

hemicaespitosa should probably be re-established for it. This species has been trawled from Santa Monica Bay in 24–35 fathoms.

Polyclinum sp. A

This is an encrusting species of *Polyclinum*. The colony examined was about 45 cm long, 30 cm wide and 2–3 cm thick, with a smooth upper surface lightly coated with sand. It was collected from San Nicholas Island, where it was found living under a rocky ledge at a depth of 35 ft.

In addition to the above species, there is also a form of *Polyclinum* that is egg-shaped and has a slender stalk. This form of *Polyclinum* has been taken several times in the Point Dume area. It is here included as a form of *Polyclinum planum*, which is usually laterally flattened, and has a thick peduncle.

During the course of this and previous studies it was recognized that there is a need for a key to the Southern California ascidians. Therefore the following artificial key was prepared. It is based upon preserved material and zooid characteristics are used extensively, thus a dissecting microscope will be required. Zooid size, gonad description and the characteristic number of rows of stigmata described in the following key refer to adult zooids only.

A Preliminary Artificial Key to the Ascidians
Found in Southern California

- | | |
|---|-----------------------------------|
| 1. Simple ascidians | 33 |
| – Colonial ascidians | 2 |
| 2. Body entire, not divided into 2 or 3 regions | 26 |
| – Body divided into 2 regions | 14 |
| – Body divided into 3 regions | 3 |
| 3. Atrial languet present | 7 |
| – Atrial languet absent | 4 |
| 4. Each zooid with its own test (although sharing a common base) | 5 |
| – Zooids embedded in a common test, colony composed of lobes or club shaped heads | 6 |
| 5. Twelve or thirteen rows of stigmata, zooids up to 35 mm tall, color in life, translucent grey to slightly greenish | <i>Euherdmania claviformis</i> |
| – Seven rows of stigmata, zooids up to 30 mm tall, color in life, golden yellow | <i>Pycnoclavella stanleyi</i> |
| 6. Lobes incrustated with sand, and up to 20 mm tall, color in life, transparent encrusted with sand | <i>Ritterella aequalisiphonis</i> |
| – Lobes incrustated with sand, up to 25 mm in height, color in life, transparent test with red zooids | <i>Ritterella pulchra</i> |
| 7. Colony composed of distinct lobes or club shaped heads | 8 |
| – Colony surface rather even, not composed of distinct lobes or club shaped heads | 11 |
| 8. Branchial sac with 5 rows of stigmata, lobes of the colony up to 25 mm tall, sand encrusted | <i>Aplidium arenatum</i> |
| – Branchial sac with 8 or more rows of stigmata | 9 |
| 9. Stomach smooth, without distinct longitudinal folds (except for typhlosole), lobes of the colony up to 11 cm tall, color in life, salmon | <i>Synoicum parfustis</i> |

- Stomach with 5 to about 20 distinct longitudinal folds 10
- 10. Branchial sac with 8 to 13 rows of stigmata, lobes of the colony up to 35 mm tall, sand encrusted *Aplidium* sp.
- Branchial sac with 16 to 21 rows of stigmata, lobes of the colony up to 5 cm in height, sand encrusted *Aplidium propinquum*.
- 11. Entire colony supported by a distinct peduncle, colony may be up to 20 cm tall, color in life, red wine to yellow *Polyclinum planum*
- Entire colony attached by a broad base, not supported by a distinct peduncle 12
- 12. Stomach wall with many (8-23) longitudinal folds 13
- Stomach wall smooth, without many longitudinal folds, colony up to 8 cm across, mahogany colored in life *Polyclinum laxum*
- 13. Eight to twelve rows of stigmata, colony up to 20 cm across, 1/2 to 3 cm thick, color in life, white to salmon pink *Aplidium californicum*
- Thirteen to fifteen rows of stigmata, colony up to 16 cm across and 3 1/2 cm thick, color in life, white *Aplidium solidum*
- 14. Each zooid with its own test (although sharing a common base) 15
- Zooids embedded in a common test 16
- 15. Zooids with about 80 rows of stigmata, zooids (including test) up to 35 mm tall, color in life, jade green *Rhopalaea* sp.
- Zooids with 16 to 20 rows of stigmata, zooids (including test) up to 40 mm tall, color in life, white or vivid pink *Clavelina huntsmani*
- 16. Atrial siphon present and tube-like 17
- Atrial siphon absent, atrial aperture an opening on the dorsal surface .. 23
- 17. Spicules present in the test 18
- No spicules present in the test 20
- 18. Spicules disk-shaped, or occasionally in the form of amorphous calcareous deposits, colony may be 25 cm or more across and up to 2 cm thick, color in life, orange-tan, whitish or grayish *Cystodytes lobatus*
- Spicules stellate 19
- 19. Surface of test completely opaque due to the abundance of spicules, zooids not visible through the test, colony up to 15 cm across and 4 mm thick, flesh color in life *Trididemnum opacum*
- Surface of test translucent due to the scarcity of the spicules, zooids clearly visible through the test, colony up to 8 cm across and 3 mm thick, color in life, brown *Trididemnum* sp.
- 20. Test tough and hard, upper surface even, without lobes, colony up to 15 mm thick, color in life, burgundy *Archidistoma psammion*
- Test soft with even surface, or with projecting lobes 21
- 21. Colony soft, with an even surface, without projecting lobes 22
- Colony with projecting lobes or elongate heads which may be up to 40 mm tall, color in life, turquoise ...; *Archidistoma ritteri*
- 22. Zooids average about 3 mm long or less, colony about 1 cm thick color in life, white to pale vermillion *Archidistoma diaphanes*
- Zooids 5 to 8 mm long, colony about 2 cm thick, color in life, light grey *Archidistoma molle*
- 23. Minute spicules present in the test 24
- Minute spicules absent 25

24. Atrial aperture a plain round opening restricted to the dorsal surface, with no languet, colony up to 4 mm thick, color in life, white to orange *Didemnum carnulentum*
 - Atrial aperture very large, extending around to the sides of the branchial sac, atrial languet present, colony about 3 mm thick, color in life, grey *Lissoclinum caulleryi*
25. Atrial aperture with a languet, each row of stigmata crossed by a transverse vessel, colony flat and about 1 cm thick or club shaped and up to 3½ cm tall, color in life, variable: white, grey, green, brown, and mixed *Distaplia occidentalis*
 - Atrial aperture without a languet, the rows of stigmata not crossed by a transverse vessel, colony about 2 mm thick, gelatinous, color in life, tan *Diplosoma macdonaldi*
26. Four to 8 rows of stigmata 27
 - Nine to 13 rows of stigmata 29
27. Each zooid with its own test or zooids fused, but not arranged in systems, atrial siphon tube-like, and opening directly to the outside, maximum height (including test) about 3 mm, color in life, emerald green
 *Perophora annectens*
 - Zooids arranged in systems, atrial aperture opening into a common cloaca 28
28. Four rows of stigmata, colony up to 2 mm thick, color in life, dark grey *Botryllus tuberosus*
 - Eight rows of stigmata, colony up to about 2 mm thick, colorless, has the appearance of fish eggs *Botryllus* sp.
29. Zooids in systems, atrial aperture provided with a languet and opening into a common cloaca, colony up to about 5 mm thick 30
 - Zooids not in systems, atrial aperture without a languet, and opening directly to the outside 31
30. Tadpoles with about 32 small papillae surrounding the anterior end of the body, color in life, orange, purplish *Botrylloides diegense*
 - Tadpoles with 8 large papillae surrounding the anterior end of the body, color in life, golden yellow *Botrylloides* sp.
31. Branchial sac with 3 longitudinal vessels, zooids up to 6 mm in height, color in life, grey *Polyzoa translucida*
 - Branchial sac with 5 longitudinal vessels 32
32. Zooids close together in a common test, colony up to about 4 mm thick, color in life, crimson *Metandrocarpa dura*
 - Zooids separated, each with its own test, but interconnected with at least a film of test, zooids up to 5 mm tall, color in life, crimson
 *Metandrocarpa taylori*
33. Branchial sac with internal longitudinal folds 40
 - Branchial sac flat, without internal longitudinal folds 34
34. Anterior end of the test a flattened disk provided with thin horny plates, reaches a maximum height of 50 mm, color in life, jade green, yellowish or brownish *Chelyosoma productum*
 - Anterior end not flattened nor provided with thin horny plates 35
35. Ascidian resembling a ball of mud, stigmata arranged in perfect double

- spirals, maximum test diameter about 15 mm color in life, muddy grey
 *Eugyra arenosa*
- Ascidian not resembling a ball of mud, stigmata not arranged in perfect
 double spirals 36
- 36. Branchial sac extends posteriorly beyond the stomach in a long narrow
 pouch which is as long or longer than the distance from the stomach to
 the branchial siphon, maximum test length 14 cm, appearance in life,
 translucent, tinged with green *Ascidia vermiformis*
- Branchial sac does not extend posteriorly in a long narrow pouch 37
- 37. Stigmata spiral, stomach on the right side of the body, intestine curves
 ventrally under the stomach, maximum length of the test 45 mm, color
 in life, jade green to yellowish *Corella willmeriana*
- Stigmata straight, stomach on the left side of the body, intestine curves
 dorsally over the stomach 38
- 38. Atrial siphon located on the dorsal side near, or posterior to the middle
 of the body 39
- Atrial siphon located near the anterior end of the body, maximum test
 length 25 cm usually 10 cm or less color in life, yellowish green
 *Ciona intestinalis*
- 39. Test transparent or translucent, flexible, laterally flattened, test up to
 50 mm long, color in life, jade green *Ascidia ceratodes*
- Test opaque, rigid, cartilaginous, not laterally flattened, up to 45 mm
 long, color in life, jade green *Ascidia* sp.
- 40. Large tentacles branched 41
- Tentacles always simple 47
- 41. A closed renal sac on the right side of the body 42
- No renal sac present on the right side of the body 43
- 42. An "S" shaped ovary on each side of the body, maximum test diameter
 4 cm, usually 15 mm or less sand encrusted *Molgula regularis*
- An oblong ovary on each side of the body, maximum test length 15 mm,
 sand encrusted *Molgula pugetiensis*
- 43. Test provided with precisely intersecting rows of small papillae, maxi-
 mum diameter 4 cm, usually 2 cm or less, color in life, pearly white ...
 *Bathypera ovoida*
- Test not provided with precisely intersecting rows of small papillae (but
 may be provided with spines exhibiting no precise pattern) 44
- 44. Body of test provided with spines, and usually relatively free of encrust-
 ing debris or organisms 45
- Body of test lacking spines (although minute spines may be present on
 the siphons), test may or may not be covered with debris or encrusting
 organisms 46
- 45. Body supported by a stalk, total length of the test up to 9 cm, color in
 life, dull rose red *Boltenia villosa*
- Body attached directly by the posterior end, no stalk present, up to 10
 cm in diameter, but usually 3 cm or less, color in life, reddish about the
 apertures, otherwise brown *Halocynthia hilgendorfi igaboja*
- 46. Siphons located at opposite ends of an elongate body and directed in
 nearly opposite directions, test free of encrusting debris or organisms,

40

- up to 65 mm long, color in life, dull white *Pyura mirabilis*
- Both siphons directed upwards, test usually encrusted with debris or organisms, up to 120 mm long, color in life, rose red at ends of siphons *Pyura haustor*
47. Body supported by a narrow stalk, the upper part of which is hollow and contains a tubular prolongation of the mantle 48
- Body attached directly by the posterior end, no hollow narrow stalk present 49
48. Conspicuous tubercles anteriorly, longitudinal folds of the test restricted to the posterior body and stalk, 4 or more ovaries on the right side of the body, test up to 20 cm tall, color in life, rose brown to brown *Styela clava*
- Tubercles few and inconspicuous, longitudinal folds extend anteriorly, nearly to the siphons, 3 or fewer ovaries on the right side of the body, test up to 30 cm tall, color in life, tan to reddish brown *Styela montereyensis*
49. Branchial sac with only one internal longitudinal vessel between the branchial folds, test up to 30 mm tall, color in life, reddish brown *Styela truncata*
- Branchial sac with 2 or more internal longitudinal vessels between the branchial folds 50
50. Two ovaries on each side of the body 51
- Other than 2 ovaries on each side of the body 53
51. Posterior region of the test provided with slender branching papillae which are usually obscured by silt, test up to 25 mm in height, color in life, greyish yellow *Styela* sp.
- Test not provided with such papillae 52
52. Ovaries clearly sinuously curved, test up to 30 mm tall, color in life, yellow posteriorly, purplish anteriorly *Styela partita*
- Ovaries only slightly sinuously curved, nearly straight, test up to 40 mm tall, color in life, reddish brown *Styela gibbsii*
53. One ovary on the right side of the body, test up to 20 mm long, color in life, reddish brown *Styela coriacea*
- At least three ovaries on the right side of the body, test up to 10 cm tall, color in life, white and brown *Styela plicata*

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