

MICROORGANISMOS EN SUS HABITATS NATURALES: AIRE, AGUA Y SUELO

Referencia: Capítulo 9, *Microbial Ecology*. Atlas & Bartha.

ECOesfera (bioESFERA), constituye la totalidad de los seres vivos en el planeta y su ambiente (atmo-, hidro-, y lito-ecoesfera).

✓ **HABITAT**: influencia sobre crecimiento, actividad, interacciones, supervivencia

ATMO-ecoesfera

✓ Características y estratificación atmosférica

- tropoesfera [vida]
- Estratoesfera
- ionoesfera

✓ Temperatura, radiación, oxígeno, agua, nutrientes

✓ Hábitat y medio de dispersión microbiana (ej. aerosoles)

✓ Microorganismos en la atmósfera

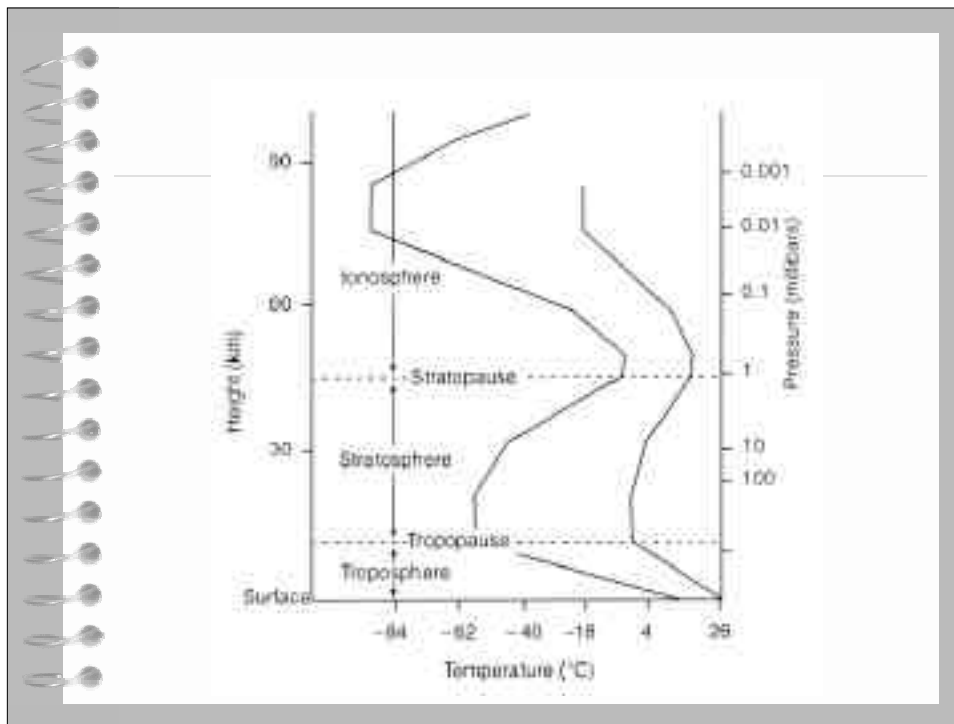


Table 6.3
Quantitative estimates of microorganisms (%) in the troposphere

| Microorganism | N. Canada (7 m) | N. Canada (3000 m) | Quebec (3000 m) |
|--------------------------------|-----------------|--------------------|-----------------|
| Bacteria | | | |
| Gram-positive pleomorphic rods | 46 | 34 | 30 |
| Gram-negative rods | 29 | 33 | 4 |
| Spiral bacteria | 18 | 34 | 11 |
| Gram-positive cocci | 15 | 23 | 11 |
| Other bacteria | 1 | 0 | 2 |
| Fungi | | | |
| Ascomycetes | — | 70 | 62 |
| Basidiomycetes | — | 7 | 3 |
| Zoozooids | — | 3 | 2 |

Source: Stearns 1972.

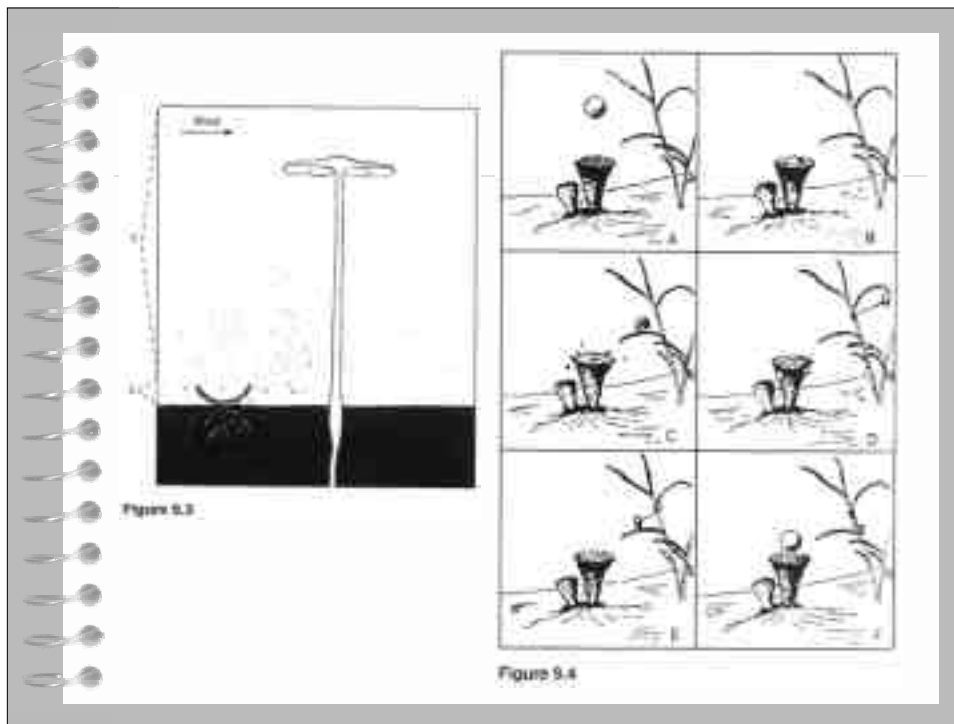


Table 9.1

Estimated distance traveled by several fungi, calculated from terminal velocities assuming nonturbulent wind moving at 1 m per second

| Fungus | Assumed liberation height | Distance (m) |
|-------------------------|---------------------------|--------------|
| <i>Helminthosporium</i> | 1 m | 50 |
| <i>Puccinia</i> | 1 m | 80 |
| <i>Agaricus</i> | 5 cm | 40 |
| <i>Lycoperdon</i> | 5 cm | 100 |

Source: Gregory 1973.

Table 8.2
Survival times of some bacterial and archaeal species in the oil-drift state

| Survival time | Organism |
|--|---|
| 10 ⁶ years | <i>Corynebacterium jeikeium</i> (acid-fast, spore-forming bacilli, 100%) |
| 10 ⁴ -10 ⁶ years | <i>Cocci, actinomyces</i> , gram-negative bacilli, spore-forming bacteria |
| 10 ³ years | <i>Mycobacterium thermophilum</i> - <i>thermaerans</i> , <i>Thermococcus</i> spp. |
| 200 years | <i>Bacillus</i> sp., <i>Clavibacter</i> sp. |
| 140 years | <i>Neisseria meningitidis</i> |
| 10-50 years | <i>Bacillus anthracis</i> |
| 15 years | <i>Haemophilus influenzae</i> |
| 3 years | <i>Enterobacter aerogenes</i> |
| 0.6-1.2 years | <i>Streptococcus pneumoniae</i> |
| 1.1 years | <i>Mycobacterium</i> sp., <i>Mycobacterium</i> sp., <i>Streptococcus</i> sp., <i>Staphylococcus</i> sp., <i>Staphylococcus</i> sp. |
| 320-300 days | <i>Escherichia coli</i> , <i>Staphylococcus aureus</i> , <i>Staphylococcus aureus</i> , <i>Staphylococcus aureus</i> , <i>Staphylococcus aureus</i> , <i>Staphylococcus aureus</i> , <i>Staphylococcus aureus</i> |
| 10 days | <i>Mycobacterium</i> spp. |
| 40-50 days | <i>Clavibacter</i> spp. |
| 12-40 days | <i>Campylobacter jejuni</i> , <i>Legionella pneumophila</i> serogroup 4, <i>Legionella pneumophila</i> , <i>Legionella pneumophila</i> , <i>Legionella pneumophila</i> |
| 3.5-10 days | <i>Staphylococcus aureus</i> , <i>Staphylococcus aureus</i> , <i>Staphylococcus aureus</i> , <i>Staphylococcus aureus</i> , <i>Staphylococcus aureus</i> |
| 23-48 hours | <i>Streptococcus pneumoniae</i> , <i>Streptococcus pneumoniae</i> , <i>Streptococcus pneumoniae</i> , <i>Streptococcus pneumoniae</i> , <i>Streptococcus pneumoniae</i> |
| 2-4 hours | <i>Haemophilus influenzae</i> , <i>Haemophilus influenzae</i> |
| 10-40 minutes | <i>Streptococcus pneumoniae</i> , <i>Streptococcus pneumoniae</i> |
| 20-18 minutes | <i>Staphylococcus aureus</i> |
| 2-6 minutes | <i>Staphylococcus aureus</i> |

Source: Price (1984)

HIDRO-ecoesfera

✓ Ambientes acuáticos

- Ríos
- Lagos
- Lagunas
- Otros

✓ Ambientes marinos

✓ Estuarios

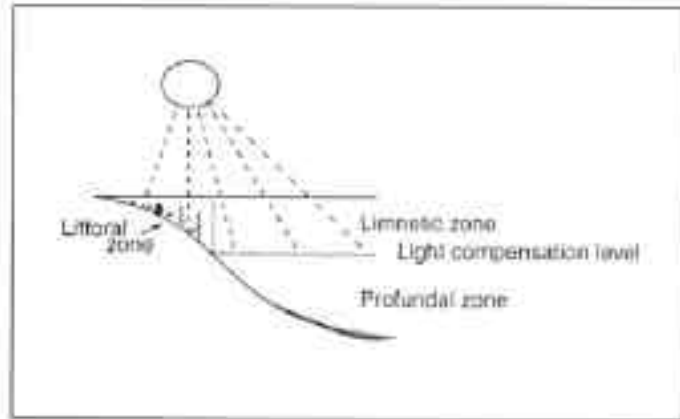


Figure 9.12

Zonation of a lake habitat based on light penetration.
 (Source: Odum 1971. Reprinted by permission, copyright
 W. B. Saunders Co., Philadelphia.)

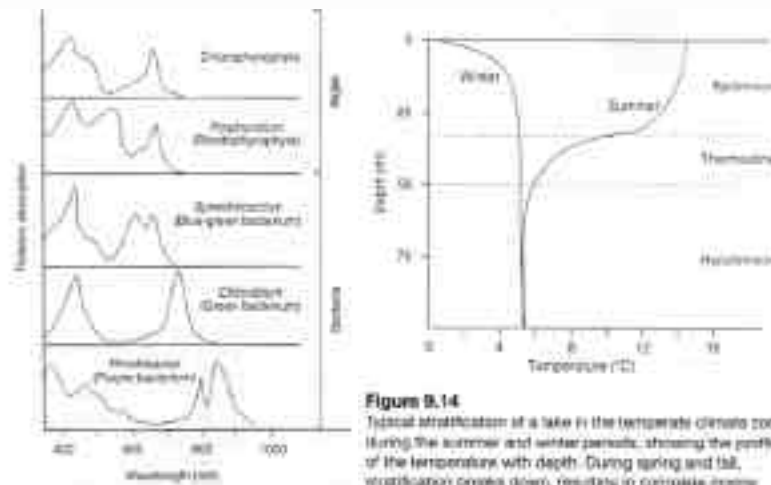


Figure 9.13

Relative spectra of representative photosynthetic microorganisms. Note that Chlorobium and Rhodospirillum can absorb light in the far-red part of the spectrum, which is not utilized by algae. Because these bacteria live below the algal layer, this ability offers ecological advantage. (Source: Garver and Cohen Bailey 1987. Reprinted by permission, copyright Cambridge University Press.)

Figure 9.14

Typical stratification of a lake in the temperate climate zone during the summer and winter periods, showing the profile of the temperature with depth. During spring and fall, stratification breaks down, resulting in complete mixing (turnover) of the lake water.

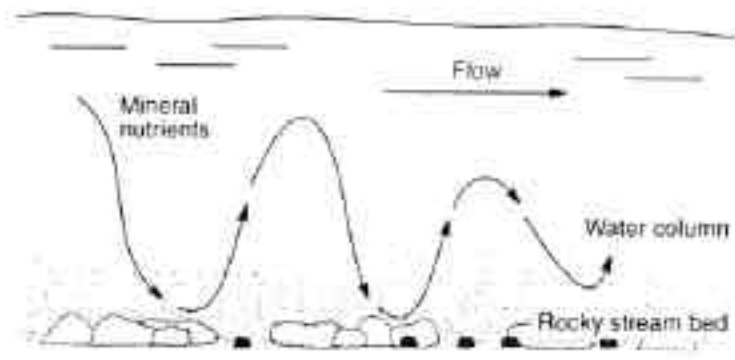


Figure 9.16

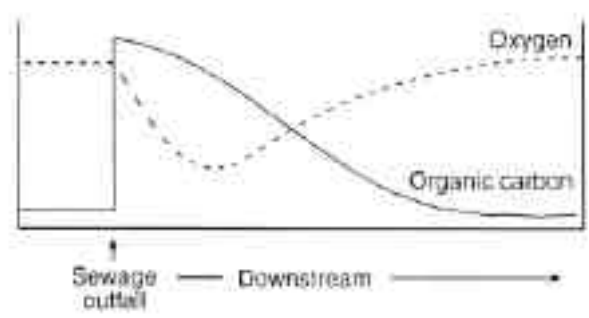


Figure 9.17
 Relationship of organic carbon and dissolved oxygen in a river above and below a sewage outfall.

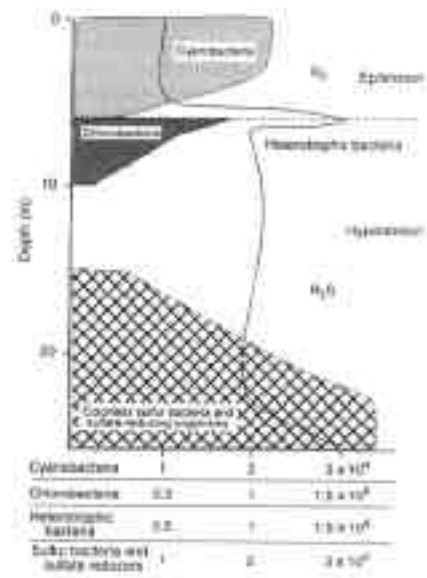


Figure 9.16

| Lake [†] | Turnover T_1 (hours) | Secondary productivity (mg C/m ³ /day) |
|-----------------------------------|---------------------------|---|
| Oligotrophic Lawrence, Mich. | 4-300 | 1-80 |
| Mesotrophic Crooked, Ind. | 80-470 | 63-110 |
| Eutrophic Little Crooked, Ind. | 36-232 | 180-205 |
| Lötsjön, Sweden | | |
| Summer | 0.4-5 | <100 |
| Winter | 20-300 | <20 |

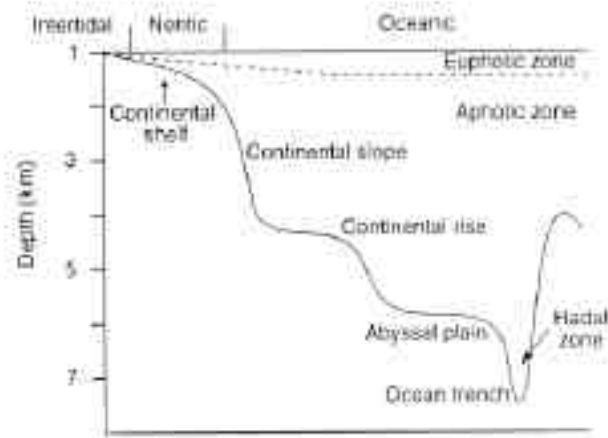


Figure 9.23

Major horizontal zonation in an ocean profile. (Source: Odum 1971. Reprinted by permission, copyright W. B. Saunders, Philadelphia.)



Figure 9.24

LITO-ecoesfera

- ✓ Suelos y sus propiedades físicas, químicas y biológicas
 - SOLIDO (materiales inorgánicos, área superficial)
 - GAS (difusión de aire; deshidratación)
 - LIQUIDO (difusión solutos, migración de microorganismos, etc.)
- ✓ Formación de suelo: material parental, clima, topografía, actividad biológica, tiempo

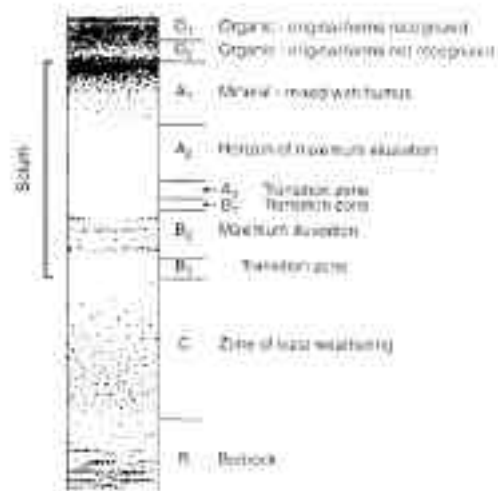


Figure 9.31
Vertical soil profile showing soil horizons. (Source: Buchman and Brady 1988. Reprinted by permission, copyright Macmillan Publishing Co.)

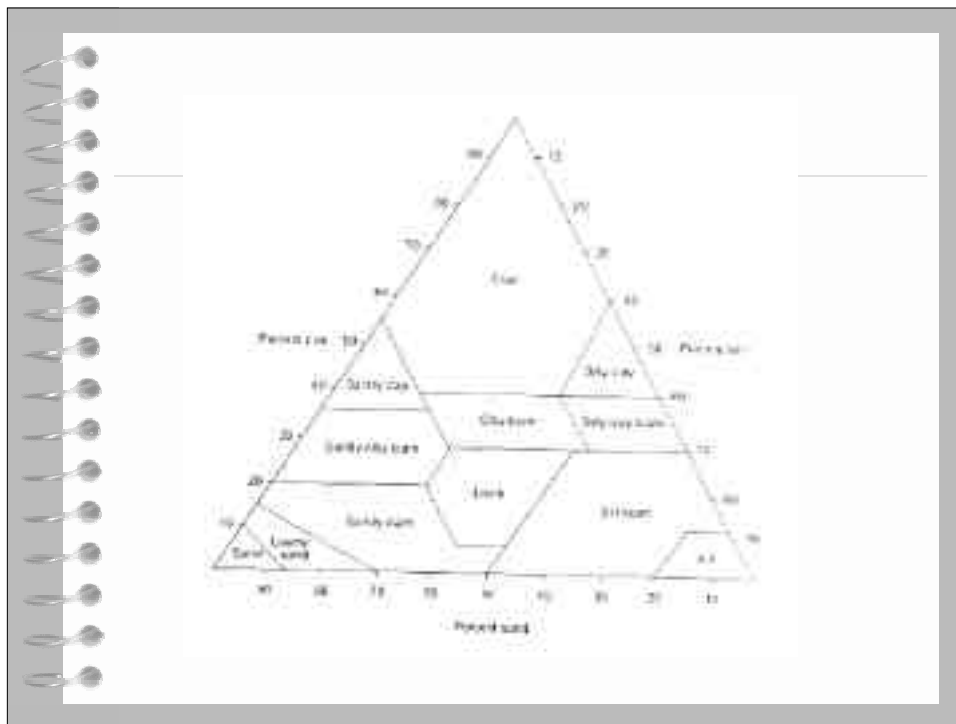


Table 9.8

Comparison of size range, particle number, and surface area per gram of sand, silt, and clay. The calculations assume spherical particles with the maximum diameter within the size range.

| Soil component | Diameter (mm) | No. of particles/g | Surface area (cm ² /g) |
|----------------|---------------|-----------------------|-----------------------------------|
| Sand | 2.00–0.05 | 90 | 11 |
| Silt | 0.05–0.002 | 5.78×10^6 | 454 |
| Clay | 0.002 | 9.03×10^{10} | 8,000,000 |



Figure 9.34
Soil aggregate showing microorganisms and patchy distribution of bacterial microcolonies. The section also shows the presence of water and air within pore spaces. (Source: Brock 1979. Reprinted by permission of Prentice Hall, Englewood Cliffs, NJ.)

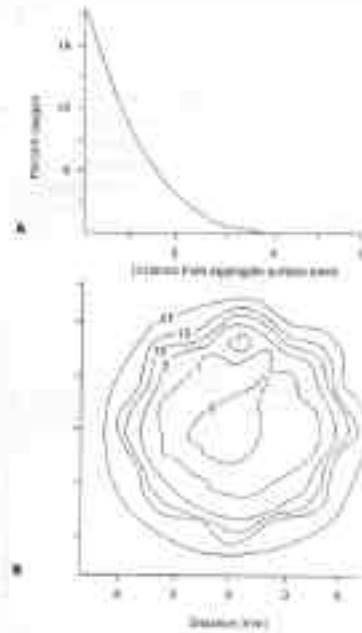


Figure 9.32