

Guideline to the morphological species description for the Sponge Barcoding Database (SBD).

Every sequence submission for the Sponge Barcoding Project should be accompanied by specimen photographs and a brief morphological description. This data facilitates all SBD-users a verification of the correct species identification and might lead to additional phenotypic characters.

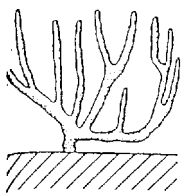
Here we provide a brief guideline to the morphological descriptions used for the submission to the Sponge Barcoding Database. We aim for short but precise descriptions and therefore suggest that the correct terminology should be used to make the descriptions unambiguous. The figures are taken with friendly permission from John Hoopers ["Spongeguide"](#)¹. The following criteria should be described (see examples for different demosponges below):

- 1) **GROWTH FORM** (see table "growth forms")
- 2) **COLOUR ALIVE**
- 3) **COLOUR IN ETOH** (if applicable)
- 4) **OSCULES** (location, arrangement, abundance)
- 5) **TEXTURE** (see table "surface structures")
- 6) **SURFACE ORNAMENTATION** (see table "surface structures")
- 7) **CHOANOSOMAL SKELETON** (see tables: "Demospongiae skeleton")
- 8) **ECTOSOMAL SKELETON** (see tables: "Demospongiae skeleton features: Ectosome")
- 9) **MEGASCLERES** (see taxon-relevant spicule sheets; measurements and size categories would increase the information content)
- 10) **MICROSCLERES** (see taxon-relevant spicule sheets; measurements and size categories would increase the information content)

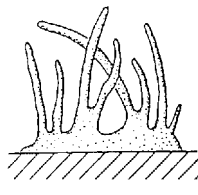
The samples should be accompanied with their unique Genbank Accession Number to distinguish them from other conspecifics.

¹ An even more detailed thesaurus is published by Boury-Esnault & Rützler (1997) *Smithsonian Contributions to Zoology*, 596, 1-55

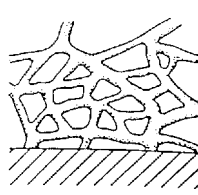
GROWTH FORMS



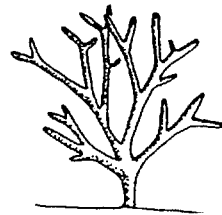
aborescent-bifurcate
branching



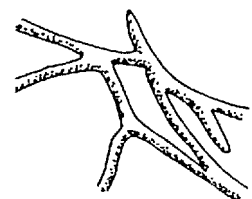
digitate-branching
(from basal mass)



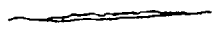
clathrate, reticulate
branching



branching-erect,
aborescent



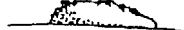
branching-repent



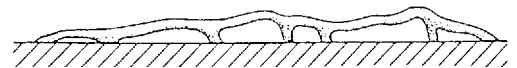
thinly encrusting



thickly encrusting



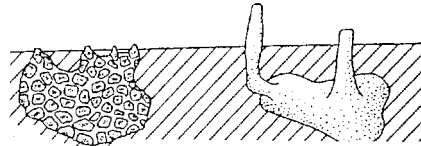
encrusting cushion



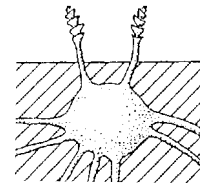
repent, stoloniferous branching



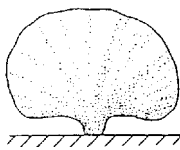
boring



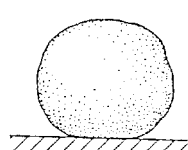
excavating, (burrowing in e.g. calcitic substrata)



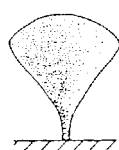
endopsammic (burrowing in sand),
producing fistules



foliaceous,
(leaf-shaped)



globular subspherical
(ball shaped)



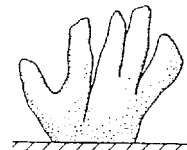
flabellate
(fan shaped)



ficiform
(fig shaped)



ovate
(egg shaped)



palmate
(hand shaped)



lamellate



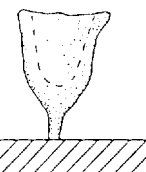
tubular
cylindrical



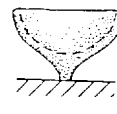
pedunculate
(club shaped)



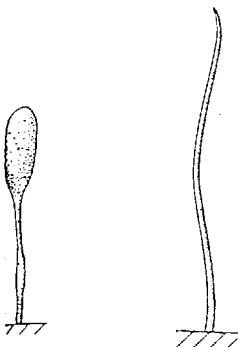
vasiform
(vase shaped)



cupriform,
cup shaped



turbinate
(inverted cone
shaped)



clavate
(club shaped)



flagelliform
(whip shaped)



stipitate club
(long stalk)



pinnate
(feather shaped)



columnar
erect cylindrical
club

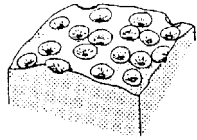


massive
pear shaped

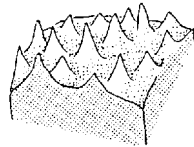


massive lobate

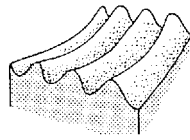
SURFACE STRUCTURES



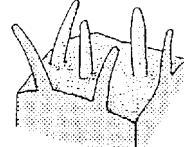
areolate



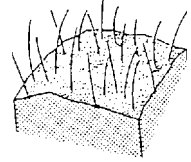
conulose



corrugated



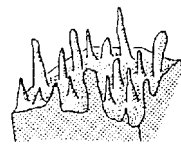
fistulose



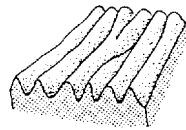
hispid



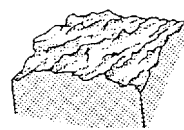
honeycombed
polygonal
surface



papillate



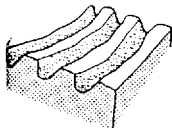
ribbed



rugose
(roughened)



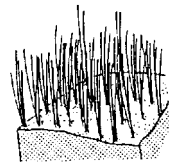
spiny fibrous



sulcate
(furrowed grooves)



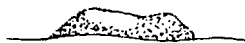
verrucose
(warty)



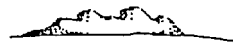
villose
(shaggy)



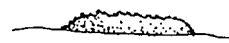
fistules
(oscular chimneys)



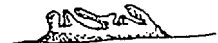
even



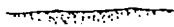
uneven



wrinkled



irregularly folded



smooth



tuberculate



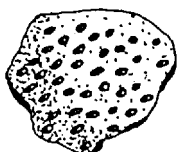
conulose



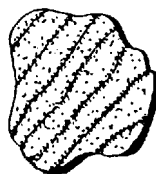
hirsute
(shorter than hispid)



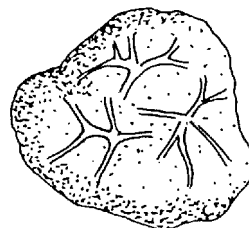
velutinous
(velvety)



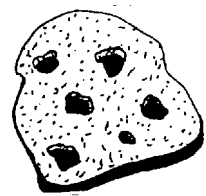
punctate



striated

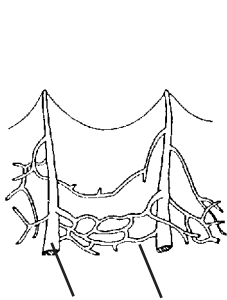


astrose drainage canals

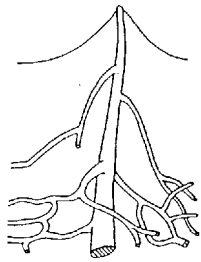


cavernous
(cavities)

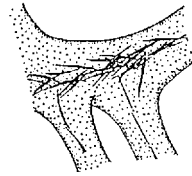
DEMOSPONGIAE SKELETON: SPONGIN FIBRES



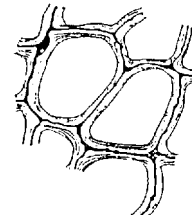
primary fibre secondary fibre



clear fibres (no inclusions)



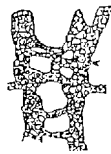
spicules embedded in fibres



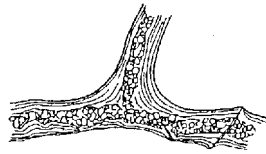
fibres pithed



fibres heavily pithed



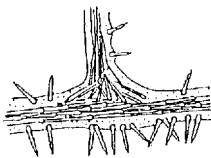
fibres fully cored with detritus



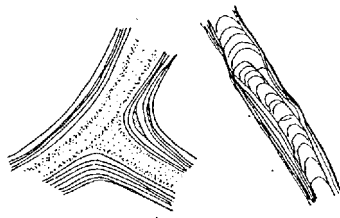
fibres partially cored with detritus



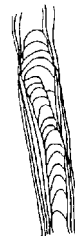
collagen filaments



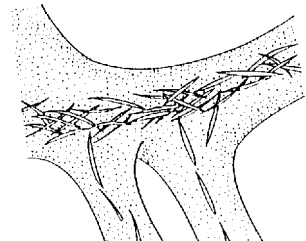
fibres cored and echinated with spicules



fibres laminated



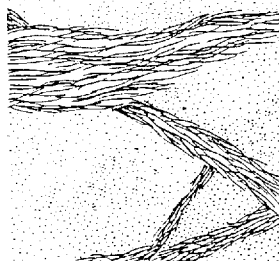
fibres stratified with bark



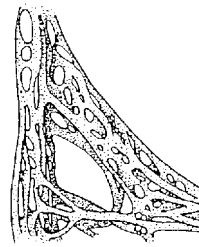
fibres cored with spicules



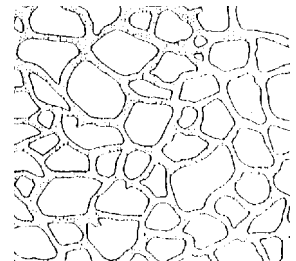
basal spongin plate



collagen fascicle

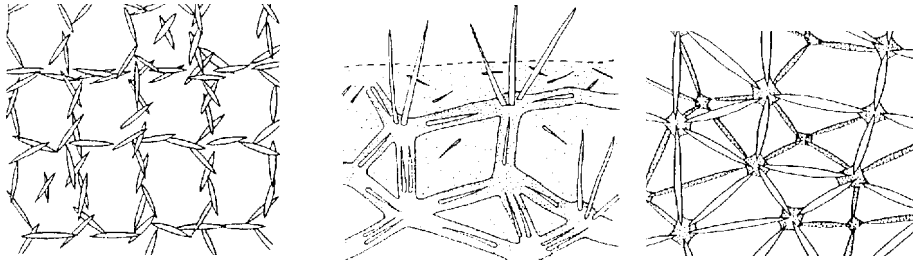


compound fasciculate fibre

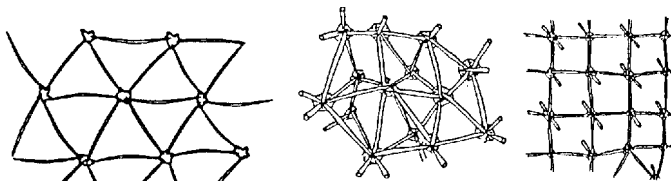


homogeneous fibre

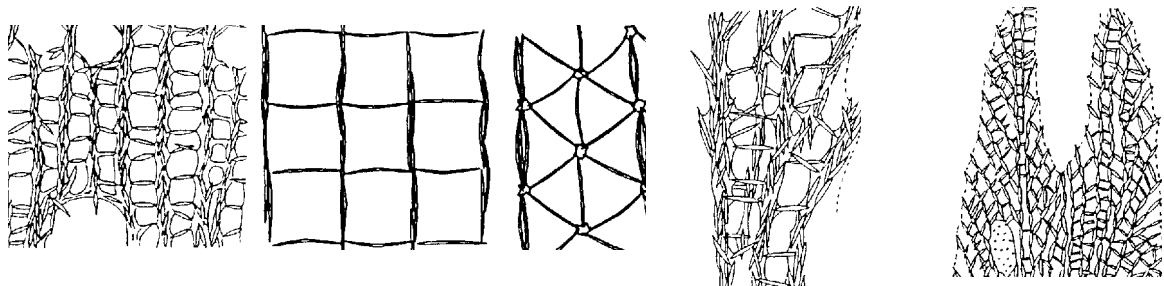
DEMOSPONGIAE SKELETON: GENERAL FEATURES



Isotropic skeletons (no distinction between primary and secondary and/or tertiary tracts)

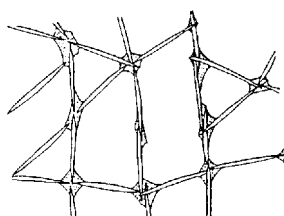


Isotropic and isodictyal skeletons (meshes of equal length)

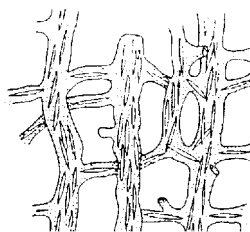


anisotropic skeletons (distinction between primary and secondary and/or tertiary tracts)

accretive skeleton (anisotropic with ascending primary, radial tracts; interconnecting tracts about equal in thickness)



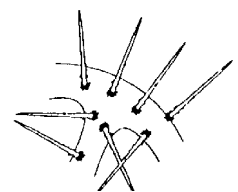
unispicular tracts
(one spicule per tract)



paucispicular tracts
(few spicules per tract)

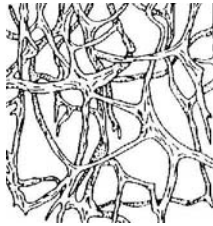


multispicular tracts
(several or many spicules per tract)

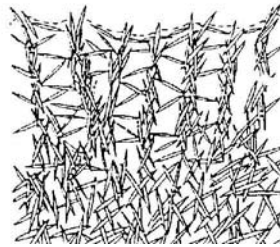


tracts with echinating spicules

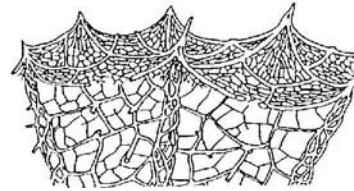
DEMOSPONGIAE SKELETONS: CHOANOSOME



anastomosing reticulate
(tracts or fibres interconnected)



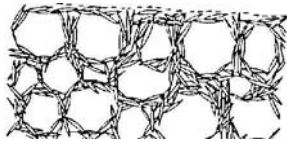
loose or vague reticulated
skeleton



evenly reticulate fibrous (with more
condensed reticulated surface)



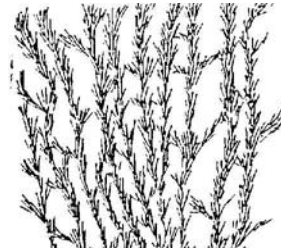
polyhedral
fibroreticulate



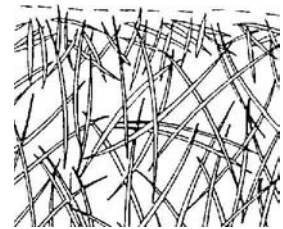
alveolate (skeleton arranged around
choanosomal cavities)



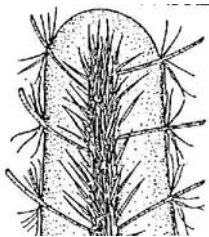
plumose skeleton



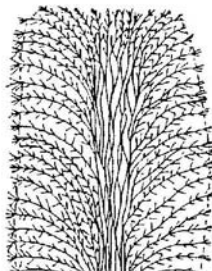
plumoreticulate skeleton
(plumose with a few connections)



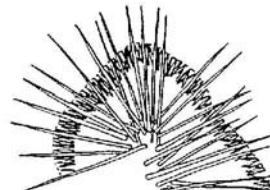
confused reticulate skeleton



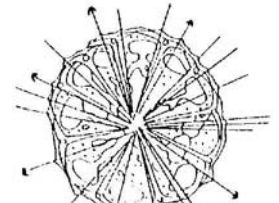
axially compressed skeleton:
extra-axially radial



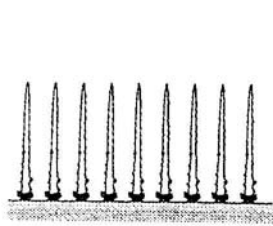
axially compressed skeleton:
extra-axially plumose



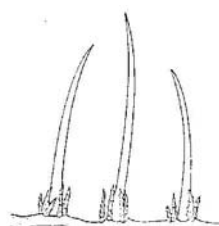
radial / radiate skeleton



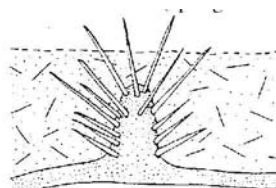
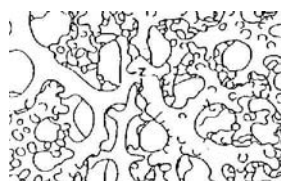
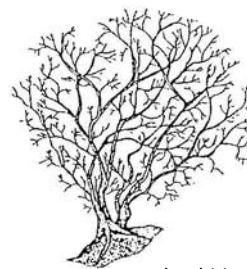
confused radiate skeleton



hymedesmoid skeleton



dendritic skeleton



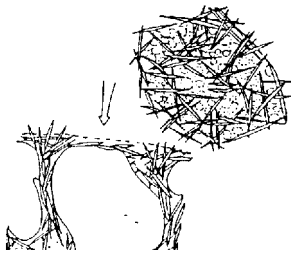
microcionid skeleton
(spongin nodes, plumose tracts)

articulated skeleton of
interlocking spicules (desmas)

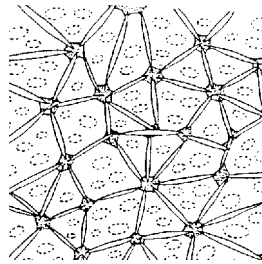


articulated skeleton of
hexactine spicules (Hexactinellida)

DEMOSPONGIAE SKELETON FEATURES: ECTOSOME



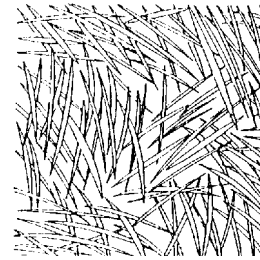
tangential skeleton



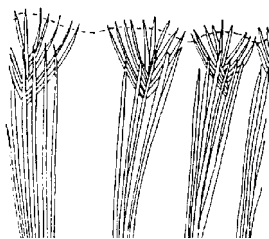
isodictyal reticulated tangential skeleton (perpendicular to surface)



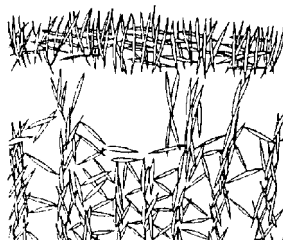
paratangential skeleton (perpendicular to surface)



parchment or peel (tangential ectosomal skeleton in tight feltwork; perpendicular to surface)



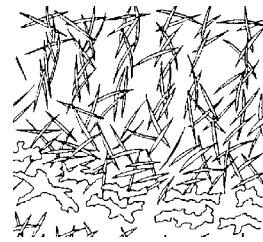
ectosomal bouquets or brushes of spicules



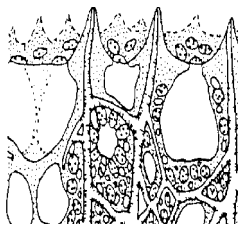
ectosomal palisade (erect fence of spicules)



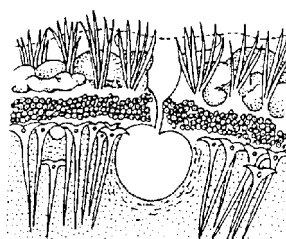
lithistid skeleton



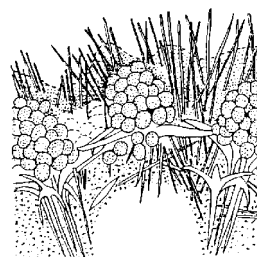
sublithistid skeleton



primary ascending fibres (main fibres ending perpendicular to skeleton)

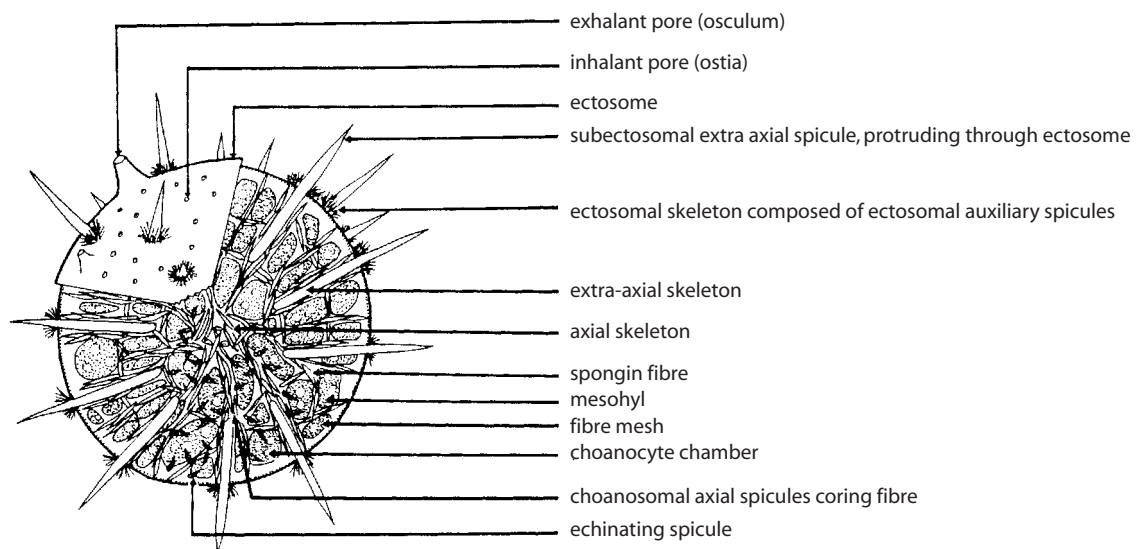
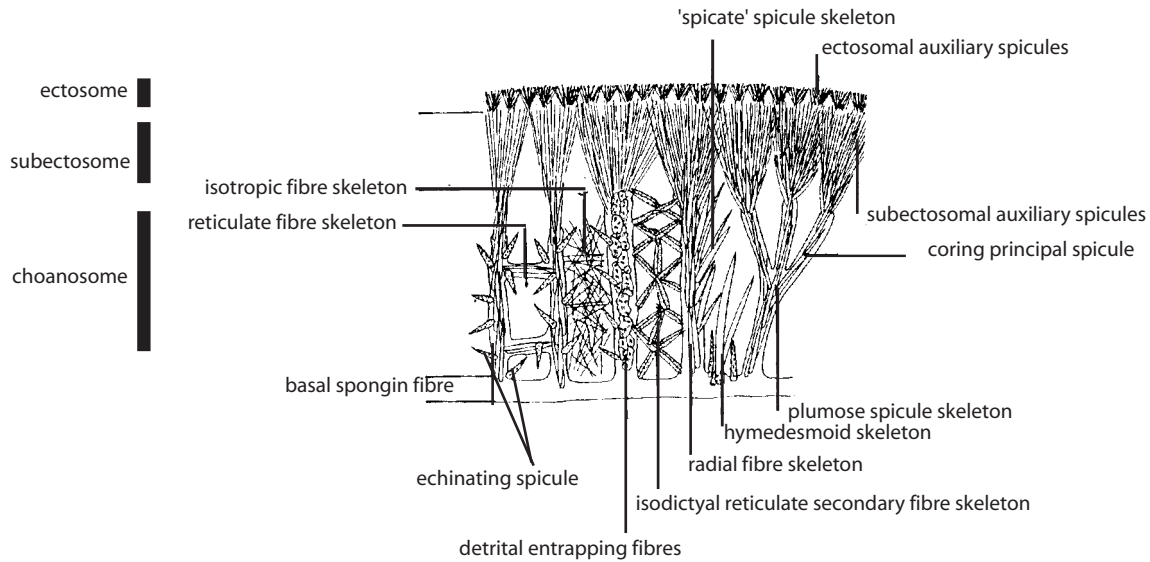


cortical skeleton (reinforced surface)

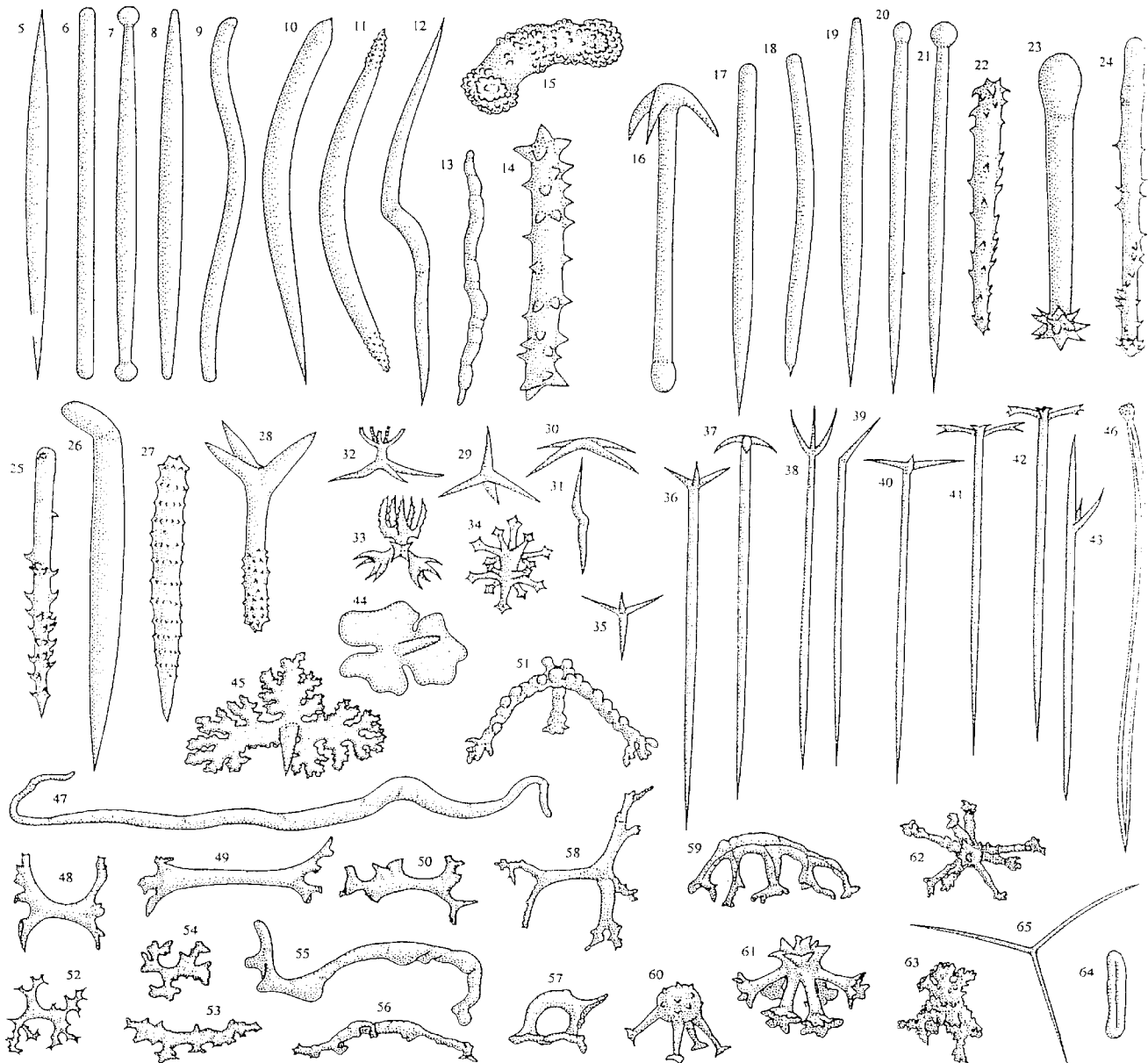


ectochrome (outer layer of cortex)

DEMOSPONGIAE SKELETON: FEATURE EXAMPLES



DEMOSPONGIAE SPICULES (1): MEGASCLERES

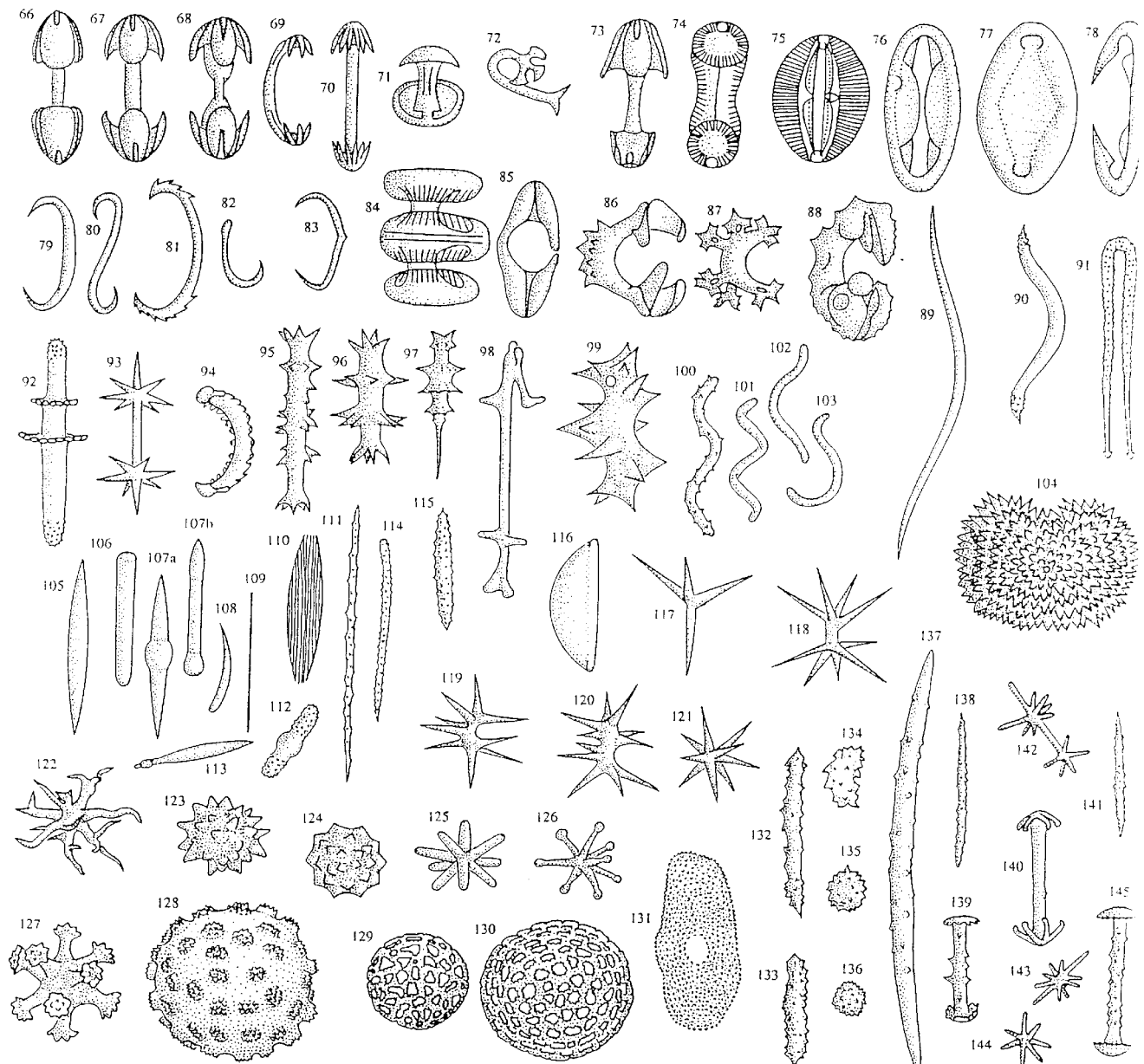


- 5 oxea
- 6 strongyle
- 7 tylote
- 8 strongyloxea
- 9 sinuous strongyle
- 10 anisoxea
- 11 acanthose oxea
- 12 sinuous oxea
- 13 tuberculate vermiform strongyle
- 14 acanthotylostrongyle
- 15 club-shaped acanthostrongyle
- 16 cladotylote
- 17 style
- 18 hastate style
- 19 anisostyle
- 20 subtylostyle
- 21 tylostyle
- 22 acanthostyle
- 23 stellate acanthotylostyle
- 24 acanthostyle with clavulate spines

- 25 acanthostyle with recurved spines
- 26 rhabdostyle
- 27 verticillate acanthostyle
- 28 sagittal triact (acanthoplaciotriaene)
- 29 undifferentiated calthrops
- 30 tetrapod calthrops
- 31 centrangulate diact
- 32 monoloph (lophotetractine)
- 33 candelabrum
- 34 amphimesodichotriaene
- 35 short shaft triaene
- 36 plagiotriaene
- 37 anatriaene
- 38 prototriaene
- 39 promonaene
- 40 orthotriaene
- 41 dichotriaene
- 42 trichotriaene
- 43 trichodal or heterocladal prototriaene
- 44 discotriaene

- 45 phyllotriaene
- 46 oxytyle
- 47 ophirhabd (monocrepidal) desma
- 48,49,50 dendroclones desma
- 51 tripodal dicranoclone (triclepidal) desma
- 52,53 rhizoclones (monocrepidal) desma
- 54 rhizoclone with spinose zygomeres desma
- 55 heloclone (monocrepidal) desma
- 56 irregular heloclone desma
- 57 megaclone (monocrepidal) desma
- 58 tetracclone (tetracrepidal) desma
- 59 rhabdorepid (monocrepidal) desma
- 60 sphaeroclone (anacrepidal) desma
- 61 typical sphaeroclone desma
- 62 modified sphaeroclone (astroclone) desma
- 63 hypersilicified sphaeroclone desma
- 64 tylotiform (collagenous spongin spicule)
- 65 triaeniform (collagenous spongin spicule)

DEMOSPONGIAE SPICULES (2): MICROSCLERES



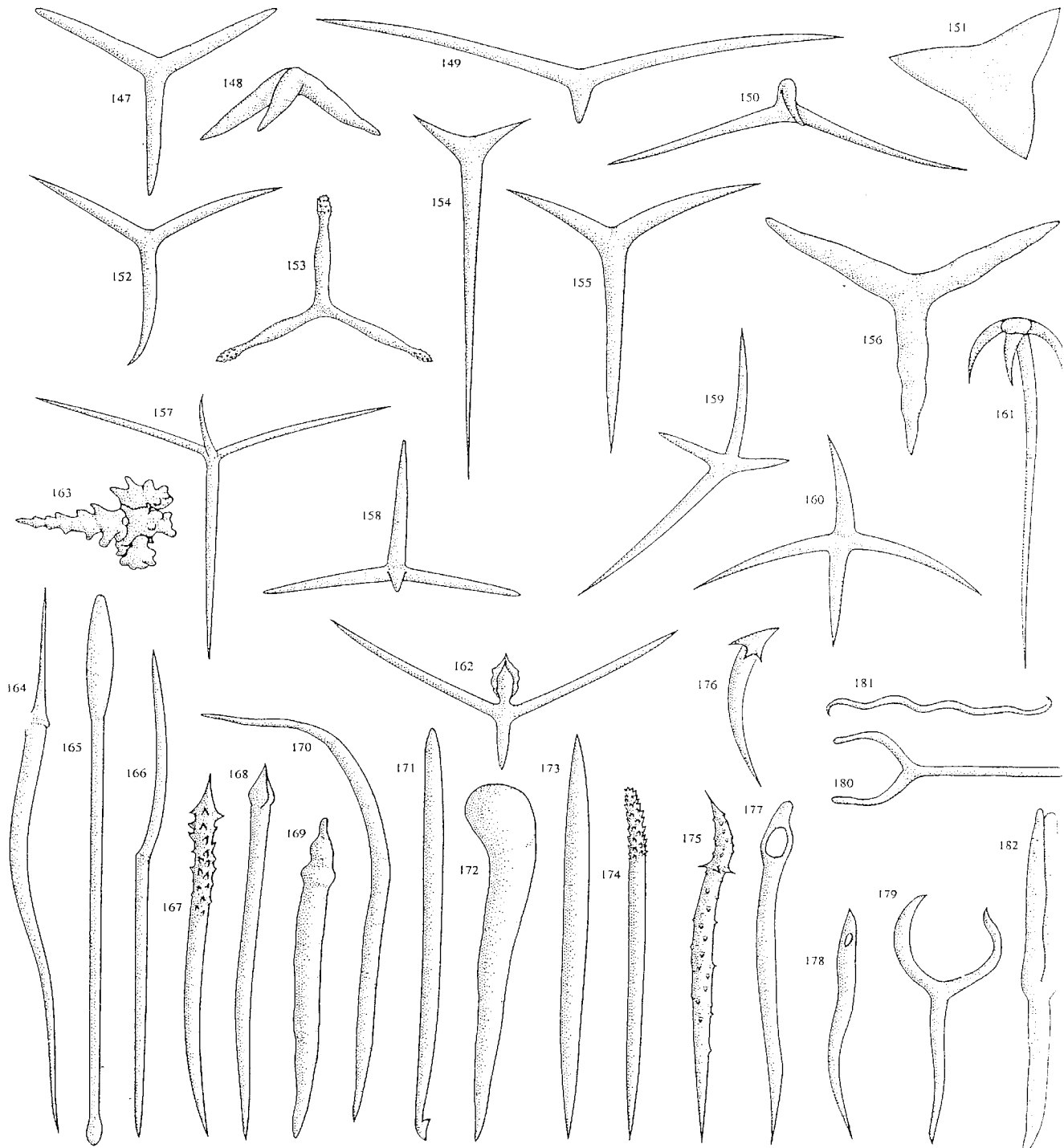
66 palmate isochela
67 arcuate isochela
68 anchorate isochela
69 unguiferous isochela
70 birotulate isochela
71,72 bipocilli
73 palmate anisochela
74 placochela
75 sphaerancora
76 canonochela
77 clavisc (compound diancistra)
78 diancistra
79 c-sigma
80 s-sigma
81 serrate sigma
82 croca
83 centrangulate sigma
84 tetrapocilla
85 cleistochela

86 spined isancora
87 spined chela
88 tuberculate isochela
89 toxa
90 spined toxa
91 forceps
92 discorhabd (Didiscus)
93 oxydiscorhabd
94 dentate "sigmata"
95 sanidastoid discorhabd
96 sanidastoid discorhabd
97 anisodiscorhabd
98 young sigmodiscorhabd
99 spiraster
100 spinispira
101 spirula
102 toxaspire
103 sigmaspire
104 selenaster

105 microxea
106 microstrongyle
107a centrotylote microxea
107b centrotylote microstyle
(microtylostyle)
108 comma
109 raphide
110 trichite (bundle of raphides)
111 onychaete
112 spined centrotylote rod
113 spear-shaped microstyle
114 thraustoxea
115 sanidaster
116 "eçailles" (monocrepidial disc)
117 plesiaster streptaster
118 amphiaser streptaster
119 metastar streptaster
120 spiraster streptaster
121 oxyaster euaster

122 oxyaster
123 oxyspheraster euaster
124 pycnaster euaster
125 strongylaster euaster
126 tylaster euaster
127 anthaster euaster
128 anthospheraster euaster
129 sterrospheraster euaster
130 sterraster euaster
131 aspidaster euaster
132-136 acanthoxeas and transitional pseudospherasters (in gemmula)
137,138 acanthoxea (in gemmula)
139 gemmule amphidisc or birotule (in gemmula)
140 gemmule amphidisc (in gemmula)
141 acanthoxeote (in gemmula)
142-144 pseudasters (in gemmula)
145 gemmule amphidisc (in gemmula)

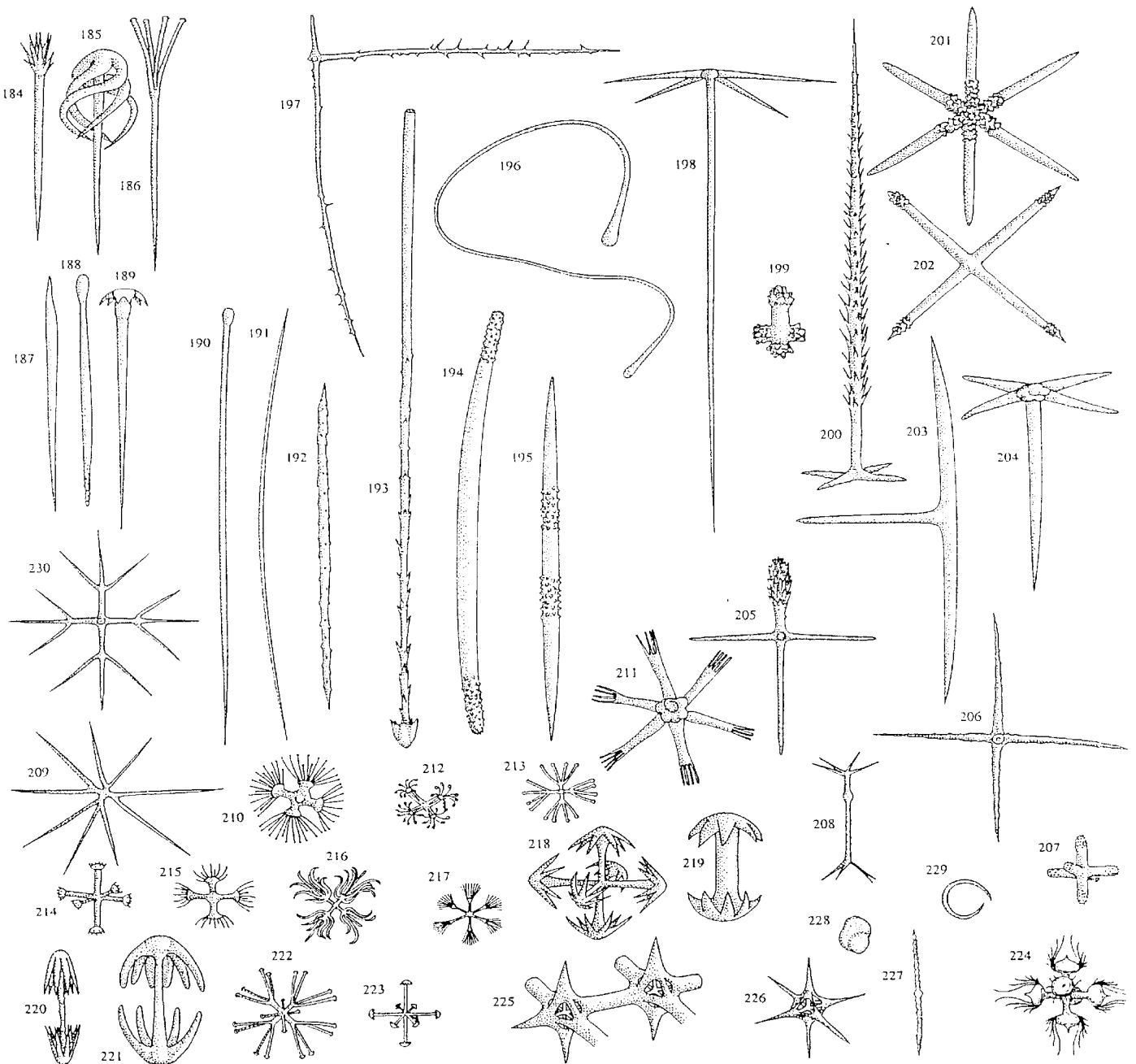
CALCAREA SPICULES



- 147 triradiate symmetrical rays
- 148 tripod
- 149 sagittal triradiate paired rays
- 150 triradiate curved ray
- 151 triradiate fused rays
- 152 triradiate sinuous rays
- 153 triradiate spined rays
- 154 triradiate vestigial rays
- 155 sagittal triradiate
- 156 triradiate tuberculate rays
- 157 sagittal quadrigonate
- 158 quadrigonate

- 159 sagittal quadrigonate with paired rays
- 160 sagittal quadrigonate equal rays
- 161 quadrigonate cladote rays
- 162 quadrigonate of apophyle
- 163 acanthose quadrigonate
- 164 - 174 calcitic oxeas ("monacts")
- 175 - 176 trichoxeas
- 177 - 178 needle-eye microxeas
- 179 diapason or 'tuning fork' spicule
- 180 tuning fork with paired rays
- 181 sinuous oxea
- 182 irregular tuning fork spicule

HEXACTINELLIDA SPICULES



- 184 sarule (sceptule)
- 185 spinoanchorate clavule (sceptule)
- 186 scopule (sceptule)
- 187 lonchiole (sceptule)
- 188 pilate clavule (sceptule)
- 189 disc-ended clavule (sceptule)
- 190 normal tylostyle
- 191 amphiox
- 192 uncinata
- 193 terminal end of basal bidentate with anchor
- 194 diactinal acanthophore
- 195 diactinal rhabd
- 196 sinuous rhabd
- 197 spiny-rayed acanthophore
- 198 hypodermal pentactine
- 199 tetractinal acanthophore

- 200 pentactinal pinule
- 201 hexactin
- 202 stauractin
- 203 triactin
- 204 superficial pentactine
- 205 dermal pinule
- 206 microhexactine
- 207 stronglylhexaster
- 208 oxydiaster
- 209 oxyhexaster
- 210 discohexaster
- 211 discocaster
- 212 codonhexaster
- 213 tylohexaster
- 214 graphiome
- 215 florime

- 216 plumicome
- 217 discocome
- 218 hexadisc
- 219 birotulate amphidisc
- 220 amphidisc
- 221 abnormal macramphidisc
- 222 onychohexaster
- 223 spherical discohexaster (discospiraster)
- 224 strobiloplumicome
- 225 part of dictyonal mesh with two lychniscs joined
- 226 young lychnisc before inclusion in framework
- 227 centrotyle rhabd
- 228 sphere
- 229 ring "sigma"
- 230 hemioxyhexaster