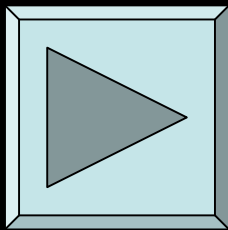
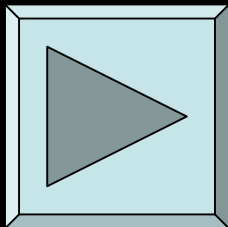


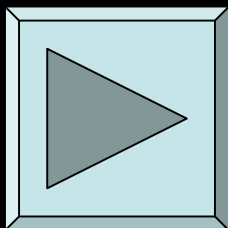
Abbildungen für Riffvorlesung 27.11.2002 / 4.12.2002



Ökologie der Scleractinia



Weitere Rifforganismen



Riffdefinitionen und Rifftypen

Hydrozoen

Dia 1189: Feuerkoralle Millepora, (Foto Hanna/Wells)



Feuerkoralle Millepora, (Film Leinfelder)

Movie is not embedded in this pdf-version.
See www.palaeo.tv, section modern
for full version of this movie



Dia 1201: Hydrokoralle *Stylasterina*, (Foto ?)



Weichkorallen-Hydrozoen-Ensemble (Foto Lehnert)



Octokorallen

darunter:

Stolonifera (Orgelkorallen)

Coenothecalia (Heliopora, blaue Koralle)

Alcyonaria und **Gorgonacea**: Weich- und Lederkorallen

Pennatularia: Seefedern

Seeanemonen

(gehören mit Scleractinia zu Zoantharia bzw. Hexakorallen)

Actinaria, Corallimorpharia, Zoanthinaria

Tubipora (Orgelkoralle) u.a. , Foto Leinfelder



Dia 1111: Gorgone



Dia 1231: „Des toten Mannes Hand“



Dia 1193: Oktokoralle Dendronephthya mit Spiculae



Dia 1118: Spiculae von *Alcyonaris* (stachelige Lederkoralle)
mit Crustacee *Stenopus*



Dia 1203: Stacheldrahtkoralle (fehlt noch)

Seefächer, Bahamas (Foto Leinfelder)



„Peitschenkorallen“, Kolumbien (Foto Leinfelder)



Weichkorallen (Foto ?)



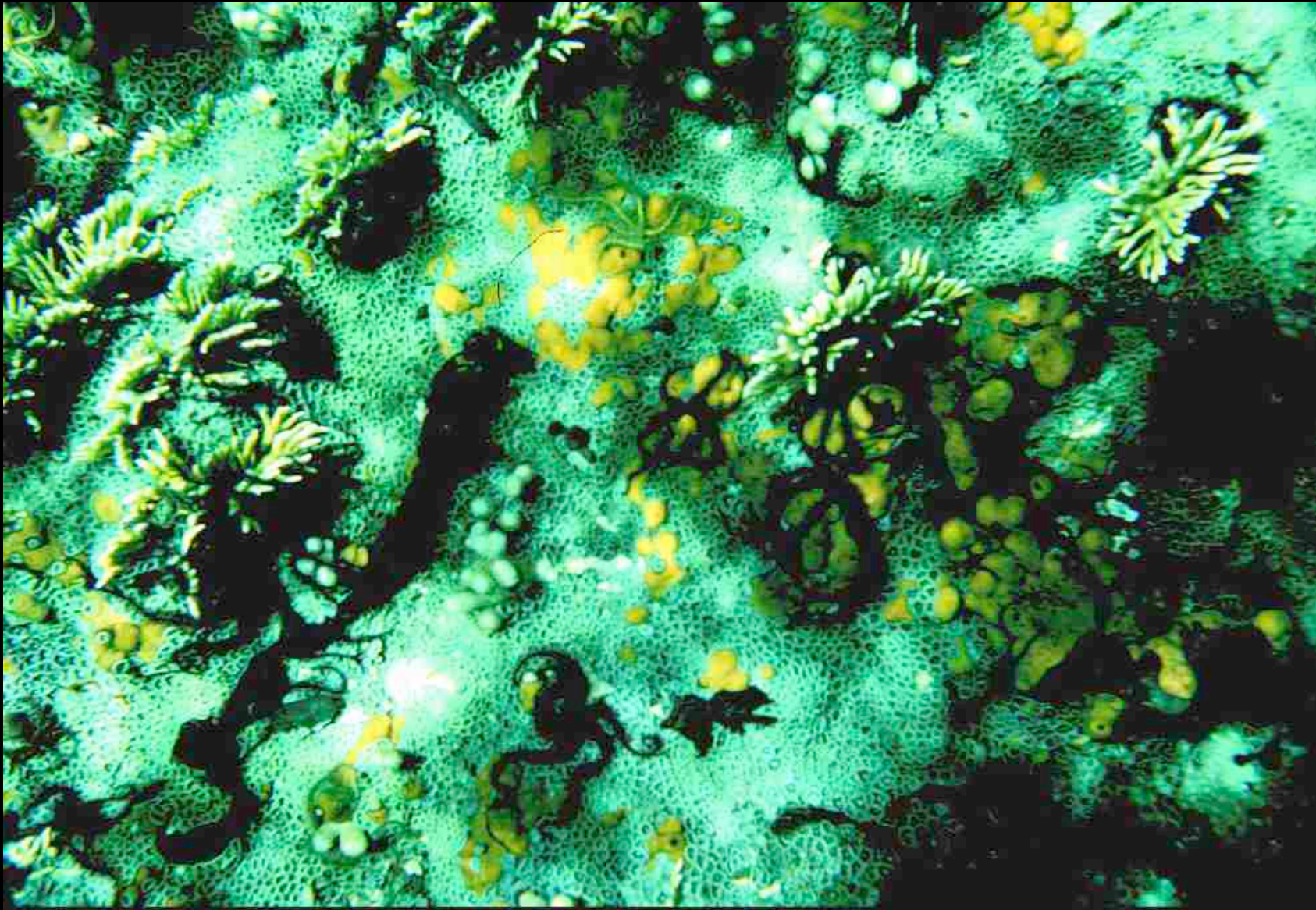
Weichkorallen (Foto ?)





Seefeder
(Foto Grüter)

Zoanthus, Panamá (Foto AG Leinfelder)



Palythoa (Kolumbien) Foto Leinfelder



Seeanemonen (Foto ?)

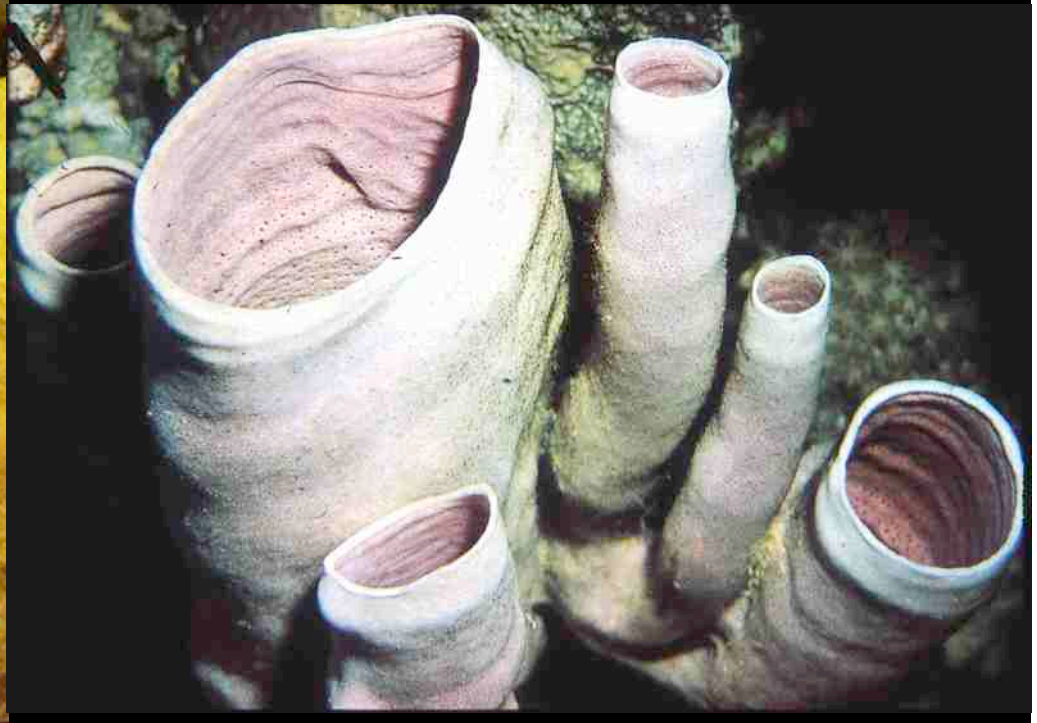


Dia 1182: Edelkoralle, Mittelmeer



Schwämme im Korallenriff

Dia 1197/98: Röhrenschwämme (Rotes Meer)



Riesenschwämme, Bocas, Panamá (Foto AG Leinfelder)



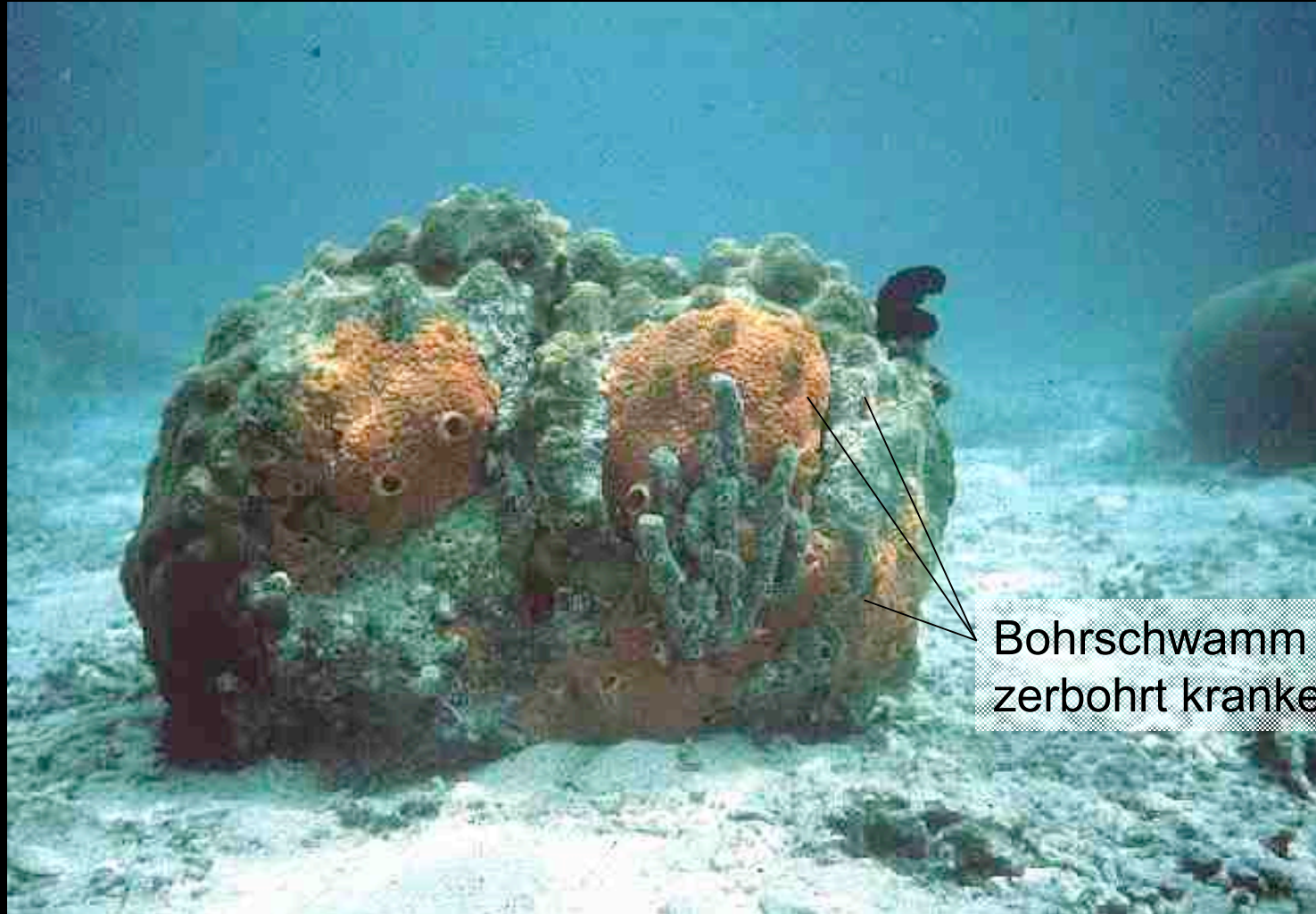
Riesenschwamm, Bocas, Panamá (Foto AG Leinfelder)



Demospongia-Ensemble, Bocas, Panamá (Foto Saric)



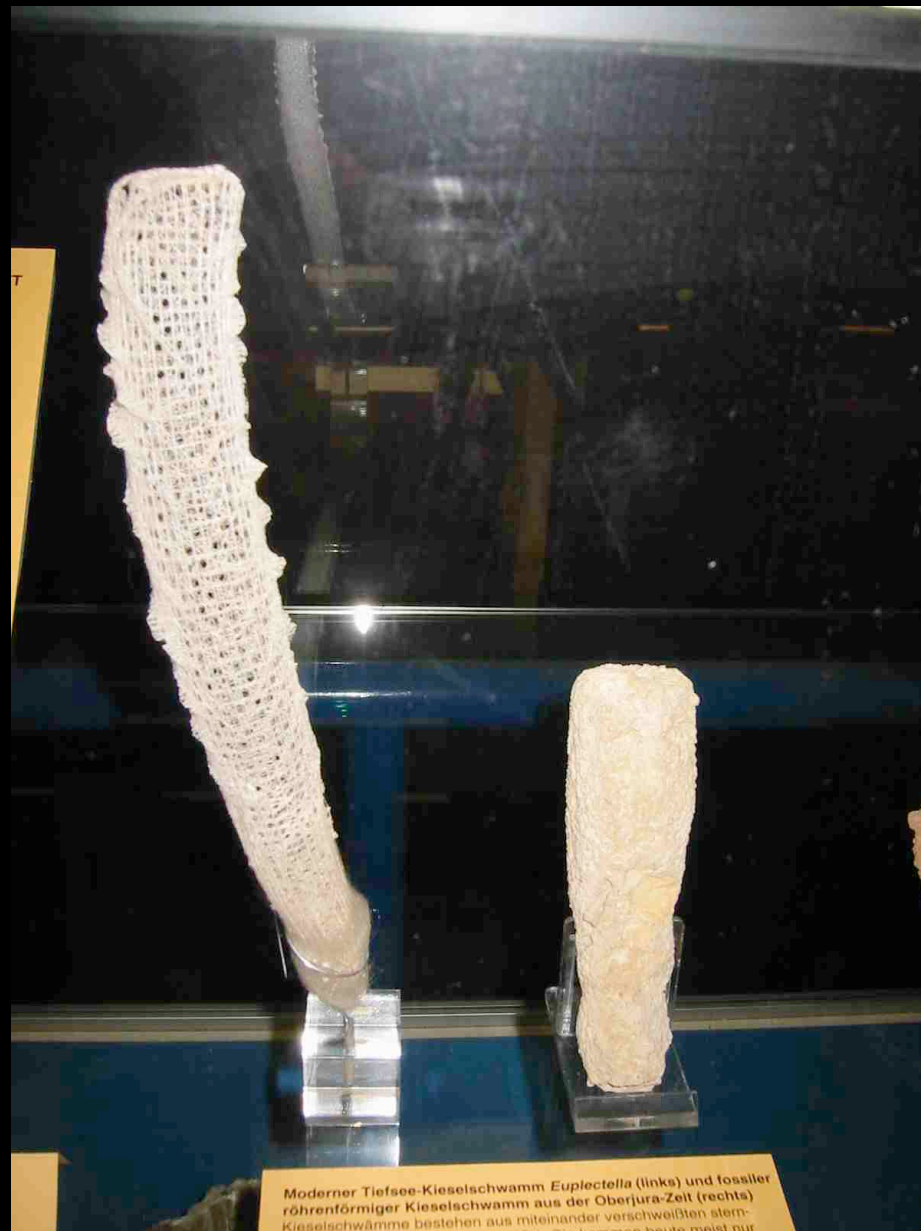
Cliona-Bohrschwamm, Panamá (Foto AG Leinfelder)



Bohrschwamm
zerbohrt kranke Koralle

Rezente Stromatopore (Foto Leinfelder) fehlt noch

Hexactinellider Glasschwamm (Foto Leinfelder)



Moderner Tiefsee-Kieselschwamm *Euplectella* (links) und fossiler röhrenförmiger Kieselschwamm aus der Oberjura-Zeit (rechts)
Kieselschwämme bestehen aus miteinander verschweißten sternförmigen Kieselstacheln. Heutzutage besteht die moderne Tiefsee-Kieselschwämme heute meist nur aus einem einzigen Kieselstachel.

Riffbinder

Rotalgen, Mikroben im Riff

Inkrustierende coralline Rotalgen, GBR (Foto RW Müller)



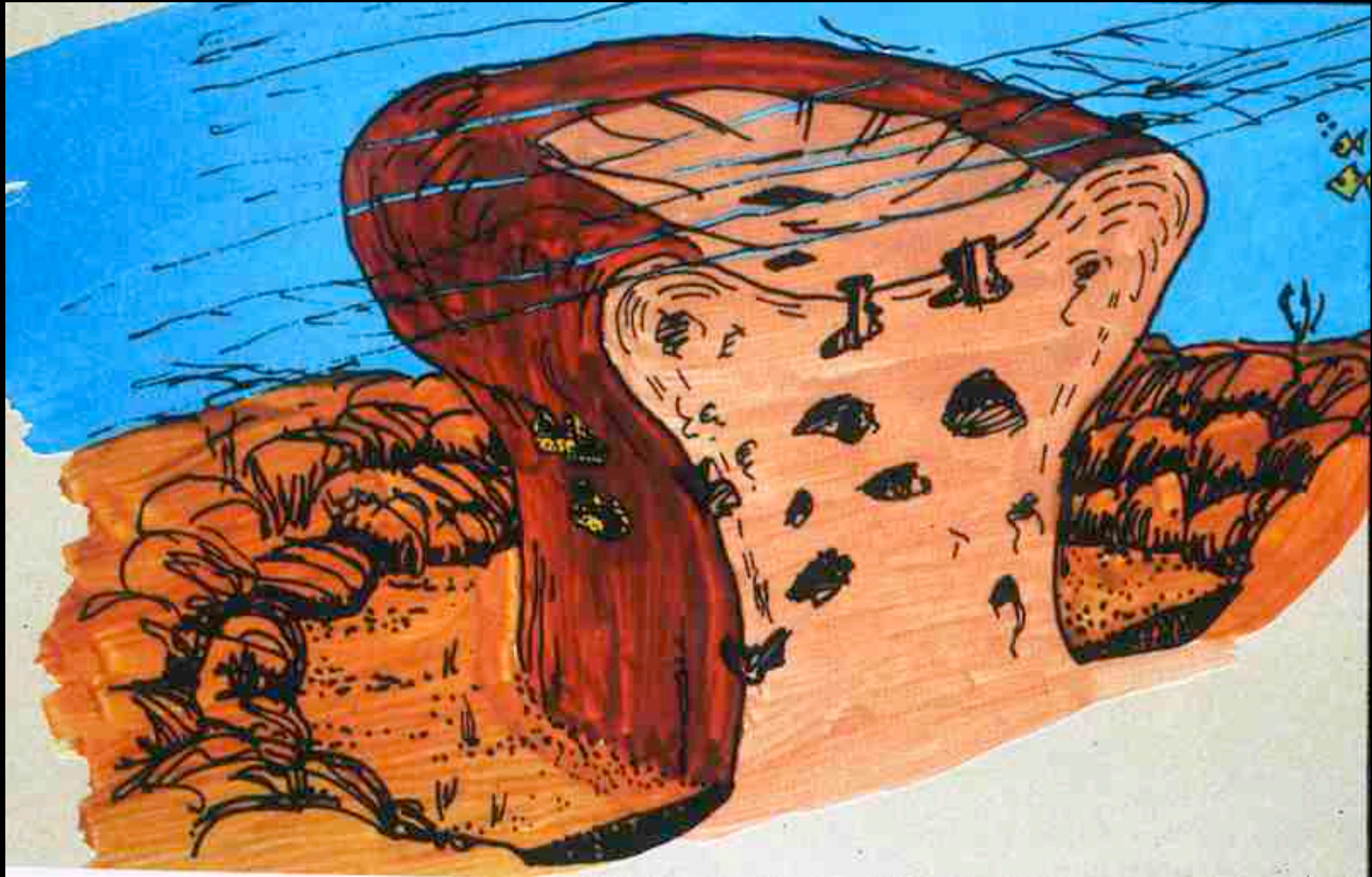
Dia 1235: Rotalgenriffkamm



Inkrustierende coralline Rotalgen, Abrolhos, Brasilien
(Foto Tauchprospekt)



Dia 1152: Algal Cup Reef, Bermudas



Dia 1102: Riffkamm



Mikrobielle, verkalkende Filme, GBR (Foto RW Müller)



Bahamas-Stromatolith (noch fehlend

Röhrenwürmer (Foto ?)



Dia 1108: Borstenwurm



Foraminifere: *Homotrema rubrum*
(Kolumbien, Foto Leinfelder)





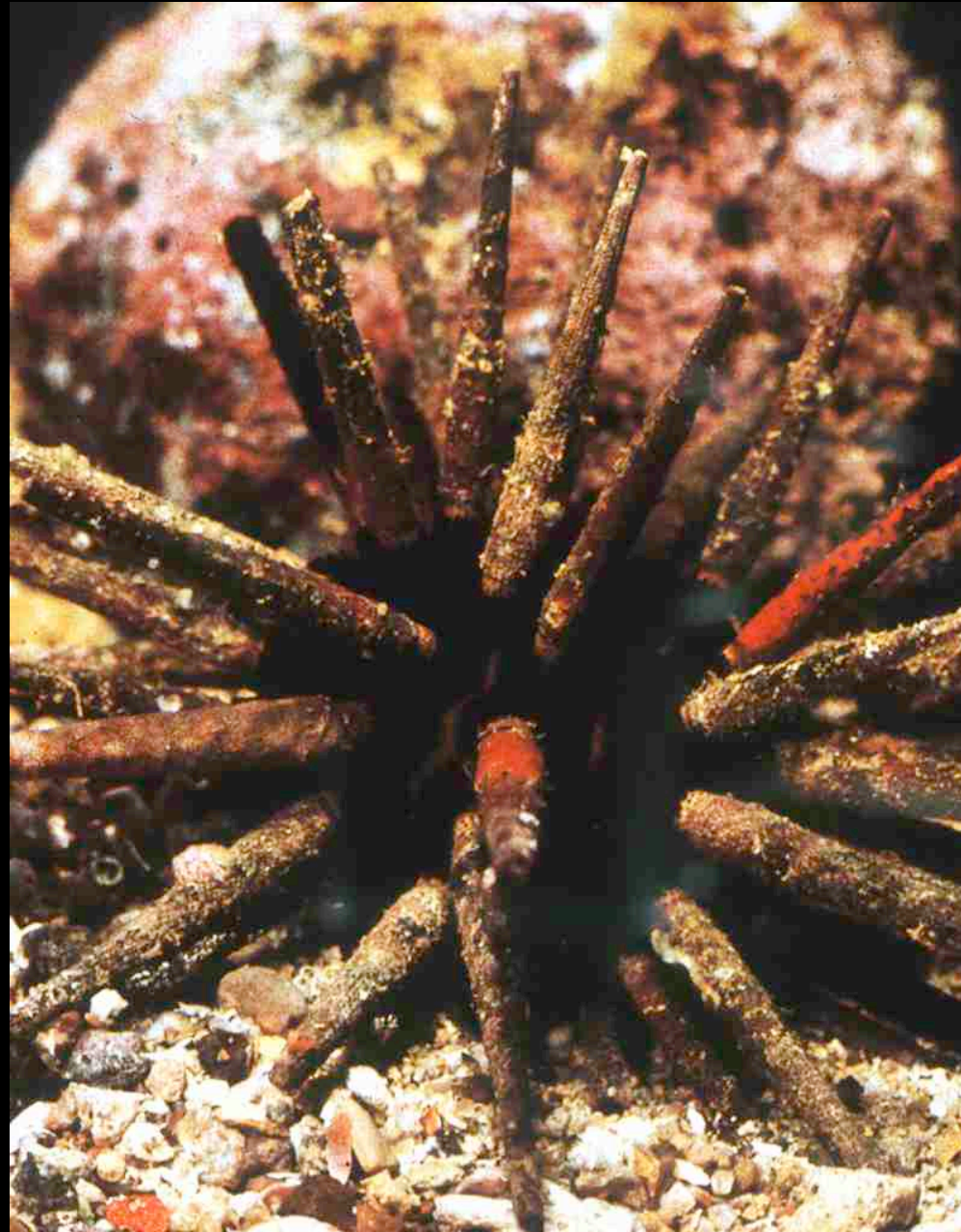
Bryozoen im Riff
(Foto Grüter)

Echinodermen

Seeigel Diadema (Foto AG Ginsburg)



Dia 1192: Griffelseeigel mit Bryozoen



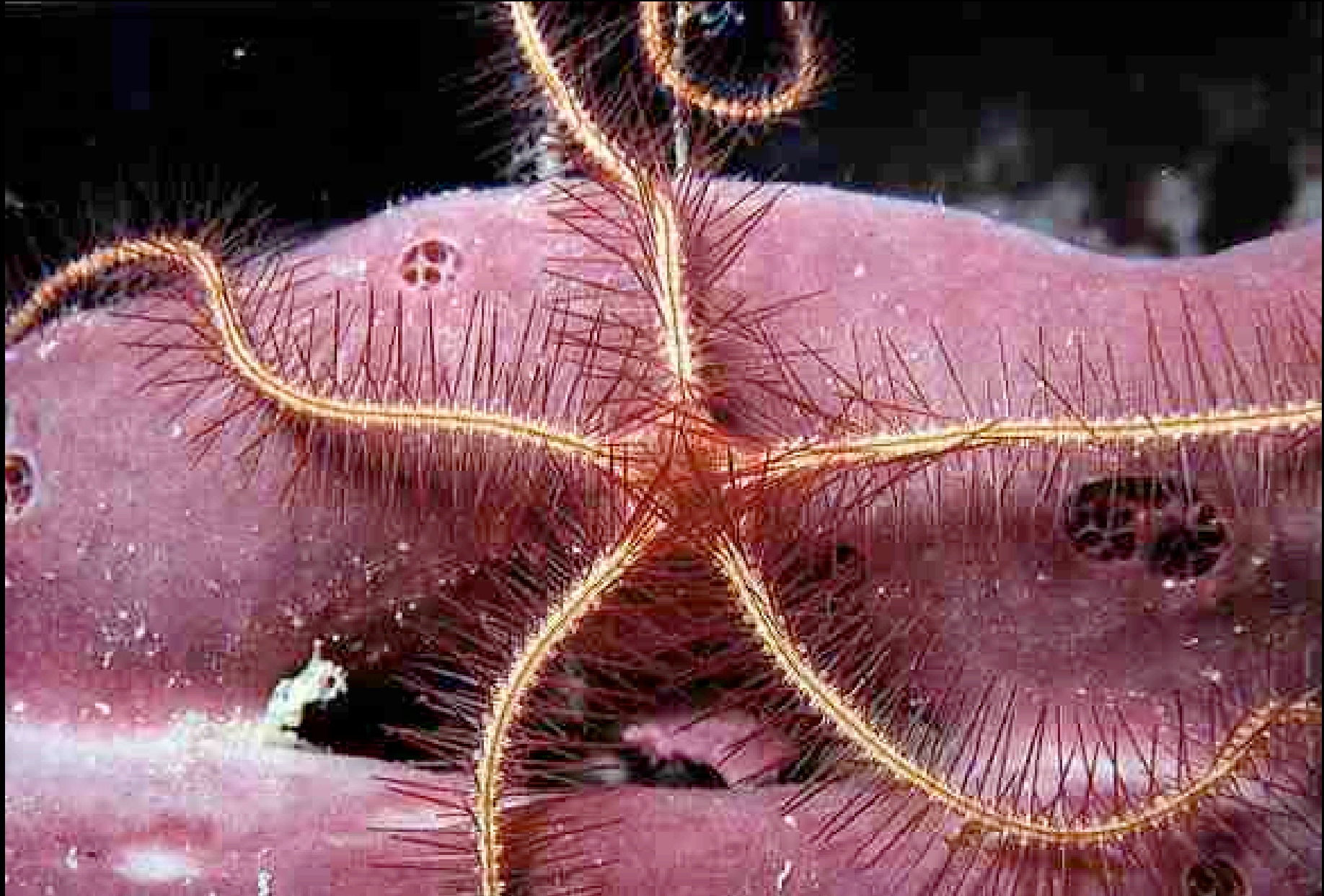
Seestern, Bahamas, (Foto Leinfelder)



Dornenkronenseestern, *Acanthaster planci*, (Foto ?)



Schlangenstern auf Schwamm, (Foto ?)



Schlangensterne auf Montastrea, Panamá (Foto AG Leinfelder)



Dia 1237: Haarstern



Haarstern (Foto ?)



Dia 1232: Holothurie: Seemop



Crustaceen

Einsiedlerkrebs (Foto Hanna/Wells / Schellenberger)



Putzergarnelen auf Muräne (Foto ?)

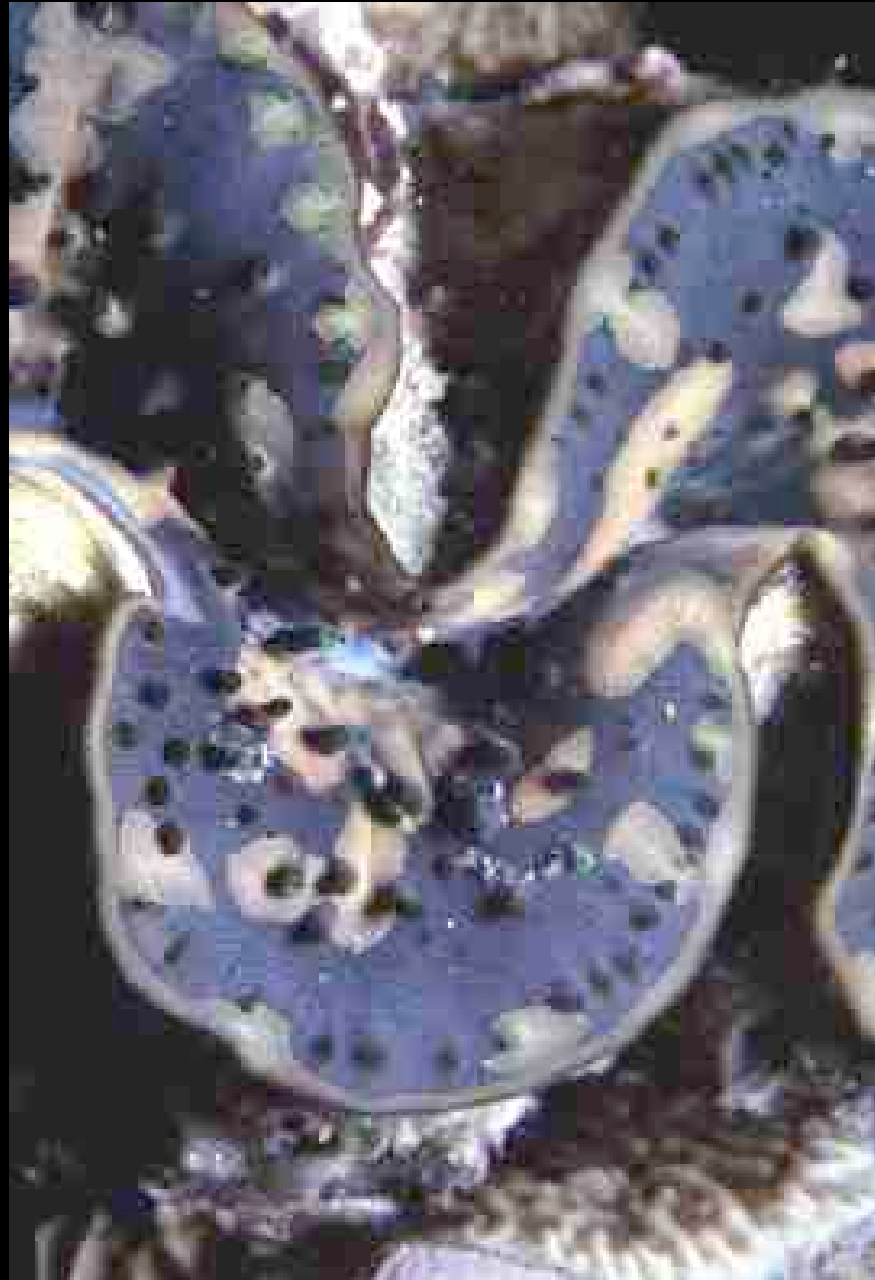


Mollusken und sonstige Invertebraten

Dia 1233: Tridacna - Riesenmuschel



Mantel von Tridacna - Riesenmuschel



Tritonshorn (Foto ?)



Nacktschnecke auf Schwamm (Foto ?)



Nacktschnecke (Foto ?)



Dia 1116: Tunikaten



Ascidien (Foto ?)



Portugiesische Galeere (Foto Leinfelder)



Dia 1196: Bewohner eines Porites-Stockes



Fische und andere Wirbeltiere

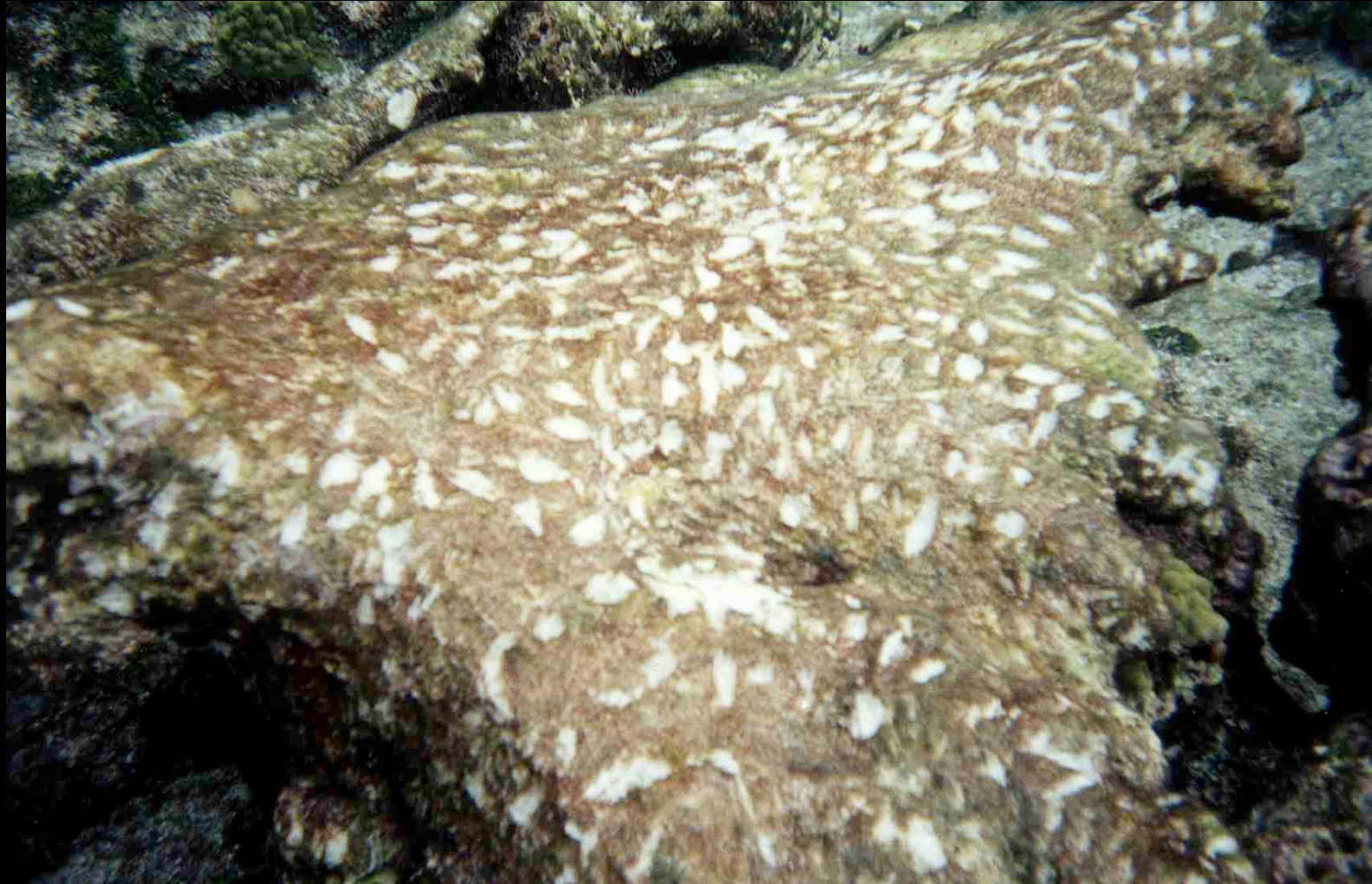
Papageifisch (Foto AG Ginsburg)



Papageifisch (Foto Hanna/Wells)



Papageifisch-Fraßspuren (Foto Leinfelder)



Igelfisch (Foto Hanna/Wells)



Damselische (Foto AG Ginsburg)

Gärtnerfische



Doktorfische, Foto Grüter



Putzerfisch (Foto AG Ginsburg / Schellenberger)



Dia 1230: Clownsfisch in Seeanemone



Seeanemone mit Clownsfisch (Foto Brümmer?)



Skorpionsfisch (Foto Grüter)



Steinfisch (Foto Grüter)



Lanzenfisch (Foto Hanna/Wells)



Rasierklingenfische (Foto Grüter)



Rotfeuerfisch (Foto Leinfelder)



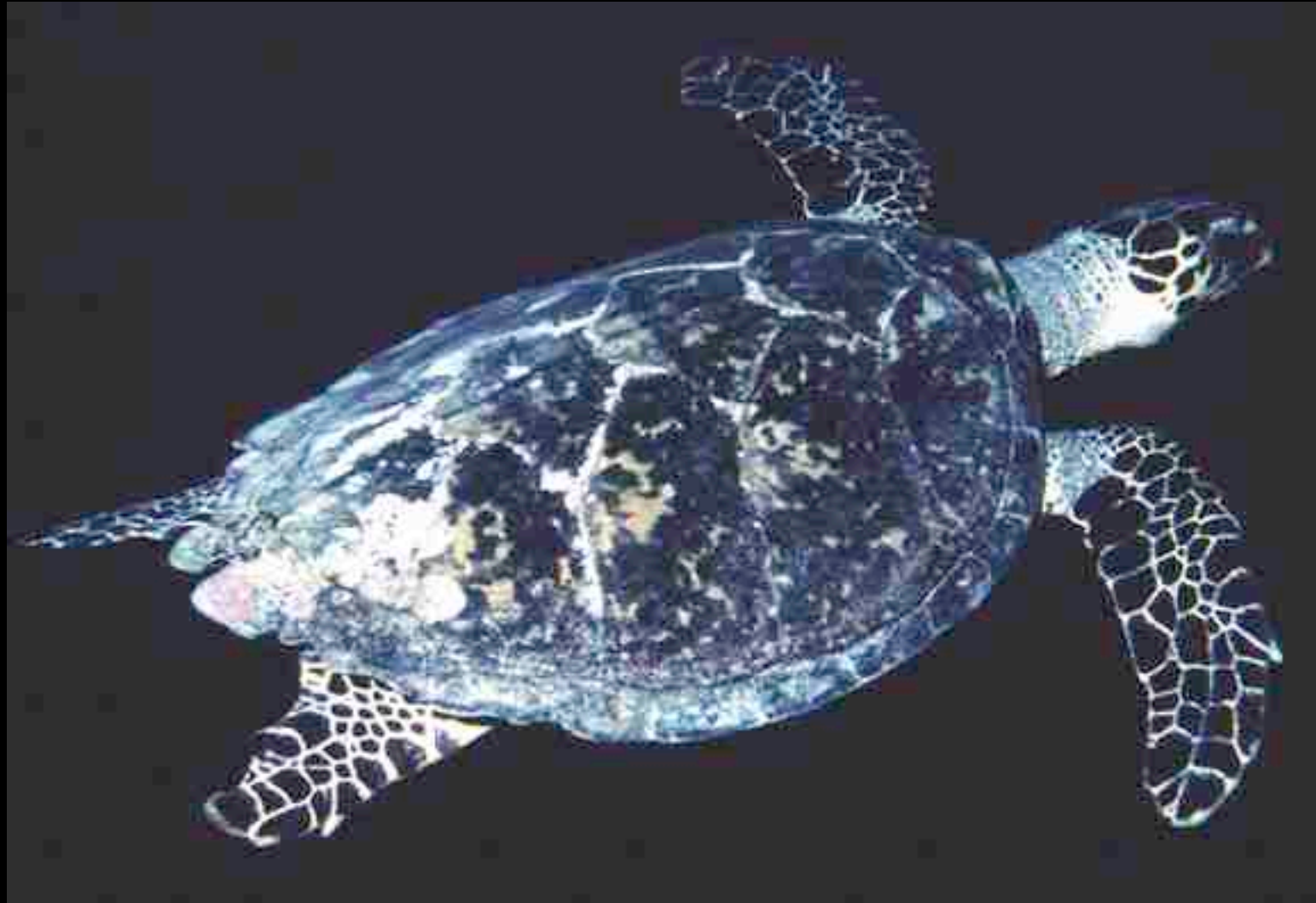
Napoleonsfisch (Foto Hanna/Wells)



Ammenhai (Foto AG Leinfelder)



Meeresschildkröte (Foto Hanna/Wells)



Delphin (Foto Hanna/Wells)



Seekuh (Foto Hanna/Wells)



Riffdefinitionen und Rifftypen

Riffdefinitionen von Heckel 1974

Lowenstam, 1950; reaffirmed by Nelson and others, 1962		Organisms "passively" produced sediment, but not rigid, wave-resistant framework		Organisms actively built rigid, wave-resistant framework	
BANK				REEF	
Kornicker and Boyd, 1962		(BANK)		Organisms in growth position that influenced adjacent sedimentation	
				REEF	
Dunham, 1970		Thick, laterally restricted mass of pure carbonate		Organisms built & bound framework	
STRATIGRAPHIC REEF				ECOLOGIC REEF	
This paper					
Evidence of positive topographic relief					
No evidence of relief. (if high skeletal content, BIOSTROME)		BUILDUP (if large, broad, PLATFORM, SHELF)			
No evidence of type indicated at right		Evidence of potential wave resistance or of turbulent water, implying wave resistance & evidence of some degree of control over surrounding environments.			
BANK		REEF (if built mainly by organisms, ORGANIC REEF)			
		wave-washed talus absent	wave-washed talus present		
		FRAMEWORK REEF			
Organic framework present, but no evidence of water turbulence	Abraded-grain calcarenites + remains of rooted organisms	Early rims of drusy spar	Talus calcilutite: if stromatolitic, STROMATOLITE REEF;	Talus inorganically bound by spar cement	Talus organically bound + large skeletal fragments
POTENTIAL REEF (in deep or calm water)	ORGANICALLY? BOUND SKELETAL-DEBRIS REEF	SPAR-CEMENTED DEBRIS REEF	if abraded mud clasts, MUD-FRAMEWORK REEF	INORGANIC-FRAMEWORK REEF;	ORGANIC-FRAMEWORK REEF
			SPAR-CEMENTED FRAMEWORK REEF		

Riffdefinitionen(2) von Heckel 1974

DESCRIPTIVE TERMINOLOGY FOR CARBONATE BUILDUPS

PREDOMINANT CONSTITUENT	SKELETAL GRAINS	LIME MUD	NONSKEL. GRAINS
DOMINANT ROCK TYPES	PACKSTONE, GRAINSTONE BOUNDSTONE	WACKESTONE, MUDSTONE	(OVER 70% TOTALLY NONSKEL. GRAINS)
GENERAL TERM	SKELETAL BUILDUP	LIME-MUD BUILDUP	OOLITE (etc) BUILDUP
DISTINCTION AS TO SHAPE	SKEL. MOUND, KNOLL, BAR, BARRIER REEF, ATOLL, etc.	LIME-MUD MOUND, LIME-MUD BAR	OOLITE MOUND, OOLITE BAR
DISTINCTION AS TO TYPE OF SKEL. MATERIAL	e.g. SPONGE MOUND, CORAL-STROMATOPOROID PATCH REEF, BRACHIOPOD KNOLL, DIVERSE SKELETAL ATOLL		
DISTINCTION AS TO DOMINANT HABIT OF SKELETAL MATERIAL	<p>Use ENCRUSTED for encrusting or otherwise permanently attached skeletal material e.g. ENCRUSTED BRYOZOAN MOUND, ENCRUSTED OYSTER REEF</p> <p>Use LOOSE for solitary colonies, unattached, whole or disarticulated skeletal material e.g. LOOSE FORAM MOUND, LOOSE GREEN ALGAL-PELMATOZOAN REEF</p> <p>Use ABRADED for material exhibiting abrasion e.g. ABRADED DIVERSE SKELETAL BAR</p> <p>Use MIXED for buildups in which no one form or component is dominant e.g. MIXED DIVERSE SKELETAL-LIME MUD-PISOLITE BARRIER REEF</p>		

Rifftypen nach Geister 1983

Geomorphologische Grundtypen von Korallenriffen		Saumriffe oder Küstenriffe		Wallriffe oder Barriereriffe		Atolle		Korallenbänke		Fleckenriffe	
		Küste	Riff	Lagune	Lagune	Lagune	Lagune	Lagune	Lagune	Lagune	Lagune
nähere Charakterisierung der Riffe											
Lage auf Kontinental- oder Ozeanboden	Riffe auf dem Kontinental-schelf (Schelfriffe)	Schelfsaumriffe an der Küste von Jamaika, Kuba	Schelfwallriffe von Belize, Florida	"Arrecife Alacrán", ein Schelfatoll vor Yucatán	"Pedro Bank", eine Schelf-Korallenbank auf dem Nikaragua-Rücken	Schelf-Fleckenriffe von Veracruz					
	ozeanische Riffe	ozeanisches Saumriff an der Südostküste von San Andrés	ozeanische Wallriffe der Inseln San Andrés und Providencia	ozeanische Atolle: Courtown Cays, Serrana Bank, Roncador Bank	ozeanische Korallenbank von Islote Aves	ozeanische Fleckenriffe vor St. Lucia					
Lage auf In-sular- bzw. Kontinental-schelf	Bankriffe	Banksaumriffe vor Kuba und an der SE-Küste von San Andrés	Bankbarriere-Riffe von San Andrés, Providencia, Florida, St. Croix	Bankatolle: Courtown Cays, Serrana Bank, Roncador Bank							
	Schelfkantenriffe	?	Schelfkanten-Wallriff Belize	Schelfkanten-Atoll Glovers Reef							
Lage im offenen Meer oder in einer Lagune bzw. Bucht	offenmeerische Riffe	offenmeerisches Saumriff an der SE-Küste von San Andrés	offenmeerische Wallriffe von Providencia, Belize, Florida	offenmeerisches Atoll: Glovers Reef, Courtown Cays, Serrana Bank	offenmeerisch sind alle bekannten westindischen Korallenbänke	offenmeerische Fleckenriffe (z.B. Kelchriffe) von Bermuda und St. Lucia					
	Lagunenriffe	Lagunen-Saumriff "Little Reef" vor San Andrés, Bahía de Concha bei Sta. Marta	Lagunen-Wallriff, z.B. die innere Barriere bei den Riffflexen von Martinique und St. Croix	Lagunenatolle: "Rhomboid Shoals" von Belize	nicht beschrieben	Lagunen-Fleckenriffe von Glovers Reef-Atoll					
Lage zum heutigen Meeresspiegel	seichte Riffe (Flachwasserriffe)	alle oben genannten Riffe	alle oben genannten Riffe	alle oben genannten Riffe	seichte Korallenbänke: Pedro Bank, Isla de Lobos, Islote Aves	alle oben genannten Riffe					
	ertrunkene Riffe	?	ertrunkene Wallriffe von Florida, Barbados, San Andrés	ertrunkenes Atoll: Saba-Bank	ertrunkene Korallenbänke: Flower Garden Banks	ertrunkene Fleckenriffe von West Flower Garden Bank und Saba-Bank					
	aufgetauchte Riffe	nicht beschrieben	aufgetauchtes Wallriff der Rosario-Inseln	nicht beschrieben	nicht beschrieben	nicht beschrieben					
Lage zum Passat	luvseitige Riffe	luvseitiges Saumriff vor Galeta Point, Panamá	luvseitiges Wallriff von Providencia			luvseitige Fleckenriffe im NE und E von Bermuda					
	leeseitige Riffe	leeseitiges Saumriff von Barbados und Curaçao	leeseitiges Wallriff von Barbados (ertrunken)			leeseitige Fleckenriffe vor Anegada, Jungfern-Inseln					
Anzahl der parallelen Riffzüge	einfache Riffe	alle oben genannten Riffe	fast alle bekannten Wallriffe	alle genannten Atolle Ausnahme: Saba-Bank							
	doppelte bzw. mehrfache Riffe	dreifaches Saumriff von Great Corn Island	doppeltes Wallriff von Martinique und St. Croix	doppeltes Atoll der Saba-Bank (ertrunken)							

Dia 1219: Malediven-Atolle



Dia 1234: Inselfaumriff Lizard Island, GBR



Inselbarriereriff, Providencia, Kolumbien



Barriereriff, San Andres (Foto Leinfelder)



Barriereriff, San Andres (Foto Leinfelder)



Saumriff, Fleckenriffe, Providencia (Foto Leinfelder)



Barriereriff, Fleckenriffe, Providencia (Foto Leinfelder)



Barriereriff, Fleckenriffe, Providencia (Foto Leinfelder)



Barriereriff, Fleckenriffe, Netzirffe Providencia (Film Schmid/Leinfelder)

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Riffzonen - Übersicht (nach James 1984)

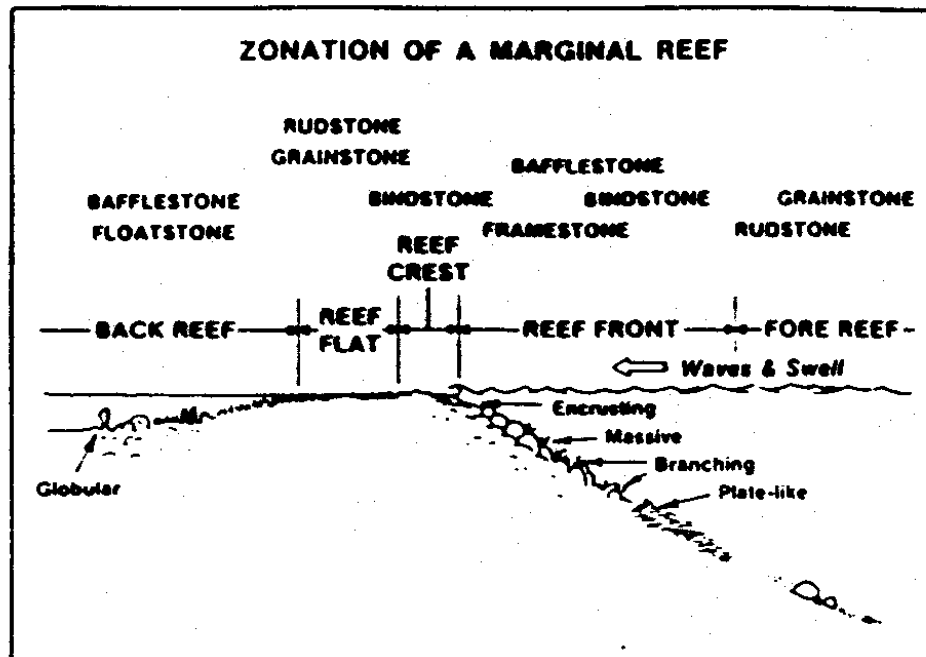


Figure 9
Cross-section through a hypothetical zoned, marginal reef illustrating the different reef

zones, spectrum of different limestones produced in each zone, and environment of different reef-building forms.

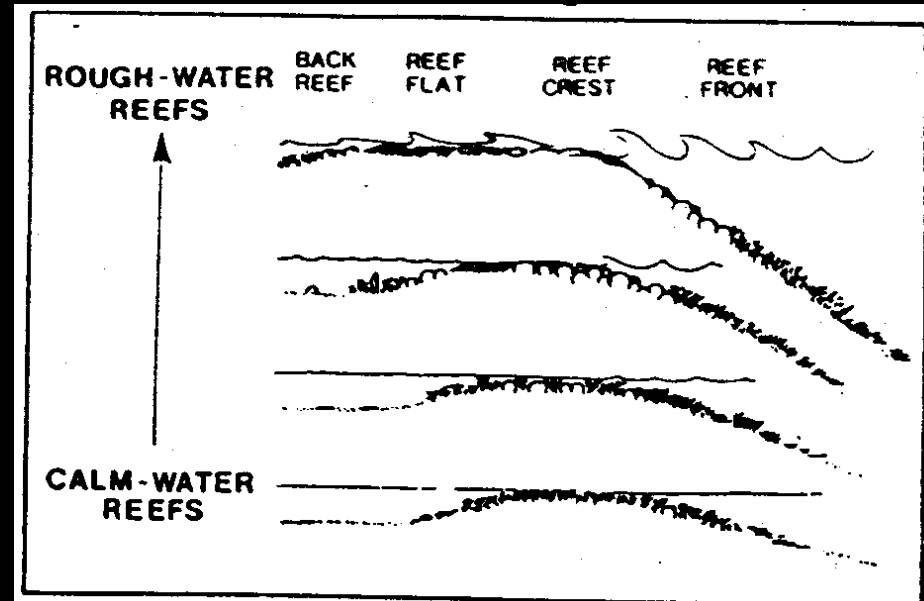


Figure 10

Dia 1171: Spurs and Grooves, Jamaica



Riffgefüge - Übersicht

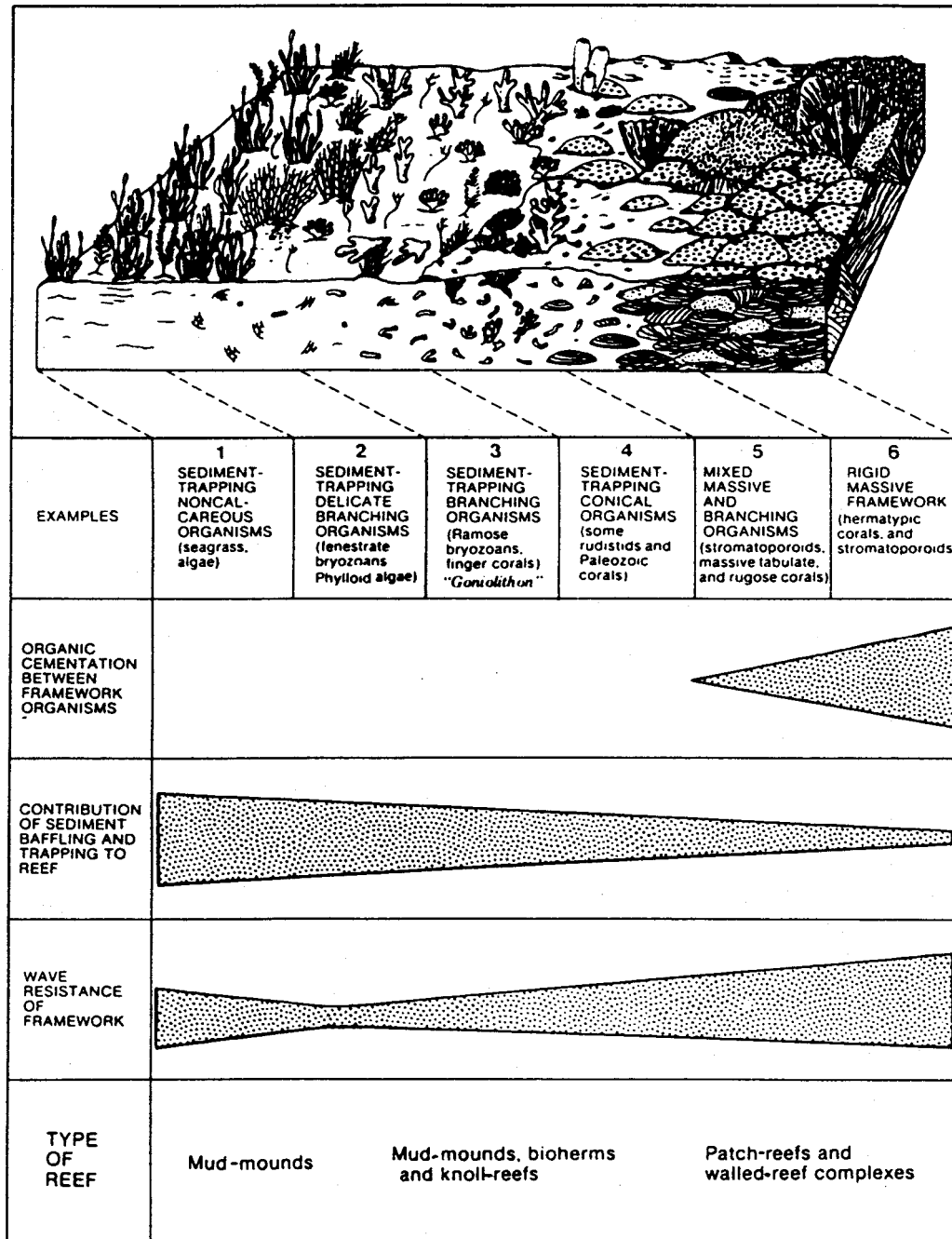
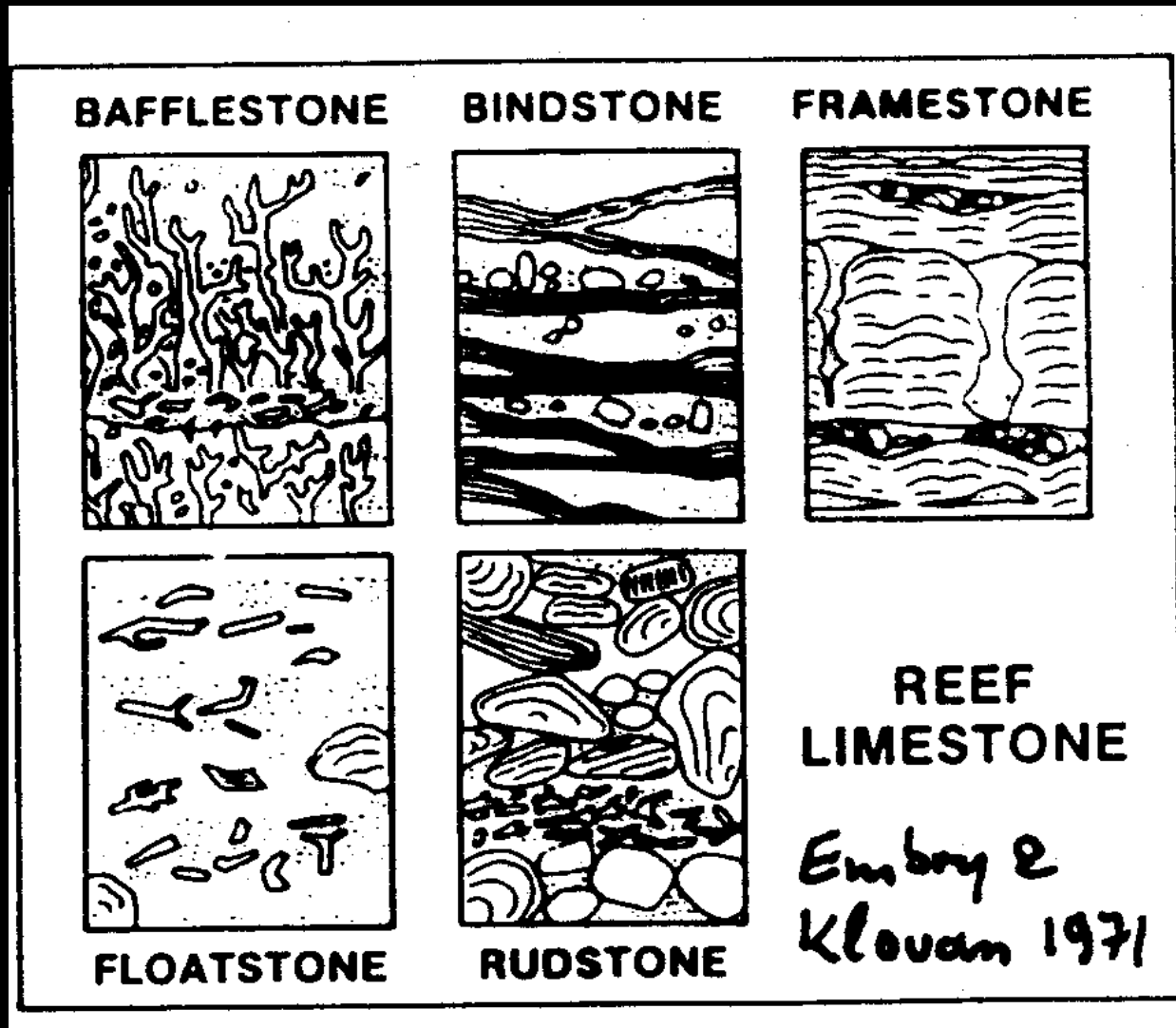
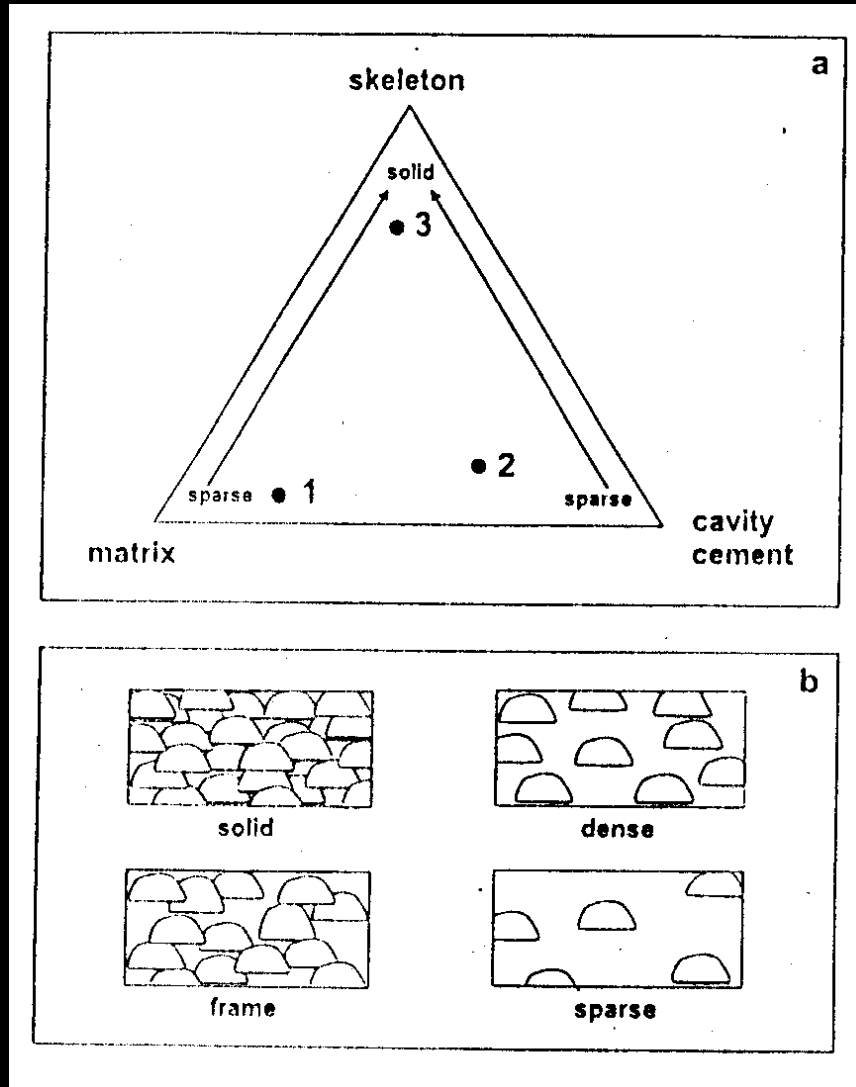


Fig. 5.—Variation in types of reef framework from non-calcareous "invisible" frameworks such as sea grass might form to massive organically-bound skeletal bioherms

Weitere sedimentologische Charakterisierungsmöglichkeiten
















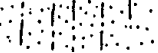



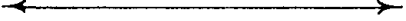


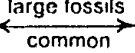
Weitere sedimentologische Charakterisierungsmöglichkeiten



Original components organically bound together during deposition

By massive organisms which build a rigid framework	By encrusting organisms which encrust fragments	By tabular organisms which cover debris and sediments	By branching organisms which act as baffles	By vagrant organisms which cement debris and sediments
Framestone	Bindstone	Coverstone	Bafflestone	Biocement stone

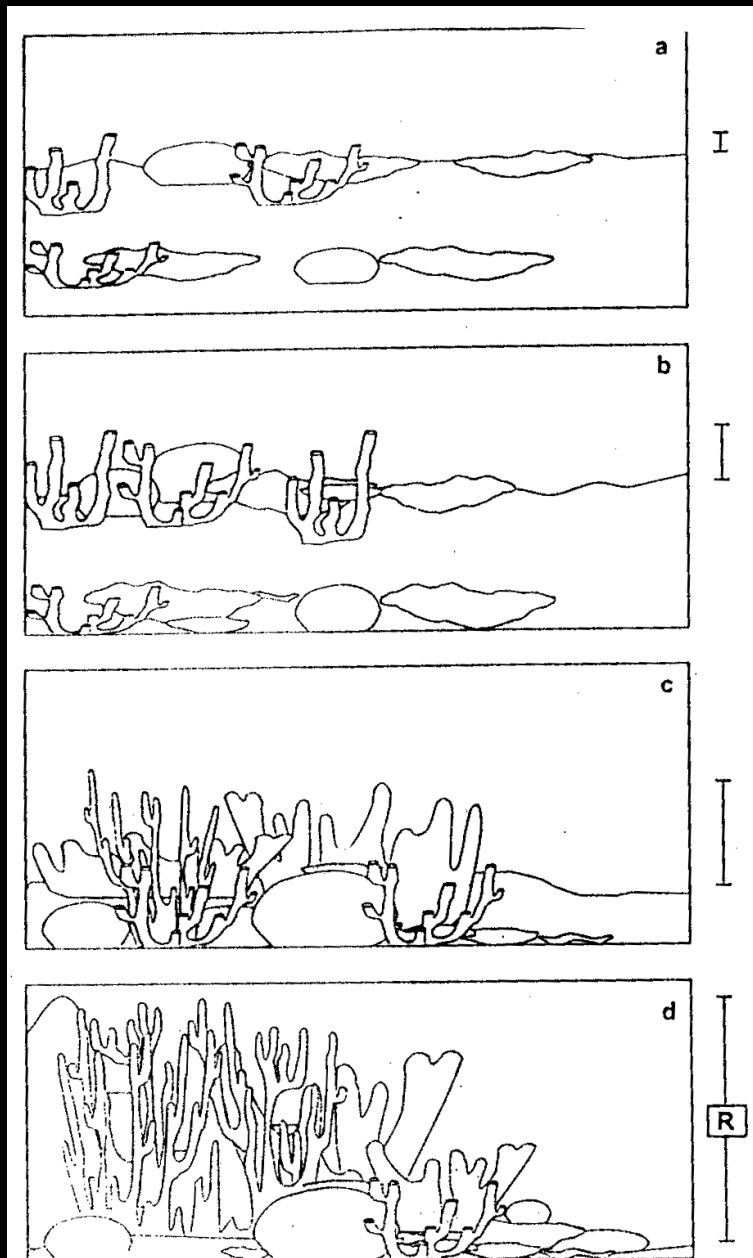
Weitere sedimentologische Charakterisierungsmöglichkeiten

MANY LARGE BIOCLASTS (FOSSILS/FOSSIL-FRAGMENTS) (>10% of rock volume bioclasts >2mm dimensions)						
Bioclasts closely packed, touching		Bioclasts widely spaced, not touching	BIOCLAST TYPES			
not cemented, only in mechanical contact	organically attached or cemented to one another ("boundstones")					
	forming frame of their own skeletons ("framestones")	interspersed among broken skeletal debris				
rudstone 	cruststone 	coverstone  bindstone 	floatstone 	tabular plates 	SKELETONS	
		lettuce stone 		foilaceous sheets 		
		globstone 		globular masses 		
	branchstone 	bafflestone 		branching colonies 		COLONY
		biocementstone 		soft strands 		
		shellstone 		VARIOUS SHELLS 		
	FOSSILS IN GROWTH POSITION 			OTHER CHARACTERISTICS		
	FOSSILS FREE 					
large fossils abundant 		large fossils common 				

Weitere sedimentologische Charakterisierungsmöglichkeiten

ALLOCHTHONOUS		AUTOCHTHONOUS					
Depositional fabric dominated by bio- and lithoclastic reefal material. More than 10% of the fragments are greater than 1 cm in size.		Facies dominated by a growth fabric of <i>in situ</i> and <i>in growth position</i> skeletons of calcifying organisms					
Matrix supported.	Supported by the greater than 1 cm component.	Growth fabric dominated by platy to tabular colonies where calcification in the horizontal plane dominates over that of the vertical plane (width to height ratio of dominant organisms: 30:1 - 5:1). These growth forms constitute more than 60% of the total CSV.	Growth fabric dominated by sheet-like & lamellar colonies where calcification in the horizontal plane greatly dominates over that of the vertical plane (width to height ratio: >30:1). These growth forms constitute more than 60% of the total CSV.	Growth fabric dominated by domal & irregular massive colonies which have the same calcification potential in all free directions. These growth forms constitute more than 60% of the total CSV.	Growth fabric dominated by organisms which have a dominant vertical component of growth and relatively restricted lateral growth (for example all types of branching colonies and rod and tubular solitary forms). These growth forms constitute more than 60% of the total CSV.		No one growth form dominates in terms of CSV.
					PILLARSTONE		
FLOATSTONE	RUDSTONE	PLATESTONE	SHEETSTONE	DOMESTONE	Sparse	Dense	MIXSTONE

Constratal growth



SUPERSTRATAL GROWTH

Weitere sedimentologische Charakterisierungsmöglichkeiten

