Coastal Ecology and Management: Salt Marshes and Mangroves

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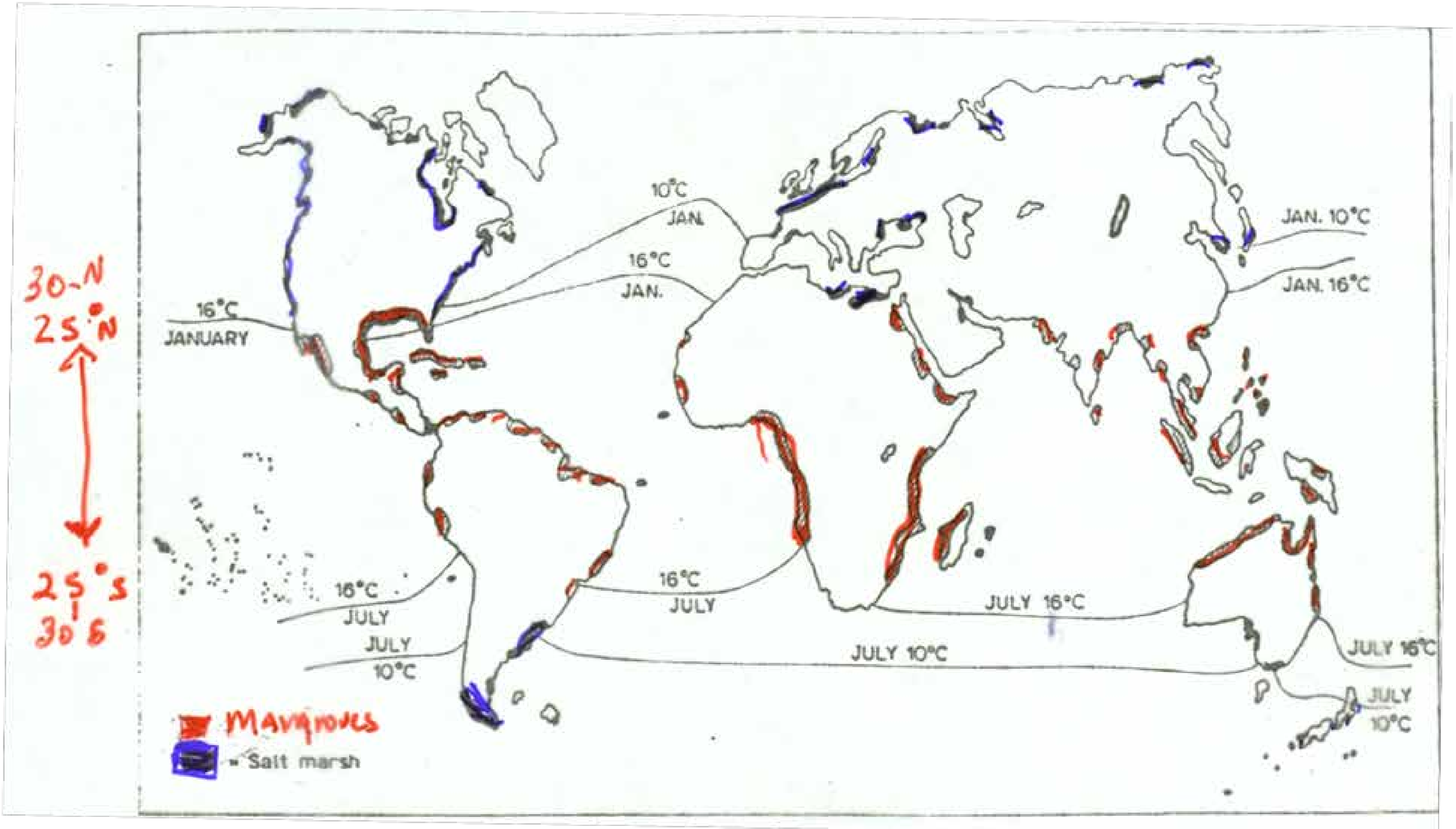
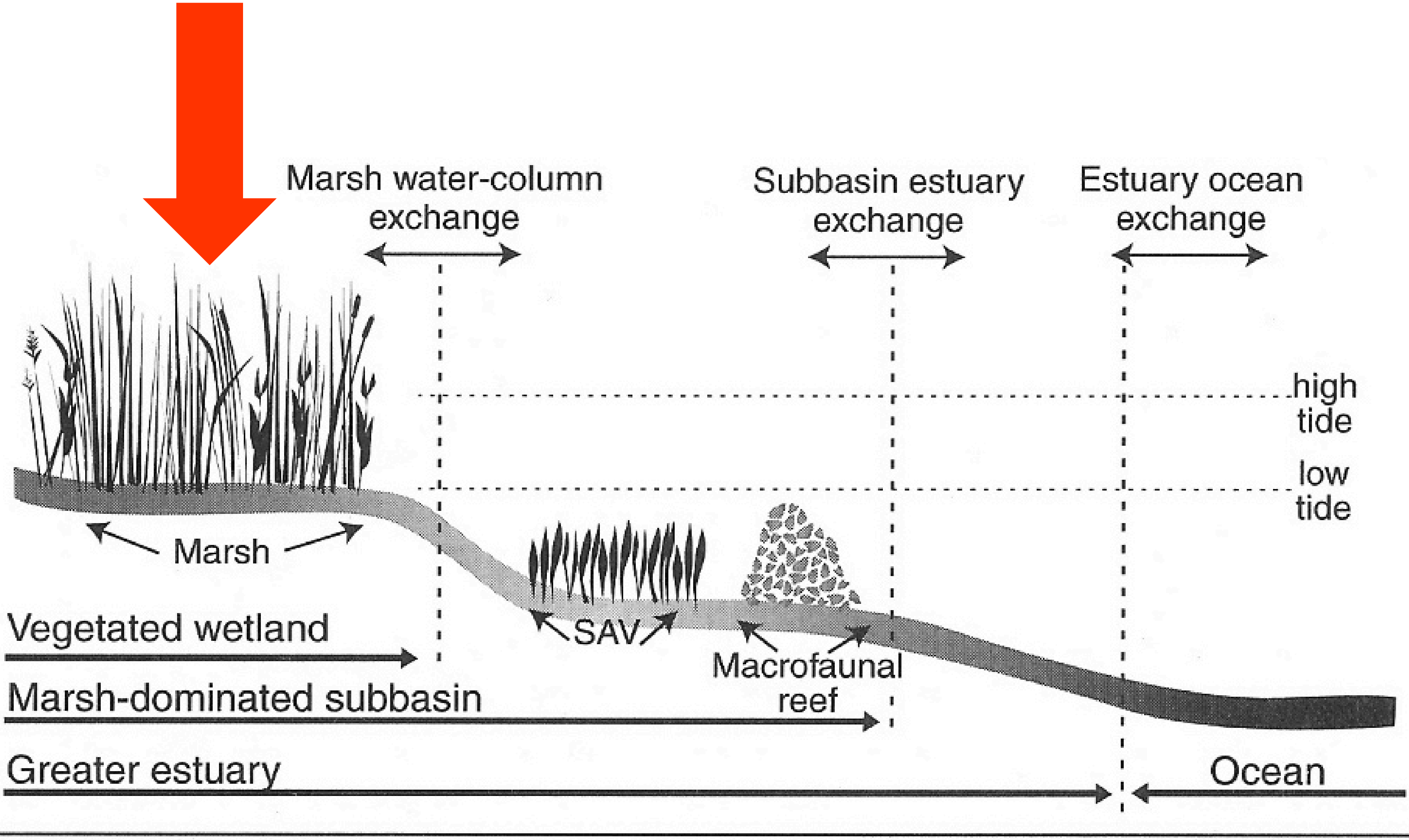


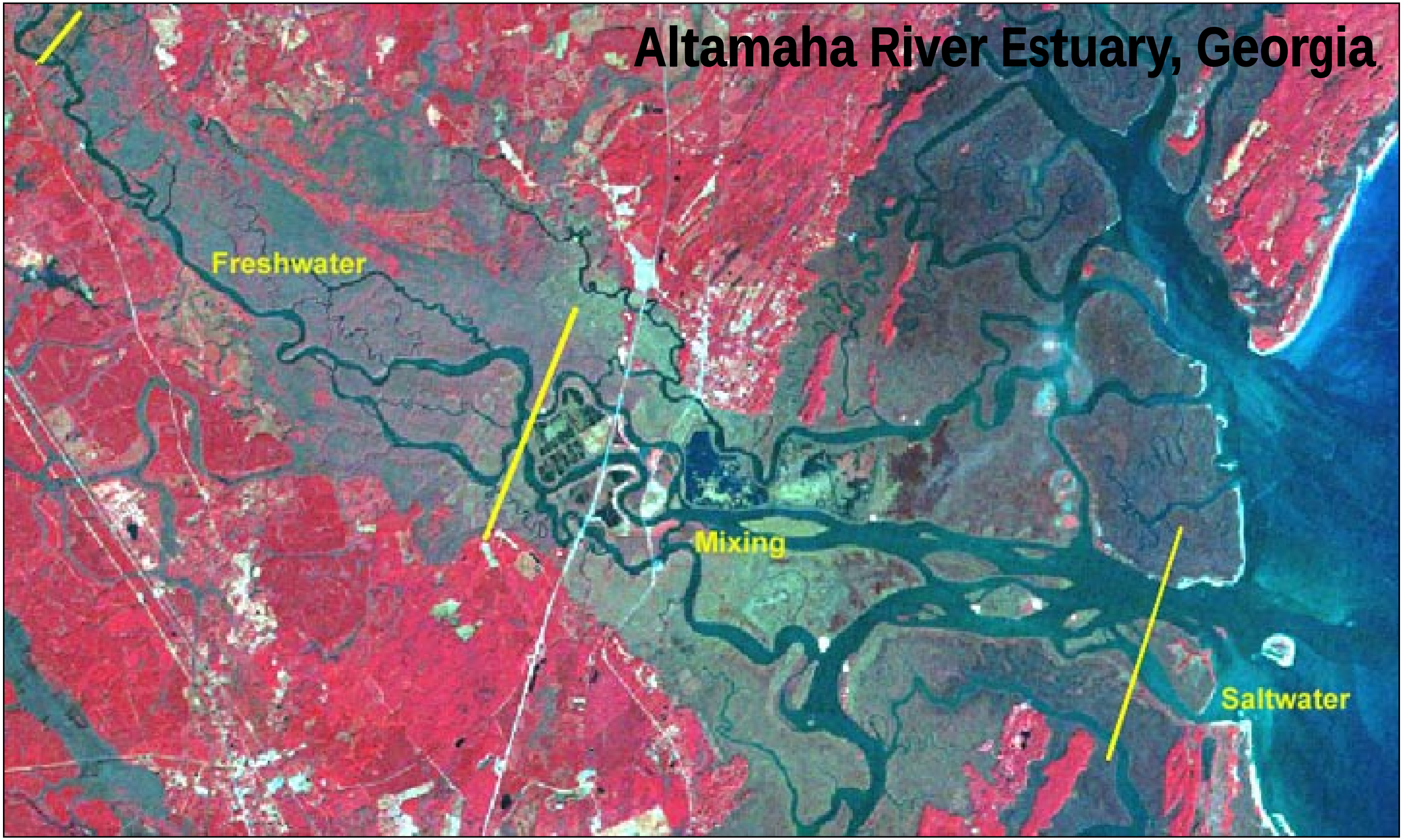
(adapted by Greg Bruland)

Tidal Salt Marsh: Formation and Development



(Mitsch & Gosselink 2000)

Tidal Salt Marsh: Formation and Development



HTTP://COASTGIS.MARSCI.UGA.EDU/SUMMIT/IMAGES/ALTSALINITY.JPG

Tidal creek in a South Carolina *Spartina alterniflora* marsh

Tidal *Spartina alterniflora* marsh in coastal North Carolina

Tidal salt marsh behind a barrier island in coastal NC


San Quintin tidal salt marsh, Mexico

Hawai‘i salt marsh: Honu‘apo

Tidal Salt Marsh: Formation and Development

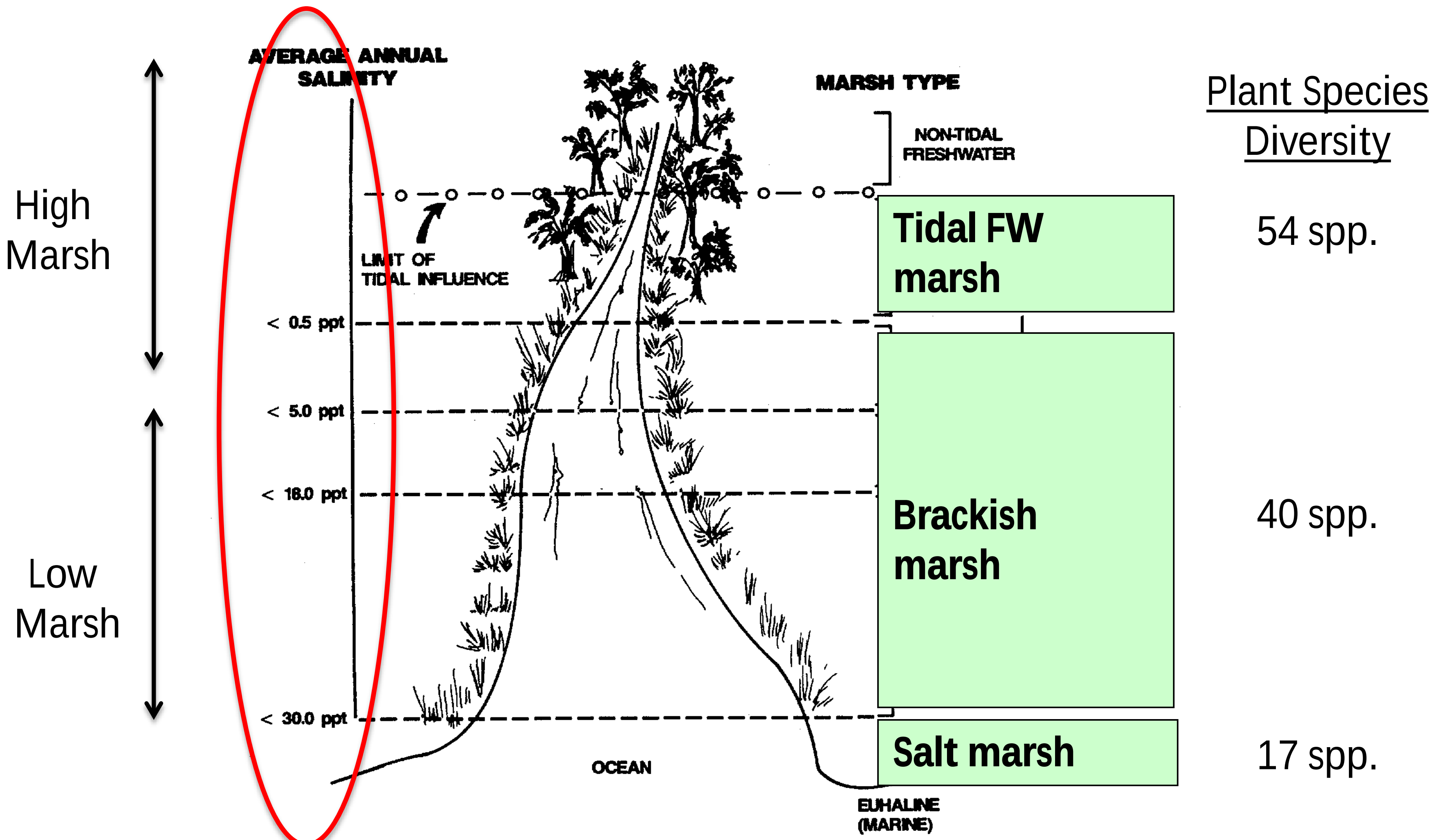
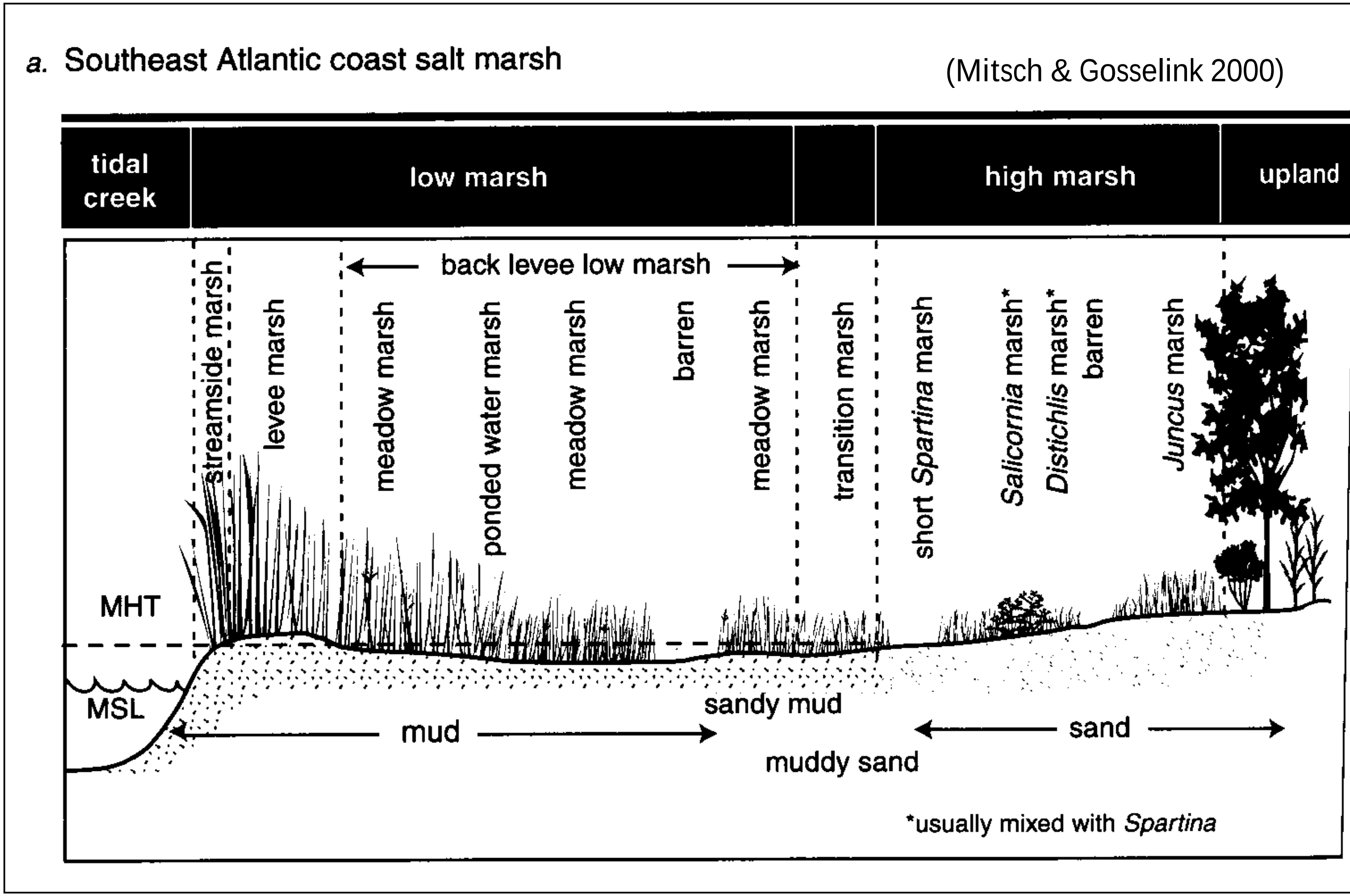


Figure 1 The relationship between marsh type and average annual salinity (values are approximate only). Terminology is based on Cowardin et al (24). From Odum et al (99).

Tidal Salt Marsh: Formation and Development



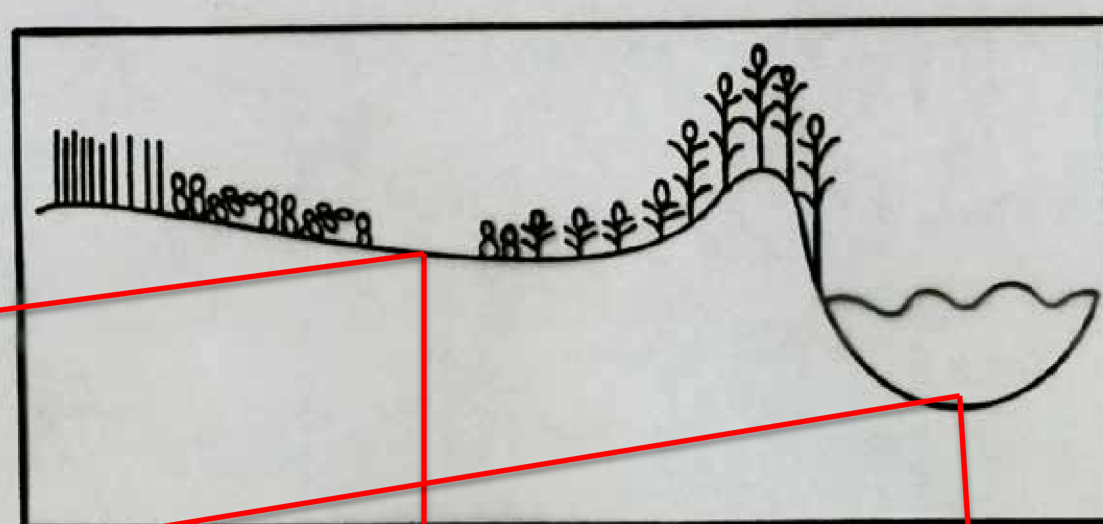
<u>Vegetation Morphology</u>

- **Taller and hardier in low marsh**
- **Shorter and less robust in the high marsh**

Tidal Salt Marsh: Formation and Development

Panne or Salt Flats

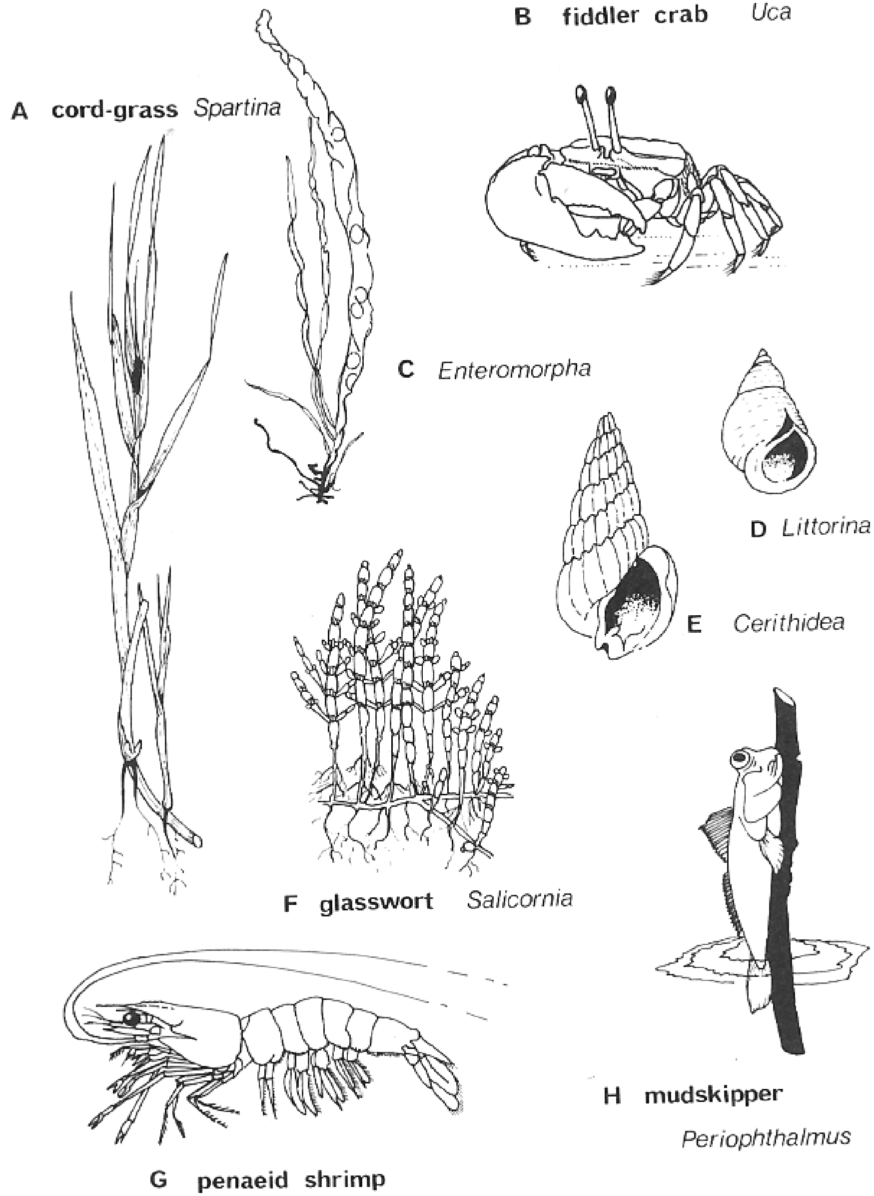
Tidal Creeks



Vegetation zones	*Juncus - Borrichia*	*Salicornia - Batis*	Salt flats	*Spartina alterniflora* Short	*Spartina alterniflora* Tall	Tidal creek
Frequency of flooding (%)	2 - 5	4 - 8	5 - 10	40 - 80	80 - 100	100
Interstitial salinity (ppt)	24.5	41.0	127.0	33.2	23.3	20.0

Fig. 5.1. The relation of the salt flat's interstitial salinity and its vegetation (redrawn from Antlfinger and Dunn 1979).

Tidal Salt Marsh: Community Dynamics



(Boaden & Seed 1985)

Tidal Salt Marsh: Community Dynamics

http://newell.myweb.uga.edu/periwink.htm

- **Potential of significant herbivory by marsh periwinkle snail**
- **Overharvesting of blue crab leads to increasing periwinkle populations that overgraze *Spartina***
- **Leads to bare patches & die-back**

(Silliman et al. 2005)

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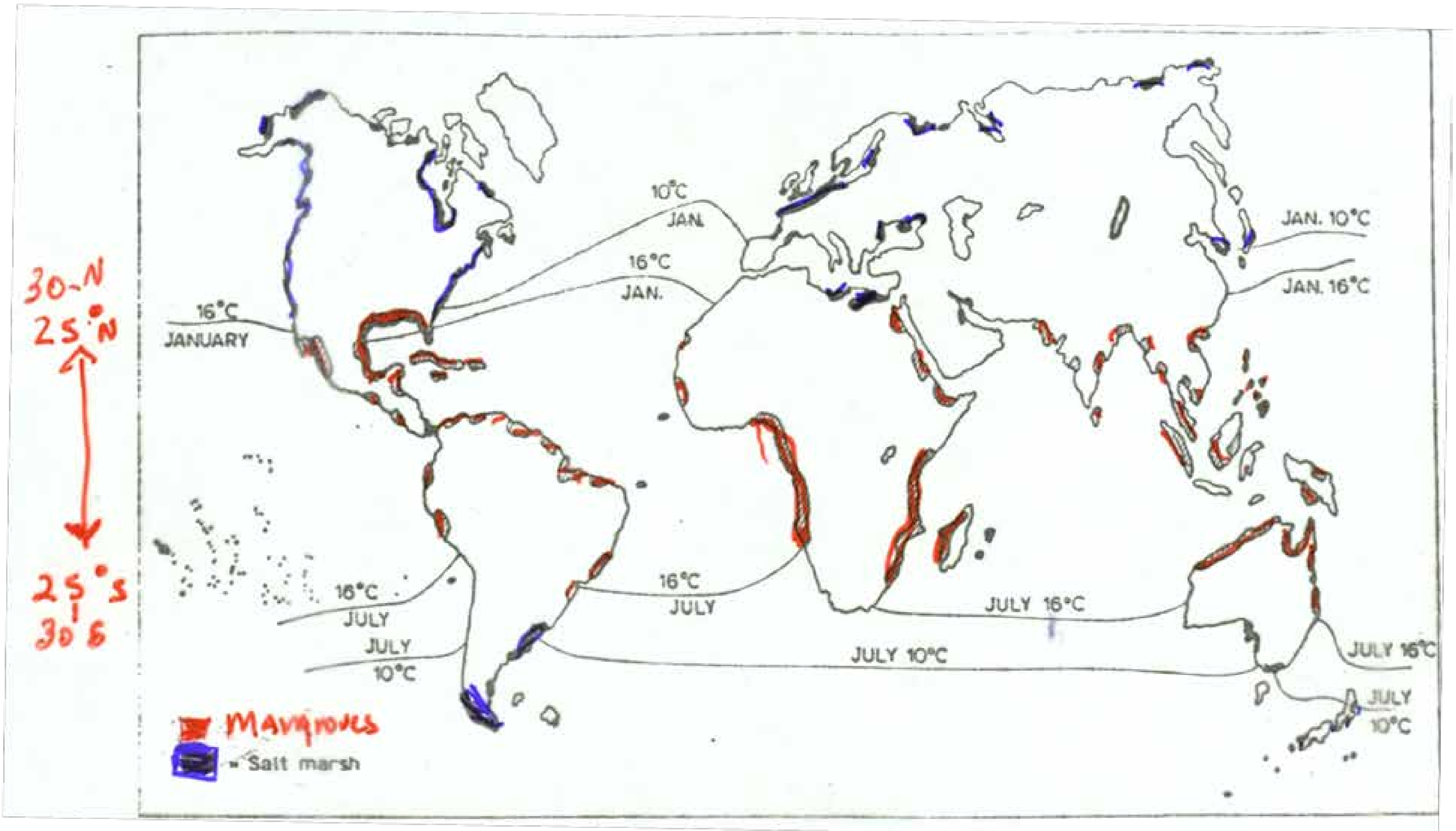
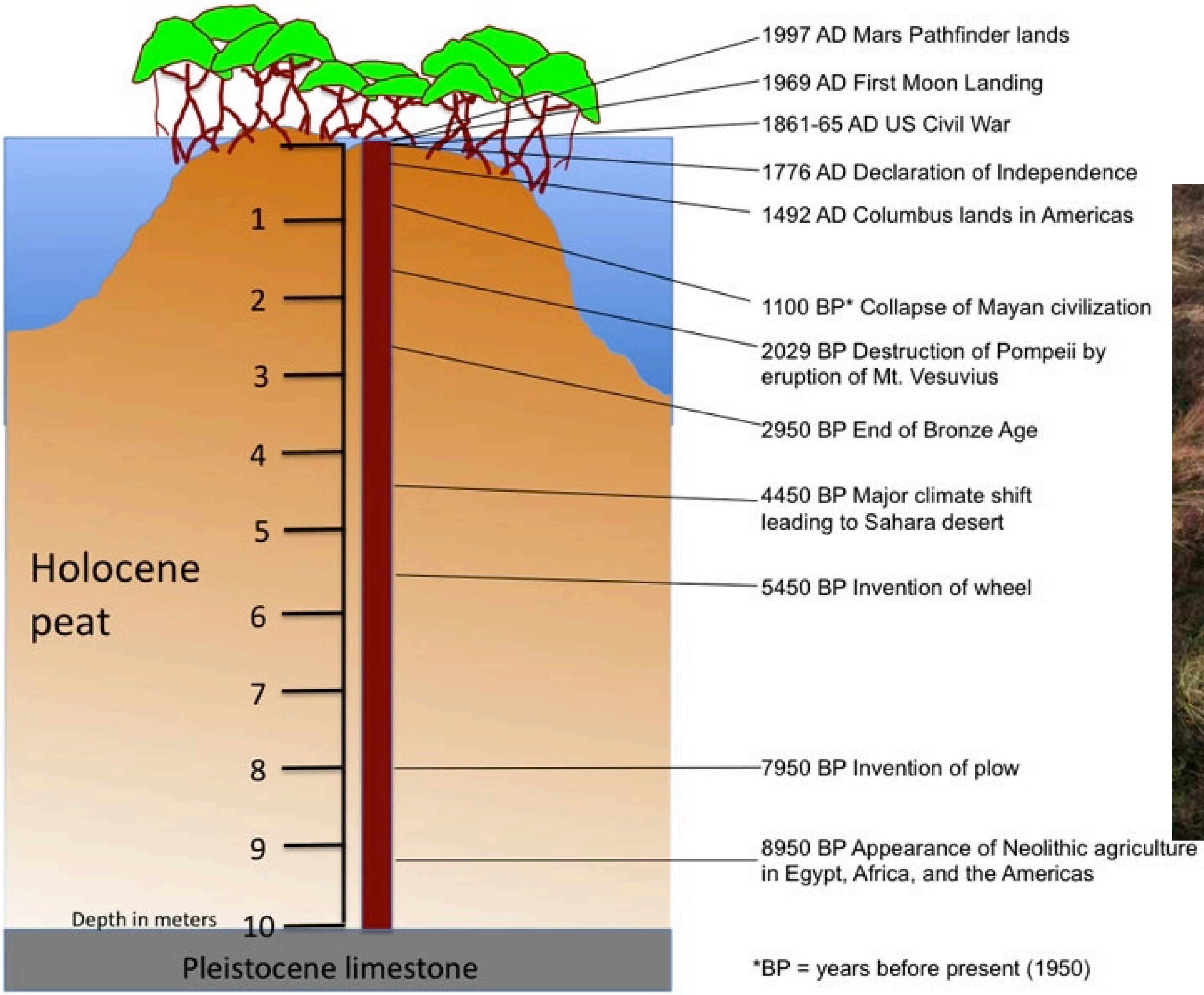


(adapted by Greg Bruland)

Mangrove: Formation and Development

http://etc.usf.edu/clippix/pix/close-up-of-mangrove-prop-roots_medium.jpg

Mangrove: Formation and Development



Mangrove: Formation and Development

HTTP://RPS.UVI.EDU/VIMAS/BLACK%20MANGROVE.HTM

Mangrove: Formation and Development

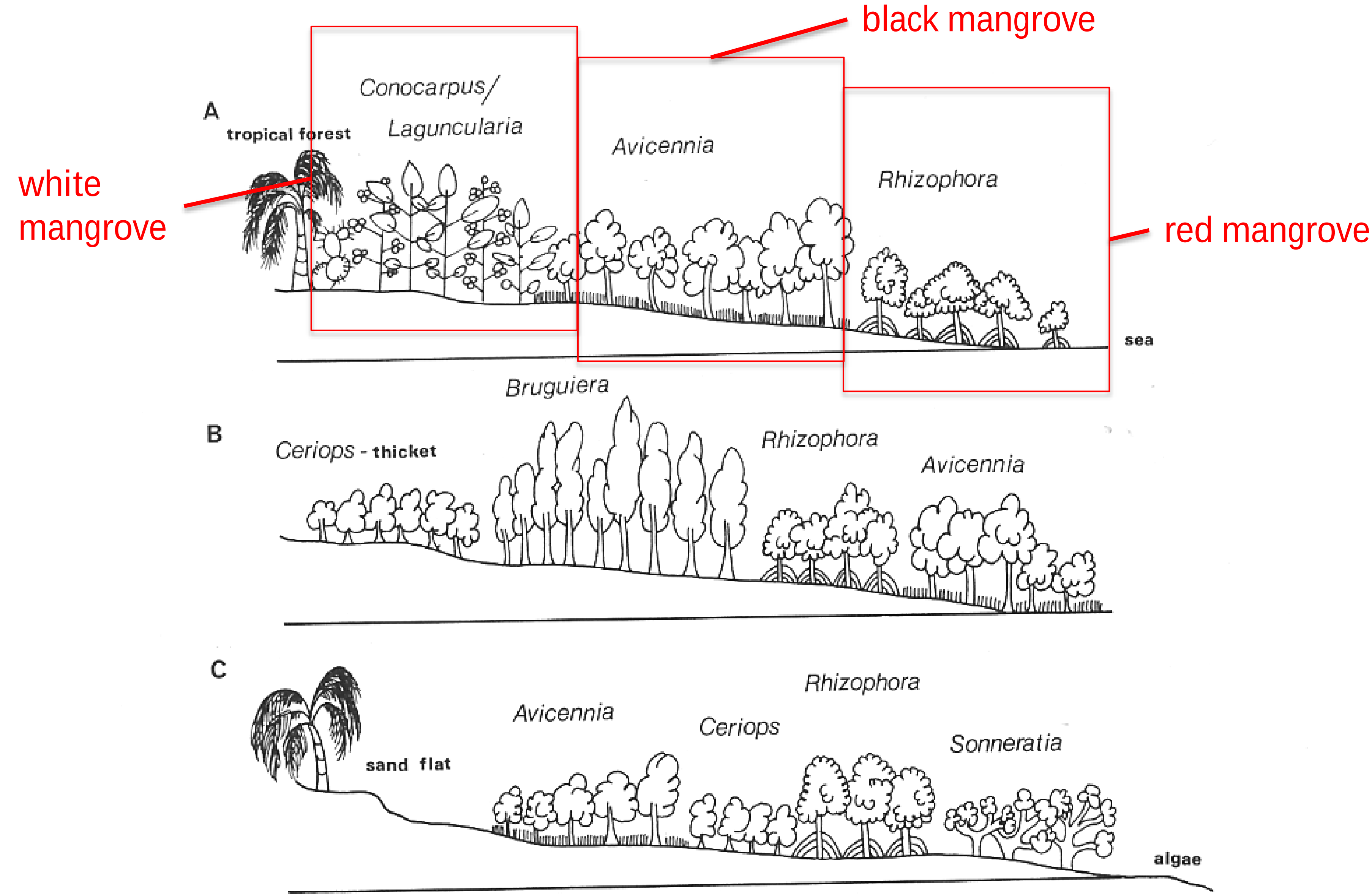


Figure 7.5 Generalized zonation patterns of mangroves in different geographical regions: (*A*) Florida; (*B*) West Indo-Pacific; (*C*) East Africa. (Boaden & Seed 1985)

Rhizophora mangle – red mangrove

Avicennia germinans – black mangrove

Laguncularia racemosa – White mangrove

Mangrove: Formation and Development

Table 11-1 Soil salinity ranges for major mangrove types

Hydrodynamic Type	Soil Salinity (ppt)
Fringe mangroves	
Avicennia zone	59
Rhizophora zone	39
Riverine mangroves	10–20[a]
Basin mangroves	
Avicennia zone	>50
Laguncularia zone	Low salinity
Mixed forest zone	30–40

[a]Higher in dry season when less freshwater streamflow is available.
Source: Cintrón et al. (1985).

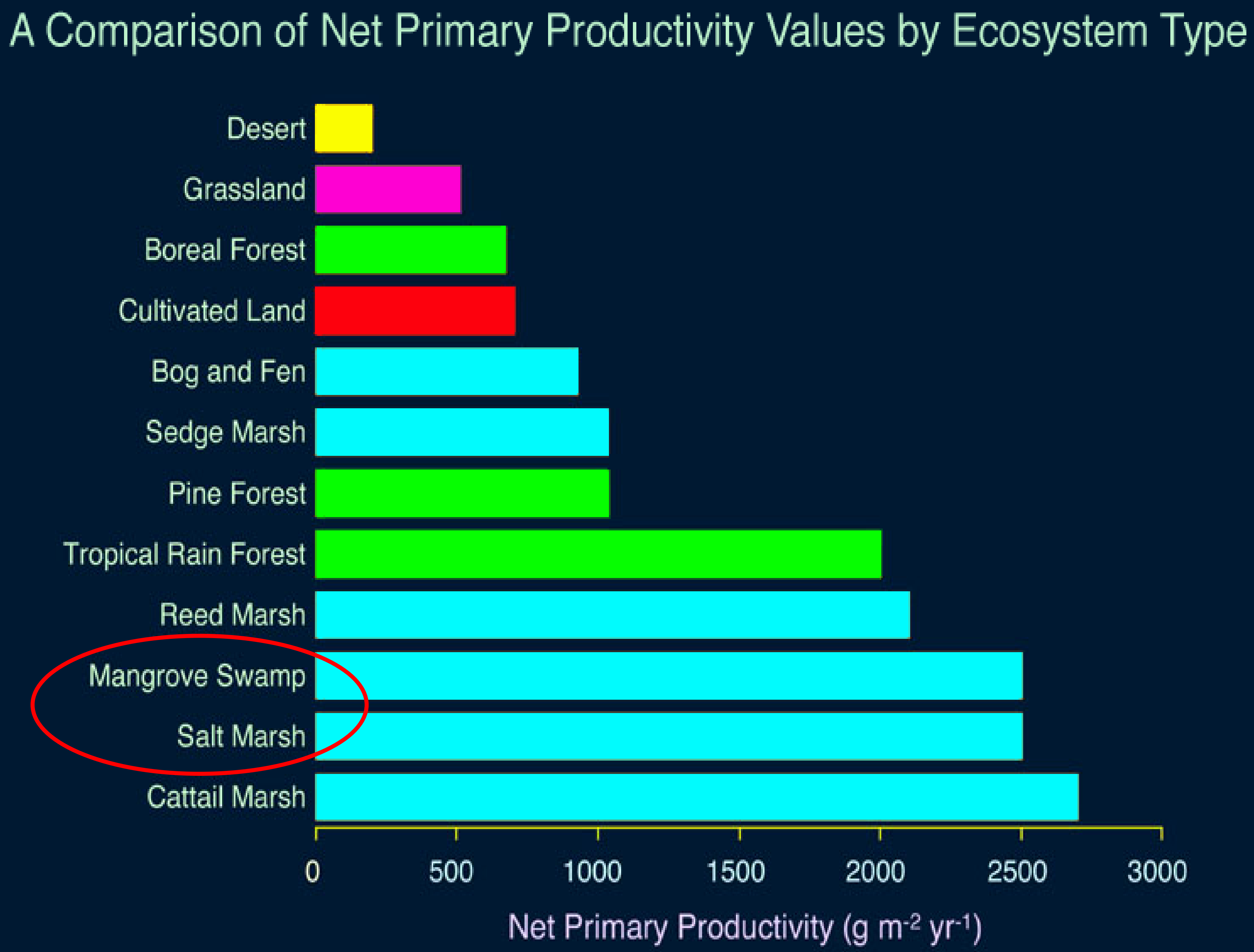
Filter feeders: Oysters

Barnacles and oysters attach to stems and roots

Neosarmatium smithi
Indo-Pacific

Consumers: Crabs

Grapsid crabs of the genus *Sesarma* may consume up to ¼ of annual litterfall of *Rhizophora*


A Comparison of Net Primary Productivity Values by Ecosystem Type
Desert
Grassland
Boreal Forest
Cultivated Land
Bog and Fen
Sedge Marsh
Pine Forest
Tropical Rain Forest
Reed Marsh
Mangrove Swamp
Salt Marsh
Cattail Marsh
0
500
1000
1500
2000
2500
3000
Net Primary Productivity (g m-2 yr-1)

Rhizophora on Oahu

Rhizophora on Oahu

Global Ecology and Biogeography Letters (1998) **7**, 61–71

MANGROVE SPECIAL ISSUE

Mangroves as alien species: the case of Hawaii

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Abstract. Prior to the early 1900s, there were no mangroves in the Hawaiian Archipelago. In 1902, *Rhizophora mangle* was introduced on the island of Molokai, primarily for the purpose of stabilizing coastal mud flats. This species is now well established in Hawaii, and is found on nearly all of the major islands. At least five other species of mangroves or associated species were introduced to Hawaii in the early 1900s, and while none has thrived to the degree of *R. mangle*, at least two have established self-maintaining populations (*Bruguiera gymnorrhiza* and *Conocarpus erectus*). Mangroves are highly regarded in most parts of the tropics for the ecosystem services they provide, but in Hawaii they also have important negative ecological and economic impacts. Known negative impacts include reduction in habitat quality for endangered waterbirds such as the Hawaiian stilt (*Himantopus mexicanus knudseni*), colonization of habitats to the detriment of native species (e.g. in anchialine pools), overgrowing native Hawaiian archaeological sites, and causing drainage and aesthetic problems. Positive impacts appear to be fewer, but include uses of local importance, such as harvesting *B. gymnorrhiza* flowers for lei-making, as well as some ecological services attributed to mangroves elsewhere, such as sediment retention and organic matter export. From a research perspective, possible benefits of the presence of mangroves in Hawaii include an unusual opportunity to evaluate their functional role in coastal ecosystems and the chance to examine unique or rare species interactions.

Key words. Species introductions, alien species, Hawaii, *Rhizophora mangle*, *Bruguiera gymnorrhiza*, *Conocarpus erectus*, mangroves.

(Field et al. 2008)

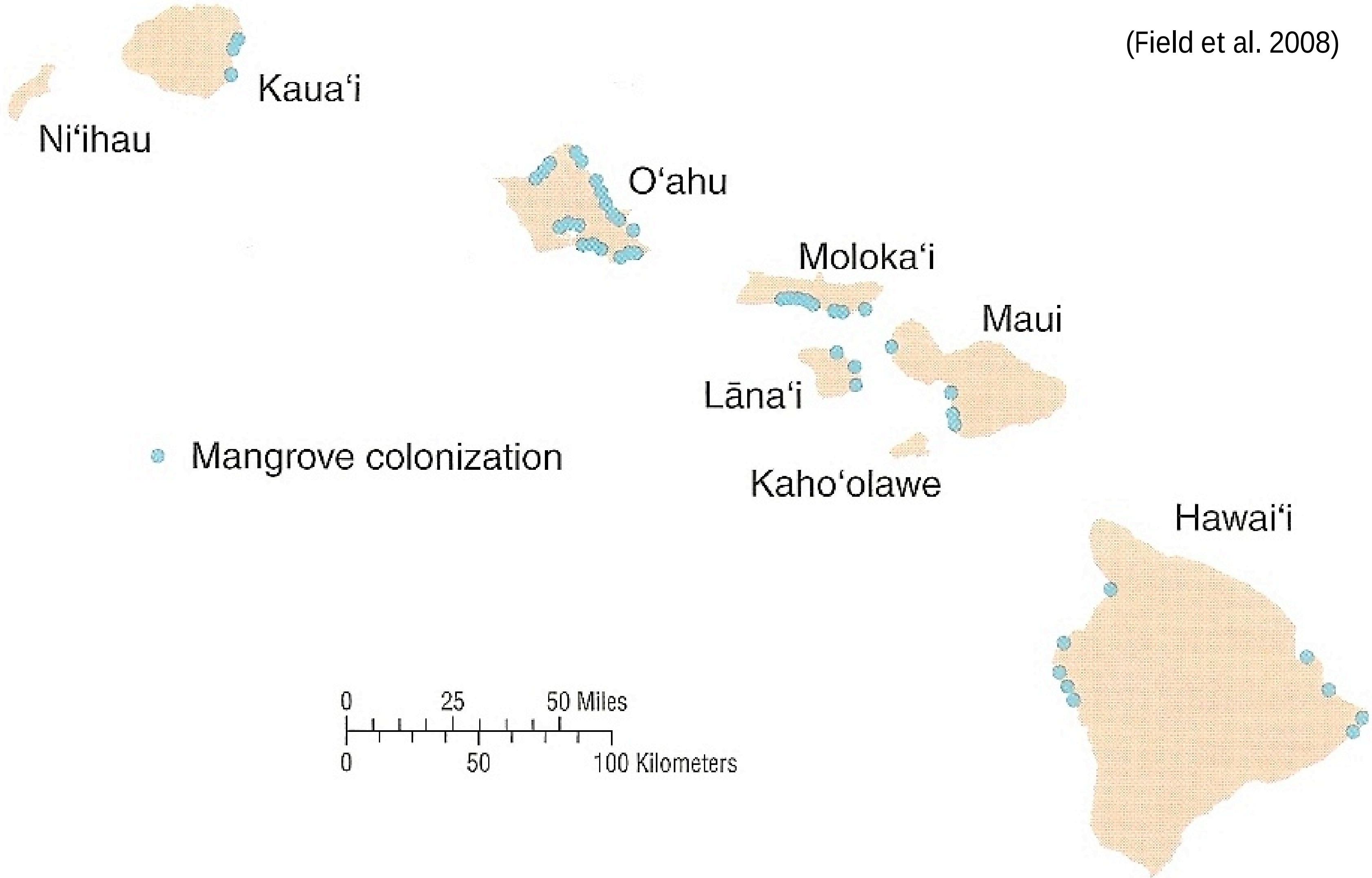

Figure 3. Map showing the approximate sites (blue dots) of known mangrove colonization throughout the eight main Hawaiian Islands. Sites updated from Allen (1998) and Wester (1981).