

Deep-Water Marine Benthic Habitat Classification Scheme

Key to Habitat Classification Code for Mapping and use with GIS programs

(modified after Greene et al., 1999)

Interpreted from remote sensing imagery for mapping purposes

Megahabitat – Use capital letters (based on depth and general physiographic boundaries; depth ranges approximate and specific to study area).

A = Aprons, continental rise, deep fans and bajadas (3000-5000 m)

B = Basin floors, Borderland types (floors at 1000-2500 m)

F = Flanks, continental slope, basin/island-atoll flanks (200-3000 m)

I = Inland seas, fiords (0-200 m)

P = Plains, abyssal (>5000 m)

R = Ridges, banks and seamounts (crests at 200-2500 m)

S = Shelf, continental and island shelves (0-200 m)

Seafloor Induration - Use lower-case letters (based on substrate hardness).

h = hard substrate, rock outcrop, relic beach rock or sediment pavement

m = mixed (hard & soft substrate)

s = soft substrate, sediment covered

Sediment types (for above indurations) - Use parentheses.

(b) = boulder

(c) = cobble

(g) = gravel

(h) = halimeda sediment, carbonate

(m) = mud, silt, clay

(p) = pebble

(s) = sand

Meso/Macrohabitat - Use lower-case letters (based on scale).

a = atoll

b = beach, relic

c = canyon

d = deformed, tilted and folded bedrock

e = exposure, bedrock

f = flats, floors

g = gully, channel

i = ice-formed feature or deposit, moraine, drop-stone depression

k = karst, solution pit, sink

l = landslide

m = mound, depression

n = enclosed waters, lagoon

o = overbank deposit (levee)

p = pinnacle (Note: Pinnacles are often difficult to distinguish from boulders. Therefore, these features may be used in conjunction [as (b)/p] to designate a meso/macrohabitat.

r = rill

s = scarp, cliff, fault or slump

- t = terrace
- w = sediment waves
- y = delta, fan
- z# = zooxanthellae hosting structure, carbonate reef
 - 1 = barrier reef
 - 2 = fringing reef
 - 3 = head, bommie
 - 4 = patch reef

Modifier - Use lower-case subscript letters or underscore for GIS programs (textural and lithologic relationship).

- a = anthropogenic (artificial reef/breakwall/shipwreck)
- b = bimodal (conglomeratic, mixed [includes gravel, cobbles and pebbles])
- c = consolidated sediment (includes claystone, mudstone, siltstone, sandstone, breccia, or conglomerate)
- d = differentially eroded
- f = fracture, joints-faulted
- g = granite
- h = hummocky, irregular relief
- i = interface, lithologic contact
- k = kelp
- l = limestone or carbonate
- m = massive sedimentary bedrock
- o = outwash
- p = pavement
- r = ripples
- s = scour (current or ice, direction noted)
- u = unconsolidated sediment
- v = volcanic rock

Seafloor Slope - Use category numbers. Typically calculated for survey area from x-y-z multibeam data.

- 1 Flat (0-1°)
- 2 Sloping (1-30°)
- 3 Steeply Sloping (30-60°)
- 4 Vertical (60-90°)
- 5 Overhang (> 90°)

Seafloor Complexity - Use category letters (in caps). Typically calculated for survey area from x-y-z multibeam slope data using neighborhood statistics and reported in standard deviation units.

- A Very Low Complexity (-1 to 0)
- B Low Complexity (0 to 1)
- C Moderate Complexity (1 to 2)
- D High Complexity (2 to 3)
- E Very High Complexity (3+)

Geologic Unit – When possible, the associated geologic unit is identified for each habitat type and follows the habitat designation in parentheses.

Examples: Shp_d1D(Q/R) - Continental shelf megahabitat; flat, highly complex hard seafloor with pinnacles differentially eroded. Geologic unit = Quaternary/Recent.

Fhd_d2C (Tmm) - Continental slope megahabitat; sloping hard seafloor of deformed (tilted, faulted, folded), differentially eroded bedrock exposure forming overhangs and caves. Geologic unit = Tertiary Miocene Monterey Formation.

Determined from video, still photos, or direct observation.

Macro/Microhabitat – Preceded by an asterik. Use parentheses for geologic attributes, brackets for biologic attributes. Based on observed small-scale seafloor features.

Geologic attributes (note percent grain sizes when possible)

- (b) = boulder
- (c) = cobble
- (d) = deformed, faulted, or folded
- (e) = exposure, bedrock (sedimentary, igneous, or metamorphic)
- (f) = fans
- (g) = gravel
- (h) = halimeda sediment, carbonate slates or mounds
- (i) = interface
- (j) = joints, cracks, and crevices
- (m) = mud, silt, or clay
- (p) = pebble
- (q) = coquina (shell hash)
- (r) = rubble
- (s) = sand
- (t) = terrace-like seafloor including sedimentary pavements
- (w) = wall, scarp, or cliff

Biologic attributes

- [a] = algae
- [b] = bryozoans
- [c] = corals
- [d] = detritus, drift algae
- [g] = gorgonians
- [n] = anemones
- [o] = other sessile organisms
- [s] = sponges
- [t] = tracks, trails, or trace fossils

[u] = unusual organisms, or chemosynthetic communities

[w] = worm tubes

Seafloor Slope - Use category numbers. Estimated from video, still photos, or direct observation.

- 1 Flat (0-1°)
- 2 Sloping (1-30°)
- 3 Steeply Sloping (30-60°)
- 4 Vertical (60 - 90°)
- 5 Overhang (90°+)

Seafloor Complexity - Use category numbers. Estimated from video, still photos, or direct observation. Numbers represent seafloor rugosity values calculated as the ratio of surface area to linear area along a measured transect or patch.

- A Very Low Complexity (1 to 1.25)
- B Low Complexity (1.25 to 1.50)
- C Moderate Complexity (1.50 to 1.75)
- D High Complexity (1.75 to 2.00)
- E Very High Complexity (2+)

Examples: *(m)[w]1C - Flat or nearly flat mud (100%) bottom with worm tubes; moderate complexity.

*(s/c)1A - Sand bottom (>50%) with cobbles. Flat or nearly flat with very low complexity.

*(h)[c]1E - Coral reef on flat bottom with halimeda sediment. Very high complexity.

Shp_d1D(Q/R)*[m][w]1C - *Large-scale habitat type*: Continental shelf megahabitat; flat, highly complex hard seafloor with pinnacles differentially eroded. Geologic unit = Quaternary/Recent. *Small-scale habitat type*: Flat or nearly flat mud (100%) bottom with worm tubes; moderate complexity.