD, 1973.).

CORNWELL, G. W. Educación universitaria para la formación de ecólogos especializados en manejo de fauna silvestre (wildlife ecologist). Caracas, Asociación Nacional para la Defensa de la Naturaleza y Sociedad Venezolana de Ciencias Naturales, 1970. 22 p. (15)

COX, G. W. Readings in conservation ecology. New York, Appleton, 1969. 595 p. (16)

_____. Lecture and laboratory approaches to the teaching of ecology. BioScience 20(13):755-760. 1970. (17)

CUBILLOS Z., A. La contaminación de las aguas y el Río Cauca. Boletín del Departamento de Biología, Universidad del Valle (Colombia) 3(2-4):65-71. 1971. (18)

DALE, M. B. Systems analysis and ecology. Ecology 51(1):2-16. 1970. (19)

Systems analysis is defined as the use of scientific method with conscious regard for the complexity of the object of study. It has strong relationships with problem solving, in that the same four phases—lexical, parsing, modelling, and analysis—are identifiable in both. Examination of each of these phases reveals some of the problems involved in the use of systems methods in ecology. A model of a precipitation–evaporation system is presented as an example. Problems in experimenting with models of systems and with control, opti-

mization, and comparison of such models are considered. — (M. B. D.).

DARNELL, R. The new ecology. *BioScience* 20(13):746-748. 1970. (20)

DASMANN, R. F., MILTON, J. P. y FREEMAN, P. H. *Ecological principles for economic development*. London, Wiley, 1973. 252 p. (21)

Este libro es una muestra del hecho de que en los últimos años, al lado de la algarabía de conservacionistas, de grupos radicales (y de hippies) movilizadas en nombre de la ecología, y que culminó en la conferencia de Estocolmo, ha habido otros grupos de personas preocupadas por armonizar los objetivos del desarrollo económico con los de la conservación del ambiente.

Mantienen los autores que así como ha sido obvio que los esfuerzos de desarrollo que ignoran la economía y la ingeniería probablemente naufraguen, debería ser igualmente obvio que los esfuerzos de desarrollo que no toman en cuenta las reglas ecológicas del juego también están destinados a sufrir consecuencias adversas. Ahora hay disponible, por otra parte, suficiente conocimiento ecológico para permitir una mejor labor de desarrollo que la realizada en el pasado. Consecuentemente, el objetivo del libro es presentar algunos conceptos ecológicos que han sido suficientemente probados en la práctica como para considerarlos válidos y útiles en las actividades de desarrollo.

En la presentación de los conocimientos ecológicos pertinentes al desarrollo, se ha puesto énfasis especial en los ecosistemas que están en la actualidad sujetos a fuerte presión de desarrollo: bosques húmedos tropicales, sabanas y llanuras en las regiones tropicales, subtropicales y mediterráneas; y aquellas que consideran especialmente frágiles, como altas montañas, zonas costaneras e islas. También se revisan varios problemas que pueden suscitarse en el desarrollo de la irrigación y de cuencas hidrográficas, del desarrollo forestal, y de proyectos agrícolas y ganaderos, y en una manera algo diferente de la promoción del turismo.

Los capítulos más largos son los de desarrollo de cuencas hidrográficas y de desarrollo agrícola. El capítulo más corto no es el de turismo, sino el de los trópicos húmedos, a pesar de que dos de los autores, Freeman y Milton, realizaron parte de su formación académica en el trópico húmedo (Turrialba). Esto por

por otra parte, explica el por qué no están ausentes del todo las referencias a trabajos latinoamericanos.

Aparte de este ligero desbalance, el libro está bien presentado, claramente escrito y con referencias bastante recientes. Representa una guía útil y sencilla para planificadores del desarrollo y tomadores de decisión sobre los conocimientos ecológicos que no se pueden ignorar sin exponer al ambiente a ciertos riesgos. — (Extractado de A. Gorbitz, *Turrialba* 23(4):490. 1973).

DEFAUCE, C. Síntesis de los conceptos actuales de la lucha integrada. *Boletín de la Estación Central de Ecología* 1(1):5-13. 1972. (22)

Las causas del desarrollo de la lucha integrada son de tipo económico y de conservación de la Naturaleza, pero sus motivaciones intrínsecas son bioecológicas, pues cualquier procedimiento de lucha puede tener efectos indeseables. En especial, la lucha química puede producir resistencia en los insectos, resurgimiento de la plaga, brotes de otras plagas y riesgos por su toxicidad y por los residuos sobre la fauna.

Las ventajas de la lucha integrada, con la que se aminoran los efectos indeseables, proviene de la disminución de las cantidades de insecticida empleadas, de la conservación de los enemigos naturales de los insectos indeseables y de la reducción del costo debido a sus aspiraciones limitadas respecto a la mortalidad del insecto.

La lucha integrada tiende a la multiplicidad de acciones con una concepción ecológica. Los principios básicos son el concepto de ecosistema, el concepto de nivel permisible y el concepto de evitar acciones perturbadoras.

Por el primer concepto, la lucha integrada considera el complejo total de organismos presentes, junto con el medio y sus interrelaciones. El concepto de nivel permisible establece el importante criterio de aceptación de un cierto grado de daño hasta unos prefijados niveles o umbrales. La evitación de acciones perturbadoras se puede lograr por el empleo de plaguicidas con selectividad fisiológica, ecológica o física. — (C. D.)

DOUGLAS, I. The efficiency of humid tropical denudation systems. *Transactions of the Institute of British Geographers* 46:1-16. 1969. (25)

- DYNE, G. M. VAN ed. The ecosystem concept in natural resources management. New York, Academic Press, 1969. 383 p. (24)
- FERNANDEZ PEREZ, A. y GUERRERO M., R. Informe de la delegación de Colombia en la reunión técnica de programación sobre investigación ecológica para el trópico americano. In Reunión Técnica de Programación sobre Investigaciones Ecológicas para el Trópico Americano, Maracaibo, Venezuela, 1973. In forme. Maracaibo, IICA-TROPICOS, Facultad de Agronomía, Universidad del Zulia, 1973. p. irr. (IICA. Informes de Conferencias, Cursos y Reuniones. Documento no. 8). (25)
- FORD, E. B. ed. Ecological genetics. 3 ed. New York, Barnes and Noble, 1971. 410 p. (26)
- FRANKE, R. The biologist, the psychologist, and the environmental crisis. BioScience 21(5):221-224. 1971. (27)
- FUNDAÇÃO BRASILEIRA PARA A CONSERVAÇÃO DA NATU-
REZA. Homen, Ecologia, e Meioambiente. Rio de Janeiro, 1971. 77 p. (28)
- GOLLEY, F. B. y MISRA, R. Organic production in tropical ecosystems. BioScience 22(12): 735-736. 1972. (29)
- HENDERSON, H. Ecologists versus economists. Harvard Busines Review 51:28. 1973. (30)
- A particularly good summary of the role economics and play and have played in the effort to deal analytically with the environmental situation.
Covers externalities, "growthmanship", income distribution, systems analysis and problems of non-market valuation. A good 32-item bibliography. — (BLOCK, D. Environmental aspects of economic growth in less developed countries. An annotated bibliography. s.l., D.C. OECD, 1973.).
- HLADIK, A. y HLADIK, C. M. Rapports tropiques entre vegetation et primates dans la forêt de Barro Colorado, Panama. La Terre et la Vie 23(1):25-117. 1969. (31)
- INNIS, G. An experimental undergraduate course in systems ecology. BioScience 21(6):283-284. 1971. (32)
- KAY, D. y SKOLNIKOFF, E. B. eds. World Eco-crisis: international organization in response. Madison, University of Wisconsin Press, 1972. 324 p. (33)
- KLOPFER, P. H. La conducta ecológica. Trad. por D. Cazes. México, Grijalba, 1970. 202 p. (34)
- Indice: ¿Por qué los depredadores no consumen excesivamente a sus presas? ¿Cómo comparten las especies los alimentos y el espacio? ¿Por qué varía la diversidad de las especies? ¿Cómo se mantienen distintas las especies? ¿Cómo están organizadas las comunidades? Bibliografía. — (BOWKER EDITORES. Libros Universitarios: Bibliografía de Ciencias Exactas y Naturales, 1974).
- _____. Behavioral aspects of ecology. 2 ed. Englewood Cliffs, New Jersey, N. J., Prentice-Hall, 1973. 224 p. (35)
- An eclectic approach to behavior and ecology. Considers the major problems of ecology and suggests how the application of psychological viewpoints can contribute to an understanding of them. — (P. H. K.).
- KORMONDY, E. J. Concepts of ecology. Englewood Cliffs, New Jersey, N. J., Prentice-Hall, 1969. 209 p. (36)
- LAGROTTA G., R. A. La contaminación, crisis ambiental. MAG (Panamá) 6(6):29-32. 1971. (37)

LASSER, J. La conservación ambiental y los recursos naturales renovables. *Acta Botánica Venezolana* 7(1-4):9-31. 1972. (38)

LOKER, J. Defensa de la naturaleza. *Américas* 25(6-7):(supl.)1-16. 1973. (39)

El medio natural no tiene que ser sólo preservado sino reconstituido y mejorado con el auxilio de la propia técnica que ha contribuido y sigue contribuyendo a su acelerado deterioro. Todos los argumentos conservacionistas y contrarios a la contaminación parten de esa afirmación hoy ya generalizada al punto de constituir una de la principales preocupaciones de gobiernos.

Las páginas que siguen permiten formar juicio sobre el alcance de problema en Latinoamérica y sobre los esfuerzos que dentro de la acción cooperativa interamericana viene realizando la OEA. — (G. de Z.).

LOVE, G. A. y LOVE, R. M. ed. *Ecological crisis readings for survival*. New York, Harcourt Brace Jovanovich, 1972? 342 p. (40)

A collection of 22 stimulating essays by well-known scientists, journalists, and public officials, this book presents the basic facts of the present ecological crisis for the general reader. The editors begin with the premise that man and his environment are inextricably linked and that what affects man's environment is of concern to every member of society. The essays deal with a variety of pertinent topics, such as environmental destruction and examples of ecological damage, and include calls to action by social scientists, politicians, and writers concerned with the moral and social aspects of ecology. — (G. A. L. y R. M. L.).

LUGO LUGO, H. La educación y la lucha contra la contaminación ambiental. *La Educación* 16(60-61):21-25. 1971. (41)

MacARTHUR, R. H. *Geographical ecology: patterns in the distribution of species*. New York, Harper and Row, 1972. 288 p. (42)

The first text to treat thoroughly some of the most active areas of current ecological research, this book presents at the same time the author's major original contributions to the field. Previously unpublished formulations are included. Competition theory and its application to species distributions, island patterns, species diversity, tropics-temperate comparisons, and other topics are phenomenologically arranged, all with field examples. Mathematical derivations appear in chapter appendixes, permitting selective use. For advanced undergraduate and graduate courses.

McCAULL, J. Conference on the ecological aspects of international development. *Nature and Resources* 5(2):5-12. 1969. (43)

Incluye: Lake Valencia

McMILLAN, C. Ecotypes and ecosystem function. *BioScience* 19(2):131-134. 1969. (44)

The role of the ecotype in ecosystem function is one of insuring community adaptation to its habitat by maintaining environmental relations conducive to efficient usage of energy input. The unique site-ecosystems that result from the concomitant selection of ecotypic variants within different kinds of organisms have been demonstrated most completely in the temperate grassland ecosystem-type. Examination of the deciduous forest-cloud forest ecosystem type and the marsh ecosystem-type has provided further examples of ecotype-ecosystem interplay in temperate to tropical regions. Since the plant ecotype plays a major role in determining the primary productivity of a point ecosystem, project ecosystem analyses need to include a consideration of ecotypic status of component populations and an assessment of the contribution of the ecotype to ecosystem function. — (C. Mc.).

MARTINEZ M., G. E. Las cuencas hidrográficas en El Salvador. *Agricultura en El Salvador* 12(2):39-51. 1972. (45)

La presente exposición contiene una referencia general de las características y condiciones ecológicas, económicas y sociales de

El Salvador y su relación con el estado actual de los recursos naturales en las cuencas hidrográficas, en las que se identifican los problemas originales por la alteración del equilibrio natural de los recursos y sus efectos negativos en las disponibilidades de ellos para su aprovechamiento integral. También se revisa el uso actual y potencial de los recursos naturales y se indican las acciones que se considera indispensable ejecutar para contrarrestar los problemas que se confrontan, a los fines de propiciar sobre bases firmes un desarrollo económico y social equilibrado en todo el país.

Esencialmente, la presente exposición lleva implícito el propósito de llamar la atención a los compañeros Delegados al presente Seminario, sobre la urgente necesidad de revertir el proceso de destrucción de los recursos naturales renovables, aplicando en nuestros respectivos países, las mejores capacidades y los medios que ofrece la tecnología moderna para recuperarlos y aprovecharlos eficientemente en beneficio de nuestros pueblos. —

(G. E. M. M.).

MÉRIDA. UNIVERSIDAD DE LOS ANDES, FACULTAD DE CIENCIAS FORESTALES. Programas de docencia de ecología en la Facultad de Ciencias Forestales. In Reunión Técnica de Programación sobre Investigaciones Ecológicas para el Trópico Americano, Maracaibo, Venezuela, 1973. Informe. Maracaibo, IICA-TROPICOS, Facultad de Agronomía, Universidad del Zulia, 1973. p. irr. (IICA. Informes de Conferencias, Cursos y Reuniones. Documento no. 8). (46)

MISRA, C. K. ed. Ecology study of ecosystems. Delhi, A. H. Wheeler, 1970. 305 p. (47)

MONTOYA, L. Resumen de la situación actual de los programas de investigación ecológica en el Trópico Americano. In Reunión Técnica de Programación sobre Investigaciones Ecológicas para el Trópico Americano, Maracaibo, Venezuela, 1973. Informe. Maracaibo, IICA-TROPICOS, Facultad de Agronomía, Universidad del Zulia, 1973. p. irr. (IICA. Informes de Conferencias, Cursos y Reuniones. Documento no. 8). (48)

MOREIRA, A. Investigaciones ecológicas en los trópicos húmedos de Bolivia. In Seminario sobre Ecología Tropical, Itabuna, Brasil, 1972. Informe. Turrialba, Costa Rica, IICA-TROPICOS, 1974. (En prensa). (49)

MUELLER, M. New Canal: What about bioenvironmental research? Science 163:165-167. 1969. (50)

MURGUIA, V. E. Efecto de la contaminación del agua sobre plantas y animales. In Seminario sobre Evaluación de la Contaminación Ambiental, 1º, Atilhuetzia, México, 1971. Evaluación de la Contaminación Ambiental. México, D. F., Instituto Mexicano de Recursos Renovables, 1972. pp. 79-92. (51)

ODUM, E. P. Ecología. São Paulo, Livraria Pionera, 1969. 201 p. (52)

Este livro organiza-se ao redor de uma série de gravuras ou modelos; gráficos que ilustram aqueles princípios da Ecologia, fundamentais a compreensão da matéria, tanto pelo estudante como pelo leigo. O modelo representado pela gravura é extremamente útil para demonstrar a estrutura e função, de tal maneira que as relações entre ambas possam ser salientadas. Uma vez que estas relações tenham sido esclarecidas, acredito que o leigo estará melhor equipado para atender, apreciar e preservar seu próprio ambiente, enquanto o estudante que deseja continuar para além deste livro poderá, logicamente, ser levado a detalhes descritivos por um lado e a modelos matemáticos mais rigorosos por outro.

Dois pontos de vista sublinham a apresentação. O conceito de níveis de organização e a crença que a homeostase e a regulação biológica são importantes, tanto no nível ecológico quanto no fisiológico, são as bases adotadas no desenvolvimento do livro. Em segundo lugar, o Homem é considerado, neste livro, como uma parte da Natureza; daí não existir um capítulo a parte ou apêndice chamado "o Homem e a Natureza". A influência do Homem sobre os sistemas ecológicos é salientada continuamente. Do mesmo modo, a aplicação de princípios básicos, nos esforços da Humanidade, tais como o aumento da produção de alimentos, evitar a poluição, desenvolver espaçonaves autônomas, e utilização da energia atômica, são ressaltados, apesar

de que poucos detalhes podem ser dados em livro tão resumido. — (E. P. O.).

ODUM, E. P. The strategy of ecosystem development. Science 164:(3877)262-270. 1969. (53)

_____. Ecología. Trad. 3 ed. México, Interamericana, 1972. 656 p. (54)

Título Original Fundamentals of Ecology

Introducción. Objeto de la ecología. Principios y conceptos relativos a la energía en los sistemas ecológicos. Principios y conceptos relativos a los ciclos biogeoquímicos. Principios relativos a los factores limitativos. Principios y conceptos relativos a la organización a nivel de la comunidad. Principios y conceptos correspondientes a la organización a nivel de la población. Las especies y el individuo en el ecosistema. Desarrollo y evolución del ecosistema.

Ecología de sistemas: el método de los sistemas y los modelos matemáticos en ecología. Ecología de agua dulce. Ecología terrestre. Recursos. Contaminación e higiene ambiental. Ecología de la radiación. La sensibilidad a distancia como instrumento para el estudio y la administración de ecosistemas. Perspectivas en ecología microbiana. Ecología del vuelo espacial. Hacia una ecología humana. — (BOWKER EDITORES. Libros Universitarios: Bibliografía de Ciencias Exactas y Naturales, 1974).

ODUM, H. T. Environment, power and society. New York, Wiley Interscience, 1971. 331 p. (55)

OWEN, O. S. Natural resources conservation, an ecological approach. New York, MacMillan, 1971. 593 p. (56)

PATINO R., A. Una batalla ecológica; el rescate de la Laguna de Sonso. Boletín del Departamento de Biología, Universidad del Valle (Colombia) 3(1):5-17. 1970. (57)

Bajo este título presentamos algunos materiales elaborados por nosotros a partir de marzo

del presente año, para denunciar el peligro de extinción que se cierne sobre uno de los ecosistemas más representativos del paisaje vallecaucano: la laguna de El Chircal, llamada también de Sonso. Esta batalla ecológica reviste un doble significado: por una parte, intenta configurar una nueva estrategia para el rescate de un recurso valiosísimo, tanto desde el punto de vista biológico como económico y social; de otro lado, representa un nuevo enfoque de la docencia universitaria, tan urgente de proyecciones nacionales, tan necesitada de aportes creativos que la transformen en genuina herramienta para el pregonado cambio social que no se avizora todavía por parte alguna.

Los materiales que forman parte de esta documentación son los siguientes:

- 1) La agonía de la Laguna de El Chircal o de Sonso.
- 2) Declaración de los estudiantes de la Universidad del Valle.
- 3) Invitación a la primera jornada ecológica de Univalle.
- 4) Conceptos de algunos estudiantes participantes en la jornada ecológica.
- 5) Ecosistema, Boletín Informativo no. 1. — (A. P. R.).

PATINO R., A. Hacia una crisis ecológica en el Valle del Cauca? Boletín del Departamento de Biología, Universidad del Valle (Colombia) 3-4(2-1):5-38. 1971. (58)

PENN, R. J. La producción y el ambiente. LTC. Newsletter no. 36:30-34. 1972. (59)

Se ha desarrollado un conflicto de proporciones entre aquellos que mantienen que los países menos desarrollados deben precipitarse a usar programas de "revolución verde" para alimentar a crecientes poblaciones y aquellos que sienten que estos programas pueden causar un daño tal al ambiente, que todo progreso logrado sería negado o aún invertido.

La primera postura ha sido tomada con firmeza, recientemente por Norman E. Borlaug. Una postura opuesta por Rene Dubos.

Dado el nivel de tecnología de hoy, urge una agresiva planificación provincial, nacional, e internacional. Hace falta la participación de gente en todos los niveles, pero especialmente al nivel local. La planificación debe ser un proceso en el cual el científico, el ciudadano, el representante gubernamental y el administrador juntan sus ideas y se ponen en comunicación.

El proceso de planificación seguido de acción, de evaluación y de una planificación continuada, parecía tener la mejor posibilidad de arribar a la respuesta óptima. Esta evaluación y planificación continuada son la aplicación de la ciencia biocibernética-acción y feedback a la integración de la voluntad del hombre (un problema de la política a seguir) en vez de aplicarla a la maquinaria.

— (R. J. P.).

PIELOU, E. C. An introduction to mathematical ecology. New York, Wiley-Interscience, 1969. 286 p. (60)

REUNION TECNICA DE PROGRAMACION SOBRE INVESTIGACIONES ECOLOGICAS PARA EL TROPICO AMERICANO, MARACAIBO, VENEZUELA, 1973. Informe. Maracaibo, IICA-TROPICOS, Facultad de Agronomía, Universidad del Zulia, 1973. p. irr. (IICA. Informes de Conferencias, Cursos y Reuniones. Documento no. 8). (61)

RIVAS MIJARES, G. et al. Contaminación ambiental en Venezuela. Caracas, Fondo Editorial Común, 1973? (62)

La acción creadora y transformadora del hombre sobre la naturaleza, ha desencadenado un proceso de destrucción del ambiente, considerado como favorable a la vida de la población humana, así como a la vida de los animales y plantas útiles.

La situación tiende a agravarse crecientemente.

El proceso envuelve la contaminación de la atmósfera, ríos, lagos y mares, el despilfarrero y agotamiento de los recursos naturales, la destrucción de la vida animal y vegetal y la amenaza general a los sistemas ecológicos.

— (G. R. M. et al.).

ROA MORALES, P. Génesis de los medanos de los llanos centrales de Venezuela. In Reunión Técnica de Programación sobre Investigaciones Ecológicas para el Trópico Americano, Maracaibo, Venezuela, 1973. Informe. Maracaibo, IICA-TROPICOS, Facultad de Agronomía, Universidad del Zulia, 1973. p. irr. (IICA. Informes de Conferencias, Cursos y Reuniones. Documento no. 8). (63)

RODRIGUES, W. A. A situação atual das pesquisas ecológicas na Amazonia brasileira. In Reunión Técnica de Programación sobre Investigaciones Ecológicas para el Trópico Americano, Maracaibo, Venezuela, 1973. In forme. Maracaibo, IICA-TROPICOS, Facultad de Agronomía, Universidad del Zulia, 1973. p. irr. (IICA. Informes de Conferencias, Cursos y Reuniones. Documento no. 8). (64)

ROMERO, V. Investigación ecológica en los trópicos húmedos de Colombia. In Seminario sobre Ecología Tropical. Itabuna, Brasil, 1972. Informe. Turrialba, Costa Rica, IICA-TROPICOS, 1974. (En prensa). (65)

SALINAS, P. J. La importancia de los estudios de ecología a nivel universitario, con especial referencia a Venezuela. In Reunión Técnica de Programación sobre Investigaciones Ecológicas para el Trópico Americano, Maracaibo, Venezuela, 1973. Informe. Maracaibo, IICA-TROPICOS, Facultad de Agronomía, Universidad del Zulia, 1973. p. irr. (IICA. Informes de Conferencias, Cursos y Reuniones. Documento no. 8). (66)

Se hace un recuento de los antecedentes de la crisis ecológica a nivel mundial y especialmente en los países tropicales. Se citan ejemplos de destrucción de ambiente vírgenes y modificados. Se plantea la necesidad de los inventarios de recursos. Se hace hincapié en la importancia de estudiar en detalle la ecología de las especies más significantes.

Se destaca la importancia de los estudios de ecología en todos los niveles de la educación formal y en especial la educación universitaria. Se hace referencia a los profesionales universitarios especializados en Venezuela.

Se analizan los problemas del pasado y del presente, especialmente sus causas. Se expone la situación actual de la educación ecológica en las universidades de Venezuela. Se plantea la carencia de un Departamento de Ecología en las Universidades venezolanas y posiblemente latinoamericanas, por lo cual no se están formando ecólogos en nuestro medio. Se proponen algunas alternativas para el futuro.

- a. Breves comentarios desde la educación pre escolar hasta la pre-universitaria.
- b. Detalles sobre la educación universitaria 'no especializada'.
- c. Detalles sobre la educación universitaria especializada.
- d. Se plantea la necesidad dentro de cada

- universidad de centrar las actividades ecológicas en un Departamento de Ecología. Se exponen las funciones y estructura del departamento y su papel en la formación de profesionales de diferentes disciplinas orientados o no en ecología, así como de ecólogos. Finalmente se destaca la necesidad de elaborar y promulgar una ley de Educación Ambiental. — (P. J. S.).
- SARMIENTO, G. y MONASTERIO, M. Corte ecológico del Estado Guárico. Boletín de la Sociedad Venezolana de Ciencias Naturales 28(115-116):83-106. 1969. (67)
- SEGURA, M. Consideraciones ecológicas para el desarrollo del oriente peruano. In Forum sobre Desarrollo de la Selva Peruana, Lima, 1973. Informe. Lima, Universidad Nacional Agraria, 1973. (Doc. III-B). (68)
- SINGER, S. F. ed. Global effects of environmental pollution. New York, Springer-Verlag, 1970. 218 p. (69)
- SUMMERHAYS, S. Galapagos Islands in the balance. Ecologist 3(4):144-149. 1973. (70)
- The ecology of the Galapagos Islands is unique and because of their associations with Charles Darwin, the islands occupy a special place in the history of the development of scientific thought. For this reason alone they merit special consideration. Yet today they are subject to threats similar to those that affect wild areas everywhere. If they are to retain their value to science the pressure from tourists must be controlled, populations of feral animals reduced and, at the same time, the economy of the human inhabitants of the islands protected.
- This article outlines the need, and the cost.
- TAMAYO, F. Importancia de la Ecología. In Reunión sobre Investigaciones Ecológicas para el Trópico Americano, Maracaibo, Venezuela, 1973. Informe. Maracaibo, IICA-TROPICOS, Facultad de Agronomía, Universidad del Zulia, 1973. p. irr. (IICA. Informes de Conferencias, Cursos y Reuniones Documento no. 8). (71)
- TAZAN, G. R. DE. Investigación ecológica en los trópicos húmedos en Ecuador. In Seminario sobre Ecología Tropical, Itabuna, Brasil, 1972. Informe. Turrialba, Costa Rica, IICA-TROPICOS, 1974. (En prensa). (72)
- U. S. BROOKHAVEN NATIONAL LABORATORY. Diversity and stability in ecological systems. Upton, 1969. 264 p. (73)
- Report of Symposium in Biology. 1969.
- UNZUETA, O. Información boliviana sobre investigaciones en ecología tropical. In Reunión Técnica de Programación sobre Investigaciones Ecológicas para el Trópico Americano, Maracaibo, Venezuela, 1973. Informe. Maracaibo, IICA-TROPICOS, Facultad de Agronomía, Universidad del Zulia, 1973. p. irr. (IICA. Informes de Conferencias, Cursos Y Reuniones. Documento no. 8). (74)
- VAUGHAN, C. El factor más influyente es la destrucción o alteración del ambiente. A groindustria (Costa Rica) 1(5):27-30. 1972. (75)
- WEINBERG, A. M. Technology and ecology - is there a need for confrontation. Bio-Science 23(1):41-45. 1973. (76)
- WHITTAKER, R. H. Communities and ecosystems. New York, McMillan, 1970. 162 p. (Current Concepts in Biology Series). (77)
- El libro del Dr. Whittaker es un ejemplo del proceso de evolución que han sufrido los enfoques tradicionales de la ecología hacia otros más modernos, que estén dirigidos a la solución de los problemas actuales de productividad y de control de la contaminación ambiental.
- El libro está formado por seis capítulos, en los cuales se desarrollan los conceptos relativos a la comunidad y al medio, a la productividad de ecosistemas, a los diversos ciclos de elementos y a la contaminación, para finalizar con una exposición sobre aspectos de ecología humana.
- El libro que se ha presentado es altamente recomendable para la consulta por personas

que se inician en estudios ecológicos, es ágil, muy explicativo y actual. — (Extractado de J. M. Montoya Maquín, Turrialba (Costa Rica) 21(3):361. 1971.).

WILSON, T. W. Medio y desarrollo; están en conflicto? Facetas 5(2):91-97. 1972. (78)

Uno de los puntos cruciales del debate a que tienen que enfrentarse los cruzados del ambientalismo es si sus programas suponen frenar o retardar el desarrollo económico. Si esto es así, escribe el autor, los ambientalistas no podrán ser atendidos por los países en desarrollo. Pero proporcionan datos evidentes para hacer ver que el conflicto no es inevitable y que pueden encontrarse soluciones que a la vez protejan el ambiente y estimulen el desarrollo. —

WORKSHOP ON GLOBAL ECOLOGICAL PROBLEMS, la. WISCONSIN, 1971. Man in the living environment. s.l., The Institute of Ecology, s.f. 267 p. (79)

Este libro presenta el análisis colectivo, hecho por un Seminario sobre Problemas Ecológicos Globales, celebrado en Madison, Wisconsin, en mayo y junio 1971, sobre problemas importantes de calidad y manejo del ambiente.

El seminario nació del deseo de transmitir el punto de vista del ecólogo a la Conferencia de la ONU sobre Problemas del Ambiente (Estocolmo 1972).

El certamen se dividió en cuatro grupos de trabajo: a) ciclos biogeoquímicos, b) obstáculos ecológicos al uso de la tierra por el hombre, c) ecosistemas para beneficio del hombre, y d) impacto del hombre sobre los sistemas acuáticos. Los informes de los grupos se discutieron en plenarios y se aprobaron recomendaciones, tanto del plenario como de los grupos.

La lectura del libro es poco satisfactoria. Se percibe que falta algo para que se considere como una obra buena. La experiencia que se examina y se presenta es la limitada de los participantes, en su gran mayoría de la Universidad de Wisconsin. Esto se refleja en las referencias a la literatura en las que predominan las de Estados Unidos. En los pocos casos de experiencias de otros países,

las referencias son de segunda y tercera mano.

Por ejemplo, uno de los primeros y más sobresalientes casos de control integrado de plagas es el del algodón en el Perú, que data de unos veinte años. Sin embargo, la mención de este trabajo pionero (p. 123) se toma de un artículo de Doudett et al sobre parásitos de un saltamontes de la vid en California que no tiene que hacer ni con algodón ni con el Perú (La referencia bibliográfica está incompleta y es muy difícil encontrar el artículo, ya que California Agriculture comienza todos sus números con la página 1). El idioma no puede haber sido un obstáculo porque la experiencia peruana ha sido divulgada en inglés, entre otros por J. E. Wille, en revistas británicas.

Hay demasiadas recomendaciones; más de 60. Al lado de una que otra contribución novedosa o específica, hay muchas muy generales, obvias y ya hechas antes por numerosas personas y publicaciones. Además hay en todo el texto numerosas "conclusiones" que se aproximan sospechosamente a recomendaciones.

El libro está, además mal editado. No tiene lugar de edición aunque haya indicios que sea Madison; no tiene fecha aunque se sospecha que sea 1971.

El capítulo sobre el consumo y las reservas de fósforo ha sido revisado y el libro tiene unas hojas sueltas en mimeógrafo que rectifican lo ya impreso.

El grupo de trabajo ha descubierto a última hora que las reservas conocidas de fósforo durarán cuatro veces más que lo que figura en el libro. Uno no puede sino pensar cuáles otras cifras del libro habrá que rectificar también.

Pocos de los capítulos de este libro llegarán a publicarse en una revista científica: el tamiz de los "referees" y del comité editorial, esos guardianes del prestigio de una publicación periódica, lo impediría en la forma de "primera aproximación" como están publicados en el libro que comentamos. — (Extractado de A. Gorbitz. Turrialba (Costa Rica) 23(1):113-114. 1973.).

ZAFFANELLA, M. Necesidad de una metodología adecuada para resolver problemas de productividad. In Seminario Regional de Estudios Integrados sobre Ecología, Buenos Aires, 1970. Actas. Montevideo, Oficina de Ciencias de la UNESCO para América Latina, 1971. pp. 139-150. (80)



ECOLOGIA ANIMAL



ECOLOGIA ANIMAL

ANDREWS, R. M. Structural habitat and time budget of a tropical Anolis lizard. Ecology 52(2):262-270. 1971. (81)

Structural habitat data generally support the interpretation that competition for food results in habitat partitioning. In this investigation, the importance of ethological factors in determining the structural habitat of Anolis lizards is demonstrated by examining the structural habitat of Anolis polylepis during foraging and social interaction, its two major activities.

"Overall" structural habitats show that intraspecific classes use perches of significantly different heights and diameters. Perch heights of adult males and females are also shown to be related to the type of activity in which they are engaged. Overall structural habitat data show a greater difference between the sexes than actually exists in their feeding locations. Ecological differences between insular and continental Anolis potentially affecting the structural habitat are also discussed. — (R. M. A.).

BALLINGER, R. E., MARION, K. R. y SEXTON, O. J. Thermal ecology of the lizard, Anolis limifrons with comparative notes on three additional panamanian Anoles. Ecology 51(2):246-254. 1970. (82)

Data on the thermoregulation of Anolis limifrons in Panama suggest that at least some tropical species are less warm adapted than previously thought. Anolis limifrons has a lower minimum voluntary temperature, eccentric temperature, and critical thermal maximum than a majority of the temperate zone lizards thus far studied.

Thermoregulatory adjustment is by behavioral mechanisms as indicated by observations on basking and orientation. A seasonality in the preferred temperature is indicated by field data from the wet and dry seasons. It is suggested that the lower preferred temperature in the dry season is an adaptation to conserve water or minimize water loss.

Anoles (A. limifrons and A. frenatus) in closed canopy forest are less warm adapted

than the grassland A. auratus, whereas an ecotone species (A. tropidogaster) is intermediate in its thermoregulatory characteristics.

Differences in dermal morphology in three species of panamanian anoles are suggested to be an adaptation to varied capacities of heat gain. — (R. E. B., K. R. M. y O. J. S.).

BENSON, W. W. y EMEL, T. C. Demography of gregariously roosting population of the nymphaline butterfly Marpesia berania in Costa Rica. Ecology 54(2):326-335. 1973. (83)

Population of the daggerwing butterfly, Marpesia berania (Hewiston) (Nymphalidae; Nymphalinae), assemble nightly in roots of up to 68 individuals in the tropical rain forest of the Osa Peninsula, Costa Rica. Gregarious nocturnal roosting in butterflies is uncommon, and reported almost exclusively in supposedly distasteful species.

We studied two roots, using a marking technique that permitted visual censusing. The butterflies maintained roosting sites in the same general locations and regularly returned to them before evening, during life spans of over 5 months. The sex ratio was unity, and the rates of population recruitment and mortality were apparently the same for both sexes. The instantaneous mortality rates were approximately 0.00126 (on a daily basis) over the study period, and the recruitment rates for the two roots were 0.907 and near 0.15 butterfly per day for March and April, 1968 (the last month of the dry season and the first month of the wet season). In the following 3 months of the wet season, recruitment decreased to near zero.

The empirically determined rates of recruitment and mortality accurately predicted the initial population size, indicating that the adult population was under equilibrium conditions during the dry season and the first month of the wet season. — (W.W.B. y T.C.E.).

BONSMÁ, J. C. Ecología de los animales domésticos. In Sosa, R. ed. Ganadería en los trópicos. Caracas, Asociación Venezolana de Criadores de Ganado Cebú, 1973. v. 1, pp. 17-36. (84)

BRINKMANN, W. L. F. y SANTOS, A. DOS. Time dependency of hydrogen-ion concentration and electric conductivity measurements in river water samples of Central Amazonia. *Acta Amazonica* (Brasil) 1(2):57-62. 1971. (85)

BRINKMANN, W. L. F. y SANTOS, U. DE M. The effect of cold fronts on the H₂S and O₂ distribution in a flood-plain lake of Central Amazonia. In *Seminario sobre Ecología Tropical*, Itabuna, Brasil, 1972. Informe. Turrialba, Costa Rica, IICA - TROPICOS, 1974. (En prensa). (87)

Algumas vezes não é possível analisar no próprio local amostras d'água com relação aos valores de pH e condutibilidade elétrica, havendo por isso necessidade de posteriores determinações no laboratório.

Foram investigadas as possíveis variações em uma série de 4 amostras colhidas em diversas profundidades no Rio Negro, bem como uma série de 4 amostras de diferentes igarapés da mata tropical úmida ao longo da rodovia BR-174, sendo obtidos os seguintes resultados após um período de armazenamento:

- a) As variações verificadas nas amostras do Rio Negro foram significantes em relação ao período de depósito das mesmas (dois meses);
 - b) As mostras dos igarapés mantiveram-se mais ou menos estáveis durante 30 dias. De acordo com os resultados obtidos por outros autores para outras regiões terciárias da Amazônia, os valores analíticos mostram a possibilidade de serem elas analisadas depois de um mês desde a data da coleta;
 - c) A natureza da conservação das amostras no laboratório (normal e refrigerador) não mostram variações significativas.
- (W. L. F. B. y A. dos S.).

CANESTRI CEDEÑO, V. La pesca y la polución. Caracas, AIDIS, 1973. 10 p. (88)

Trabajo presentado al Foro sobre Saneamiento Ambiental en la Cuenca del Lago de Valencia. Octubre 1973.

La hoya del Lago de Valencia como Ecosistema y desde el punto de vista ictiográfico, representa la imagen de un cuerpo de agua continental, sometido al impacto deteriorante de incidencias humanas y tecnológicas.

El Lago de Valencia ha sido tradicionalmente descrito englobado dentro de los Ecosistemas límnicos, típicos de cuerpos de agua interiores de elevada biocenosis.

Es evidente que la acción de los contaminantes contenidos en los efluentes no tratados, ha influido en el nivel fitoplanctónico, diversificando sus componentes y elevándose a niveles próximos a una eutroficación.

De no establecer criterios mínimos a corto plazo, en cuanto a la calidad hídrica de los afluentes que llegan al lago, y de no aplicar las medidas de control que se derivan de los mismos, se alcanzará una total ecocrisis, que puede conducir a la extinción de las formas superiores de vida acuática. El plazo, dentro del cual puede ocurrir la crisis es imposible de estimar, pero es absolutamente seguro que en la rata de crecimiento actual de la carga poluente, la fecha crítica no es muy lejana. — (V. C. C.).

CARR, A. y CARR, M. H. Site fixity in the caribbean green turtle. *Ecology* 53(3): 423-429. 1972. (89)

Although tagged green turtles that return to Tortuguero Beach to nest show definite site fixity, their site discrimination is not absolute. The modal distance between successive returns, whether after the 2-week interesting period of a given season or after the 2-or 3-year remigration interval between nesting season, is .2 km; average separation of return points is 1.2 km. In view of the steady reworking of the Tortuguero foreshore by wing,

_____. y SANTOS, U. DE M. Fish mortality in lake and Igarapé waters of a Central Amazonian flood-plain lake during cold front conditions. In *Seminario sobre Ecología Tropical*, Itabuna, Brasil, 1972. Informe. Turrialba, Costa Rica, IICA - TROPICOS, 1974. (En prensa). (86)

Heavy fish deaths are observed in Central Amazonian flood-plain lakes and Igarapés normally associated with cold front conditions. As rapid cooling does not affect fish, the fish deaths are related to the distribution and concentration pattern of oxygen and hydrogen sulfide in the water bodies studied. Hydrogen sulfide, toxic to fish, limits the available space in the lake and Igarapé waters, while oxygen saturation falls short of the tolerance minimum of various fish species in the remaining water layer. — (W. L. F. B. y U. de M. S.).

waves, and longshore currents, it seems unlikely that olfaction could be an important cue in landfall and nest-site discrimination, and this new delimitation of the homing goal reinforces that belief. The straying of nesting females as far as 7 km from previous nesting sites suggests how colony proliferation may occur. No Tortuguero turtle has ever been found nesting on any other shore. -- (A. C. y M. H. C.).

CHILDRESS, J. R. Behavioral ecology and fitness theory in a tropical hermit crab. *Ecology* 53(5):960-964. 1972. (90)

Certain aspects of the behavioral ecology of the tropical hermit crab, Clibanarius albidigitus, can be analyzed more fully with the use of fitness set theory. Building in the premise that an optimum shell weight ratio (termed "weight index") confers maximum fitness to individual crabs, two independent estimates of fitness, clutch size and percentage aggressive dominance, were plotted against a wide range of weight indexes. These measures were made for individuals of C. albidigitus inhabiting two environments (represented as two species of gastropod shells) and behavioral and reproductive fitness sets were constructed. The dissimilarities of the predicted optimum weight indexes for the two fitness sets, combined with the fact that suitable gastropod shells present a limiting resource, indicate a behavioral strategy by which larger shells than necessary for maximum reproductive fitness are utilized. This strategy, termed the "optimal ratios strategy" has definite advantages to individual hermit crabs and has probably evolved in response to severe competition for shells. — (J. R. C.).

FITTKAU, E. J. Distribution and ecology of Amazonian Chironomids (Diptera). *Canadian Entomologist* 103(3):407-413. 1971. (91)

FLEMING, T. H., HOOPER, E. T. y WILSON, D. E. Three Central America bat communities: structure, reproductive cycles, and movement patterns. *Ecology* 53(4):555-569. 1972. (92)

Three bat communities were studied for 1 year at each of two localities in the Panama

Canal Zone and one locality in western Costa Rica.

Removal sampling and banding techniques using Japanese mist net were employed to document community structure, food habits, reproductive cycles, and movement patterns of these bats.

Results indicated that 27-31 species occur at or near ground level at each locality. Species diversity as measured by H' , was highest in the Costa Rican community; each community contained 3-4 common species and many uncommon species. Based on body size and general food habits, niche overlap appears to be greatest among small to intermediate-sized insectivores and frugivores, many of which, however, are apparently uncommon. Four basic reproductive patterns are found among the species. Most frugivores are seasonally polyestrous whereas some insectivores are monestrous and at least one is polyestrous. It is postulated that in both insectivores and frugivores birth peaks coincide with maximum food levels. Recapture patterns of several species suggest that home range size may be positively correlated with body size; omnivorous species may have larger home ranges than similiary sized species with more restricted diets. — (T. H. F., E. T. H. y D. E. W.).

GLEISLER, R., KNÖPPEL, H. A. y SIOLI, H. The ecology of freshwater fishes in Amazonica. Present status and future talks for research. *Applied Sciences and Development* 2:144-162. 1973. (93)

HAFFER, J. Speciation in Amazonian forest birds. *Science* 165(3889):131-137. 1969. (94)

HERNANDEZ, J. Potencial y bases para la prospección de la fauna silvestre de la Amazonia colombiana. Bogotá, Instituto de Desarrollo de los Recursos Naturales Renovables, 1971. (95)

HEYER, R. W. y BERVEN, K. A. Species diversities of herpetofaunal samples from similar microhabitats at two tropical sites. *Ecology* 54(3):642-645. 1973. (96)

Amphilians and reptiles were collected from tree buttresses in two different regions

to determine whether within-habitat species diversity differences were evident. Using the method suggested by Pielou (1966), the average species diversity per individual was $H' = 1.92 \pm .47$ for the collection of amphibians and reptiles taken from tree buttresses in a tropical dry forest formation in Thailand, $H' = 4.95 \pm .84$ for the tree butters collection taken in Ecuador. Part of the within-habitat diversity differences are due to a difference in kind of organism: a large number of terrestrial frogs are present in Ecuador; there are no terrestrial frogs from the Thai site. Other differences are also operating, however. The number of lizard species are comparable in the two collections (8 from Thailand, 10 from Ecuador) yet the Brillouin diversity measure of the Ecuadorian lizard collection was $NH = 2.24$, higher than the diversity of the Thai lizard collection, $NH = 1.25$. The diversity differences are postulated to be due to different sizes of the total forest herpetofaunas of the two regions. — (R. W. H. y K. A. B.).

HOWMILLER, R. Studies on some island waters of the Galapagos. Ecology 50(1):73-80. 1969. (97)

Arcturus lake is a stratified hypersaline lake occupying a caldera near the center of Genovesa Island. It is about 500 m in diameter and has a maximum depth of 30 m. The lake is frequented by large numbers of seabirds and is an outstanding example of guano trophy.

Organic production in the epilimnion was great, and the hypolimnion was anoxic at the time of these studies. The lake is probably stratified during the entire year. There appear to be no fishes in the lake. The invertebrate fauna is dominated by corixids and tanaid shrimps. — (R. H.).

JANZEN, D. H. Herbivores and the number of tree species in tropical forest. The American Naturalist 104(940):501-528. 1970. (98)

A high number of tree species, low density of adults of each species, and long distances between conspecific adults are characteristic of many lowland tropical forest habitats. I propose that these three traits, in large part, are the result of the action of predators on seeds and seedlings. A model is presented that allows detailed examination of the effect

of different predators, dispersal agents, seed-crop sizes, etc. on these three traits.

In short, any event that increases the efficiency of the predators at eating seeds and seedlings of a given tree species may lead to a reduction in population density of the adults of that species and/or to increased distance between new adults and their parents. Either event will lead to more space in the habitat for other species of trees, and therefore higher total number of tree species, provided seed sources are available over evolutionary time.

As one moves from the wet lowland tropics to the dry tropics or temperate zones, the seed and seedling predators in a habitat are hypothesized to be progressively less efficient at keeping one or a few tree species from monopolizing the habitat through competitive superiority. This lowered efficiency of the predators is brought about by the increased severity and unpredictability of the physical environment, which in turn leads to regular or erratic escape of large seed or seedling cohorts from the predators. — (D. H. J.).

JANZEN, D. H. Sweep samples of tropical foliage insects: description of study sites, with data on species abundances and sizes distributions. Ecology 54(3):658-686. 1973. (99)

Samples of 800 sweeps each were taken in 25 different Costa Rican and Caribbean Island sites in order to analyze community-level structure of foliage-inhabiting insects. Physical environmental data and important biotic features of the sites are recorded. Sampling methods, taxonomic problems in sorting samples, and summary statistics are described. Species abundances and size distributions of the insects are appended. Interpretation of the results of the sweep samples is left for a companion paper (Janzen 1973). — (D. H. J.).

_____. Sweep samples of tropical foliage insects: effects of seasons vegetation types elevation, time of day, and insularity. Ecology 54(3):687-708. 1973. (100)

Detailed data (numbers of species, numbers of individuals, measures of species diversity, evenness, dry weight) are presented on the

adult beetles, adult bugs, or all arthropods, in sweep samples from Costa Rica secondary vegetation and primary forest understory during night and day, over a 3,340-m elevational transect, during the wet and dry seasons, and from Caribbean Island secondary vegetation. Adult bugs were found to be reduced much more severely than adult beetles in moving from secondary vegetation to primary forest understory. The number of species and individuals of insects is severely reduced in this transition, though the reduction in number of species is probably an artifact of inadequate samples from the forest understory. There is a strong movement of insects into moist refugia during the dry season, and a strong reduction in numbers of species and individuals during the dry season in areas with a severe dry season. In areas with a very mild dry season, the numbers and species of insects appear to rise during the dry season. There is very low overlap in insect species composition between secondary vegetation and the adjacent forest understory. The numbers of insects and species above intermediate elevations show a general decrease, and intermediate elevations appear to have the highest insect density. This is believed due to a higher harvestable productivity from the plant community at intermediate elevations owing to lowered plant maintenance costs on cool nights. The insect community changes little from day to night, except during the dry season in areas that have a severe dry season. Here there is a dramatic increase in individuals and numbers of species at night, in dry sites with nearby moist refugia. It appears that a high proportion of the insect community passes the dry season as active adults in reproductive diapause.

The islands have dramatically reduced numbers of individuals as well as species of insects in both the wet and dry seasons. Part of the large "insectivorous" lizard community supported by these depauperate islands may be due to the lizards turning vegetarian. In order to digest vegetable matter, lizards probably have to bask in the sun; this exposes them to predators, but lizard predators are absent from the islands. — (D. H. J.).

KARR, J. R. Structure of avian communities in selected Panama and Illinois habitats. Ecological Monographs 41(3):207-233. 1971. (101

To elucidate the causal factors responsible for diversity gradients in avian communities, avian populations were studied for 12 months in seven lowland tropical areas in the

Republic of Panama and compared with populations in structurally similar habitats in Illinois. Resident (breeding) species made up 38-49% of the species on temperate areas but only 20-36% of the species in similar tropical habitats. There were significantly more species of irregular occurrence in mature tropical habitats. Tropical grassland avifaunas were no higher in diversity (number of species and information measures of diversity) than those of temperate grassland areas, but shrub and forest habitats in the tropics had higher diversity as measured by either diversity measure. The number of species was proportionately higher than the information measure because of the relatively small effect of the many rare species on the information measure. Determination of the biomass and energy relations for the bird populations showed that higher total population size in tropical areas is correlated with smaller bird size and reduced individual energy requirements. When only breeding seasons are compared, the reduced energy requirements are a result of the higher temperatures in tropical areas.

Twenty-five to fifty per cent of the increased number of tropical breeding species when compared to similar temperate habitats results from the addition of a new food source, i.e., fruits. Additional species are primarily insectivores. The increase in insectivores seems to be due to additional subdivision of the resources and exploitation of a new kind of insect food, especially by species that depend on relatively large insects. Since energy requirements of tropical and temperate avifaunas are about the same, increased productivity is not related causally to the increased tropical diversity.

The stratal distribution of species in several tropical (lowland and montane) and temperate avifaunas indicates that avian communities may subdivide the vegetation profile similarly throughout the world despite sharp differences in the number of species in the various areas. Bark species are about equally numerous in Panama and Illinois forest, but ground, low medium, and high strata contain increased numbers of species in the tropics.

The shift away from classical defended territories in mature tropical habitats seems to be correlated with patchy distribution of food resources in frugivores and ant-following species and reduced food abundances in other species. As a result of this food distribution, the frequency of flocking increased in shrub and forest habitats. In grassland habitats, which experience greater seasonal changes in precipitation, the spacing systems of birds are more similar to those in all temperate habitats studied. Degree of terri-

torial defense against conspecifics and amount of interspecific flocking is inversely related to the distribution of food resources; more patchy or unpredictable food distributions, or both, result in fewer species defending exclusive territories.

The mayor factor related to the increased diversity of tropical avifaunas seems to be the relative stability of food resources resulting from environments that are more or less "equitable" throughout the year. Both within- and between-habitat increases in diversity of avian communities are discussed. The stability-time hypothesis is discussed in light of available data on organization of avian communities. — (J. R. K.).

KNÖPPEL, H. A. Food of Central Amazonian fishes. Contribution to the nutrient-ecology of Amazonian rain-forest-streams. Amazonia (Brasil) 2(3):257-351. 1970.

(102)

O presente trabalho comunica o exame de conteúdos estomacais de 1296 peixes, coletados em igarapés da Amazonia Central nos anos de 1965 e 1967. Por contagem dos individuos encontrados nos estômagos dos peixes como por avaliação da porcentagem volumétrica dos componentes dos alimentos ingeridos e pela frequência dos mesmos, analisaram-se quantitativamente os conteúdos estomacais, e pela distinção de 24 componentes alimentares diferentes verificouse qualitativamente a alimentação dos peixes. Discutem-se então os conteúdos estomacais sob diversos pontos de vista.

Larvas de insetos e restos vegetais são essenciais para a alimentação dos peixes. E grande o número de espécies (13) em cujos estômagos se encontram formigas (e/ou outros insetos aéreos). Não aparecem, entre os peixes examinados, especialistas pronunciados na escolha de alimento.

Os conteúdos estomacais nas diversas famílias são de uma certa uniformidade, sendo a maioria das espécies de peixes mostras um espectro ± largo na escolha dos componentes da alimentação.

A formação da boca, da dentadura es dos dentes, do trato estomacalintestinal, e o comprimento relativo do intestino não podem ser utilizados como da ecologia alimentar.

A alimentação dos peixes é uniforme apesar de localidades limnologicamente diferentes; tão pouco é a época (estação do ano) da coleta que influe sobre a composição dos conteúdos estomacais. Os peixes, mesmo parecendo adaptados a um certo biótopo, encontram o seu alimen

to em todo o corpo d'água. Não é possível uma diferenciação dos conteúdos estomacais em relação à idade dos peixes. O conhecimento dos alimentos de uma série de peixes revela um fator cujo papel, no jogo das interrelações mútuas entre corpo d'água e paisagem, pode ser, até então, somente comunicado como uma contribuição à discussão.

Baseado em alguns argumentos deduzidos da situação geológico-geográfica e das condições tropicais da região central-amazônica, a oferta de alimento é interpretada como sendo suficiente. — (H. A. K.).

LEON, P. E. Ecología de la ictiofauna del Golfo de Nicoya, Costa Rica, un estuario tropical. Revista de Biología Tropical (Costa Rica) 21(1):5-30. 1973. (103)

En esta investigación se estudió la ecología de la ictiofauna del Golfo de Nicoya, un estudio tropical, por medio de muestreos de la pesca con redes de arrastre desde barcos de investigación del Proyecto de Desarrollo Pesquero y de la FAO.

El análisis de los muestreos indica que la diversidad disminuye al alejarse del mar y acercarse a las áreas de menor salinidad en las desembocaduras de los ríos. En general, esta situación es típica de los estuarios. En las áreas interiores del Golfo es notable el predominio de la familia Sciaenidae en cuanto a diversidad, número de individuos y biomasa. Otras familias que forman parte de la "Comunidades de Sciaenidae" son las familias Ariidae, Cynoglossidae, Polynemidae, Engraulidae y Clupeidae. También se comprobó que algunos peces óseos (familias Sciaenidae, Clupeidae y Trichiuridae) utilizan las partes menos salinas del Golfo como criadero de sus etapas juveniles.

Se comprobó además la perturbación que generalmente acompaña al desarrollo agrícola e industrial de esta zona dada su importancia como criadero de muchos organismos marinos, algunos de gran importancia comercial. — (P. E. L.).

LIGHT, P. Reproductive cycles of three species of Anoline lizards from the isthmus of Panama. Ecology 52(2):201-215. 1971. (104)

A study of the reproductive cycle of three species of lizards, a forest form, Anolis

limifrons, a forest edge species, A. tropidogaster, and a grassland species, A. auratus, was carried out in the Isthmus of Panama from November 1965 until September 1969. The collecting sites were: Pacific side for all three species, mid-Isthmus for A. limifrons and A. auratus and Caribbean side for A. limifrons.

Females of all three species of all sites were reproductively active during the wet season (May through December). For A. tropidogaster and A. auratus egg production almost ceases during the dry season. In A. limifrons egg production essentially ceases at the drier Pacific site and is reduced at the other two wetter ones during same January-to-April period. The testes of males of all three species have mature spermatozoa during the dry season but mean testis weight declines from wet season highs. The male changes occur before the corresponding ones in their females so that the cycles of the two sexes may be controlled by different factors. Lipid levels of adults from the mid-Isthmus site show high values in the late dry season and lower ones throughout much of the wet season.

Precipitation, food level, temperature, photoperiod, soil and leaf wind, and evaporation are considered as cues influencing the cycle. The most likely candidate for the female cycle is precipitation with certain limitations. The flexible reproductive system of A. limifrons enables it to reproduce at low rates in some areas where the other two species must cease reproduction during dry periods. — (P. L.).

LUGO, A. E. et al. The impact of the leaf-cutler ant Atta colombica on the energy flow of a tropical wet forest. *Ecology* 54(6):1292-1301. 1973. (105)

The patterns, quantity, and activities associated with the leaf-cutting of Atta colombica were studied August 20-27, 1971, in a lowland tropical wet forest at Osa Peninsula, Costa Rica (Lat. 08°42'N Long. 83°29'W). The study nest had an area of 44.8 m² and covered 1.4 ha of forest floor. Daily, on a m² of forest floor, the study nest had inputs of 10.17 leaf fragments with an area of 0.0108 m², a weight of 0.0813 g, an ash content of 0.0039 g. and a potential energy of 0.3455 kcalories. The ants return to the forest floor 0.0525 g of refuse with a potential energy of 0.0764 kcalories and an ash content of 0.0212 g/m² day. It was calculated that the leaf-cutting activity of ants reduced the gross production of the forest by 1.76 Kcal/m².

day but accelerated net production by at least 1.80 Kcal/m²· day through the return of ash rich in phosphorus to the forest floor. The size of the Atta nest may be determined by the balance of the energy input to the nest and the cost of obtaining, carrying (concentrating), and distributing the potential energy into the nest. Of a work force of 12,000 ants/m² of trail, 75% were not carrying leaves and were assumed to be doing trail maintenance work. Rainfall and litter fall were the main obstacles of leaf transport, which was about 70% efficient.

The ant's energy allocation for maintenance, which limits growth, and the establishment of reward feedbacks to their energy producers have implications for man's urban system development. — (A. E. L. et al.).

MARKEL, R. P. Temperature relations in two species of tropical west American Littorines. *Ecology* 52(6):1126-1130. 1971. (106)

The intertidal zonation and temperature relationships of two Litorina species which co-occurred over a wide range of latitudes in the West American tropics were studied. It was found that L. aspera lives higher in the intertidal zone, experiences higher tissue temperatures in the field, and has a higher upper lethal temperature than L. modesta.

A positive correlation between intertidal height and heat resistance has been observed previously in temperature latitudes. A similar correlation in two high intertidal tropical snails was found in this study. There is a large difference between maximum temperature recorded in the field and thermal tolerance determined in the laboratory, providing the animals with a considerable safety factor. It is suggested that temperature is a major factor influencing the intertidal distribution of these species. — (R. P. M.).

MARTIN, W. E. ed. Symposium on the sea-level canal bioenvironmental studies; presented at the 19th Annual Meeting of the American Memorial Institute, of biological Sciences. Columbus, Ohio, Battelle Memorial Institute, 1969. (107)

NOVAES, F. C. Distribuição ecológica de abundância das aves em um trecho da mata do baixo Rio Guamã (Estado do Pará). Boletim Museu Paraense "Emílio Goeldi", Zoologia no. 71:1-54. 1970. (108)

ORIAN, G. H. The number of bird species in some tropical forests. *Ecology* 50(5):783-801. 1969. (109)

Resident birds were censused in seven plots in Costa Rica ranging from 0 to 6 months dry season and from sea level to 2,380 m in elevation. Included were one highland and two lowland sites that were dominated by one or two species of trees. All stands were tall, undisturbed forests, but some were surrounded by agricultural land.

The number of species of birds recorded was not measurably affected by the tree species diversity of the length of the dry season. However, a larger proportion (about 90%) of the total forest species known to occur in the region as a whole was found in the drier areas, whereas only about 50% were recorded in the wetter areas. This suggests that "between-habitat diversity" may be greater in the areas with less severe dry seasons. The highland sites had markedly fewer species than the lowland sites, and a greater percentage of the species foraged by moving actively than was the case in the lowland sites. The large number of tropical lowland forest species that hunt by sitting and waiting for prey to move can probably be attributed to lack of wind, larger leaf size, larger biomass and higher recruitment rates of insects, more large nocturnal insects and more arboreal reptiles and amphibians.

Many species of birds were limited to narrow vertical ranges in the forests, but the great increase in numbers of species in the tropics is only in small part accounted for by finer vertical subdivision of the forest. The greatest contribution is made by the addition of species with no temperate counterparts, suggesting that the greater range of resource types permanently above threshold values in tropical forests is the major cause of increased bird species diversity. — (G. H. O.).

REYNA ROBLES, R. Ecología y control de insectos. In Seminario Internacional sobre la Enseñanza de la Parasitología Agrícola, Guatemala, 1972. Informe. Guatemala, IICA, Zona Norte, 1972. pp. 6-9. (110)

ROCKWOOD, L. L. Population ecology of leaf-cutter ants in Guanacaste. *Organization for Tropical Studies News* 71-5:4-5. 1971. (111)

TEMPLETON, W. L. *et al.* Freshwater ecological studies in Panama and Colombia. *BioScience* 19(9):804-808. 1969. (112)

TERBORGH, J. y WESKE, J. S. Colonization of secondary habitats by peruvian birds. *Ecology* 50(5):765-782. 1969. (113)

Complete surveys of the bird faunas of 4- to 10-acre study plots in six habitats were undertaken at a locality in the Apurímac Valley of Peru. Two of the habitats, forest and matorral, represent the primary vegetation of the region. Four secondary habitats incorporated varying degrees of departure from the structure and composition of natural vegetation of the 221 species of land birds found in the 6 habitats, all but 10 were recorded in at least 1 of the 2 primary habitats.

With the exception of these 10 species the fauna of the secondary habitats was drawn from 3 species pools: forest, matorral and species common to both. The proportions of forest and matorral species in the secondary habitats varied greatly in relation to the vegetation of the habitats and their proximity to the source faunas.

Mist nets were used in all the study plots to sample the avifauna using the airspace between 6 in. and 6 ft above the ground. The species diversity in samples of 100, calculated according to the Shannon-Wiener formula, showed rather little variation from one habitat to another.

Of greater interest was the fact that in most habitats the mist net caught fewer than half of the species known to be present. In temperate habitats virtually all species are eventually captured. This contrast is considered to reflect a fundamental difference in the spatial relationships of bird niches in temperate and tropical forest. The above and other evidence indicate that many tropical bird species confine their foraging activities to narrow vertical zones in the vegetational column.

The number of bird species in the four secondary habitats was much lower than in primary habitats having similar foliage height profiles.

The discrepancies are accounted for by an hypothesis that evokes two complementary parameters: the isolation of tracts of second-

ary habitat from primary vegetation and certain qualitative aspects of habitat that are not adequately expressed by the foliage height diversity index. — (J. T. y J. S. W.).

WARNER, G. F. The occurrence and distribution of crabs in a Jamaican Swamp. The Journal of Animal Ecology 38(2):379-389. 1969.

(114)

(1) The zonation of crabs was studied in a Jamaican mangrove swamp. Three zones were recognized in the swamp—the Upper Swamp, Mid-Swamp and the Lower Swamp, and two more zones above and below the swamp—the Supra-littoral and Sub-littoral Zones. All these zones contain characteristic crab faunas except the Mid-Swamp which is transitional in nature.

(2) The crab fauna of the Jamaica swamp is compared with crab faunas of swamps in Brazil, Java and Mozambique and they are found to be similar.

This indicates the existence of a characteristic mangrove crab fauna primarily adapted to life in mangrove swamps.

(3) Mangrove crabs seek cover on the swamp floor from predation and desiccation.

They may dig their own burrows, invade other crab's burrows, inhabit communal 'crab runs' just under the swamp floor or live amongst flostsam.

Exceptions are the adults of Aratus pisoni which climb trees.

(4) The size distributions of three species were studied in detail. The mean sizes of Pachygrapsus gracilis and Sesarma curaçaense increase towards the upper swamp and Aratus pisoni adults and juveniles are commonest in the Lower Swamp. Adult A. pisoni are restricted to the Lower Swamp because their arboreal habits make them susceptible to desiccation and also because the females undertake periodic breeding migrations to the seaward edge of the swamp. Large individuals of Pachygrapsus gracilis and Sesarma curaçaense are commoner in the Mid and Upper Swamp because the 'crab runs' which they use for cover are more extensive in the softer soil there. — (G. F. W.).

WEAVER, P. L. Species diversity and ecology of tidepool fishes in three pacific coastal areas of Costa Rica. Revista de Biología Tropical (Costa Rica) 17(2):165-185. 1970. (115)

Existen grandes diferencias en la morfología de las pozas entre mareas de Playas del Coco, Rincón de Osa y Tamarindo, en el Océano Pacífico en Costa Rica. El ambiente en Playas del Coco y Tamarindo se puede calificar de rocoso y estable; el de Rincón de Osa como de cieno y variable.

Las características del agua también varían en las tres localidades, siendo la de Playas del Coco y Tamarindo marina y la de Rincón de Osa salobre.

Los peces de estas pozas varían en cada sitio. En Playas del Coco se encontró 14 familias y 28 especies en Rincón de Osa. Doce familias y 17 especies fueron comunes a Playas del Coco y Tamarindo; tres familias y ninguna especie a Playas del Coco y Rincón de Osa.

En Playas del Coco no hubo correlación entre la diversidad de especies y la profundidad de la poza, biomasa y profundidad, diversidad de especies y volumen de agua, biomasa y volumen, ni entre biomasa y el factor de diversidad de la poza. Sí hubo una correlación significativa entre la diversidad de especies y factor de diversidad de la poza entre mareas.

En Tamarindo no hubo correlación de biomasa y diversidad de especies con la profundidad, el área de superficie, el volumen ni la diversidad de la poza.

En Playas del Coco muestreos posteriores revelaron una reducción en la biomasa total y aumento en la longitud promedio, en la longitud y en la biomasa de los peces. En Rincón de Osa hubo reducción en la biomasa total y en la biomasa promedio, y aumento en la longitud promedio. En Tamarindo muestreos posteriores dieron como resultado la disminución de la biomasa total. No hubo relación aparente entre la longitud promedio de los peces y la biomasa. En todas las localidades el muestreo continuo produjo disminución en el número de especies, así como en el de individuos por especie. — (P. L. W.).

WEBER, N. A. Ecological relations of the Atta species in Panama. Ecology 50(1):141-147. 1969. (116)

ZARET, T. M. y STANLEY R., A. Competition in tropical stream fishes: support for the competitive exclusion principle. Ecology 52(2):336-342. 1971. (117)

Two collections of fish were made from the same Panama lowland stream, one during the dry season, and a second during the wet season.

Food overlaps among nine sympatric fish species were calculated for each collection by examining fish stomach contents.

Species habitats and feeding methods were determined from field and laboratory observations. Estimates of food abundance, measured independently from food overlap, were made by direct and indirect methods, and were used to determine relative levels of competition.

The results show that food overlaps among the fishes are at a minimum during the dry season. Food abundance is also lowest during the dry season, which suggests increased competition for food at this time.

This seasonal coincidence of the most distinct species separations with the time of increased competition are exactly those consequences predicted by the principle of competitive exclusion. It is concluded that this study provides strong support for the validity of this principle. — (T. M. Z. y A. S. R.).

Two distinct morphs of the freshwater zooplankter Ceriodaphnia cornuta are distributed heterogeneously within the same tropical lake. One form, having a relatively superior reproductive potential, is the numerically dominant morph in the open-water areas of the lake. The second form is found commonly only in the near-shore areas along with a nearly equal percentage of the first form. The second morph has a large advantage in terms of avoiding predation and its distribution coincides with that of the important lake predator, the planktivorous fish Melaniris chagresi. Complementary field and laboratory studies support the conclusion that the stable polymorphism of Ceriodaphnia cornuta, found only in the nearshore waters, is maintained by predation pressure from Melaniris chagresi. The relationship found in this study among predation, competition, and the primary productivity of the ecosystem is discussed in terms of how these factors interact to determine the final species diversity. — (T. M. Z.).

ZARET, T. M. Predator-prey interaction in a tropical lacustrine ecosystem. *Ecology* 53(2):248-257. 1972. (118)



ECOLOGIA HUMANA



ECOLOGIA HUMANA

BOUGHEY, A. S. Man and environment: a introduction to human ecology and evolution. New York, Macmillan, 1971. 472 p. (119

Human ecology is not new but the recent union of several traditional disciplines, each in its own perspective relating man to his environment, promises to make it a science. In developing this long-needed introductory human ecology and evolution text, Boughey draws generously from parallel developments in sociology, engineering, ecology and the biomedical sciences. The product is a pioneer effort in creating a synthesis which emphasizes the mutual interdependence of man and ecosystems as the fundamental theme.

The first chapter is an introductory treatment of the structure and function of ecosystems, emphasizing productivity. Illustrations in this chapter tend to be more confusing than informative, and many basic concepts are considered only in this section. The next four chapters trace a fascinating biological and social evolution from early hominids to Homo erectussapiens groups, concluding with the ecological development of human societies. Man's success and dispersal over the earth are attributed to his unique potential for cultural adaptation and evolution. Pleistocene overkill of megafauna and contemporary problems in environmental quality are examples of this adaptability (or lack thereof?). Resultant diversity in human traits is objectively associated with both the imprint of environmental factors as well as race of origin.

Discussions of human population dynamics and the interaction of environmental crises with population patterns are framed in an historical perspective of population control. Boughey bars no holds in explaining the impending population crisis, recognizing a danger not only in numbers themselves, but also in concomitant depletion of natural resources, stress of population pressures, and deterioration of environmental quality. Included is an effective presentation of contemporary birth control practices.

Next the text proceeds to relate man's social evolution to current environmental crises. In an otherwise rational treatment of subject areas, Boughey in this enthusiasm here neglects to present objective alternative points of view. On aspects of air pollution,

seven pages are devoted to a biased presentation of a scientifically questionable attitude on the hazards of radioactive fallout (this aspect no longer a serious threat since the Nuclear Test Ban Treaty). In discussion of waste treatment to alleviate water pollution, tertiary treatment capabilities for removing nutrients and toxic materials are largely ignored. A chapter on pesticides devotes 12 pages to chlorinated hydrocarbons, but only one paragraph to organophosphates and other classes of pesticides.

The dilemmas of conservation and protection of living organisms are considered, but the concept of carrying capacity is never developed to its fullest potential as the ecological basis for establishing the steady state limits of global exploitation by man. Similarly, ecological aspects of multiple landuse planning are glossed over. The text concludes with a fascinating projection of the evolution of Homo innovatus and the yet uncertain future of mankind. In man's continuing cultural evolution, what personal rights may yet need to be sacrificed for a better society? Boughey reviews immediate prospects, alternative choices, and critical decisions still to be faced on environmental and population issues.

Some editorial faux pas are disappointing: units are missing from table 6-3, discussion of the birth rate equation on p. 240 is in error, on p. 359 a "Stanford" reactor appears as Hanford, and "ecological niche" is incorrectly defined in the glossary. But any work so comprehensive in scope can be vulnerable to such criticism.

The book conveys in a very readable text fundamental ecological and evolutionary principles of human biology. The author coalesces a seemingly disordered array of concepts into logical patterns which leave the reader with new perspectives. Man and the Environment is recommended to student, teacher and layman for an appreciation of man's past and an insight into his future. — (David E. Reichle. Oak Ridge National Laboratory. Bioscience 22(6): 385-386. 1972.).

BRIGGS, J. C. The sea-level Panama Canal: potential biological catastrophe. Bioscience 19(1):44-47. 1969. (120

DENEVAN, W. The aboriginal population of western Amazonia in relation to habitat and subsistence. *Revista Geográfica (Brasil)* no. 72:61-86. 1970. (121)

DOGAN, M. y STEIN, R. ed. *Quantitative ecological analysis in the social sciences*. Cambridge, Mass., M.I.T. Press, 1969. 607 p. (122)

1967 symposium of social scientists on the historical record of ecological analysis, on use of quantitative techniques in ecological research, on use of multiple data files, and the organization of world studies. Basically a sociological collection which considers and the various factors, both ecological and geographical, which affect individual and group behaviour. — (Block, D. *Environmental aspects of economic growth in less developed countries; an annotated bibliography*. s.l., D.C. OECD, 1973.)

EHRlich, P. R. y EHRlich, W. H. *Population, resources, environment, issues in human ecology*. San Francisco, Freeman, 1970. 383 p. (123)

EXPERT PANEL ON PROJECT 12: INTERACTIONS BETWEEN ENVIRONMENTAL TRANSFORMATIONS AND GENETIC AND DEMOGRAPHIC CHANGES IN THE PROGRAMME ON MAN AND THE BIOSPHERE (MAB), PARIS, 1972. Final report. Paris, UNESCO, 1972. 35 p. (MAB report series no. 4).

This report is focused on crucial aspects of the changing relationships between the environmental and the adaptive, demographic and genetic structure of human populations. Three situations are singled out for special attention: isolated rural situations (including subsistence agriculture), urbanisation and migration.

Attention is focused on these situations because they occur over a wide range of conditions, they provide a firm basis for comparative and co-ordinated study, and they are particularly relevant to problems of the developing world.

The project is so designed that much can be accomplished with modest resources and at moderate levels of sophistication. The project should yield important practical results

in a relatively short time and with the greatest economy of manpower. Thus, for a programme which is within strategy of repeated surveys, featuring a minimum of essential observations which are repeated at fairly frequent intervals. The same strategy of repeated surveys could be adopted by a considerable number of countries at a more elaborate level, using more test and a greater variety of samples for longer periods or at more frequent intervals. A third, more elaborate level of intensive ecological analysis could be undertaken where suitably located research centres are available and where teams of scientists from different disciplines could be assembled. A tentative, indicative list of observations needed at the different levels of sophistication of study are given. Suggestions are made on the possible contribution of studies on human biology in other MAB projects.

FUENZALIDA VOLLMAR, F. La estructura de la comunidad de indígenas tradicional. In Keith R. G. et al. *La hacienda, la comunidad y el campesino en el Perú*. Lima, Instituto de Estudios Peruanos, 1970. pp. 61-104. (125)

GARLICK, J. P. y KEAY, R. W. J. ed. *Human ecology in the tropics*. Oxford, Pergamon Press, 1970. 112 p. (126)

Tropical agriculture and health are the foci of the ninth symposium of the Society for the Study of Human Biology. The interdisciplinary approach extends from these two areas into fields of ecology, economics, and sociology.

Six of the seven papers are concerned primarily with African studies; the other relates to the Guianas.

The first paper considers agriculture in western Nigeria, where both forest and savanna occur. Soil types are correlated with these two ecosystems; siltplus-clay content in soils of forest and cocoa plantation was found to be in excess of 35%, but this component constituted less than 15% in savanna soils, whether cultivated or not. Aerial surveys showed very little change in the forest-savanna boundaries in more than a decade, despite periodic burning and an increase in human populations density. The investigators suggest that "the extreme sharpness of the change from forest to savanna is strongly influenced by soil properties affecting moisture relationships and ease of root development, especially by woody species."

Fire is not discounted as a factor which affects the forest-savanna boundary, but information gleaned from aerial surveys indicated the following: some savannas are rarely burned; burning is more intense over drier, more shallow soils; and burns rarely penetrate areas of woody growth, presumably because of the sparse herb layer.

There is strong interplay between agricultural economy and ecology.

Where forest is cleared, the intent is to replace it by tree crops; small crops and bananas provide the main yield as the trees develop. In the savannas, crop rotation and matching crops to the environmental situation achieve maximum utilization of the cleared land.

A comparative study of land use by three ethnic groups in the Guianas comprises the second paper. Bush Negroes and the indigenous Akawaio and Waiyana Indians are forest-dwellers who practice the slash-and-burn type of agriculture. Their uses and locations of villages and gardens often differ because of cultural heritage.

A clear, inclusive introduction to tropical health is the first of five papers on this subject. Caloric values and productivity for tropical crops and animal protein are discussed with the view of obtaining maximal yield for human nutrition. Ecology and prospects for control of African shistosomes are summarized. The complexity of epidemiology of African sleeping sickness is emphasized; fire, human social order, and destruction of trees by elephants are related to control of the disease.

In a Gambian village, child development was studied by a team of specialists, who found that the growth rate of young children decreased during the wet season. This was attributed to the fact that children received less attention during this season, because their mothers had to raise crops. Undernourishment often went unrecognized and was related to increased disease and mortality during the rainy period.

The interdisciplinary approach of this symposium is commendable; it clarifies some situations and more clearly defines problems.

The symposium does not dwell on much technical detail, but summarizes work by the writers and others. One may develop a rather sketchy picture of tropical human ecology from this consive volume, but the well-chosen topics make it a very good, readable introduction to the field. The specialist may be unhappy because of the single viewpoint in each area. For example, it is held that fore is not a major factor in maintaining the savanna. Certainly this view is not accepted

by all ecologists. Use of the metric system would be preferable to English units. Apologies are made for the length of time taken to publish the volume, but the date of presentation of the symposium is not given. After a search, I estimate its date to be 1967 or earlier.

Even so, the volume is one of very few concerned with its increasingly important subject in ecology-ecologists, students, and general public.

HANBURY-TENISON, R. Tribal societies in the modern world. *Ecologist* 2(11):4-6. 1972. (127)

Robin Hanbury-Tenison is Chairman of Survival International (The Primitive Peoples Fund). This year he visited two tribes in Panama and Colombia, which in their different ways illustrate some of the problems facing the so-called primitive peoples throughout the world.

HANZEN, W. E. Readings in population and community ecology. 2 ed. Philadelphia, W. B. Saunders, 1970. 400 p. (128)

HEMING, J. Robbed of a future: the Brazilian Indians. *Ecologist* 2(11):7-10. 1972. (129)

No-one doubts that the Brazilian Indians are doomed to eventual extinction.

The only question is when and how. The Brazilian government could still act to preserve the remaining Indians. It could ensure that when change comes it is introduced under controlled conditions, at the Indians' request and at a speed they can assimilate. It seems unlikely that this will happen.

HILLS, T. L. Some geographical problems of the New World Tropics. *Revista Geográfica (Brasil)* no. 71:7-21. 1969. (130)

Quinze anos de experiência nas Antilhas, nas regiões periféricas da bacia amazônica, nas ilhas do Pacífico e outros países do extremo oriente, permitem ao autor tecer valiosas

considerações sobre os problemas dos trópicos, encarados do ponto de vista do habitante rural, lavrador e minifundista, tendo em conta a premente necessidade de desenvolvimento no mundo atual e as aspirações das próprias nações subdesenvolvidas.

Cita vários autores em defesa da tese que se deve testar e rever constantemente à luz de pesquisas cada vez mais aprofundadas e atualizadas, as teorias e hipóteses de ordem cultural, socio-econômica e ecológica. Examina as relações entre o homem e o ambiente, e os fatores determinantes da escolha dos principais sistemas hortícolas, assim como a orientação dada a culturas e civilizações primitivas.

A interrelação dos recursos e sua capacidade de sustentar uma população crescente sugerem a aplicação à América tropical de ecossistemas comprovadamente estáveis, como o da rizicultura de várzea alagável do Oriente.

A extensão aos países em desenvolvimento da "revolução quantitativa" justifica-se pelo melhoramento da estatística geográfica iniciado nos países desenvolvidos. Na parte sobre metodologia, estuda-se o papel do geógrafo, a sua formação e os conhecimentos de outras disciplinas que lhe permitam exercer uma influência válida sobre a interpretação de dados e o planeamento integral. Para todo programa de reforma agrária, precisa desde o princípio verificar a maneira do lavrador visualizar o meio em que vive e trabalha, problema que promoveu os avanços recentes no campo da etnologia.

Uma breve alusão às novas técnicas de pesquisa como a do sensor orbital na determinação das mudanças sazonais da unidade dos solos tanto da hileria quanto dos campos limpos, conduz a um apelo ao geógrafo de interessar-se cada vez mais nos programas de reforma agrária e/ou de desenvolvimento e ocupação da terra nos trópicos do Novo Mundo, frisando porém a necessidade de uma maior precisão estatística e de uma perspectiva ecológica bem compreendida. — (T. L. H.).

HOLDREN, J. y EHRLICH, P. R. ed. *Global ecology readings toward a rational strategy for man*. New York, Harcourt Brace Jovanovich, 1977. 295 p. (131)

This collection of contemporary essays emphasizes the unified nature of the problems in population, resources, and environment that confront mankind today. The readings are interdisciplinary in scope, and, together with the editors' commentary at the beginning of each section, they provide a perspective shaped by two underlying themes: the first is the enormous complexity of the problems man faces,

embracing a wealth of interconnections among human populations, manmade systems, and natural systems; the second is the fundamentally radical changes needed in human institutions and behavior to recure a viable ecological strategy.

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT. *Environmental, health, and human ecologic considerations in economic development projects*. Washington, D.C., 1973. 50 p. (132)

Recognizing the possible environmental effects of economic development projects and their possible negative effects on the process of development itself, the Bank has attempted to set forth guidelines of environmental considerations, suggested criteria and standards, and tolerance levels which should be taken into account in the planning and appraisal stages of development projects. This book provides such guidelines for 16 types of development projects. Guidelines are organized around six categories: environment/resource linkages, project design and constitution, operations, socio-cultural factors, health impacts, and long-term considerations. Guidelines are presented in the form of questions which should be posed, and presumably answered in the affirmative, for each type of project. — (BLOCK, D. *Environmental aspects of economic growth in less developed countries. An annotated bibliography*. s.l., D.C. OECD, 1973.).

KORMONDY, E. J. *Ecology and the environment of man*. *BioScience* 20(13):751-754. 1970. (133)

McBRYDE, F. W. y COSTALES, A. S. *Human ecology of north-western Colombia. (The Chocó)*. *BioScience* 19(5):432-436. 1969. (134)

MARTINEZ, A. *Ecología humana del Ejido*. Benito Juárez, Oaxaca, México, Instituto Nacional de Investigaciones Forestales. Boletín no. 5. 1970. (135)

MILLER JUNIOR, G. T. Replenish the earth: a primer in human ecology. Belmont, Wadsworth Publishing, 1972. 199 p. (136)

PONS, G. Ecología humana en Centroamérica. San Salvador, El Salvador, Secretaría General. Organización de los Estados Centroamericanos, 1970. 247 p. (Monografías técnicas no. 7). (137)

La presente monografía sobre Ecología Humana en Centroamérica plantea uno de los principales problemas sociales - el de la distribución especial de la población - y propone resoluciones racionales apoyados en un cuerpo de doctrina científica impregnada de humanismo.

Es un estudio concebido con tan amplia perspectiva y apoyado en tan extensa documentación técnica, como este ensayo sobre Ecología Humana. Partiendo de consideraciones estrictamente ecológicas el Autor se adentra en el ámbito geográfico, económico, cultural y social de la Patria Grande proporcionándonos una visión integral y objetiva de la misma.

El ensayo constituye un diagnóstico de la actual situación centroamericana.

Como tal, no puede menos que considerar los cuatro elementos de toda vida social, a saber: el ambiente físico, el trabajo, la población y las necesidades. — (G. P.).

RAPOPORT, A. The ecology of housing. Ecologist 3(1):10-17. 1973. (138)

What is built is more important than how it is built. And in deciding what should be built, purely physical standards are much less important than maintaining cultural integrity. The author shows that by forcing us to depart from the confines of conventional design, the ecological approach to housing can lead us to an architecture which is socially supportive rather than destructive. — (Ecologist 3(1): 10. 1973.).

SMITH, R. L. ed. The ecology of man: an ecosystem approach. New York, Harper and Row, 1972. 436 p. (139)

A broad introduction to ecology based on the assumption that such problems as population, food, and pollution will be solved only if approached ecologically. International in scope, the text arranges writings on ecology, geography, economics, sociology, and cultural anthropology within an ecosystems framework. The editor's general introduction and introductions to each part and selection unite the articles into a well-integrated text.

These papers were written expressly for the book; others are reprinted from such publications as Bioscience, Science Foreign Affairs, Agricultural History, and Geographical Review. — (BioScience 22(3):194. 1972.).





ECOLOGIA VEGETAL



ECOLOGIA VEGETAL

ACOSTA-SOLIS, M. Observaciones fitogeográficas; Humboldt y Bonpland. Flora (Ecuador) 12(4146):89-166. 1969. (140)

ALLEN JUNIOR, L. H., LEMON, E. y MULLER, L. Environment of a Costa Rican Forest. Ecology 53(1)102-111. 1972. (141)

Wind speed and turbulence were measured at five heights simultaneously in a Costa Rican forest with non-stalling, heated thermocouple anemometers. A persistent daytime stable thermal stratification of the air beneath the top canopy decreased small-scale turbulence, which may increase boundary-layer resistance of leaf-to-air transport of water vapor and CO₂. Three CO₂ source layers (ground level, trunk space, and above the top canopy) and two CO₂ sink layers (top canopy and bottom canopy) were found in this forest. Low nocturnal wind speed allowed CO₂ from respiration to accumulate at night. — (L. H. A. J., E. L. y L. M.).

AMBASHT, R. S. A text of plant ecology. Varanasi, India, Shree Mahabir; 1969. 212 p. (142)

ANDERSON, R. C. Environmental scaling of microhabitats for some Costa Rican grasses. Turrialba (Costa Rica) 19(1):57-65. 1969. (143)

Con las descripciones de habitats contenidas en el libro de colecciones de la asignatura de Agrostología, 1966, de la O.T.S. (Organization of Tropical Studies), se evaluó el microhabitat de varias gramíneas de Costa Rica mediante una escala de clasificación numérica. Se establecieron criterios para asignar valores, que iban de uno a cinco, para luz, humedad y alteración de habitat por el hombre.

El área de estudio se dividió en cuatro regiones: Los Llanos del Pacífico, los Llanos Tropicales Húmedos, las Elevaciones Medias (500 a 1500 m) y las Altas Elevaciones (por encima de 1500 m). Una comparación florística de las regiones, usando un índice de similitud, reveló que los Llanos Tropicales Húmedos, Ele-

vaciones Medias, y Llanos del Pacífico tienen muchas especies en común, mientras que las Altas Elevaciones tienen menos especies en común con las otras regiones.

Las especies que ocurrieron en tres o cuatro regiones tendieron a ser especies que se encontraban en habitats alterados con fuerte intensidad de luz.

En general, las más altas elevaciones examinadas tuvieron un por ciento más grande de gramíneas nativas, mientras que las elevaciones medias y aquellas que apenas pasaban de los 1500 metros a mantener más gramíneas introducidas. — (R. C. A.).

ARAUJO, V. C. Fenología de essencias florestais amazônicas. I. In Seminario sobre Ecología Tropical, Itabuna, Brasil, 1972. Informe. Turrialba, Costa Rica, IICA-TROPICOS, 1974. (En prensa). (144)

O presente trabalho, como contribuição ao estudo da flora amazônica no que tange à fenologia, visa levantar informações capazes de orientar a coleta de material botânico de 36 espécies, para estudos taxonômicos e pesquisas silviculturais.

Este estudo foi iniciado em 1962, com a escôlha sistemática de espécies florestais arbóreas, até 1965, quando totalizou o número de duzentos e dez espécimens, com três indivíduos para cada espécie. A escôlha das espécies obedeceu às normas básicas silviculturais seguintes: valor madeireiro conhecido ou com possibilidade de industrialização, quer seja local, nacional ou internacional, produtoras de gomas, resinas e óleos essências (madeira ou segmentos); fuste e copa perfeitos; grande porte e não sobremaduras.

Durante o período de observações que obedeceu ao "QUADRO DE OBSERVAÇÕES FENOLOGICAS", verificou-se que:

- a) o maior índice de floração é precisamente no período de estiagem (junho a novembro);
- b) a frutificação distribui-se durante todo o ano;
- c) a mudança foliar transcorre de modo geral antes da floração, algumas durante o desenvolvimento dos frutos, com poucas espécies de folhas totalmente caducas;
- d) existem espécies de floração e de fruti-

- ficação anual, bianual, poli-anual ou uma única vez (veja grupo dos tachis);
- e) existem espécies que não dependem de estação climática para floração, frutificação e mundaça foliar.

Uma divisão em grupos relaciona as fases vegetativas as ocorrências da floração, da frutificação da mudança foliar, condições de clima, para, num quadro, mostrar o período de classificação o tipo vegetativo foliar. — (V. C. A.).

ARAUJO, V. C. The factor light as a basic element in tree growth in the Amazonian Forest. In Seminario sobre Ecología Tropical, Itabuna, Brasil, 1972. Informe. Turrialba, Costa Rica, IICA-TROPICOS, 1974. (En prensa).

Pesquisa comparativa foi realizada com 21 espécies florestais nativas, de valor econômico conhecido, para as condições de plena luminosidade (corte raso da floresta e de sombra (eliminado o sub-bosque), com o objetivo de conhecer ecologicamente as espécies e o seu melhor meio ambiente de sobrevivência e desenvolvimento.

As dificuldades na organização de um programa silvicultural para a região de Manaus (Reserva Florestal Ducke), ensejaram a planificação e execução de um trabalho, cujos resultados, possibilitariam desenvolver em futuro próximo uma política florestal, atendendo nas informações básicas aos reclamos da coletividade.

As espécies foram escolhidas sucessivamente de 1962 a 1966, a medida dos conhecimentos de suas aplicações e das possibilidades de obtenção de material propagativo.

Os resultados obtidos para as diferentes épocas de plantios, 1962, 1964, 1965 e 1966, nos permitiram chegar às seguintes conclusões:

- a) entre o pequeno número de espécies florestais amazônicas estudadas, encontramos espécies com rápido, regular e lento desenvolvimento;
- b) algumas espécies sobrevivem sob sombra com crescimento muito lento;
- c) que existem espécies sem capacidade de sobreviver sob sombra, sendo a sua existência na floresta condicionada a aberturas de clareiras naturais e artificiais;
- d) é sob plena luz que as espécies na quase totalidade, têm o seu "MAXIMO" desenvolvimento. — (V. C. A.).

ARRUDA, N. B. y BRITTO, D. P. P. S. Abudação mineral do amendoim. I. Ensaio en solos das séries Itaguaí e Ecologia. Pesquisas Agropecuária Brasileira 7:143-148. 1972. (Serie Agronomia). (146)

E relatada uma pesquisa realizada com o objetivo de estudar o efeito de N, P, K, Ca e Mg e suas interações sobre a cultura do amendoim (Arachis hypogaea L.). Os trabalhos foram instalados em solos mapeados como das séries Itaguaí e Ecologia, dominantes na área do km 47 e Baixada de Sepetiba.

Nos solos estudados, pertencentes à série Itaguaí, foi positivado o efeito da cal, sendo que em um dos solos desta série houve, também, efeito favorável do magnésio no aumento da produção do amendoim. Sendo solos de uma mesma série, parece estranho o fato mencionado mas é necessário esclarecer que, na série Itaguaí, existem vários tipos de solos cujas reações divergem quanto as adubações e, além do mais, que as respostas do amendoim aos fertilizantes não são constantes, variando muito, mesmo em solos de mesmo tipo. Foi constatada, ainda, a negatividade do potássio num dos solos estudados da série Itaguaí, pois este macronutriente neutralizou, quando junto a qual, ao magnésio e ao nitrogenio, a ação benéfica destes, na produtividade.

No solo da série Ecologia, somente o efeito do magnésio foi estatisticamente significativo, mas o magnésio, junto ao fósforo e ao potássio, mostrou reação positiva, enquanto que a cal mostrou reação negativa na produção embora sem significação estatística. — (B. N. A. y D. P. P. S. B.).

ARMENTA S., J. L. La ecología y la naturaleza. Agronomía en Sinaloa (México) 4(9):2-4. 1971. (147)

ASHTON, P. S. Speciation among tropical forest trees: some deductions in the light of recent evidence. Journal of the Linnean Society (Biol.) 1:155-196. 1969. (148)

BASTOS, T. X., PEREIRA, F. B. y DINIZ, T. D. de A. S. Contribuição ao conhecimento da ecologia de floresta equatorial úmida. In Reunión Técnica de Programación sobre Investigaciones Ecológicas para el Trópico Americano, Maracaibo, Venezuela, 1973. Informe. Maracaibo, IICA-TROPICOS, Facultad de Agronomía, Universidad del Zulia, 1973. p. irr. (IICA. Informes de Conferencias, Cursos y Reuniones. Documento no. 8.) (149)

Foram analisados os resultados de investigações microclimáticas de temperatura do ar, umidade do ar, déficit de saturação e temperatura do solo, em reserva de floresta do Instituto de Pesquisa Agropecuária do Norte (IPEAN) em Belém, Pará, onde são encontradas formações vegetais de florestas de várzea, igapó e terra firme.

Para os diferentes tipos de mata existentes na reserva, foram analisados os gradientes verticais e horizontais de temperatura e umidade do ar e o comportamento térmico e higrídico de um dia seco e um dia úmido.

Todos os elementos climáticos foram comparados aos dados obtidos em área descoberta, provenientes do Posto Meteorológico do IPEAN, localizado próximo da reserva, e a outras áreas de florestas úmidas tropicais.

Os dados apresentados de temperatura e umidade referem-se a maio de 1968 a abril de 1969, os de temperatura de solo datam de novembro de 1972 a fevereiro de 1973. — (T. X. B., F. B. P. y T. D. de A. S. D.).

BARRONS, K. C. Some ecological benefits of woody plant control with herbicides. *Science* 165(3892):465-468. 1969. (150)

BARROS, R. S. Periodicidade de crescimento vegetativo do café. In *Seminário sobre Ecologia Tropical*, Itabuna, Brasil, 1972. In *forme*. Turrialba, Costa Rica, IICA - TROPICOS, 1974. (En prensa). (151)

BAYNTON, H. W. The ecology of an elfin forest in Puerto Rico. III. Hilltop and forest influences on microclimate of Pico del Oeste. *Journal of the Arnold Arboretum* 50(1): 80-92. 1969. (152)

Rainfall on Pico del Oeste, although twice as frequent by night, is only half as intense as during the day. Rain is mainly orographic by night and convective by day.

Trunk flow accounts for 21 percent of the rainfall.

The canopy has a storage capacity equal to a depth of 0.035 inches or 886 ml/m².

On the average, water extracted from the clouds by the foliage is slightly less than 10 percent of rainfall.

Winds are strongest at night and weakest during the afternoon. — (H. W. B.).

RAZAN, R. et al. Estudio comparativo sobre la productividad de ecosistemas tropicales bajo diferentes sistemas de manejo. In *Reunión Técnica de Programación sobre Investigaciones Ecológicas para el Trópico Americano*, Maracaibo, Venezuela, 1973. Informe. Maracaibo, IICA-TROPICOS, Facultad de Agronomía, Universidad del Zulia, 1973. p. irr. (IICA. Informes de Conferencias, Cursos y Reuniones. Documento no. 8). (153)

BENACCHIO, S. Sugerencia para la aplicación de la ecología en la agricultura del trópico. In *Reunión Técnica de Programación sobre Investigaciones Ecológicas para el Trópico Americano*, Maracaibo, Venezuela, 1973. Informe. Maracaibo, IICA-TROPICOS, Facultad de Agronomía, Universidad del Zulia, 1973. p. irr. (IICA. Informes de Conferencias, Cursos y Reuniones. Documento no. 8). (154)

BLACK, C. C. Ecological implications of dividing plants into groups with distinct photosynthetic production capacities. *Advances in Ecological Research* 7:87-144. 1971. (155)

BLAIR, F. Problemas ecológicos de América Latina. *Lavoura (Brasil)* 74:14-17. 1971. (156)

BLASCO, M. La planificación de las estaciones experimentales en relación a las zonas de vida humana y vegetal de la región Andina. In *Seminario Regional sobre Gestión de Centros de Investigación Agrícola*, Lima, 1973. Informe. Lima, IICA - Z.A. Escuela Superior de Administración Pública del Perú, 1973. Documento C-3-2. (157)

BLYDENSTEIN, J. El clima y los pastizales naturales en América del Sur. Turrialba, (Costa Rica) 22(3):258-262. 1972. (158)

La descripción climática y la selección de los criterios para su clasificación pone énfasis en las características que influyen el desarrollo de los pastizales en su aspecto de producción de forraje a través del año entero. Como es de esperar, los pastizales más produc-

tivos se encuentran bajo condiciones húmedas con una precipitación bien distribuida en el año y sin estación muy fría. Los pastizales tropicales, tanto las sabanas de tierra caliente como los pastizales de altura, se encuentran bajo un régimen climático más comparable con la zona semi-árida del clima templado, con una característica época seca durante parte del año.

Estos efectos tienen una incidencia importante sobre el potencial productivo de los pastizales como recurso forrajero para la ganadería. — (J. B.).

BREWER-CARIAS, Ch. Observaciones sobre el nicho ecológico de *Heliamphora*; planta carnívora del cerro de la Neblina. *Natura* (Venezuela) no. 48-49:4-7. 1972. (159)

_____. Plantas carnívoras del cerro de la Niebla. *Defensa de la Naturaleza* (Venezuela) 2(6):17-21, 23-26. 1973. (160)

BRINKMANN, W. L. F. y SANTOS, A. DOS. Natural waters in Amazonia. III. Ammonium molybdate-reactive silica. *Amazonia* (Brasil) 2(4):443-448. 1970. (161)

Natural waters of the Amazonian Tertiary formations along the Manaus-Itacoatiara Road were studied with respect to variations in average seasonal and yearly soluble silica content. In general the variations are small and concentrations very low, for all input fractions, i.e., rainfall, stemflow, and throughfall (about 90 percent of the total (470 analyses) lower than 1.0 mg/l). While 90 percent of total ground water analyses (excluding well IV 3) have soluble silica concentrations lower than 1.5 mg/l, high rain forest stream waters are slightly higher (90 percent of all values lower than 2.0 mg/l). The Rio Negro waters show 90 percent of the total samples analyzed between 2.0 mg/l and 3.0 mg/l soluble silica. — (W. L. F. B. y A. dos S.).

_____. y SANTOS, A. DOS. Natural waters in Amazonia. V. Soluble magnesium properties. *Turrialba* (Costa Rica) 21(4):459-464. 1971. (162)

Na região terciária Amazônica, próximo a

Manaus, as principais fontes de magnésio nas águas naturais são a água que escorre pelos troncos e a água total da floresta.

Os teores de magnésio resultam da "lavagem" das copas, folhas, cuales e brotos pela água da chuva e, até certo ponto, da dissolução de produtos metabólicos de macro e microorganismos.

Nas águas do solo foi encontrado algum magnésio mas na água da chuva e nos regatos só foram encontrados traços de magnésio.

O magnésio pode ser encarado como elemento circulante no sistema fechado da floresta tropical úmida.

Em comparação com os teores de magnésio encontrados em água naturais por todo o mundo, os teores encontrados nas águas circulantes da Amazônia terciária são extremamente baixos. — (W. L. F. B. y A. dos S.).

BRINKMANN, W. L. F., WEIMAN, J. A. y RIBEIRO G., M. N. Air temperatures in Central Amazonia. I. The daily record of air temperatures in a secondary forest near Manaus under cold front conditions (July 4 th, to July 13 th, 1969). *Acta Amazonica* (Brasil) 1(2):51-56. 1971. (163)

No período de 3 a 14 de julho de 1969 a temperatura do ar foi medida em duas altitudes em uma capoeira da Reserva Florestal Ducke, Estrada Manaus-Itacoatiara (Km - 26). Do dia 10 até o dia 13 a temperatura foi influenciada por uma onda fria (friagem) caída no local e cujo desenvolvimento foi observado por satélite (fotografado). No início da friagem, a temperatura baixou nos dois níveis até 15°C voltando após algumas horas a apresentar variações devidas ao movimento turbulento das camadas de ar. — (W. L. F. B., J. A. W. y M. N. R. G.).

_____. y RIBEIRO G., M. N. Air temperatures in Central Amazonia. II. The effect of near-surface temperatures on land-use in the tertiary region of Central Amazonia. *Acta Amazonica* (Brasil) 1(3):27-32. 1971. (164)

Temperaturas máximas e mínimas do ar foram medidas em dez locais diferentes na Amazônia Central, a uma altura de 2 cm acima da superfície do solo. Como resultado destas medidas foram determinadas três tipos de temperatura, sendo que cada uno dos três tipos apresentam influencias específicas para a agricultura,

silvicultura e pecuária em relação aos tipos de solos. Estas investigações foram realizadas em latossolos e solos arenosos, visto que, esses dois tipos cobrem aproximadamente 90% dos solos da Estrada Manaus-Itacoatiara.

Nos latossolos, os resultados obtidos demonstram que sem considerar outros fatores limitantes, as queimadas em grande escala prejudicam até certo ponto o desenvolvimento da agricultura, silvicultura e pecuária havendo por isso mesmo urgentes necessidades de modificar o sistema de exploração.

Sem dúvida alguma, as áreas com areias brancas, não podem ser utilizadas por longo prazo para agricultura, silvicultura e pecuária em grande escala por sofrerem fortes influências da temperatura sem levar em consideração outros fatores limitantes.

Essas áreas no momento são usadas para monoculturas (mandioca e abacaxi) porém em futuro elas devem permanecer conservadas. — (W. L. F. B. y M. N. R. G.).

BRINKMANN, W. L. F. Light environment in tropical rain forest of Central Amazonia. Acta Amazonica (Brasil) 1(2):37-49. 1971. (165)

O autor apresenta um estudo comparativo do fator "luz" em tres tipos de floresta na região central da Amazônia: floresta ribeirinha (floresta da baixa terra firme), carrasco e mata primária.

São discutidas as dificuldades e a complexidade do problema enfatizando-se a importância das correlações entre luz e estrutura da floresta.

É caracterizado o equipamento utilizado e descrito o procedimento seguido para a determinação da intensidade luminosa total, utilizando-se diferentes filtros em 51.840 determinações durante a estação chuvosa e a estação seca, procurando verificar a intensidade luminosa total e espectral em cada stratum e como são aquelas intensidades distribuídas no tempo.

A frequência relativa da intensidade luminosa foi computada em sete classes intensidade e três períodos de tempo por dia. A composição espectral da luz foi determinada como frequência relativa de intensidades por meio de filtros para cinco faixas de comprimento de ondas.

Na floresta ribeirinha foram encontradas as melhores condições de luz e na mata primária foram registrados os valores luminosos mais baixos. O carrasco ocupa uma posição intermediária, com nítida tendência as condições encontradas na mata primária.

Quando a composição espectral da luz recebida pelo stratum ao nível do solo nos três tipos de floresta, foi encontrado um pico de intensidade na faixa 5.950 Å - 7.500 Å, um pico secundário entre 4.420 e 6.440 Å e um terceiro pico, menos importante, entre 3.500 a 5.150 Å. — (W. L. F. B.).

BRINKMANN, W. L. F. y NASCIMENTO, J. C. DE. The effect of slash and burn agriculture on plant nutrients in the Tertiary region of Central Amazonia. Turrialba (Costa Rica) 23(3):284-290. 1973. (166)

Este trabalho foi realizado em uma área experimental de cacau próxima ao km 30 da rodovia Manaus-Itacoatiara.

Foram estudadas as modificações na composição química da camada superficial do solo (até 20 cm de profundidade), em latossolos amarelos (85 por cento da área total da Amazônia Central) e em solos hidromórficos (aproximadamente 1 por cento da mesma área), antes e depois da queima da mata derrubada.

Observou-se que a fertilidade, em condições naturais, é baixa nos dois tipos de solos estudados. Durante a queimada se perdeu um apreciável teor de nutrientes sob a forma de substâncias voláteis e em forma de partículas e, uma grande quantidade de nutrientes foi rapidamente liberada e depositada sobre o solo. Grande parte destes nutrientes, temporariamente disponíveis, foram perdidos por lixiviação, uma vez que a capacidade de absorção das plantas foi insuficiente para aproveitá-los. A disponibilidade atual de nutrientes foi reduzida de forma notável devido a uma fixação sólida.

Conclui-se, com base nos resultados obtidos, que o retorno de nutrientes ocasionado pela queimada não é capaz de garantir a agricultura tropical a longo prazo, sendo necessária a correção do pH e o uso de fertilizantes bem como, é indispensável o uso de herbicidas, inseticidas e fungicidas para reduzir a competição radicular e as proteções do solo contra o impacto dos agentes atmosféricos por meio da utilização de sombreamento, observando-se as exigências da cada cultura. — (W. L. F. B. y J. C. de N.).

_____. y SANTOS, A. DOS. Natural waters in Amazonia. VI. Soluble calcium properties. In Seminario sobre Ecología Tropical, Itabuna, Brasil, 1972. Informe. Turrialba, Costa Rica, IICA-TROPICOS, 1974. (En prensa). (167)

As principais fontes do cálcio encontrado na água na região terciária Amazônica próxima a Manaus, são a água escorrendo sobre os troncos e a água total da floresta. O teor em cálcio solúvel deve ser proveniente da lavagem, pela chuva, da copa, dos cuales, fôlhas e, até um certo ponto, da dissolução de produtos metabólicos de macro-e microorganismos.

A água da chuva, as águas do solo e dos rios geralmente só foram encontrados traços de cálcio pode ser encarado como elemento circulante num sistema fechado. De um modo geral, os teores de cálcio das águas naturais da região terciária Amazônica são extremamente baixos. — (W. L. F. B. y A. dos S.).

BUDOWSKI, G. The distinction between old secondary and climax species in tropical Central American lowland forest. *Tropical Ecology* 11(1):44-48. 1970. (168)

CAMARGO, A. P. DE. Problema climático inexistente. *Coopercotia* 26(232):21, 24-25. 1969. (169)

A discussion on the relation between the "cerrado" vegetation and the climate in Brazil. Studies on the availability of water have indicated that water deficiency is not a characteristic of the "cerrado" - ecology, as has often been suggested. Graphs. Coloured map. — (Royal Tropical Institute, Amsterdam. *Tropical Abstracts* 25(1):11. 1970. no. 41).

CAMARGO, P. N. Falta incentivo ao cerrado. *Coopercotia* 26(232):14-20. 1969. (170)

The "cerrado" lands, covering around 160 million ha in Brazil, are characterized by their vegetation growing on acid soils, which are poor in organic matter and minerals, and have an extreme low water retention and nutrient adsorption capacity. As an incentive for more intensive use of this land it is recommended that government aid should be provided to land owners for the clearing of the land, which is difficult because the trees and shrubs are very deep-rooted. Furthermore, tax-exemption should be introduced for "cerrado" lands in production or in development.

The distribution of "cerrado" lands in Brazil is discussed, and a list of plants growing on the "cerrado" soils is presented.

Table. Map. Photos. — (*Tropical Abstracts* 25(1):11. 1970. no.39).

CAMPOS, J. C. Ch. Considerações sobre o sistema de classificação ecológica proposto por Holdridge. *Revista Ceres (Brasil)* 20(108): 87-96. 1973. (171)

Para se utilizar eficientemente os recursos do meio ambiente é importante conhecer os fatores ecológicos e suas interações. A definição de áreas de condições ecológicas específicas é chamada "zonamento ecológico".

Um sistema, relativamente recente, para classificar regiões ecológicas terrestres foi proposto por Holdridge. Este autor procurou evitar a subjetividade na definição de áreas ecológicas, utilizando dados climáticos quantitativos.

Embora este sistema se baseie, principalmente, na precipitação e biotemperatura, ele também considera fatores fisiográficos, edáficos e a fisionomia da vegetação, sendo considerado de alcance mundial.

Pelo sistema, uma primeira categoria de divisão do meio ambiente é denominada por "zona de vida"; dentro de uma zona de vida pode ocorrer uma ou mais "associações" de plantas. Na identificação de uma associação, a taxonomia das mesmas não é fundamental, mas sim, a sua fisionomia.

O nome da zona de vida é acompanhado pelo nome do piso altitudinal e da região latitudinal, sendo encontrados através de quadro e gráficos apropriados.

A consideração de uma grande classe de amplitude em temperaturas e precipitações, entre os limites das zonas da vida as vezes é apontada como uma das imperfeições do sistema.

E reconhecido, por outro lado, que este sistema contribuiu com inovações para o estudo da ecologia podendo ser apontados como inovações o uso da escala logarítmica, a introdução do conceito de biotemperatura e de linha de geada e o método prático para a determinação da evapotranspiração potencial. — (J. C. Ch. C.).

CANESTRI, V. et al. Diagnóstico de la destrucción de los ecosistemas de manglares en las áreas Tucacas-Chichiriviche (Edo. Falcón) y Carenero (Edo. Miranda). Caracas, Oficina Nacional de Pesca, 1973. 31 p. (Informe técnico no. 61). (172)

Este trabajo se ha concebido con la finalidad de medir el deterioro ecológico en las zonas de manglares causado por la intervención humana sin previa planificación.

Se estudiaron las áreas Tucacas-Chichiriviche (Estado Falcón) y Carenero (Estado Miranda), en las cuales se comprobó la destrucción de 32 Has. de mangle, en forma de relleno, tala y dragado de canales de las mismas, para la construcción de inmuebles con fines recreativos y comerciales.

En un censo realizado al efecto se encontró que en la zona de Tuacas-Chichiriviche hay un total de 711 viviendas, de las cuales 301 están construidas sobre el agua y 410 están en tierra a orillas del manglar. Se observó además que las casas construidas en el agua ocupan un área de 16 Has. de productividad primaria disminuida.

También se pudo apreciar que en los fines de semana hay una descarga potencial de 1.899 metros cúbicos de aguas negras, lo cual pone de manifiesto el alto grado de putrefacción de materia orgánica, detergentes y excrementos, destacándose la presencia de residuos inorgánicos no biodegradables.

En las áreas estudiadas existen 340 vehículos acuáticos propulsados por motores, los cuales rinden una potencia media de 44,900 HP. en 12 horas, en cuya medida contribuyen a la contaminación sónica observada.

Se discuten algunos indicadores de la contaminación biológica, tales como el plancton, los peces coprófagos, los olores nauseabundos, etc. — (V. C. et al.).

CANO, E. La ecología y los análisis de vegetación. In Seminario Regional de Estudios Integrados sobre Ecología, Buenos Aires, 1970. Actas. Montevideo, Oficina de Ciencias de la UNESCO para la América Latina, 1971. pp. 131-137. (173)

CORRALES, F. y GONZALEZ, H. L. Situación actual del recurso pastizal en el Estado de Barinas. In Sosa, R. Welcker, H. y Salom, R. ed. Ganadería en los Trópicos. Caracas, Asociación Venezolana de Criadores de Ganado Cebú, 1973. v. 1., pp. 493-534. (174)

CROAT, T. B. The role of overpopulation and agricultural methods in the destruction of tropical ecosystems. BioScience 22(8): 465-467. 1972. (175)

DARLING, F. Efectos de las actividades del hombre sobre la biosfera. Revista Forestal (Venezuela) no. 15:3-25. 1969. (176)

DAUBENMIRE, R. Phenology and other characteristics of tropical semi-deciduous forest in north-western Costa Rica. Journal of Ecology 60(1):147-170. 1972. (177)

In tropical deciduous trees in north-western Costa Rica leaf flushing is initiated during a period when drought stresses, to which it appears an adaptation, is reaching its peak of severity. In contrast with temperate zone trees, flushing is spread over about 11 months.

Leaf senescence in the tropical forest seems more clearly triggered by drought stress than by daylength. For the forest as a whole there are two flowering seasons, a major and a minor, that correlate with major and minor seasons of drought. Tropical deciduous trees combine entomophily with deciduousness, this showing clearly that both characters did not evolve in response to the same aspect of environment. In the tropical trees dissemination is usually by wind and occurs at the end of the season of lowest vegetative activity, whereas in temperate zone trees dissemination is typically at the end of the vegetative season. In both the tropical and temperate trees, temporary dry-season shrinkage of the trunk varies from negligible in some species to shrinkage that exceeds the net annual increment in others. Dry-season shrinkage seems a genetic character of those tropical trees that have been compared in both upland and riparian habitats. Divestment of leaves gave no special insurance against trunk shrinkage during the dry season in the tropics. In the same trees both flowering and flushing occurred at times when trunk shrinkage indicated high moisture stress. In comparison with the tropical trees, radial growth of those in temperate latitudes is much more rapid and is confined to a shorter segment of the year.

Despite pronounced seasonality of cambial activity in the tropical trees, the xylem of only one species showed fairly distinct annual layers. — (R. D.).

_____. Some ecologic consequences of converting forest to savanna in northwestern Costa Rica. Tropical Ecology 13(1):31-51. 1972. (178)

A year-long study was made in northwestern Costa Rica comparing environments of a tropical semideciduous forest with a contiguous area of derived *Hyparrhenia rufa* savanna which has been burned annually. During the 5-month dry season the savanna soil becomes hard and cracks. Compaction by zebu and horses, coupled with a very sparse invertebrate soil fauna reduce porosity as shown by very different infiltration rates. During the season of maximum leaflessness the forest still intercepts about 33% of solar radiation, whereas the savanna soil is rendered bare and black by fire during this season.

Higher soil temperatures and the annual burning of all shoot production probably account for much of the striking reduction of humus in the savanna soil profile. Soils dried to the wilting point to a depth of over 90 cm in the savanna, but remained moist below 30 cm in the forest. Although chemical analyses showed the savanna soil to be somewhat less fertile by several criteria, there has been no downward movement of clay or other irreversible changes in the profile at the study site, nor were such observed elsewhere in the region. However, there is good evidence of a loss of 11 cm of soil during the 22 years since deforestation, and this erosion appears to be the most significant aspect of environmental deterioration. — (R. D.).

DI CASTRI, F. La revolución ecológica y América Latina. *Bosques (México)* 8(5):10-17. 1971. (179)

DITMER, H. J. Clipping effects on Bermuda grass biomass. *Ecology* 54(1):217-219. 1973. (180)

Clipping Bermuda grass every few days in its first year of growth to keep it at 6 different heights resulted in a variation of weights for both roots and tops in the harvested plants. The higher the grass was permitted to grow the greater the weight of both roots and tops but the root/shoot ratio remained constant at about 40% roots to tops. The dry weight of tops in unclipped plots was about 2.35 times and the roots 2.0 times those in plots maintained at 12 mm. — (H. J. D.).

EDWARDS, A. M. C. y THORNES, J. B. Observations on the Dissolved solid of the Casiquiare and Upper Orinoco, april - june, 1968. *Amazonia (Brasil)* 2(3):245-256. 1970. (181)

EWEL, J. Biomass changes in early tropical succession. *Turrialba (Costa Rica)* 21(1):110-112. 1971. (182)

EXPERT PANEL ON PROJECT No. 1: ECOLOGICAL EFFECTS OF INCREASING HUMAN ACTIVITIES ON TROPICAL AND SUB-TROPICAL ECOSYSTEMS IN THE PROGRAMME ON MAN AND THE BIOSPHERE (MAB), PARIS, 1972. Final Report. Paris, UNESCO, 1972. 35 p. (MAB report series no. 3). (183)

This report is focused on the extent and nature of man's impacts on and interactions with, tropical and sub-tropical forest systems.

The areal scope of the project ranges from evergreen and semi-deciduous forests to open woodlands, though special attention is given to closed formations, particularly the tropical evergreen forests and their derivative and replacement systems. The basic aim of the research proposed is to analyse and provide the means for forecasting the short-term and long-term effects of man on his natural environment in the humid tropics.

From consideration of a number of questions of importance to participating countries and of relevance to the MAB Programme, identification is made of a number of major problem areas and research actions which could valuably comprise the main thrust of the project, namely: evaluation of existing conditions, present uses and ecological changes; impact of land use alternatives on ecosystem fertility; consequences of loss of biological diversity; effects of human settlements; epidemiological impacts of land usages; effects of land manipulation on cultural and behavioural characteristics of human populations; development of procedures for optimization and prediction. Where feasible and appropriate, indication is made of research actions that all countries can undertake. While requiring a minimum of effort and expense, these actions should be of importance nationally and should also provide for comparison at the regional level, thus facilitating the transfer of experience and increased relevance of ecological research in tropical regions. Finally, outline suggestions

are given on the main logistic requirements for implementation of the project, and on the relations of the project to other international programmes and organizations.

FALESI, I. C. Solos da Rodovia transamazonica. In Seminario sobre Ecologia Tropical, Itabuna Brasil, 1972. Informe. Turrialba, Costa Rica, IICA-TROPICOS, 1974. (En prensa). (184)

FITTKAU, E. J. Limnological conditions in the headwater region of the Xingú river Brasil. Tropical Ecology 11(1):21-25. 1970. (185)

The drainage basin of the Rio Xingú in Central Brazil differs from those of the other tributaries of the Amazon. On a reduced scale, we find here a facsimile of the geomorphology and landscape ecology of the Amazon region as a whole. Low mountains at the periphery enclose a central plain which is overlaid with tertiary and pleistocene sediments. The rivers arising in the peripheral mountains have excavated broad valleys in these soft sediments, and deposit contrasting recent sediments in them to from a landscape comparable to the "várzea" of the Amazon. The numerous, very, large, lake-like lagoons set into these lowlands remember of the várzea lakes of the lower Amazon. Rivers which come from the peripheral areas and overflow into the várzea are relatively electrolyte-rich having a pH over 6 and rich aquatic flora and molluscan fauna. Rivers which come from the tertiary and pleistocene sediments of the central plain, however, are electrolyte-poor, with pH's from 4.5 to 5.5. These have poor aquatic flora and, in general, no mollusks with calcareous shells. They are comparable to the lotic waters of the central Amazonian area.

The source-area of the Xingú lies at the southern edge of the hylaea. An open rain forest occupies the old unflooded sediments of the plain. In the várzea, we find low-lying flooded, shore forest, and broad grasslands. The higher-lying peripheral areas are covered by "cerrado". The tributary streams are there surrounded by gallery forests. On the southern, bordering plateau, which is the watershed between the Rio Amazonas, the Rio Tocantins, the Rio Paraguai, and the Rio Paraná system, lagoons without outlets occur which usually dry up each year. These are typical of central Brazil, but do not occur in the Amazon drainage basin. — (E. J. F.).

FOERSTER, J. W. The ecology of an elfin forest in Puerto Rico. XIV. The algae of Pico del Oeste. Journal of the Arnold Arboretum 52(1):86-109. 1971. (186)

The cloud forest can be likened to a large natural culture unit having uniformly constant meteorological conditions, and, judging from the relatively large number of species found, adequate nutrients. Though all would appear uniform at the first casual investigation, careful analysis indicates that the subaerial algal epiphytes are not uniformly distributed, but are segregated into phyco-synusia. These seem to be microhabitats related to height above the ground and type of host material. The data depict an apparent random horizontal distribution but a less random vertical pattern of distribution.

This vertical distribution and apparent seasonal succession pattern appears related to slight changes in meteorological conditions. Samples taken higher on a tree trunk during drier months contain fewer species than those collected closer to the ground.

The probability exists that epiphytes located higher above the ground are subjected to greater fluctuations in temperature, moisture, and light.

However, the lower parts of a tree trunk are older and perhaps more stable chemically. Further, during wetter months the species count on the host appears to be rearranged and seasonal species variation appears.

During this period increased cloud cover and fog reduce light penetration which may be instrumental in this change.

Subaerial epiphytic algal growth in all samples studied, and especially on the four principle vascular host species in the Luquillo elfin forest on Pico del Oeste, appears not as a uniformly distributed algal veneer, but rather as associations of species representing various intergrading microhabitats. — (J. W. F.).

FORDHAM, R. y MURRAY, D. B. Ecological research on cacao in Trinidad. In Seminario sobre Ecologia Tropical, Itabuna, Brasil, 1972. Informe. Turrialba, Costa Rica, IICA-TROPICOS, 1974. (187)

FORTESCUE, J. A. C. y MARTEN, G. G. Micro-nutrients forest ecology and systems analysis. In Reichle, D. E. ed. Analysis of temperate forest ecosystems. New York, Springer-Verlag, 1970. pp. 173-198. (188)

FOURNIER O., L. A. Observaciones preliminares sobre la variación altitudinal en el número de familias de árboles y de arbustos en la vertiente del Pacífico de Costa Rica. Turrialba (Costa Rica) 19(4):548-552. 1969. (189)

This paper is a preliminary report on the altitudinal distribution of the families of trees and shrubs from the Pacific watershed of Costa Rica.

The number of families occurring at each altitudinal belt decreases above 1500 m, and only approximately a seventh of the total number of families is present above 3000 m.

It was found that the largest number of families occurs from about 1000 m to 1500 m above sea level, a part of the country has the widest variety of annual and perennial crops and also the one with the largest human population.

Most families with a wide altitudinal range of distribution are large families; however, some small families have species with range of tolerance to altitudinal changes.

— (L. A. F. O.).

FRENKEL, R. E. Treading vegetation on Costa Rican fields, Berkeley, University of California, 1970. 63 p. (190)

FULFORD, M., CRANDALL, B. y STOTLER, R. The ecology of an elfin forest in Puerto Rico. XI. The leafy Hepaticae of Pico del Oeste. Journal of the Arnold Arboretum 51(1):56-69. 1970. (191)

_____, CRANDALL, B. y STOTLER, R. The ecology of an elfin in Puerto Rico. XV. A study of the leafy hepatic flora of the Luquillo mountains. Journal of the Arnold Arboretum 52(3):435-458. 1971. (192)

GARCIA BENAVIDES, J. Zonificación de Phaseolus vulgaris en función de su régimen hídrico. Agronomía Tropical (Venezuela) 19(3):197-203. 1969. (193)

Se presentan los índices agroclimáticos del Phaseolus vulgaris, que corresponden a la intensidad de la humedad y de la sequedad. Se

analizan las épocas de siembra propicias, la variabilidad de esas épocas y los años negativos en el campo experimental del Centro de Investigaciones Agronómicas (Maracay), para un período de 15 años, indicando el método seguido y la posibilidad de la zonificación del cultivo de acuerdo a dicho método para grandes regiones. — (J. G. B.).

GARCIA BENAVIDES, J. y CANET, B. C. Zonificación ecológica para el cultivo de la nuez en Costa Rica (Macadamia sp.). San José, Costa Rica, Departamento de Diversificación Agrícola, IICA, 1972. 18 p. (194)

GATES, D. M. The ecology of an elfin forest in Puerto Rico. IV. Transpiration rates and temperatures of leaves in cool humid environment. Journal of the Arnold Arboretum 50(1):93-98. 1969. (195)

GILL, A. M. The ecology of an elfin forest in Puerto Rico. VI. Aerial roots. Journal of the Arnold Arboretum 50(2):197-209. 1969. (196)

In the humid conditions of the Puerto Rican elfin forest many freely hanging aerial roots are found on the trees, shrubs, vines, and herbs. Those of the trees and shrubs are not found in the leafy zone of the shoot system and lateral root development in the absence of injury is rare. In contrast the aerial roots of the vines and herbs arise in definite morphological positions within the leafy zone of the shoot system, and more commonly develop laterals in the absence of injury. Patterns of lateral root development may be distinctive, but other properties of the root tips such as color, rigidity, alignment, diameter and the presence of secretions, may also contribute to the character of the aerial roots of the various species. — (A. M. G.).

GILMARTIN, A. J. Transandean distributions of Bromeliaceae in Ecuador. Ecology 54(6): 1389-1393. 1973. (197)

The distributions of members of the tropical plant family Bromeliaceae with their soil-nutrient independence are especially linked to microclimate and are valuable indicators of

microclimatic regimes. Meteorological records show that the annual rainfall on the eastern slopes of the Ecuadorian Andes is higher and more evenly distributed than on the western slopes, which receive very little precipitation during several months of the year. Seventeen of the 249 Ecuadorian species of Bromeliaceae are known from collection records to be distributed on both the eastern and western slopes of the Andean Cordillera.

On the eastern slopes, individuals of these species have been consistently collected at lower altitudes than on the western slopes. The more even distribution of precipitation throughout the year and the smaller range in relative humidity on the eastern slopes is apparently responsible for the strikingly lower elevations of the species' distributions on most of the eastern slopes. — (A. J. G.).

GINEZ, A. R., FARIÑAS, M. R. y GIL BEROES, R. A. Estudio ecológico y control químico de malezas dicotiledoneas (hojas anchas) en pastizales naturales. Boletín Sociedad Venezolana de Ciencias Naturales 30(124-125):13-22. 1972. (198)

GOLLEY, F. B. et al. The structure of tropical forest in Panama and Colombia. BioScience 19(8):693-699. 1969. (199)

_____, McGINNIS, J. T. y CLEMENTS, R. G. La Biomasa y la estructura mineral de algunos bosques de Darién Panamá. Turrialba (Costa Rica) 21(2):189-196. 1971. (200)

Forest ecosystems in Darien Province, Panama, were sampled for biomass and mineral content. Biomass of living vegetation was unusually large.

For example, in flooded forests the biomass was 1,189 metric ton/ha.

Premontane forest had the lowest biomass of 284 metric ton/ha. Study of 13 mineral elements in the total ecosystem showed calcium, potassium, and magnesium occurred in greatest quantities. The per cent of the mineral inventory in the vegetation, as compared to the soil to 30 cm depth, varied by forest and element. — (F. B. G., J. T. McG. y R. G. C.).

GOLLEY, F. B. et al. Mineral cycling in a tropical forest. University Georgia, 1971? (201)

GONZALEZ, H. L. y TRUJILLO, A. E. Malezas del ecosistema pastizal de los Llanos Occidentales y del Estado Apure. In Sosa, R. ed. Ganadería en los Trópicos. Caracas, Asociación Venezolana de Criadores de Ganado Cebú, 1973. v. 2., pp. 15-52. (202)

El presente trabajo se refiere a un grupo de experiencias realizadas por el grupo de pastizales del Proyecto MAC-FAO-VEN. 17, en los Llanos Occidentales de Venezuela en el aspecto de identificación de malezas, su cuantificación, su control y combate en pastizales. Los diagnósticos realizados a nivel de sectores y de fincas revelan que aproximadamente el 25% del área dedicada al pastoreo está ocupada por especies "indeseables". Se describen las principales especies de malezas desde el punto de vista botánico y agronómico, refiriéndose también a su habitat y a su importancia desde el punto de vista económico. Considerando la abundancia y el hábito, encontramos que del conjunto de más de setenta especies descritas en 24 familias como malezas importantes, las siguientes: Estoraque (Vernonia brasiliana), Flor de Barinas (Cassia aculeata), Mastranto (Hyptis suaveolens) Escoba (Sida spp.), Arestín (Mimosa pigra) y el Platanico (Thalia geniculata) representa la casi totalidad del problema en el ecosistema considerado. Los ensayos efectuados a nivel de finca en toda el área del Estado, arrojaron resultados positivos en el control de especies indeseables en potreros; resultados similares de trabajos realizados en Colombia y Venezuela nos permiten sugerir una serie de medidas que se describen y se discuten. Entre otras prácticas, se sugiere para el manejo adecuado del pastizal: tratamientos mecánicos, herbicidas, fertilizantes, quema y principalmente combinaciones de estas prácticas, dirigidas todas a un control efectivo de las malezas en potreros para una mayor productividad del pastizal. Al final se presentan tablas de costos de prácticas u de operaciones y un ejemplo práctico para guiar a los interesados a decidir y a estimar sus costos posibles. — (H. L. G. y A. E. T.).

GONZALEZ, V. Aspectos ecológicos de la Gran Sabana. In Reunión Técnica de Programación sobre Investigaciones Ecológicas para el Trópico Americano, Maracaibo, Venezuela, 1973. Informe. Maracaibo, IICA-TROPICOS, Facultad de Agronomía, Universidad del Zulia, 1973. p. irr. (IICA. Informes de Conferencias, Cursos y Reuniones. Documento no. 8). (203)

GOODLAND, R. A Physiognomic analysis of the cerrado vegetation of central Brasil. Journal of Ecology 59(2):411-419. 1971. (204)

Cerrado shows a floristically and geographically fairly uniform physiognomic gradient, varying from herbaceous, grassy, shrubby vegetation, through 'orchard' and woodland almost to forest. This gradient was sampled using the 'point-quarter' method in 110 stands in the Triângulo Mineiro, and the results were subsequently compared with the indigenous classification which proved to be closely related. Four intergrading categories were codified: campo sujo: with trees to 3 m, 849/ha, 29 800 cm² basal area per hectare (BA/ha), approximately thirty-one tree and sixty herb species; campo cerrado: trees to 4 m, 1408/ha, 76 100 cm² BA/ha, thirty-six tree and fifty-three herb species and a canopy of 3%; cerrado (sensu stricto): trees to 6 m, forming a canopy of 19% 2253/ha and 167 600 cm² BA/ha, forty-three species and forty seven herbs; "cerradão": trees to 9 m, canopy of 46% 3215 trees/ha, 312 800 cm² BA/ha, fifty-five tree and forty-two herb species, on the average. — (R. G.).

GOODLAND, R. y POLLARD, R. The brazilian cerrado vegetation: a fertility gradient. Journal of Ecology 61(1):219-224. 1973. (205)

The physiognomic gradient of cerrado vegetation from stands of small, widely scattered trees through 'orchard', to well-developed woodland in Central Brazil has here been found to parallel a soil fertility gradient.

The basal area of trunks per hectare measured on 110 stands in the Triangulo Mineiro region was found to be correlated at the 0.1% level with P, N, and K measured in the soils of the same stands. — (R. G. y R. P.).

GUERRERO, R. Seminario de FAO sobre territorios amazónicos de Brasil, Venezuela y Colombia; Manaus, Brasil, 1972. Informe de Comisión ICA. Bogotá, Instituto Colombiano Agropecuario, 1972. s. p. (206)

HALFFTER, G. Sobre la ecología del Valle de México. Acta Politecnica (México) 12(55): 29-36. 1971. (207)

HARRIS, D. R. The ecology of swidden cultivation in the upper Orinoco rain forest Venezuela. Geographical Review 61(4):475-495. 1971. (208)

HECK, G. A. T. Ecología e economía. Flora (Brasil) 1(1):26-27. 1970. (209)

HOLDRIDGE, L. R. et al. Forest environments in tropical life zones: a pilot study. New York, Pergamon Press, 1971. 747 p. (210)

_____. Ecología de la meliaceas latinoamericanas. In Symposium on Integrated Control of *Hysipyla*. 1^o Turrialba, Costa Rica, 1973. Proceedings. Turrialba, Costa Rica, IICA-CTEI, 1973. Documento no. 16. (211)

Muchas veces los problemas de plagas o pestes en plantaciones han recibido demasiado énfasis con el resultado que los productores no piensan más que en los controles químicos o biológicos. Se olvidan a veces que un organismo más fuerte es generalmente más resistente a los ataques de parásitos. Para producir plantaciones de árboles fuertes y resistentes hay que plantarlos en condiciones de clima y suelo que sean satisfactorias para el crecimiento de la especie o las especies. También hay que recordar que la mayoría de los rodales naturales de árboles en los trópicos son de muchas especies. Es posible que unas especies que tienen mal comportamiento en plantaciones sean excelentes si son manejadas en bosques mezclados. Como el estudio de los factores ambientales se llama ecología, vamos a explorar un poco la ecología o requisitos ecológicos de los árboles de la familia MELIACEAE que crece en las Américas... (L. R. H.).

HOWARD, R. A. The ecology of an elfin in Puerto Rico. VIII. Studies of stem growth and form and of leaf structure. *Journal of the Arnold Arboretum* 50(2):225-267. 1969. (212)

_____. The ecology of an elfin forest in Puerto Rico. X. Notes on two species of Maregravia. *Journal of the Arnold Arboretum* 51(1):41-55. 1970. (213)

HUTCHEON, W. V. Some physiological factors to be taken into account in relating the growth and behaviour of cacao to the environment. In *Seminario sobre Ecología Tropical, Itabuna, Brasil, 1972. Informe. Turrialba, Costa Rica, 1974. (En prensa)*. (214)

Various approaches to the study of cacao ecophysiology are discussed, and their limitations considered. The main complicating factors in relating the behaviour of cacao to environmental factors are thought to be as follows: difficulties in describing the micro-environment of the whole tree; the existence of correlations between environmental factors in the field; the many influential and interacting factors affecting certain processes; internal factors, lag effects and the fact that sequences of environmental changes may induce certain responses.

Environmental factors believed to affect the various developmental processes of cacao are discussed in the light of work in Ghana and elsewhere. In view of the mutual benefits to each other of ecological and physiological studies, it is thought that more consideration should be given to the physiological conditions and processes occurring in a chain of events between the primary environmental factors and the ultimate plant response. — (W. V. H.).

IGBOZURIKE, M. U. Ecological balance in tropical agriculture. *Geographical Review* 61(4):519-529. 1971. (215)

INTERNATIONAL CO-ORDINATING COUNCIL OF THE PROGRAMME ON MAN AND THE BIOSPHERE (MAB), PARIS, 1971. Final Report. Paris, UNESCO, 1972. 65 p. (MAB report series no. 1). (216)

Ecological effects of increasing human activities on tropical and subtropical forest ecosystems.

JANZEN, D. H. Association of a rainforest palm and seed-eating beetles in Puerto Rico. *Ecology* 53(2):258-261. 1972. (217)

The scolytid beetle Cocotrypes carpophagus may attack as many as 100% of the seeds of the common Puerto Rican rainforest palm Euterpe globosa by the end of the fruiting season when the population densities of the beetle are at their maximum. At the beginning of fruit fall, the percentage attack is extremely small. It is hypothesized that the build-up of this seed predator on the crop each year is the selective force producing the strong inter-tree fruiting synchrony displayed by E. globosa. Further, this synchrony appears to prevent the beetle from depressing the palm population density to the low level characteristic of most tropical trees. It is also hypothesized that such a beetle-palm interaction could not occur on the mainland of Central America owing to the difficulty of satiating the large mainland community of vertebrates and insects that prey on palm seeds. — (D. H. J.).

JANZEN, D. H. Escape in space by Sterculia apetala seeds from the bug Dysdercus fasciatus in Costa Rica deciduous forest. *Ecology* 53(2):350-361. 1972. (218)

When a seed of the large tree Sterculia apetala falls to the ground beneath the parent tree in a Costa Rican tropical deciduous forest, it is typically found and fed upon within a few minutes by cotton-stainer bugs (Dysdercus fasciatus). The rate of seed discovery by the bugs is highest where the seed fall is most intense and tapers off to zero between 30 and 60 m from the tree trunk. Seeds that fall beneath the parent appear to have no chance of survival under forested conditions. Seeds in open pasture are not found by the bugs, but probably die of desiccation. The bugs are not present under sterile S. apetala trees. Squirrels and monkeys appear to be the primary dispersal agents: after carrying the pods away from the parent, they appear to lose some seeds because of their face hands being stuck by the hairs on the inner walls of the seed pods. The coevolution of the Dysdercus - Sterculia-mammal interaction is discussed with

respect to the effect of seed predators on the density of adult trees in the habitat. — (D. H. J.).

JORDAN, C. F. *et al.* Tritium movement in a tropical ecosystem. *BioScience* 20(14): 807-812. 1970. (219)

_____. Productivity of a tropical forest and its relation to a world pattern of energy storage. *Journal of Ecology* 59(1): 127-142. 1971. (220)

Production of a young secondary successional plant community and an older mature stand were measured in the tropical forest of the Luquillo Mountains of Puerto Rico. Production of both communities was relatively low, probably because of limited solar energy input into the forest.

Rate of wood production and rate of leaf and litter production of plant communities throughout the world were compared. Annuals have the highest rate of leaf and litter production, and often the highest rate of total production. Leaf and litter production is relatively uniform in perennial herb and grass, and tree communities. Rates of wood production by trees is similar throughout the world, but efficiency of wood production is higher in northerly latitudes. In areas where solar energy is limited, there may be a selective advantage in producing wood as efficiently as possible. — (C. F. J.).

_____. y KLINE, J. R. Mineral cycling: some basic concepts and their application in a tropical rain forest. *Annual Review of Ecology and Systematics* 3:33-50. 1972. (221)

JUNK, W. Investigations on the ecology and production-biology of the "floating meadows" (*Paspalo echinochloetum*) on middle Amazon. I. The floating vegetation and est ecology. *Amazoniana (Brasil)* 2(4):449-495. 1970. (222)

Investigations on the "floating meadows" (*Paspalo-echinochloetum*) of the várzea-region of central Amazonia in the surroundings of Manaus were made from May 1967 until October

1968. The ecology of the dominating species *Paspalum repens* Berg, *Paspalum fasciculatum* Willd., *Echinochloa polystachya* (H. B. K.) Hitchcock, *Leersia hexandra* Swart (Fam. Gramineae) and diverse subsidiary species (*Oryza perennis* Moench, *Hymenachne amplexicaulis* (Rudge) Nees, *Panicum chloroticum* Nees (Fam. Graminae), *Scripus cubensis* Poepp Kunth. (Fam. Cyperaceae) etc., was studied in details.

Regarding *Paspalum repens* Berg, various floating and one terrestrial forms of growth were observed. Further, quantitative investigations on primary production and the development of populations of this species were made. As shown by 4 *Paspalum repens* populations which were growing under different environmental conditions, conclusions on age and rapidity of growth of the population could be drawn from the relation between quantity of stems and number of shoots.

The preliminary conditions for a "secondary colonization" of floating populations by non-floating plants and the repercussions of such sort of colonization on the primary populations are discussed.

The várzea-waters are subdivided into 3 biotopes with regard to the floating vegetation, and the factors responsible for them are discussed:

1. Bank- and sedimentation-zones in the Solimões-Amazon.
Dominating species: *Paspalum fasciculatum*, *Paspalum repens*, *Echinochloa polystachya*.
2. Várzea lakes with high fluctuations of water level.
Dominating species: *Paspalum fasciculatum*, *Paspalum repens*, *Echinochloa polystachya*. Sometimes, however, as well all other mentioned species occur in masses. Biotope richest in species.
3. Várzea lakes with relatively little fluctuations of water level.
Dominating species: *Leersia hexandra*, *Scripus cubensis*, *Paspalum repens*.

Both the current-region of the Solimões - Amazon as a biotope of its own and the influence of black-water on the vegetation are discussed. — (W. J.).

KLINE, J. R. *et al.* Measurement of transpiration in tropical trees with tritiated water. *Ecology* 51(6):1068-1073. 1970. (223)

The measurement of transpiration of water

by trees in the field with tritiated water as a tracer depends upon a new application of established theory of radionuclide dynamics in steady-state systems.

The techniques required are non-destructive to the trees and probably have negligible disturbing effects on transpiration. Average transpiration rates ranging from 1.75 to 372 liters per day tree were measured by the proposed method on tropical forest trees which ranged from the understory to the canopy in size. Statistical errors range from 12.1% on the largest tree to 6.2% on the smallest for one standard deviation.

Non-random sources of error in the method may include (1) loss of tritium from leaves due to rainfall; and (2) possible enrichment of tritiated water in leaves due to differences in vapor pressure and molecular diffusion coefficients between tritiated water and ordinary water.

These require further experimental evaluation. The method may be generally applicable to field measurements of transpiration in trees. — (J. R. K. et al).

KNIGHT, D. H. A field guide to the trees on Barro Colorado Island. Panama, C.Z., Wyoming and the Smithsonian Tropical Research Institute, 1970. 94 p. (224)

KÜCHLER, A. W. y MONTOYA M., J. M. The UNESCO classification of vegetation some test in the tropics. Turrialba (Costa Rica) 21(1): 98-109. 1971. (225)

En Costa Rica se llevó a cabo una evaluación de la clasificación de la vegetación de la UNESCO, con la finalidad de establecer sus cualidades y validez en medio tropical.

Se discute la necesidad de hacer una evaluación, así como del método empleado para ese fin. Durante el trabajo de campo que cubrió un amplio rango de medios del país, a fin de incluir la mayor cantidad de tipos de vegetación, se emplearon registros fitocenológicos.

La base para juzgar la clasificación fue la de ubicar las observaciones de campo en el esquema de la clasificación y ver el grado de correlación que existía entre las categorías asignadas y las observaciones de campo.

Los resultados indican que la clasificación cumple bastante bien con la finalidad para la cual fue elaborada, pero sin embargo requiere de algunas modificaciones y revisiones.

Observaciones realizadas en Venezuela, en términos generales, confirman los resultados obtenidos en Costa Rica. — (A. W. K. y J. M. M.).

LAMBERTI, A. Contribuição ao conhecimento da ecología das plantas do manguezal de Itanhaen. Botânica (Brasil) no. 23:1-217. 1969. (226)

Por mangal ou manguezal entendemos um grupo de plantas desenvolvendo-se na zona litorânea, em substrato plano, lodoso, bordejando estuários, enseadas, lagoas, baías etc.

O termo castelhano "manglar" e o francês "palétuvier" correspondem a manguezal mangue ou "magrove".

A falta de investigações ecológicas sobre as plantas dos manguezais brasileiros foi uma das razões que nos impeliram a iniciar, com este trabalho, uma série de pesquisas que possibilitem um melhor conhecimento dessa vegetação.

Ofrecemos agora o nosso trabalho sobre o manguezal de Itanhaém, com informações sobre o ambiente climático e edáfico, a vegetação, a morfologia e a anatomia dos principais componentes da vegetação, o teor salino das folhas e do solo e, principalmente, dados sobre o balanço hídrico das principais espécies.

A parte experimental deste trabalho foi desenvolvida no anos de 1962 a 1964, no curso de quase todos os meses. — (Extractado de la Introducción. A. L.).

LANDI, M. Relevamiento ecológico en el estudio integral a nivel de establecimientos. In Seminario Regional de Estudios sobre Ecología, Buenos Aires, 1970. Actas. Montevideo, Oficina de Ciencias de la UNESCO para América Latina, 1971. pp. 269-276. (227)

LEDoux, P. y LOBATO, R. C. Investigações de Bio-ecología experimental sobre uma população de Minquartia guianensis Aublet (Fam. Olacaceae). In Simposio Internacional sobre Plantas de Interés Económico de la Flora Amazónica, Belém, 1972. Turrialba, Costa Rica, IICA-TROPICOS, 1974. (En prensa). (228)

LYFORD, W. H. The ecology of an elfin forest in Puerto Rico. VII. Soil root, and earthworm relationships. *Journal of the Arnold Arboretum* 50(2):210-224. 1969. (229)

Soil on the steep narrow ridge of Pico del Oeste is wet and the mucky surface, 25 to 30 centimeters thick, has about 50 percent organic matter.

Fallen tree leaves, on which grow liverworts and algae, lie on a layer of clean roots and these in turn are on and in the soil. Tree stems and branches are blanketed with liverworts, algae, and other epiphytes, and the amount of organic matter on the stems per unit area approximates that on the surface of the soil. Soil-like material occurs on the stems and branches of trees. Some may be carried up from the soil by fauna. Large earthworms up to 60 centimeters long and 1 centimeter in diameter are common in the soil ingest and move large amounts of it. — (W. H. L.).

McARTHUR, R. H. Patterns of communities in the tropics. *Journal of the Linnean Society (Biol.)* 1:19-30. 1969. (230)

McGINNIS, J. et al. Elemental and hydrologic budgets of the Panamanian Tropical moist forest. *BioScience* 19(8):697-700. 1969. (231)

MEDINA, E. Ecofisiología vegetal: aspectos teóricos y aplicados. *Boletín Sociedad Venezolana de Ciencias Naturales* 30(124-125):91-114. 1972. (232)

MEGGERS, B. J., AYENSU, E. S. y DUCKWORTH, W. D. ed. *Tropical forest ecosystems in Africa and South America: A comparative review.* Washington, D. C., Smithsonian Institution Press, 1973. 350 p. (233)

MELLO, M. O. DE A. et al. Contribuição ao estudo da flora madeireira do Estado da Bahia. *Boletim Instituto Biológico da Bahia (Brasil)* 8(1):37-47. 1970. (234)

MERIDA. UNIVERSIDAD DE LOS ANDES, FACULTAD DE CIENCIAS FORESTALES. Programa de investigación de ecología forestal en la Facultad de Ciencias Forestales. In *Reunión Técnica de Programación sobre Investigaciones Ecológicas para el Trópico Americano*, Maracaibo, Venezuela, 1973. Informe. Maracaibo, IICA-TROPICOS, Facultad de Agronomía, Universidad del Zulia, 1973. p. irr. (IICA. Informes de Conferencias, Cursos y Reuniones. Documento no. 8). (235)

MONDOÑEDO, J. R. Algunos aspectos ecológicos en la producción de hortalizas. In *Seminario Regional sobre Horticultura con énfasis en Olericultura*, Guatemala, 1973. Guatemala, IICA, 1973. p. irr. (IICA. Informes de Conferencias, Cursos y Reuniones no. 15). (236)

MONTEITH, J. L. Dry matter production. In *Seminario sobre Ecología Tropical*, Itabuna, Brasil, 1972. Informe. Turrialba, Costa Rica, IICA-TROPICOS, 1974. (En prensa). (237)

_____. Evaporation and plant water relations. In *Seminario sobre Ecología Tropical*, Itabuna, Brasil, 1972. Informe. Turrialba, Costa Rica, IICA-TROPICOS, 1974. (En prensa). (238)

_____. Instrument for measuring weather. In *Seminario sobre Ecología Tropical*, Itabuna, Brasil, 1972. Informe. Turrialba, Costa Rica, IICA-TROPICOS, 1974. (En prensa). (239)

_____. Methods and instruments for measuring the response of plants to weather. In *Seminario sobre Ecología Tropical*, Itabuna, Brasil, 1972. Informe. Turrialba, Costa Rica, IICA-TROPICOS, 1974. (En prensa). (240)

MONTOYA M, J. M. Zonas ecológicas para frijol en América Central, una metodología. In *Reunión Técnica sobre Programación de Investigación y Extensión en Frijol y otras leguminosas de Grano para América Central*, Turrialba, Costa Rica, 1969. Informe. Turrialba, IICA, Centro de Enseñanza e Investigación, 1969. v. 2., pp. 26-34. (141)

MONTOYA M., J. M. y GARCIA B., J. Comparación de dos técnicas para estimar temperaturas medias, con fines agroecológicos, en localidades carentes de registro. Turrialba (Costa Rica) 21(1):112-115. 1971. (242)

Based on thermometric information of 73 meteorological stations in Costa Rica, an evaluation was made of two used techniques to estimate average air temperatures of localities where no weather stations exist.

The first technique consists of calculating the equations of the relation altitude/temperature whereas the second is based on calculation of the median gradient based in drawing rectilinear isotherms, reduced to sea level temperatures.

Statistical analysis indicates that the estimated temperatures obtained by these techniques are highly similar to the observed temperatures of the localities with temperature records ($F = 465.7$ and $F = 678.7$ respectively). The use of the first technique which is less complicated is recommended for regions where temperature records of a reasonable number of stations are available. The second technique is more complicated and is recommended for cases where less information is available. — (J. M. M. M. y J. G. B.).

MORELLO, J. Estudios ecológicos y fitogeográficos para el desarrollo. In Seminario Regional de Estudios Integrados sobre Ecología, Buenos Aires, 1970. Actas. Montevideo, Oficina de Ciencias de la UNESCO para América Latina, 1971. pp. 199-211. (243)

MORI, S. The ecology and uses of the species of Lecythis in Central America. Turrialba (Costa Rica) 20(3):344-350. 1970. (244)

Este trabajo trata de la distribución, la ecología y los usos de las especies del género Lecythis en América Central y da una clave para su determinación. El género es de mucho interés por sus nueces comestibles que son consideradas más sabrosas que las Bertholletia excelsa (Nuez de Brasil). Sin embargo se comprobó que la nuez de una especie de género, Lecythis minor, es tóxica, debido a un alto contenido del elemento selenio. — (S. M.).

MYERS, Ch. W. The ecological geography of cloud forest in Panama. American Museum no. 2396:52. 1969. (245)

NEVLING JUNIOR, L. I. The ecology of an elfin forest in Puerto Rico. V. Chromosome numbers of some flowering plants. Journal of the Arnold Arboretum 50(1):99-103. 1969. (246)

_____. The ecology of an elfin forest in Puerto Rico. XII. A new species of Gonocalyx (Ericaceae). Journal of the Arnold Arboretum 51(2):221-227. 1970. (247)

_____. The ecology of an elfin forest in Puerto Rico. XVI. The flowering cycle and interpretation of its seasonality. Journal of the Arnold Arboretum 52(4):586-613. 1971. (248)

ODUM, H. T. y PIGEON, R. F. A tropical rain forest a study of irradiation and ecology at El Verde, Puerto Rico. Atomic Energy Commission, 1970. 1666 p. (249)

Overwhelming is the only adjective adequate to describe first impressions of this book. This 10-pound, 1666-page volume is organized into 9 sections, containing a total of 100 chapters, credited to 92 individual authors. In its oversize pages is assembled probably the greatest fund of ecological information that has ever been accumulated for a comparable piece of real estate, in this instance the El Verde site in the Luquillo Mountains of Puerto Rico.

This is the second major study of this general type to be published by the Atomic Energy Commission, the first being the 1966 publication on Environment of the Cape Thompson Region, Alaska.

Much of the credit for the realization of the present volume, as well as for its predecessor, goes to John N. Wolfe, former Chief, Environmental Sciences Branch, USAEC.

Wolfe was nearly a generation ahead of this time in seeing the significance of multidisciplinary studies of major ecosystems as a basis for environmental management. Much of the additional credit goes to H. T. Odum for being able to focus the efforts of a wide

diversity of investigators toward an understanding of the complex tropical forest ecosystem and for being able to get all of the manuscripts together and published.

As stated in Odum's preface, the basic aim of the research reported here was, "to learn how a rain forest works as a system and under stress, including populations, mineral cycles, metabolism, and operations of the complex living structure, by concentrating new and old techniques and many investigators on one small area".

Not unexpectedly, this AEC project was keyed to an experiment to reveal the effects of radioactivity on a major ecosystem. In fact, the realities of environmental concern (or more precisely unconcern) in the early 1960s were such that a study such as this probably could no have found support without a precise mission orientation.

The experiment involved selection of two similar sites at El Verde and exposure of one site to a 10,000 curie ¹³⁷Cs gamma source over a period of 3 months. Before, after, and recovery studies were made on many kinds of organisms at the test and control sites.

In practice, the work was done by a small resident group and by a large number of transient scientist who worked at the site for varying lengths of time.

The first of the nine sections is simply an introduction to the project. The chapters contained in the second through eighth sections are essentially individual research reports in investigations that have in common the fact that most of the work was done at the same site. The same is true of the first nine chapters of the ninth section. The final 90-page chapter is appropriately titled, Summary: An Emerging View of the Ecological System at El Verde. This emerging view is actually a whole series of vistas of bits and pieces of a very intricate total picture, a fact which Odum obviously recognizes.

In this preface, Odum states that, "The second purpose of the book is to provide the details for a new wave of effort at El Verde aimed at understanding complex ecosystems and their meaning for man". What he is saying is that most of the answers to the question he has posed at the opening of the final chapter:

How does the Tabonuco forest system receive its energies, operate, distribute its energies, cycle its chemical elements, and maintain a stable pattern of structure by organization and control?

still remain largely to be answered. However, this does no detract from the fact that this book represents a monumental first step toward such understanding of this planet's most complex ecosystem—the tropical forest. —(W. FRANK BLAIR. University of Texas. Bioscience 21(17):925-926. 1971.).

ORTOLANI, A. A. et al. Parámetros climáticos e a cafeicultura. Rio de Janeiro, Instituto Brasileiro do Café, 1970. 27 p. (250)

OSPINA HERNANDEZ, M. Orquídeas y ecología en Colombia. In Conferencia Mundial de Orquideología, Medellín, 1973. Anales. Medellín, 1973. (251)

PANAMA. MINISTERIO DE AGRICULTURA Y GANADERIA, INSTITUTO INTERAMERICANO DE CIENCIAS AGRICOLAS DE LA OEA. Proyecto de zonificación ecológica de los cultivos de consumo básico y tradicionales de exportación de la República de Panamá en condiciones de secano. Turrialba, Costa Rica, IICA-CTEI, 1971. 58 p. (252)

PAPADAKIS, J. El clima y los cultivos. In Seminario Regional de Estudios Integrados sobre Ecología, Buenos Aires, 1970. Actas. Montevideo, Oficina de Ciencias de la UNESCO para América Latina, 1971. pp. 69-78. (253)

_____. Fundamentals of agronomy. (Compendium of crop ecology). Buenos Aires. 1972. 73 p. (254)

The first 6 chapters deal with crop response to environment: light, temperature, water balance, plant-space, soil factors and mathematic laws. Controversial questions and new concepts are discussed, dealing with: influence of light intensity on photosynthesis; mutual shading; night temperature. In this connection plants are divided into 2 groups; "cryphilous-long day" and "non-cryphilous-short day" plants. Growth rhythm, potential evapotranspiration, injurious substances of the rhizosphere, early growth and final yield, soil fertility, and soil structure are further discussed. In the following 8 chapters the technological implications of above concepts are reviewed, such as: tillage; rotation; use of fertilizers; planting; growth retardants; irrigation; plant protection; harvest operations, and pasture management.

An alphabetical word-index concludes the book. —(Tropical Abstracts 25(11):774. 1970.).

PATINO, H. Problemas fitosanitarios y explotaciones agroecológicas. Boletín Departamento de Biología, Universidad del Valle (Colombia) 3(2)-4(1):57-63. 1971. (255)

PERSINOS, G. J. et al. The ecology of an elfin forest in Puerto Rico. XIII. Phytochemical screening and literature survey. Journal of the Arnold Arboretum 51(4):540-546. 1970. (256)

Of the thirty-five species of plants tested, alkaloids alone were found in two, alkaloids and tannins in three, saponins alone in one, saponins plus tannins in one, and tannins alone in thirteen. The remaining fifteen species contained none of these compounds although at least three gave tests for phenolic compounds.

With the exceptions of a report of alkaloids on Lobelia portoricensis and earlier work on Cecropia peltata, no published phytochemical data for any of the species of the test site were found. Our findings of alkaloids in Hillia parasitica and Psychotria berteriana are consistent with earlier reports of the presence of these constituents in other species of the same genera. On the other hand, our sample of Ilex sintenisii gave no evidence for the presence of caffeine and tannin for which I. paraguariensis is wellknown. Alkaloids found in other species of Justicia, and the alkaloids, saponin, and tannin reported for other species of Carex, were not found in Justicia martinsoniana or Carex polystachya respectively. — (G. J. P. et al.).

PETERS, W. L. Suelos y ecosistemas del trópico húmedo. In Reunión Técnica de Programación sobre Investigaciones Ecológicas para el Trópico Americano, Maracaibo, Venezuela, 1973. Informe. Maracaibo, IICA-TROPICOS, Facultad de Agronomía, Universidad del Zulia, 1973. p. irr. (IICA. Informes de Conferencias, Cursos y Reuniones. Documento no. 8). (257)

La región Amazónica que representa el clima húmedo y caliente en América Latina, ocupa 5 millones de kilómetros cuadrados.

La característica principal de esta región es la vegetación abundante, que da la impresión de una riqueza muy grande de los suelos.

Realmente los suelos en su mayor parte son muy pobres mineralógica y químicamente y la ve-

getación se mantiene gracias a un ciclo nutritivo en el cual circula cierta cantidad de nutrientes.

La intervención del hombre en este ecosistema varía de caza y recolección de frutas etc, hasta deforestación completa con fines de uso agropecuario.

El fundamento de su intervención debe ser el propósito de llegar a un manejo beneficioso y no a una explotación que causa reducción de la capacidad de producción.

Se comparan tres situaciones una sin intervención y dos con diferentes tipos de intervención del hombre, se llega a la conclusión que el sistema más adaptado hasta ahora a las condiciones ecológicas especiales de la región Amazonas es el conuco.

Se indica algunas líneas de investigación que deben dar la información necesaria para llegar a un manejo beneficioso del ecosistema bajo uso agropecuario. — (W. L. P.).

PIJL VAN DER, L. Evolutionary action of tropical animals on the reproduction plants. Journal of the Linnean Society (Biol.) 1:85-96. 1969 (258)

PULLIAM, R. H. Comparative feeding ecology of a tropical grassland finch (Tiaris olivacea). Ecology 54(2):284-298. 1973. (259)

The feeding ecology of the yellow-faced grassquit (Tiaris olivacea) was studied on a large island (Jamaica) and on the mainland (Costa Rica).

Despite an apparent reduction in competition on Jamaica, yellow-faced grassquits are less abundant in Jamaica than in Costa Rica and are found in approximately the same number of habitats on the island and on the mainland. Three seem to be no changes in the magnitude, variance, and sexual dimorphism of bill size of island grassquits which would lead to their eating more kinds of food than the mainland grassquits. However, in a series of experiments on seed-size preference, it was noted that the grassquits from Jamaica were significantly less stereotyped in their choice of seed size than were the Costa Rica grassquits.

It is suggested that an increase in the variance of bill size of island grassquits occurs only in large populations and concomitant with an increase in the number of habitats occupied by the population. — (R. H. P.).

RABINOVICH, J. El análisis de sistemas en ecología. In Seminario Regional de Estudios Integrados sobre Ecología, Buenos Aires, 1970. Actas. Montevideo, Oficina de Ciencias de la UNESCO para América Latina, 1971. pp. 151-166. (260)

RAMIA, M. Observaciones ecológicas en las sabanas del módulo experimental de Mantecal, Estado Apure. In Reunión Técnica de Programación sobre Investigaciones Ecológicas para el Trópico Americano, Maracaibo, Venezuela, 1973. Informe. Maracaibo, IICA - TROPICOS, Facultad de Agronomía, Universidad del Zulia, 1973. p. irr. (IICA. Informes de Conferencias, Cursos y Reuniones. Documento no. 8). (261)

REICHLER, D. E. ed. Analysis of temperate forest ecosystems. New York, Springer-Verlag, 1970. 304 p. (262)

RIVERA FARFAN, J. Apuntes sobre ecología y educación mesológica. s.l., 1972. (263)

RIZZINI, C. T. Aspectos ecológicos da regeneração em algumas plantas do cerrado. Brasil Florestal 3(11):50-52. 1972. (264)

ROCKWOOD, L. L. The effect of defoliation on seed production of six Costa Rican tree species. Ecology 54(6):1363-1369. 1973. (265)

The experiments reported here tested the hypothesis that increased foliage losses lead to decreased reproduction in plants. Six Costa Rican tree species were defoliated by hand twice during 1970. Subsequent collection of fruit crops during 1971 showed that control totals for fruit number and weight were much larger than totals of defoliated trees in all six species. Over 80% of the experimental defoliated plants produced no fruit whatsoever.

Individual controls outproduced their experimental counterparts in 39 of 41 paired cases where reproduction occurred in either. It is concluded that heavy defoliation of wild trees will practically eliminate seed production for the year in which it takes place.

These data and other work with crop plants have shown that both growth and reproduction are functions of leaf area.

Consequently, heavy defoliation drastically reduces the fitness of a plant.

Herbivore consumption of plant parts has probably played an important role in the evolution of both the morphology and chemistry of plants. These data support the view that physical and chemical defenses evolved by plants have played an important role in plant-herbivore co-evolution. — (L. L. R.).

RODRIGUEZ T., C. Recurso forestal y turismo. In Congreso Forestal Nacional VI, Bogotá, Colombia, 1973. Memorias. Bogotá, INDERENA, ACIF, 1973. v. 1 Doc. 1-8-1 (X-3-73). (266)

Uno de los temas más discutidos en la Ecología Aplicada, es precisamente el relacionado con la imperiosa necesidad que tiene el hombre moderno de buscar un contacto directo con la naturaleza. De ahí la importancia de conservar áreas naturales, o crear bosques artificiales, para solaz y esparcimiento de las gentes.

Pero si bien es cierto que la relación hombre-naturaleza es relevante hoy día, también lo es el hecho de que para toda planificación del aprovechamiento del medio natural, se debe tener en cuenta los principios del desarrollo del ecosistema. El reconocimiento de la base ecológica para resolver los problemas entre el hombre y la naturaleza, constituye un primer paso en el establecimiento de una política nacional del aprovechamiento de los recursos forestales. El progreso de los pueblos está destruyendo valores naturales, pero no se puede pensar en la posibilidad de su desaparición. Hay que tratar de reconstruirla al servicio del hombre, mediante la conservación, que en el sentido más amplio, es probablemente la aplicación más importante de la Ecología. Para los silvicultores, quienes tienen a su cargo la tarea técnica de la conservación, el bosque no sólo tiene que cumplir una misión económica, sino también importantes funciones sociales, tales como la recreación, ya que son campos de bienestar provistos de paisajes naturales para los conglomerados humanos que a ellos acuden.

Es importante buscar la experiencia y la actitud que para con los recursos forestales han tenido otros países que nos aventajan en desarrollo y cultura, procurando estudiar y emular sus proyectos, para tratar, en cuanto sea económicamente posible, de ponerlos en práctica en nuestro país. — (C. R. T.).

ROMERO, V. Efecto de la vegetación sobre la fertilidad natural de los suelos del trópi-
co húmedo. In Seminario sobre Ecología
Tropical, Itabuna, Brasil, 1972. Informe.
Turrialba, Costa Rica, IICA-TROPICOS, 1974.
(En prensa). (267)

RUBIO ESPINA, E. Análisis de algunos aspectos
sobre política de control de plagas en Ve-
nezuela. In Reunión Técnica de Programa-
ción sobre Investigaciones Ecológicas para
el Trópico Americano, Maracaibo, Venezuela,
1973. Informe. Maracaibo, IICA-TROPICOS,
Facultad de Agronomía, Universidad del
Zulia, 1973. p. irr. (IICA. Informes de
Conferencias, Cursos y Reuniones. Documen-
to no. 8). (268)

SALE, P. J. M. Extension growth of cacao
under controlled temperature conditions.
Journal of Horticultural Science 44:189-
193. 1969. (269)

In young cacao trees grown at different
combinations of the day and night temperatures
74°, 80° and 86°F., the rate of increase in
total extension growth was found to be markedly
greater at all times as day temperature in-
creased, although the rates of extension at
each temperature were not constant throughout
the experiment. The response to night temper-
ature was much smaller, and occurred for limited
periods and only in some of the treatments.

It was concluded that there was a direct
effect of temperature on total extension
growth, and that the effect on the amount of
extension per flush or per leaf produced was
incidental. — (P. J. M. S.).

_____. Growth flowering and fruiting of
cacao under controlled soil moisture
conditions. Journal of Horticultural
Science 45:99-118. 1970. (270)

Young clonal cacao trees have been grown
under controlled soil moisture conditions for
20 months in a glasshouse. Weighable soil
containers were used, and water was added to
restore the soil to field capacity each time
the total available water, which was about 40
lb. for each plant, had been depleted to 85%
(wet treatment), 50% (medium treatment) or 15%
(dry treatment). Plants were either given one

of these treatments for the whole experiment,
or one treatment was given during the natural
dry seasons and another during the natural wet
seasons.

Plants given a dry treatment at any time
lost their apical dominance and flushed vigor-
ously about 10 days after each watering,
though many flushes subsequently withered.
The other plants flushed normally, except that
the continuously wet plants ceased to flush
towards the end of the experiment.

The mean expanded area of each leaf was
greatest during wet and least during dry
periods, and plants which had suffered the
least soil moisture deficit throughout growth
had the greatest net leaf area and dry weight
accumulation.

There was little difference in the rate
of transpiration per unit leaf area between
plants during periods of high compared to medi-
um soil moisture, but the rate was less during
dry periods. Dry weight increases both per
unit of water transpired and per unit of net
leaf area were greatest in the wettest plants.

There was little difference between the
effects of the wet and the medium treatments
on flower production or setting or on cherelle
wilt, though ultimately slightly more pods
ripened on the wet plants. Plants in a dry
period developed few flowers, but initiation
was apparently stimulated, for in a subsequent
wet or medium period flowering was exceptional-
ly heavy; setting was poor and cherelle wilt
high, however.

It is concluded that irrigation on a
greater scale than is practised at present is
likely to be beneficial to the growth and
yield of cacao. — (P. J. M. S.).

SALE, P. J. M. Growth and flowering of cacao
under controlled atmospheric relative
humidities. Journal of Horticultural
Science 45:119-132. 1970. (271)

Young clonal cacao trees have been grown
for 390 days in controlled environment rooms,
either continuously at relative humidity levels
of 50-60% (low), 70-80% (medium) or 90-95%
(high), or alternated between any two of these
levels at 109 day intervals. The temperature
was 80 ± 1 °F. (26.7 °C) throughout, and the
plants were watered frequently to keep the
soil near to field capacity.

Plants at the low humidity flushed before
the others, but thereafter the period between
flushes was rather longer at low and medium
than at high humidity.

There was little difference in numbers of
leaves expanded, but the area of each expanded

leaf was consistently least during periods of high humidity and, overall, greatest during periods of low humidity. Leaf weight per unit area was greatest at high humidity. Total dry weight increase per plant was greatest under alternating humidities, particularly when one of the periods was at high humidity. At constant high humidity both net leaf area and total dry weight were least of all. Stem length was significantly greater at high humidity than at low.

Flowering was good in all treatments and usually particularly profuse following the transfer of plants from a low or medium to a high humidity. — (P. J. M. S.).

SANTANDER FLORES, C. I. Estudio de comportamiento de algunas especies forestales en Costa Rica. Tesis Mag. Sc. Turrialba, Costa Rica, IICA, 1973. 122 p. (272)

El Departamento de Ciencias Forestales Tropicales del Centro Tropical de Enseñanza e Investigación (CTEI) del IICA y la finca experimental La Lola establecieron a partir de 1949, plantaciones experimentales con el objeto de obtener datos preliminares sobre el crecimiento de especies forestales de maderas valiosas, bajo la condición ecológica de bosque muy húmedo premontado y bosque húmedo tropical de Holdridge de la zona Atlántica de Costa Rica.

El objetivo del presente estudio fue observar el comportamiento de ocho especies forestales comerciales, Amyris barbata Lundell, Anacardium excelsum (Bert. & Balb.) Skeels, Carapa quianensis Aubl., Colubrina arborescens (Mill.) Sarg., Dalbergia cubilquitzensis (D. Smith) Pittier, Dalbergia retusa Hemsl., Guarea longipetiola C. DC. y Pithecellobium saman (Jacq.) Benth, teniendo en cuenta los factores climáticos y edáficos; así también, el estudiar y establecer el tipo de relación existente entre algunas variables dasométricas, y estimar el grado de asociación existente en estas relaciones.

Los análisis realizados fueron: relación edad-altura total, diámetro-corazón diámetro a la altura del pecho (DAP)-altura total y comercial, DAP-diámetro de copa, volumen total o comercial con corteza, relación número de tallos por árbol-volumen comercial con corteza, volumen de corteza en porcentaje, relación DAP-volumen de corteza (%), supervivencia, crecimiento de las plantaciones y anillos de crecimiento.

Como variables se utilizaron del árbol: DAP, altura total y comercial, corazón, diámetro de copa, grosor de corteza y número de tallos

por árbol; y del sitio altitud, precipitación, temperatura promedio y propiedades físicas y químicas y capacidad de uso de los suelos.

Para el estudio de las asociaciones entre las variables dasométricas de las ocho especies forestales, se aplicaron cuatro modelos matemáticos: lineal, logarítmico, geométrico y cuadrático. — (C. I. S. F.).

SARMIENTO, G. y MONASTERIO, M. Studies on the savanna vegetation of the Venezuelan llanos. *Journal of Ecology* 57(3):579-598. 1969. (273)

The inland Venezuelan plains or "Llanos" are grouped four ecological regions, each one characterized by a predominant plant formation: the deciduous forest region in the north, with 800-1000mm annual rainfall; the semi-evergreen forest region in the west, with 1400-2000 mm annual rainfall; the swampy savanna region in the flooding area of the Orinoco river system (except in the delta proper); and the dry savanna region in the central, southern and eastern parts, with 1000-1400 mm precipitation. Each plant formation occurs outside its region only on wetter or drier azonal soils.

The Biological Station of Los Llanos (8°56'N, 67°25'W) is a representative site of the dry savanna region. Within its 300 ha protected field, the pattern of the savanna vegetation is the most complex of all types, i.e. groves of medium-sized trees scattered in a grassland dotted with small, gnarled trees. The grassland element of this pattern has the same essential floristic composition throughout, its main dominants being xeromorphic grasses and sedges of the genera Trachypogon, Axonopus, Andropogon and Bulbostylis. Curatella americana, Byrsonima crassifolia and Bowdichia virgilioides are the three woody species scattered within this continuous herbaceous matrix.

A stand of 190 ha was delimited within the Station, and the savanna sampled by 380 quadrats of 4 m² disposed in a stratified random way.

A direct association-analysis was performed, using three slightly different programs: (1) with X² as association index and the ninety-one species with frequency greater than 1%; (2) with X²/N as association index and the same ninety-one species; (3) with X²/N and the fifty species with frequency greater than 5%. Two measures of heterogeneity were calculated the maximum individual X² and the total number of 'significant' associations at the P = 0.05 level.

The three hierarchies obtained have a comparable division pattern and their upper level subdivision are similar. All three show a high degree of chaining with the corresponding separation of very small groups.

Because the third program was formally the most efficient it was selected as a basis for the ecological analysis of the groups. Twenty-three final groups were correlated with different factors, such as: land form, topographic position, type of surface sediments, soil depth, development of the soil profile, humus content, drainage conditions, distance to groves. Geomorphology was the main single factor correlated with the differentiation of vegetation groups, probably because the land form is an expression of the most operative environmental influences in this area, i.e. topographic position, parent material of soil and depth of lateritic layer. The results are discussed with emphasis on the observed heterogeneity of the vegetation and the practical utility of the classification obtained. — (G. S. y M. M.).

SARMIENTO, G. y MONASTERIO, M. Ecología de las sabanas de América tropical. Mérida, Venezuela, Universidad de los Andes, Instituto de Geografía y Conservación de Recursos Naturales, 1971. 127 p. (Cuadernos Geográficos no. 4). (274)

_____. et al. Reconocimiento ecológico de los Llanos Occidentales. I. Las unidades ecológicas regionales. Acta Científica Venezolana 22(2):52-60. 1971. (275)

In the 1st paper of this series, the landscape approach of land evaluation is applied as a preliminary reconnaissance of vegetation and environment in an area of 30,000 Km² in the Venezuelan western Llanos.

The land-system methodology was adapted to the delimitation of regional units showing both morphological and genetical homogeneity. Seven landscapes and 31 land-systems are recognized in the area, and depicted in a coloured map. From authors' English summary. Tables Map. 17 refs. — (Tropical Abstracts 27(8):514. 1972.).

SARMIENTO, G. Ecological and floristic convergences between seasonal plant formations of tropical and subtropical South America. Journal of Ecology 60(2):367-410. 1972. (276)

On the basis of several floristic, structural, morpho-logical and climatic features, four tropical seasonal formations of the Caribbean area of northern South America were compared with nine seasonal subtropical types occurring in southern South America. The main features considered were: number of wood families and genera; generic composition; floristic elements; generic diversity; layering; leaf size and leaf type of canopy layer species; number of woody genera either thorny, succulent and aphyllous representatives; mean annual rainfall and number of dry months.

The main facts disclosed by this comparison were as follows.

- (1) The tropical American formations are floristically richer than their equivalent subtropical types; α -diversity decreases toward the arid extremes of each series, but in a more irregular way in the subtropical group.
- (2) Tropical elements predominate in the less seasonal types of both series, whilst the most seasonal formations have a more heterogeneous flora from the distributional viewpoint.
- (3) A two-axis ordination of the thirteen types, showing the relative floristic affinity between them. The Gallery forest of the Paraná-Paraguay rivers, a southward extension of the Austro-Brazilian subtropical Rain forest is the subtropical type closely related to the tropical seasonal formations.
- (4) Subtropical units are lower and structurally simpler than tropical types occurring under equivalent climate (same number of dry months).
- (5) Figures for the various leaf types also show that each subtropical formation compares best with a more seasonal tropical type. However, in the subtropical area, the mixed character of leaf type is more evident when only the dominant species in each formation are considered.
- (6) Subtropical types have significantly smaller leaf sizes, whilst the proportion of taxa showing xeromorphic features is greater than in the Caribbean types.
- (7) The subtropical seasonal formations of southern South America are then floristically poorer but morphologically more diversified than the tropical types of the Caribbean area. Some morphological

features, such as aphylls, are more widespread in the former types.

- (8) It is not possible to arrange the seasonal subtropical types along a single gradient as is the case for the tropical units. The group of seasonal formations in the subtropical area varies irregularly, probably due to the combined action of the two main environmental stresses: Drought and cold. — (G. S.).

SEMINARIO REGIONAL DE ESTUDIOS INTEGRADOS SOBRE ECOLOGIA, BUENOS AIRES, 1970. Actas. Montevideo, Oficina de Ciencias de la UNESCO para América Latina, 1971. 342 p. (277)

SHIBATA, S. Algumas considerações sobre o critério de biotemperatura de Holdridge. Tesis Mag. Sc. Turrialba, Costa Rica, IICA-CEI, 1970. 89 p. (278)

Para o presente estudo foram consideradas seis diferentes estações meteorológicas situadas nas regiões temperadas, subtropicais e tropicais.

Calculou-se valores de biotemperatura a partir de dados horários de temperatura climática para um período mínimo de 3 anos por estação.

Obteve-se inicialmente a biotemperatura média diária, seguida da biotemperatura média mensal e finalmente a biotemperatura média anual. Tomou-se seis diferentes intervalos de temperaturas supostamente efetivas para o crescimento das plantas com a finalidade de determinar qual dessas amplitudes encontraria melhor correspondência com o diagrama de Holdridge. Desta forma se obtiveram seis medidas diárias, sendo que tais cálculos foram realizados independentemente por estação.

Baseados nos valores previstos de biotemperatura para essas áreas por Holdridge e Tosi, o intervalo de temperatura 0-31°C foi definido como o correto para o cálculo de biotemperatura de qualquer área. Consequentemente o limite superior seria estabelecido como 31°C.

Conforme o sistema de zona de vida, o crescimento das plantas é insignificante ou praticamente nulo acima deste citado limite superior. (Mais especificamente, deve ser ressaltado que a comunidade não apresenta incremento em biomassa durante as horas em que o termômetro está registrando temperaturas superiores a 31°C, sendo que esta referência é importante porque as diversas espécies comportam segundo seu próprio grau de resistência em relação ao

fator calórico).

O padrão de variação da biotemperatura e da temperatura do ar se apresentou de forma bem distinta para região temperada, subtropical e tropical, indicando o período do ano quando a temperatura atuaria como limitante para a produtividade das várias comunidades analisadas... — (S. S.).

SILVA, J. et al. Reconocimiento ecológico de los Llanos Occidentales. II. El norte del Estado Barinas. Acta Científica Venezolana 22(2):60-71. 1971. (279)

An area of 12,000km² covering the northern part of Barinas State, Venezuela, was investigated applying methods, which have been described in detail in the 1st paper of this series (see Trop. Abstr. v1774). In this area as a result of Pleistocene tectonics, three main geomorphological units have developed: the piedmont fans, the lifted deposits between Santo Domingo and Anaro rivers and the depressed fluvial plain between Santo Domingo and Boconó rivers. Five types of landscapes, including 16 land systems, can be recognized. The 16 land systems have been delimited, described and depicted in a map. From authors' English summary. Maps (1 coloured). 8 refs. — (Tropical Abstracts 27(8):514. 1972.).

_____. Metas y logros del grupo de ecología vegetal de la Facultad de Ciencias de la Universidad de los Andes, Venezuela. In Reunión Técnica de Programación sobre Investigaciones Ecológicas para el Trópico Americano, Maracaibo, Venezuela, 1973. In forme. Maracaibo, IICA-TROPICOS, Facultad de Agronomía, Universidad del Zulia, 1973. p. irr. (IICA. Informes de Conferencias, Cursos y Reuniones. Documento no. 8). (280)

SIMPOSIO INTERNACIONAL SOBRE PLANIFICACION DE RECURSOS HIDRAULICOS, CARACAS, 1972. Proyecto de control de aguas recuperación de tierras en el Estado Apure, estudio ecológico. Caracas, Oficina de Planeamiento, Dirección de Proyecto, Construcción, 1972. 28 p. (281)

SIOLI, H., SCHWABE, G. H. y KLIOGE, H.
Limnological outlooks on landscape-ecology
in Latin America. *Tropical Ecology* 10(1):
72-82. 1969. (282)

SMITH, R. F. y GORRIN, A. Procedimiento en la
interpretación de fotografías aéreas en la
delimitación de ecosistemas de la cuenca
del Río Morere, Venezuela, ALAF, 1970. (283)

La vegetación actual de la región
centro occidental: Falcón, Lara, Portuguesa y Yaracuy de Venezuela un resumen ecológico de acuerdo a la foto interpretación. *Boletín Instituto Forestal Latino-Americano (Venezuela)* no. 39-40:3-44. 1972. (284)

Se elaboró un mapa de la cobertura vegetal actual de los Estados centro occidentales de la República de Venezuela y se publicó a una escala de 1:784,000 en base a la interpretación de fotografías aéreas con el fin de conocer mejor los ecosistemas existentes. Las unidades mínimas de vegetación en el mapa, equivalen a un área real de 1 Km². Los tipos de vegetación designados fueron: sabana, bosque, matorral, espinar, pastos y áreas de suelos desnudos.

Estas amplias zonas casi sin vegetación se deben a fenómenos de salinidad, toxicidad, erosión laminar, erosión eólica y por inundación, según el caso.

Los espinares corresponden a áreas con árboles pequeños, dispersos y perennifolios que muestran un alto grado de competencia por el agua y no por la luz como es el de los matorrales y bosques. Estos dos últimos ecosistemas se subdividen a su vez en vegetación caducifolia y perennifolia.

Para dar un enfoque ecológico se consideran los factores geomorfológicos, climatológicos, edafológicos y de uso del terreno. El clima de los Llanos tiene dos épocas bien definidas: una de lluvias y la otra seca, lo cual favorece los tipos de vegetación caducifolia, mientras que en la parte montañosa al norte de la Región Centro Occidental la distribución de la precipitación se realiza en dos épocas del año lo que favorece la vegetación perennifolia. Se demostró que el fuego es un factor importante dentro del ecosistema en las zonas con altitud de 1.000 m. y también en una sola zona baja en y cerca de los Llanos de la Cuenca del Orinoco. En los Llanos se reconocieron tres tipos de sabanas: 1) tierras limpias de plantas leñosas que existen generalmente en suelos recientes

mientras que en las sabanas 2) achaparradas y 3) arboladas, existen suelos viejos. Existe una aparente relación positiva entre la edad de los sedimentos aluviales y la cantidad de nutrientes de los ecosistemas. Además, hay una supuesta relación entre la ocurrencia del fuego y la pérdida de nutrientes, sucediendo lo contrario entre la formación sucesional de bosques y el aumento de nutrientes. Como resultado de estos procesos los tipos sucesionales de vegetación están en forma de mosaico sobre el terreno llanero. Las montañas están cubiertas principalmente por pastos sembrados para la ganadería aunque existen zonas potenciales para la producción de madera en las sierras de Aroa y Bejuma. También hay lugares que han sido utilizados por mucho tiempo para cultivos, generalmente en suelos jóvenes, es decir los aluviales y los que fueron expuestos antiguamente a la actividad de los glaciares. La agricultura moderna se localiza mayormente en los Llanos Altos y en muchos valles entre las serranías. Un grave problema social se localiza en las sierras húmedas que están ocupadas por el "agricultor migratorio" debido a que sus métodos de explotación son rudimentarios. La vegetación del espinar en la zona árida está aparentemente en un estado semejante al original y demuestra poco daño debido al ganado caprino, sin embargo es posible que ellos hayan cambiado la composición florística de la vegetación baja y hoy en día especies poco afectadas por el ganado caprino predominan en todo el estrato bajo. Al contrario de lo que se cree, son más graves la destrucción en los matorrales por ganado bovino que por el ganado caprino en los espinares.

Por sus buenos suelos las grandes zonas desnudas de vegetación de la árida costa del norte y la "Llanura de Carota" pueden representar un buen potencial agrícola. Considerando en un sentido amplio, el mejor uso aparente de la Región es múltiple, pero lo que se destaca es la belleza del paisaje que debería ser cuidada para el turismo nacional e internacional. — (R. F. S.).

SMITH, R. F., FERRER, E. y CHAVEZ, A. La vegetación actual de la región centro occidental. Barquisimeto, Venezuela, FUDECO, Boletín Informativo, Suplemento Técnico no. 3, 1973. 69 p. (285)

SMYTHE, N. Relationships between fruiting seasons and seed dispersal methods in a neotropical forest. *The American Naturalist* 104(935):25-35. 1970. (286)

The weight of fruits and seeds that fell into 75 polyethylene sheets, each 152X152 cm, totalling 175 m² in area, was measured over a period of 17 months in the humid forest of Barro Colorado Island, in the Panama Canal Zone. A total of 72 species of fruits and seeds fell into the traps, and the number falling into any individual trap varied from three to 14. The number of fruiting species per month varied from 11 to 26, while the combined weight of fruits and seeds varied from a monthly average of 0.61-1.930 gm/square meter per day. Small-seeded fruits ripened rather evenly throughout the year, whereas large-seeded fruits tended to be seasonal.

Although the primary determinants of fruiting times may be physical, small fruits the seeds of which pass unharmed through the guts of animals tend to be monseasonal and thus avoid competition for dispersal. Fruits with large seeds that are destroyed by the animals eating them fruit synchronously.

The agouti (Dasyprocta punctata), being unable to devour the entire synchronous crop, scatterhoards much of it and, since it fails to find many of the buried seeds, aids in the dispersal of its food species. — (N. S.).

STARK, N. Nutrient cycling. I. Nutrient distribution in some Amazonian soils. *Tropical Ecology* 12(1):24-50. 1971. (287)

_____. Nutrient cycling. II. Nutrient distribution in Amazonian vegetation. *Tropical Ecology* 12(2):177-201. 1971. (288)

SYMPOSIUM ON TROPICAL ECOLOGY, WITH AN EMPHASIS ON ORGANIC PRODUCTION. NEW DELHI, INDIA, 1971. Papers. Athem, 1972. 418 p. (289)

TABORDA R., F. Responses of seedlings of sorgho (Sorghum bicolor (Linn.) Moench) to superoptimal temperatures. In Seminario sobre Ecología Tropical, Itabuna, Brasil, 1972. Informe. Turrialba, Costa Rica, IICA-TROPICOS, 1974. (En prensa). (290)

TAMAYO, F. Notas sobre ecología de la Sabana. Boletín Sociedad Venezolana de Ciencias Naturales 29(119-120):158-178. 1971.

(291)

La sabana es una comunidad herbácea, graminiforme, tropical, sujeta a una larga temporada seca; sus dominantes son gramíneas vivaces dispuestas en macollas erectas. Su origen, antes que edáfico o climático, es antropógeno, pues el fuego inducido por el hombre es el factor ecológico que más le atañe.

Pese a ser una comunidad subclimática, la sucesión no está totalmente frenada, pues los árboles y consecuentes bosquetes que en ella se implantan, no forman parte de la sabana, sino que constituyen núcleos invasores, tendientes a desplazarla. Tales núcleos son formas altamente adaptadas para realizar un proceso sucesional tardío y secular.

Los factores ecológicos que más afectan la sabana son: Los incendios, el largo período de la sequía, la restricción de las lluvias, a un período del año, el viento, el pastoreo. En el texto se citan particularidades inherentes a cada uno de estos factores. — (F. T.).

TAMAYO, F. Notas para el estudio fitogeográfico del Estado Monagas. Boletín de la Sociedad Venezolana de Ciencias Naturales 30(124-125):50-56. 1972. (292)

En el presente trabajo se menciona el relieve de toda la región y se indica el tipo de vegetación correspondiente a cada zona fitogeográfica.

Se da principal énfasis al ecosistema morichal, del cual se indican sus principales características.

Se establece que desde el punto de vista de la asociación el morichal es un Mauritietum paludosum, y las sabanas ubicadas entre Maturín y río El Tigre constituyen un Trachypogonetum axoponosus.

En las gráficas se presenta un esquema de un morichal y esbozo de mapa fitogeográfico del Estado Monagas. — (F. T.).

_____. Notas referentes a degradación de comunidades vegetales. Boletín de la Sociedad Venezolana de Ciencias Naturales 30(124-125):41-49. 1972. (293)

En este trabajo se estudia el proceso de la degradación que se produce en las comunidades xerofíticas cuando están afectadas por factores adversos. Se dan características de etapas de dicho proceso y se indica cuáles son los principales factores adversos.

Se presentan dos gráficas del proceso térmico de la xero-serie a partir de la roca madre y de suelos sedimentarios. - (F. T.).

THIBAU, C. E. Conceituação, características e regeneração da vegetação dos cerrados. (Resumo Bibliográfico). Brasil Florestal 3(11):46-50. 1972. (294)

THORNES, J. B. Variability in specific conductance and pH in the Casiquiare - upper Orinoco. Nature 221:461-462. 1969. (295)

TUNDISI, J. G. Produção primária em ecossistemas lacustres da região tropical. In Seminario sobre Ecología Tropical, Itabuna, Brasil, 1972. Informe. Turrialba, Costa Rica, IICA-TROPICOS, 1974. (En prensa). (296)

UNITED NATIONS EDUCATIONAL. SCIENTIFIC AND CULTURAL ORGANIZATION. A framework for a classification of world vegetation. Paris, 1969. 26 p. (297)

VISSER, S. A. y MIDDLETON, D. Investigation into the influence of the moisture content of the environment on the occurrence of soil micro-organisms in the tropics. Revue d'Ecologie et de Biologie du Sol 6(2):99-113. 1969. (298)

Fifteen nutritional groups of micro-organisms occurring in 25 different tropical environments and subject to different water regimes were analysed for the influence of the moisture content of the environment on the occurrence and activity of the microflora.

It was found that constantly submerged environmental conditions suppressed the occurrence of the fungi and favoured that of the bacteria, whilst damp or alternately wet and dry conditions were, on the whole, less favourable for the latter. The total number of micro-organisms was always comparatively small in the well-drained environments, which included tropical agricultural soils.

A statistical investigation was undertaken but due to significant differences being found between the variances of pairs of different water regimes, it was necessary to employ tests more sophisticated than the usual t-test in establishing significant differences in the means. These are described in the text. As a result of these the most pronounced influence of the water regime on the numbers of the bacteria was found to be in the cases of the anaerobic nitrogen fixers and the nitrifiers. There was some evidence that the groups of the aerobic nitrogen fixers and the starch and hemicellulose decomposers were also affected by it.

The fact was stressed that although the various individual species of microorganisms (such as those which comprised the group of the denitrifiers) could each be influenced by the water regime, the nutritional group as a whole would not necessarily show any dependence upon it. - (S. A. V. y D. M.).

WAGNER, R. J., WAGNER, A. B., y HOWARD, R. A. The ecology of an elfin forest in Puerto Rico. IX. Chemical studies of colored leaves. Journal of the Arnold Arboretum 50(4):556-565. 1969. (299)

WALTER, H. El problema de la Sabana; investigaciones eco-fisiológicas en el Africa Sur-Occidental en comparación con las condiciones existentes en Venezuela. Boletín de la Sociedad Venezolana de Ciencias Naturales 28(115-116):123-144. 1969. (300)

_____. Ecology of tropical and subtropical vegetation. Edinburge, Oliver Boyd, 1971. 540 p. (301)

The value and pleasure of this closely packed volume which surveys in such a clear and systematic way the main categories of habitat across the world, the chapters ranging from tropical rain forests, to other types of humid tropic vegetation into the cooler rain forest of higher altitudes in tropical mountains (chapter 4, which is particularly excellent), then tropical vergreen and deciduous forest, natural savannahs, several forms of desert (including fog-desert). Although the larger bulk of the text deals with arid and desert type formation one is led most of all to admire the treatment of what

the author calls "continuously wet tropical rain forest", which seems clumsy way of saying evergreen forest, perhaps? There is no better short statement on the subject than in these 72 pages, supported - as in every chapter - with an adequate international bibliography.

What further distinguishes this volume is the surprisingly high standard of readability. It is not exactly well-written. But one feels that the author has such completed command of the whole subject, that he is able to put together widely disconnected, spatial and temporal ideas and keep them integrated in a swiftly moving, fully documented prose style. Moreover, there is a pleasant regard for other disciplines, including even history (e.g.p. 492).

The paper is excellent, the text, figures adequate, the presentation of tabular and other information impressive...

All too often a reviewer describes a volume as an essential handbook... — (Extractado de Bulletin UICN (n.s.) 3(11):54. 1972).

WEATHERSBEE, C. Curing Amazonia's anemic jungle soils. Peruvian Times 29(1485): 11-14. 1969. (302)

WEINHARD, P. et al. Fixation non symbiotique de l'azote dans la rhizosphere de quelques non-légumineuses tropicales. Revue d'Ecologie et de Biologie du Sol 8(3): 367-373. 1971. (303)

Nitrogenase activity in the rhizosphere of some tropical non-legumes grown in laboratory under conditions simulating the tropical environment, has been measured by the acetylene reduction method. Nitrogenase activity depended on the plant species: it was high in the case of rice growing on ferrallitic alluvial soils (1,040 - 2,360. nmole C₂H₄/h/g dry root); it was low in the case of Eleusine coracana growing in a ferruginous tropical soil (1.3 nmole C₂H₄/h/g dry root). Nitrogenase activity was also shown to be strictly dependent on the soil type: thus for the same species (E. coracana), it was 300-fold higher in one soil than in the other.

Nitrogenase activity of symbiotic nitrogen fixing systems (namely nodules of legumes and

non-legumes) was roughly 100 times as great as nitrogenase activity of non symbiotic fixing systems (namely free nitrogen fixing microorganisms in the rhizospheres). But being given that the biomass of the former systems per surface unit of soil is much lower than the biomass of the later, one may assume the significance of non symbiotic nitrogen fixation in the rhizospheres, specially in tropical environments. — (P. W. et al.).

WILLIAMS, W. R., LOOMIS, R. S. y ALVIM, P. DE T. Environments of evergreen rain forests on the lower Rio Negro, Brazil. Tropical Ecology 13(1):65-78. 1972. (304)

The light, soil, and water environments of vegetation were studied in the evergreen forests of the lower Rio Negro in the Amazon Valley. Illumination penetrating to the ground amounted to 1 to 5% of total daylight on the undisturbed sites and 54% on the disturbed site, as measured by Oxalid-paper light integrators. The leaf area index for the undisturbed forests was estimated to range from 4.7 to 6.9 m²/m². The spectral distribution (380 to 1060nm) of the light penetrating to the floor of the forests was similar to those reported elsewhere for agricultural communities of maize and soybeans. Since reported photosynthetic rates of tropical rain forest species are quite low we suggest that the angles of presentation of leaves to the sun may be particularly important to the efficiency of solar energy conversion by these species, because a benefit results from the sunlight being spread over a large leaf surface at small angles of incidence where maximum photosynthesis occurs in low levels of light.

The soils studied were extremely acid (pH 3.8), had kaolinite as the dominant clay mineral, and were impoverished in plant nutrients with the possible exception of nitrogen, which was present in modest amounts. The biomass of forest species supported was more robust than might be expected in such inhospitable soil environments.

The forest flooded seasonally by "black water" was shorter in stature and different in species composition from forest flooded by "white" water of the Rio Branco. Leaf area index in the two forest was estimated to be 4.7 and 5.4 m²/m² respectively. The black water (pH 4.9) was higher in sulfate and lower in bicarbonate than the white water (pH 6.2), but the concentrations of cations and other anions did not differ appreciably. — (W. A. W., R. S. L. y P. de T. A.).

INDICES



INDICE DE AUTORES

Acosta-Solís, M. 1, 140
Allen Junior, L. H. 141
Alvim, P. de T. 304
Ambasht, R. S. 142
Anderson, R. C. 143
Andrews, R. M. 81
Araujo, V. C. 144, 145
Arevalo, A. 8
Armenta S., J. L. 147
Arruda, N. B. 146
Ashton, P. S. 148
Ayensu, E. S. 233

Ballinger, R. E. 82
Barrons, K. C. 150
Barros, R. S. 151
Bastos, T. X. 149
Baynton, H. W. 152
Bazán, R. 153
Benacchio, S. 2, 3, 154
Benson, W. W. 83
Berven, K. A. 96
Black, C. C. 155
Blair, F. 4, 156
Blasco, M. 157
Blydenstein, J. 158
Bonsma, J. C. 84
Boughney, A. S. 5, 119
Bovbjerg, R. 6
Brewer-Carias, Ch. 159, 160
Briggs, J. C. 120
Brinkmann, W. L. F. 85, 86, 87, 161, 162,
163, 164, 165, 166, 167
Britto, D. P. P. S. 146
Budowski, G. 168

Calderon U., C. 7
Camargo, A. P. de 169
Camargo, P. N. 170
Campos, J. C. Ch. 171
Campuzano, G. 8
Canestri Cedefio, V. 88, 172
Canet, B. G. 194
Cano, E. 173
Carr, A. 89
Carr, M. H. 89
Carvalho, J. F. de 9
Clapham, W. B. 10
Clements, R. G. 200

Coddington, A. 11
Collier, B. O. 12
Connell, J. H. 13
Coombs, H. C. 14
Corrales, F. 174
Corwell, G. W. 15
Costales, A. S. 134
Cox, C. W. 16, 17
Crandall, B. 191, 192
Croat, T. B. 175
Cubillos Z., A. 18

Chavez, A. 285
Childress, J. R. 90

Dale, M. B. 19
Darling, F. 176
Darnell, R. 20
Dasmann, R. F. 21
Daubenmire, R. 177, 178
Defauce, C. 22
Denevan, W. 121
Di Castri, F. 179
Dittmer, H. J. 180
Diniz, T. D. de A. S. 149
Dogan, M. 122
Douglas, I. 23
Duckworth, W. D. 233
Dyne, G. M. van 24

Edwards, A. M. C. 181
Ehrlich, P. R. 123, 131
Ehrlich, W. H. 123
Emmel, T. C. 83
Ewel, J. 182
Expert Panel on Project no. 1 MAB. 183
Expert Panel on Project no. 12 MAB. 124

Falesi, I. C. 184
Farifias, M. R. 198
Fernández Perez, A. 25
Ferrer, E. 285
Figuroa Z., R. 7
Fittkau, E. J. 91, 185
Fleming, T. H. 92

- Foerster, J. W. 186
Ford, E. B. 26
Fordham, R. 187
Fortescue, J. A. C. 188
Fournier O., L. A. 189
Franke, R. 27
Freeman, P. H. 21
Frenkel, R. E. 190
Fuenzalida Vollmar, F. 125
Fulford, M. 191, 192
Fundação Brasileira para a Conservação da
Natureza 28
- Garcia Benavides, J. 193, 194, 242
Garlick, J. P. 126
Gates, D. M. 195
Gill, A. M. 196
Gil Beroes, R. A. 198
Gilmartin, A. J. 197
Ginez, A. R. 198
Gleisler, R. 93
Golley, F. B. 29, 199, 200, 201
González, H. L. 174, 202
González, V. 203
Goodland, R. 204, 205
Gorrin, A. 283
Guerrero, R. 206
Guerrero M., R. 25
- Haffer, J. 94
Halffter, G. 207
Hanbury-Tenison, R. 127
Hanzen, W. E. 128
Harris, D. R. 208
Heck, G. A. T. 209
Hemming, J. 129
Henderson, H. 30
Hernández, J. 95
Heyer, R. W. 96
Hills, T. L. 130
Hladik, A. 31
Hladik, C. M. 31
Holdren, J. 131
Holdridge, L. R. 210, 211
Hooper, E. T. 92
Howard, R. A. 212, 213, 299
Howmiller, R. 97
Hutcheon, W. V. 214
- Igbozurike, M. U. 215
Innis, G. 32
International Bank for Reconstruction and
Development 132
- International Co-Ordinating Council of the
Programme on Man and the Biosphere (MAB)
216
Instituto Interamericano de Ciencias Agríco-
las 252
- Janzen, D. H. 98, 99, 100, 217, 218
Jordan, C. F. 219, 220, 221
Junk, W. 222
- Karr, J. R. 101
Kay, D. 33
Keay, R. W. J. 126
Kline, J. R. 221, 223
Klioge, H. 282
Klopfer, P. H. 34, 35
Knight, D. H. 224
Knöppel, H. A. 93, 102
Kormondy, E. J. 36, 133
Küchler, A. W. 225
- Lagrotta G., R. A. 37
Lamberti, A. 226
Landi, M. 227
Lasser., J. 38
Ledoux, P. 228
Lemon, E. 141
Leon, P. E. 103
Licht, P. 104
Lobato, R. C. 228
Loker, J. 39
Loomis, R. S. 304
Love, G. A. 40
Love, R. M. 40
Lugo, A. E. 105
Lugo, Lugo, H. 41
Lyford, W. H. 229
- MacArthur, R. H. 42, 230
McBryde, F. W. 134
McCaull, J. 43
McGinnis, J. T. 200, 231
McMillan, C. 44
Marion, K. R. 82
Markel, R. P. 106
Marten, G. G. 188
Martin, W. E. 107
Martínez, A. 135
Martínez M., G. E. 45
Medina, E. 232
Meggers, B. J. 233

- Mello, M. O. de A. 234
Mérida. Universidad de los Andes, Facultad de
Ciencias Forestales 46, 235
Mertz, D. 13
Miller Junior, G. T. 136
Middleton, D. 298
Milton, J. P. 21
Misra, C. K. 47
Misra, R. 29
Monasterio, M. 67, 273, 274
Mondofiero, J. R. 236
Monteith, J. L. 237, 238, 239, 240
Montoya, L. 48
Montoya M., J. M. 225, 241, 242
Moreira, A. 49
Morello, J. 243
Mori, S. 244 245
Mueller, M. 50
Muller, L. 141
Murdoch, W. 13
Murguia, V. E. 51
Murray, D. B. 187
Myers, Ch. W. 245
- Nascimento, J. C. de 166
Nevling Junior, L. I. 246, 247, 248
Novaes, F. C. 108
- Odum, E. P. 52, 53, 54
Odum, H. T. 55, 249
Orians, G. H. 109
Ortolani, A. A. 250
Ospina Hernández 251
Owen, O. S. 56
- Panamá. Ministerio de Agricultura y Ganadería
252
Papadakis, J. 253, 254
Patifo, H. 255
Patifo R., A. 57, 58
Penn, R. J. 59
Pereira, F. B. 149
Persinos, G. J. 256
Peters, W. L. 257
Pielou, E. C. 60
Pigeon, R. F. 249
Pitl Van Der, L. 258
Pollard, R. 205
Pons, G. 137
Pulliam, R. H. 259
- Rabinovich, J. 260
Ramia, M. 261
Rapoport, A. 138
Reichle, D. E. 262
Reunión Técnica de Programación sobre Investi-
gaciones Ecológicas para el Trópico Ameri-
cano. Maracaibo, Venezuela, 1973. 61
Reyna Robles, R. 110
Ribeiro G., M. N. 163, 164
Rivas Mijares, G. 62
Rivera Farfan, J. 263
Rizzini, C. T. 264
Roa Morales, P. 63
Rockwood, L. L. 111, 265
Rodrigues, W. A. 64
Rodríguez T., C. 266
Romero, V. 65, 267
Rubio Espina, E. 268
- Sale, P. J. M. 269, 270, 271
Salinas, P. J. 66
Santander Flores, C. I. 272
Santos, A. dos 85, 161, 162, 167
Santos, U. de M. 86, 87
Sarmiento, G. 67, 273, 274, 275, 276
Schwabe, G. H. 282
Segura, M. 68
Seminario Regional de Estudios Integrados so-
bre Ecología 277
Sexton, O. J. 82
Shibata, S. 278
Silva, J. 279, 280
Simposio Internacional sobre Planificación de
Recursos Hidráulicos 281
Singer, S. F. 69
Sioli, H. 93, 282
Skolnikoff, E. B. 33
Smith, R. F. 283, 284, 285
Smith, R. L. 139
Smythe, N. 286
Stanley, R. A. 117
Stark, N. 287, 288
Stein, R. 122
Stotler, R. 191, 192
Summerhays, S. 70
Symposium on Tropical Ecology 289
- Taborda R., F. 290
Tamayo, F. 71, 291, 292, 293
Tazán, G. R. de 72
Templeton, W. L. 112
Terborgh, J. 113
Thibau, C. E. 294

Thornes, J. B. 181, 295
Trujillo, A. E. 202
Tundisi, J. G. 296
United Nations Educational, Scientific and
Cultural Organization 297
U. S. Brookhaven National Laboratory 73
Unzueta, O. 74

Vaughan, C. 75
Visser, S. A. 298

Wagner, A. B. 299
Wagner, R. J. 299
Walter, H. 300, 301
Warner, G. F. 114

Weathersbee, C. 302
Weaver, P. L. 115
Weber, N. A. 116
Weiman, J. A. 163
Weinberg, A. M. 76
Weinhard, P. 303
Weske, J. S. 113
Whittaker, R. H. 77
Williams, W. R. 304
Wilson, D. E. 92
Wilson, T. W. 78
Workshop on Global Ecological Problems 79

Zaffanella, M. 80
Zaret, T. M. 117, 118

INDICE GEOGRAFICO

AMERICA 4, 39, 153, 156, 179, 211, 282

AMERICA CENTRAL 44, 137, 150, 168, 241,
244

AMERICA DEL SUR 48, 61, 106, 154, 157,
158, 233, 257, 274, 276

BERMUDAS 180

BOLIVIA 49, 74, 121

BRASIL 9, 64, 85, 86, 87, 91, 93, 94,
102, 108, 121, 129, 144, 145, 146,
149, 151, 161, 162, 163, 164, 165,
166, 167, 169, 170, 184, 185, 204,
205, 222, 226, 228, 234, 250, 264,
287, 288, 294, 296, 304

CARIBE (Islas) 99, 100, 130, 276

COLOMBIA 18, 25, 57, 58, 65, 95, 112,
127, 134, 199, 206, 251, 255, 263, 266,
267

COSTA RICA 81, 83, 89, 90, 92, 98, 99,
100, 103, 105, 109, 111, 115, 141, 143,
177, 178, 189, 190, 194, 218, 225, 242,
259, 265, 272, 278

ECUADOR 1, 8, 70, 72, 96, 97, 121, 140,
197

EL SALVADOR 45

GUYANAS 94, 126,

JAMAICA 114, 259, 269, 271

MEXICO 44, 109, 135, 207

NICARAGUA 278

PANAMA 31, 37, 50, 82, 92, 101, 104,
107, 109, 112, 116, 117, 118, 120,
127, 150, 175, 199, 200, 224, 231,
245, 252, 286

PERU 7, 68, 113, 121, 125, 302

PUERTO RICO, 98, 152, 186, 191, 192,
195, 196, 212, 213, 217, 219, 220,
223, 229, 246, 247, 248, 249, 256,
299

TRINIDAD 187, 270

VENEZUELA 2, 3, 15, 38, 43, 46, 62,
63, 66, 67, 88, 159, 160, 172, 174,
176, 181, 193, 198, 202, 203, 208,
235, 261, 268, 273, 275, 279, 280,
281, 283, 284, 285, 290, 291, 292,
293, 295, 300

INDICE DE MATERIAS

- Alkaloides 256
Agricultura
 balance ecológico 215
Agronomía
 fundamento 254
Aguas naturales
 en el Amazonas
 Amonio 161
 Magnesio 162
 Calcio 167
 disolución de sólidos 181
Amyris barbata 272
Anacardium excelsum 272
Anfibios 96
Animales domésticos 84
Anoles auratus 82, 104
 A. frenatus 82
Anolis limifrons 82, 104
 A. lizards 81
 A. polylypis 81
 A. tropidogaster 82, 104
Arachis hypogaea 146
Aratus pisoni 114
Ariidae 103
Arboles
 en Barro Colorado, Panamá 224
 factor luz 145, 148, 165
 variaciones altitudinales 189
Atta sp. 105, 116
 A. colombica 105
Aves
 abundancia y distribución 108
Avifauna 101

Balance ecológico
 en agricultura 215
Biosfera
 efectos de la actividad del hombre 176
Biomasa
 cambios 182
 y estructura mineral de algunos bosques 200
Biotemperatura
 criterios 278
Bosque
 árboles 224
 animales del ecosistema 188, 233
 ciclo mineral 201, 221
 consecuencia de convertirlo en
 sabanas 178
 ecología 152, 186, 191, 192, 195, 196,
 212, 213, 229, 246, 247, 248
 256, 299
 estructura 199

Bosque, estructura (Cont.)
 mineral y biomasa 200
 factor luz 145, 148, 165
 fenología 177
 húmedo 149, 231, 196
 relación semillas frutos 286
 medio ambiente 141, 210, 304
 micronutrientes 188
 nuboso 152, 186, 245
 pluvial
 agricultura migratoria 208
 ciclo minerales 221
 Euterpe globosa 217
 irradiación 249
 medio ambiente 304
 productividad 220
Bromeliaceae
 distribución 197
Bowdichia virgilioides 273
Byrsonima crassifolia 273

Cacao
 crecimiento bajo control de
 condiciones del suelo 270
 humedad 271
 temperatura 269
 ecofisiología y medio ambiente 214
 investigaciones ecológicas 187
Café
 crecimiento vegetativo 151
 parámetros climáticos 250
Cangrejos 90, 114
Carapa sp. 211
 C. guianensis 272
Carex polystachya 256
Cassia aculeata 202
Ceriodaphnia cornuta 118
Cercropia peltata 256
Cedrela sp. 211
Ciclo mineral
 en bosque 201, 221
Clibanarius albidigitus 90
Clupeidae 103
Cocotrupes carpophagus 217
Colubrina arborensens 272
Comunidades
 indígenas 121, 127
 estructura 125
 modelos 230
 vegetales degradación 293
Consecuencias ecológicas de convertir
 bosques en sabanas 178
Conservación
 ambiental 38

- Conservación (Cont.)
recursos naturales 39, 56
- Contaminación
ambiental 9, 37, 41, 62, 69, 77
de aguas
efecto sobre plantas y animales 51
Lago Valencia 88
Río Cauca 18
- Corte ecológico Estado Guárico, Venezuela
67
- Corte y quema efecto en la nutrición de
plantas 166
- Control
de plagas (política) 268
químico de malezas 198
- Clima
problemas 169
y cultivos 253
y pasturas naturales 158
- Crisis ecológica 40, 58
- Cuencas hidrográficas 45
- Curatella americana* 273
- Cynoglossidae 103
- Chironomids
distribución 91
- Dalbergia cubilquitzensis* 272
- Dalbergia retusa* 272
- Dasiprocta punctata* 286
- Desarrollo 43, 68, 243
- Dicotiledoneas
en pastizales naturales control
químico 198
- Dysdercus fasciatus* 218
- Echinolochloa polystachya* 222
- Ecología 20, 52, 54, 289
análisis de sistemas 122, 260
vegetación 173
aplicación en la agricultura 154
apuntes 265
bosque 152, 186, 191, 192, 195, 196,
212, 213, 229, 246, 247, 248,
256, 299
comportamiento 35
conceptos 36
consideraciones para el desarrollo 43,
68
crisis 40, 58
enseñanza 12, 15, 32, 41, 46, 66
estudios 198, 243, 277
de los Llanos Occidentales, Venezuela
275, 279
del Valle de México 207
humana 28, 79, 119, 121, 124, 125, 126,
- Ecología, humana (Cont.)
127, 129, 133, 134, 135, 136,
137, 139
importancia 71
investigaciones 48, 61
en Bolivia 49, 74
Brasil 64
Colombia 25, 65
Ecuador 8, 72
Venezuela 2, 3
forestales 235
lecturas 5, 13, 16, 40
naturaleza 147
primera disciplina en ciencia biológica
6
principios para el desarrollo económico
21
problemas 4, 156
relevamiento 227
revolución en América Latina 179
vegetal metas y logros grupo Universidad
de los Andes, Venezuela 280
y arquitectura 138
y economía 14, 209
y tecnología 76
- Ecologistas
versu economistas 30
- Ecosistemas 10, 29, 73
análisis 19
concepto 24
consideraciones propuestas por Holdridge
171
estudios 29, 47
estrategia para el desarrollo 53
dinámica 12
destrucción por superpoblación y métodos
agrícolas 175
función 44
hidrógeno movimiento 219
lacustre
producción primaria 296
Lago Valencia 88
productividad bajo diferentes sistemas
de manejo 153
- Eleusine coracana* 303
- Engraulidae 103
- Especies forestales maderables 234, 272
- Estaciones experimentales
planificación en relación a zona de vida
157
- Estudios ecológicos 277
y control químico de la maleza 198
y fitogeográficos para el desarrollo
243
- Estudios de ecosistemas 29, 47
- Euterpe globosa* 217
- Evaporación
relación planta-agua 238
- Explosiones agroecológicas 255

- Factor luz
 elemento básico en árboles de valor económico 145
 en tipos de bosque 165
- Fauna silvestre
 potencial 95
- Fenología
 de especies de la flora 144
 y otras características de árboles en Costa Rica 177
- Fijación simbiótica del nitrógeno en algunas leguminosas 303
- Fitogeografía
 estudios del Estado de Monagas, Venezuela 292
- Flora
 fenología 144, 177
 madera 234, 272
- Fotointerpretación
 de la vegetación 284
 procedimientos 283
- Fotosíntesis 155, 237
- Frijol
 zonificación ecológica 193, 241
- Génesis de los medanos de los Llanos Centrales de Venezuela 63
- Genética 26
- Geografía ecológica 42
- Gonocalyx* sp. 247
- Guarea* sp. 211
 G. longipetiolata 272
- Heliamphora* 159
- Herbicidas
 beneficio ecológico de su control 150
- Herbivoros 99
- Hillia parasitica* 256
- Hormigas 111
- Hortalizas
 aspectos ecológicos de la producción 236
- Hymenachne amplexicaulis* 222
- Hypsipyla* sp. 211
- Hyptis suaveolens* 202
- Ictiofauna
 Golfo de Nicoya 103
- Ilex sintensis* 256
 I. paraguariensis 256
- Indios del Brasil extinción 129
- Insectos
 barrenadores 99, 100
 control 110
- Instrumentos para medir
 la atmósfera 239
 respuesta de plantas al agua 240
- Investigaciones ecológicas 48, 61
 en Bolivia 49, 74
 Brasil 64
 Colombia 25, 65
 Ecuador 8, 72
 Venezuela 2, 3
 forestales 235
- Islas Galápagos 70, 97
- Lecythis* 244
- Leersia hexandra* 222
- Lectura en ecología 5, 16
 y evolución 13
 para profesores 40
- Litorina aspera* 106
 L. modesta 106
- Limnología
 consideraciones Río Xingú 185
 perspectivas 282
- Lobelia portoricensis* 256
- Lucha integrada
 conceptos 22
- Macadamia* sp. 194
- Manglares
 conocimiento de las plantas 226
 diagnóstico de la distribución de los ecosistemas 172
- Maregravia* 213
- Mariposas 83
- Marpesia berania* 83
- Matemáticas 60
- Mauritietum paludosum* 292
- Medición
 de la transpiración de árboles 223
 de temperatura del aire 163, 164
- Medio ambiente
 alteración, destrucción 75
 cambios-adaptación demográfica y genética
 estructura de poblaciones humanas 124
 contaminación 37, 62, 69, 77
 crisis 27, 33, 40
 desarrollo 78
 investigación 50
 sanidad y ecología humana para el desarrollo económico 132
 y sociedad 55
- Melaniris chagresis* 118

- Meliaceas 211
Metas y logros del grupo de ecología de la
Universidad de los Andes, Venezuela 280
Microhabitat
de varias gramíneas 143
Mimosa pigra 202
Minuartia guianensis 228
Muestras de agua
relación valores pH y conductividad
eléctrica 85
pH en el Casiquiare, bajo Orinoco 295
Murciélagos
comunidades - hábitos de alimentación
ciclo reproductivo 92
- Naturaleza ecuatoriana 1
Nicho ecológico
Heliamphora 159
Nivel del mar
Canal Panamá, potencial biológico 120
estudios biológicos 107
Nuez
zonificación ecológica 194
- Orquideas 251
- Pachygrapsus gracilis* 114
Pájaros 94, 109, 113
Panicum chloroticum 222
Paspalum fasciculatum 222
P. repens 222
Pastizal
malezas 202
recursos - Estado Barinas, Venezuela
174
Pasto
efecto del corte 180
Peces
alimentación 102
cambio de temperatura del agua 87
competencia con arroz 117
de agua dulce 93, 112
familias en las playas del Coco, Rincón
de Osa, Tamarindo, Costa Rica 115
mortalidad 86
voraces en ecosistemas lacustres 118
Pesca y polución 88
Phaseolus vulgaris 193, 241
Pithecellobium saman 272
Plantas 142
acción de los animales 258
carnívoras 159, 160
- Poblaciones
aborígenes 212
recursos, medioambiente 123
Polución 9, 37, 41, 62, 69, 77
Polynemidae 103
Problemas
fitosanitarios 255
geográficos del punto de vista del
habitante rural 130
Producción y ambiente 59, 77, 80
Psychotria berteriana 256
- Recursos
forestales y turismo 266
hídricos - planificación 281
Relevamiento ecológico 227
Reptiles 96
Rescate de la laguna de "Sonso" 57
- Sabanas 203, 261, 274, 291
vegetación 273
ecofisiológico 300
Sciaenidae 103
Scripus cubensis 222
Semillas 218
efecto de la defoliación en la
producción 265
sorgo 290
Sesarna curacaoense 114
Sida spp. 202
Sociedades tribales 121, 125, 127, 230
Sorghum bicolor 290
Sterculia apelata 218
Suelo 302
carretera transamazónica 189
ecosistema 254
fertilidad - efecto de la vegetación 267
nutrientes 287, 288
Swietenia macrophylla 211
S. mahogani 211
- Técnicas para estimar temperaturas 242
Tecnología y ecología 76
Territorios de la Región Amazónica 206
Thalia geniculata 202
Tiaris olivacea 259
Tortuga
asentamiento 89
Trachypogonatum axoponosus 292
Trichilia sp. 211
Trichiuridae 103

Vegetación 190, 285
 clasificación
 Holdridge 171
 marco 297
 Unesco 225
ecología 301
tipos 276
 Cerrado
 análisis fisiológico 204, 205
 regionalización 264
 uso intensivo 170
 vegetación
 características regeneración 294
 fertilidad 205

Vegetación (Cont.)
 y primates 31
Verronia brasiliana 202

Zonificación ecológica de cultivos de
 consumo básico y tradicionales de
 exportación 252
 frijol 193, 241
 nuez 194

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Autor

ECOLOGIA DEL TROPICO
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