

SOME OBSERVATIONS ON THE SHORE ECOLOGY OF THE OKHA COAST*

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STUDY of the shore ecology forms an important aspect in marine biological investigations. The phyto and zoogeography of the Okha coast, on the northwestern part of the peninsular India abutting on the Arabian sea, were initiated by Boergesen, cited by Dixit (1963-64) and Hornell (1909-16). Most of the later works relate to individual distributional records of species, though Misra (1960) has dealt with the algal ecology. The information contained in these works are not often available to the numerous students and researchers of various Indian and foreign universities visiting this coast every year, because it is scattered in different Indian and foreign journals. The present paper is prepared mainly to acquaint the student of marine biology with the variety, distribution and habitat of the common members of flora and fauna of the five collection grounds around Okha.

GENERAL FEATURES

Topography

Port Okha (Lat. 22°28'N Long. 69°05'E) situated at the mouth of the Gulf of Kutch, has five suitable localities for biological collections around it. These are Dwarka, Okha, Adatra, Hanuman-dandi and Balapur (Map). Dwarka is 29 kms. west of Okha. The available intertidal zone lying northwest of the town is a surf beaten rocky littoral with numerous puddles and channels. Two areas, a 'splash zone' and 'closed area' are therefore seen, the former below the steep supralittoral rocks and the other on the flat reef. Okha reef is similar to Dwarka, but on the right side it is protected from the surf-rage by the Samiyani island lying northwest of the mainland. In both the areas the reef is made of limestone rocks. Adatra, lying along the mainland on the southeast side of Okha, is also a limestone reef, with fragmentary coral formations. The severity of the waves is less here, compared to Okha and Dwarka. Hanuman-dandi and Balapur are two sides of the Beyt island, situated about 2 kms., east of Okha in the Gulf of Kutch. The former is a limestone reef, with secondary coral formation and the latter is a mudflat, having gravel-mixed upper hard mud and lower loose mud areas.

Climate and Hydrology

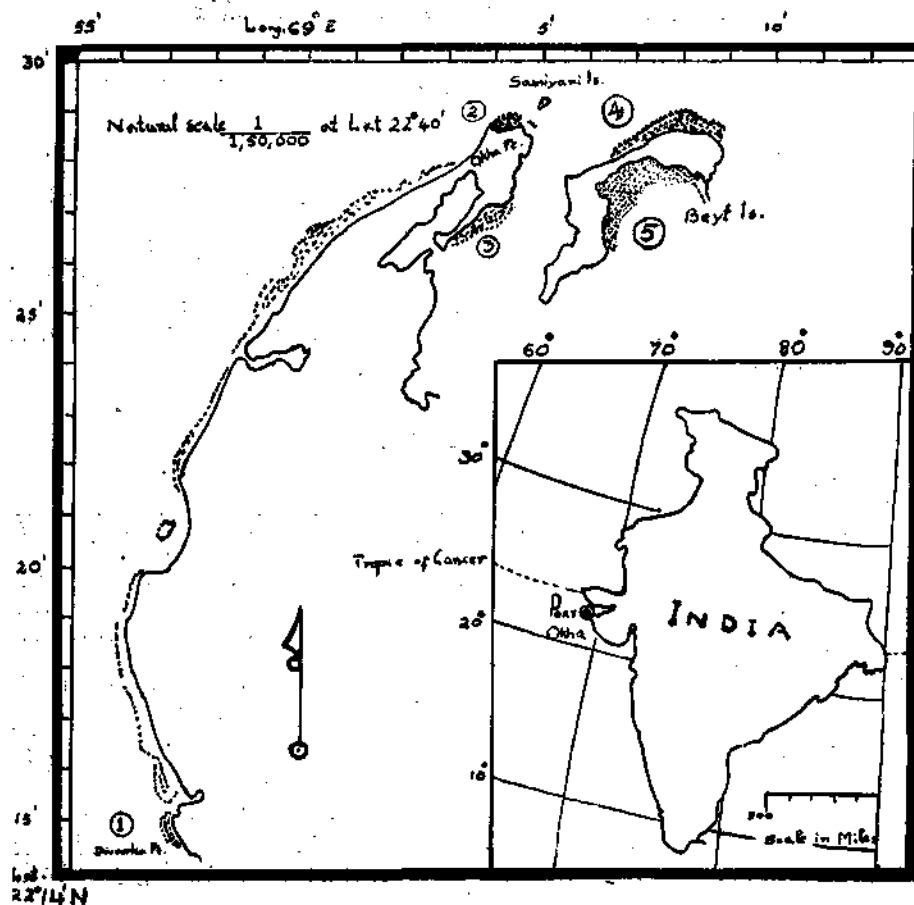
The land along this part of the country is arid, with a rainfall of 20-41 mm. per annum. The hydrological data for Port Okha shows a salinity range of 35.46-36.73‰; dissolved oxygen content of 5.3-6.7 p.p.m.; phosphate content range of 0.1-1.05 g. atom/l and nitrate content range of 2.0-11.5 g. atom/l. The maximum values are found in winter and the minimum in summer (Chauhan, 1967). The maximum and minimum atmospheric temperature are 30.4°C and 19.9°C and sea-

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water temperature range from 30°C to 20°C, the lowest temperature recorded in January-February and maximum in June-July.

Tide and Current

The lowest low water spring tides occur along this coast during the months of March to August in the morning hours and during the remaining months in the even-



Map of the Okha coast showing the grounds for biological collection

1, Dwarka 2, Okha 3, Adatra 4, Hanuman-Dandi 5, Balapur

ing hours. During the months of April, September, October and November, the ebb tides emerge the widest littoral area and as such are the best period for the floral and faunal studies. The maximum height of the high water is 4.28 M., while the low water reaches a datum of -0.34 M. (Please consult the Indian Tide Tables published by the Surveyor General of India, available from their appointed agents like E. W. Stevens & Co. Ltd., 16 Queens Road Estate, Churchgate, Bombay). A tidal current of 2 knots runs into the Gulf through Port Okha.

MATERIALS AND METHODS

The materials used in this study have been collected during the low tides of less than 0.30 M. during September to March. Most of the collections made from the areas are available for reference in the museum and herbarium of the M.B.R. Station, Port Okha.

Conventional equipment like hammer, chisel, tongs, scalpel, forceps etc., have been used for the collection. Narcotisation of most of the animals was done with menthol powder spreading over the animals kept in a tray with seawater. The duration of narcotising varied from animal to animal in different groups, and the longest time observed was 7 days for a *Cerianthus*, 25 cms. long, with no supplement to the initial quantity of the few crystals of menthol.

Preservation was done in 5% commercial neutralised formalin immediately after narcotisation, and for continued preservation for long time, either same strength of formalin or 70% rectified spirit was used. The algae were preserved in 4% commercial neutral formalin. Dry mounts were also prepared with a coating of mercuric chloride.

ECOLOGY AND DISTRIBUTION

Observations on the bathymetry and habitat of the common flora and fauna of the collection areas are detailed in the Tables I-V.

The low temperature and the abundance of organic matter in winter months accelerate the biological activity in the region, especially the Okha and Adatra coasts. Large numbers of green, brown and red algae uprooted and cast ashore into the midlittoral during the misty days with strong wind, turn the reef of Okha, Dwarka and Adatra, into a panorama of colours par excellence (Gopalakrishnan, 1969). Beautifully coloured cream, purple, green and brown nudibranch molluscs frequent the lower littoral and the lower midlittoral pools. These are found moving on the seaweeds and also their egg-mass and egg cases are common on the reef. Few to mention among these are, *Aplysia benedicti*, *Placomopherus ceylanicus*, *Kentrodoris funebris*, *Eolis* sp., *Elysia grandifolia*, and the more conspicuous and large *Melibe rangii* found wriggling among the brown weeds. The 'floating' mollusc, *Ianthina* sp. and the 'seahorse', *Hippocampus trimaculatus* are also collected during this time. A community of fishes like *Epinephelus merra*, *Pseudoscinaea melanostigma*, *Batrachus* sp. and the crab, *Pilumnus vespertilio*, a holothurian, *Holothuria pardalis*, and the large long polychaete, *Eurythoe complanata* are often encountered on the midlittoral reef of Okha and Adatra.

The distribution of the systematic groups of the flora and fauna, on the five collection grounds is summarised in Table VI. It can be seen that there are totally 64 species of algae and 144 species of animals represented on this coast. The algal group that has the maximum number of species is Rhodophyceae and the animal phylum dominating is Mollusca. The zonation pattern of the groups is presented in fig. 2.

The supralittoral on all the reefs is inhabited by a few green algae and molluscs. The area upto 50 ft. below this is sparsely populated on the Okha reef, while on the

TABLE I
SHOWING THE COMMON FLORA AND FAUNA ON THE DWARKA REEF AND THE ECOLOGICAL DISTRIBUTION

| Zone | S. No. | Name | Habitat | Taxonomy |
|---------------|--------|---------------------------------------|---|----------|
| FLORA | | | | |
| SUPRALITTORAL | 1. | <i>Boodlea composita</i> | on the exposed rocks of upper-most part | C |
| MIDLITTORAL | 2. | <i>Enteromorpha</i> sp. | on the pool margins of upper reef, epiphytic | C |
| | 3. | <i>Ulva lactuca</i> | in the rock pools | C |
| | 4. | <i>Bryopsis plumosa</i> | do. | C |
| | 5. | <i>Codium dwarkense</i> | do. | C |
| | 6. | <i>Halimeda tuna</i> | do. | C |
| | 7. | <i>Caulerpa racemosa</i> | more common in the rock pools of right side, near Mahadevji temple | C |
| | 8. | <i>C. peltata</i> | do. | C |
| | 9. | <i>C. scalpelleformis</i> | do. | C |
| | 10. | <i>C. taxifolia</i> | do. | C |
| | 11. | <i>C. sertularioides</i> | do. towards the lower levels | C |
| | 12. | <i>Galaxura oblongata</i> | in the large and deep pools of midreef | R |
| | 13. | <i>Jania</i> sp. | do. | R |
| | 14. | <i>Gelidiella acerosa</i> | do. on the inner sides of rock pools | R |
| | 15. | <i>Gracilaria corticata</i> | do. | R |
| | 16. | <i>Padina gymnospora</i> | lower areas of midreef, in pools | P |
| | 17. | <i>P. tetrastromatica</i> | do. | P |
| | 18. | <i>Sargassum tenerrimum</i> | do. | P |
| | 19. | <i>Sargassum</i> sp. | do. | P |
| | 20. | <i>Pocockiella variegata</i> | do. | P |
| | 21. | <i>Scinaia indica</i> | do. often all the five algae are seen in the same pool | R |
| | 22. | <i>Halymenia venusta</i> | in the pools of the lower reef | R |
| | 23. | <i>Colpomenia sinuosa</i> | on the sand covered rocks towards the lower reef | P |
| | 24. | <i>Iyengaria stellata</i> | do. | P |
| | 25. | <i>Hydroclathrus clathratus</i> | in the rock pools, of the mid-reef | P |
| | 26. | <i>Hypnea musciformis</i> | pools of the mid and lower littoral, cast ashore from the sublittoral, found in knots | R |
| | 27. | <i>Champia indica</i> | pools of the lower littoral | R |
| | 28. | <i>Pseudogloiophloea fascicularis</i> | in the pools of midreef, cast ashore | R |
| | 29. | <i>Griffithsia rhizophora</i> | do. | R |
| | 30. | <i>Laurencia pedicularioides</i> | pools of the lower littoral | R |
| | 31. | <i>Chondria dasyphylla</i> | do. | R |
| | 32. | <i>Acanthophora dendroides</i> | do. | R |
| | 33. | <i>Polysiphonia</i> spp. | on the sand covered rocky areas | R |
| | 34. | <i>Dictyosphaeria cavernosa</i> | on the margin of rock pools, lower reef | C |
| | 35. | <i>Spatoglossum variabile</i> | in the rock pools of lower littoral | P |
| | 36. | <i>Cryptonemia undulata</i> | cast ashore, lower littoral | R |
| | 37. | <i>Coelarthrum muelleri</i> | do. | R |
| | 38. | <i>Rhodymenia dissecta</i> | pools near Mahadevji temple, midreef | R |
| | 39. | <i>Grateloupia indica</i> | do. | R |

TABLE I—*contd.*SHOWING THE COMMON FLORA AND FAUNA ON THE DWARKA REEF AND THE ECOLOGICAL DISTRIBUTION—*contd.*

| Zone | S. No. | Name | Habitat | Taxonomy | |
|-----------------------|-----------------|-------------------------------|--|---------------------------------------|-----------------|
| SUBTIDAL FRINGE | 40. | <i>Dictyopteris australis</i> | in the pools | P | |
| | 41. | <i>Levringia boergesenii</i> | margin of the pools of the lower part, overhang into the water pools of the lower part | P | |
| | 42. | <i>Botryocladia leptopoda</i> | | R | |
| FAUNA | | | | | |
| SUPRALITTORAL | 1. | <i>Turbo intercostalis</i> | on the rock surface, in the crevices and the pools margin | M | |
| | 2. | <i>Tetracitira</i> sp.? | on the top, surface and crevices of the rocks opposite the light house area | M | |
| MIDLITTORAL | 3. | <i>Chiton</i> sp. | in the crevices of rocks and pools | M | |
| | 4. | <i>Nerita rumphii</i> | do. | M | |
| | 5. | <i>Cyprea ocellata</i> | found in the pools and base of rock on the right side of the Mahadevji temple | M | |
| | 6. | <i>C. arabica</i> | do. | M | |
| | 7. | <i>Ophiothrix</i> sp.? | do. | E | |
| | 8. | <i>Grapsus strigosus</i> | on the upper areas of the mid-reef | A | |
| | 9. | <i>Atergatis integerrimus</i> | found in the pools and crevices of rocks | A | |
| | 10. | <i>Leptodus</i> sp. | in the area near the Mahadevji temple on the right side | A | |
| | 11. | <i>Pilumnus vespertilio</i> | in the pools of midreef | A | |
| | 12. | <i>Eunice tubifex</i> | on the eroded areas of the rocks, midreef | AN | |
| | 13. | <i>Nereis</i> sp. | in the crevices or underside of rocks | AN | |
| | 14. | <i>Ligia</i> sp. | pools of midreef, on the seaweeds | A | |
| | 15. | <i>Esperella plumosa</i> | cast ashore on the midreef | PO | |
| | 16. | <i>Auleta elongata</i> ? | do. | PO | |
| | 17. | <i>Stoichactis</i> sp. | the midreef, lighthouse side and the crevices of pool rocks | CO | |
| | SUBTIDAL FRINGE | 18. | <i>Sabella</i> sp. | inside the rocks of the subtidal area | AN |
| | | 19. | <i>Serpula</i> sp. | on the rocks, do. | AN |
| 20. | | <i>Tetrodon</i> sp. | in the pools | F | |
| Abbreviations: | | | | | |
| C | means | Chlorophyceae | M | means | Mollusca |
| P | " | Phaeophyceae | PO | " | Porifera |
| R | " | Rhodophyceae | E | " | Echinodermata |
| A | " | Arthropoda | F | " | Fish (Chordata) |
| AN | " | Annelida | U | " | Urochordata |
| CO | " | Coelenterata | BR | " | Brachiopoda |
| EI | " | Echiuroidea | PH | " | Phoronida |
| S | " | Sipunculoidea | | | |

TABLE II
SHOWING THE COMMON FLORA AND FAUNA OF OKHA REEF AND THE ECOLOGICAL
DISTRIBUTION

| Zone | S. No. | Name | Habitat | Taxonomy | |
|---------------|-----------------|-----------------------------------|---|--|---|
| FLORA | | | | | |
| SUPRALITTORAL | 1. | <i>Boodlea composita</i> | rocks of upper reef | C | |
| | 2. | <i>Enteromorpha</i> sp. | upper reef, epiphytic | C | |
| | 3. | <i>Ulva lactuca</i> | lower supralittoral, pools | C | |
| MIDLITTORAL | 4. | <i>Cladophora fascicularis</i> | pools of upper region, epiphytic | C | |
| | 5. | <i>Caulerpa racemosa</i> | pools of midreef | C | |
| | 6. | <i>Pseudobryopsis mucronata</i> | do. | C | |
| | 7. | <i>Cystoseria indica</i> | do. | P | |
| | 8. | <i>Hormophysa triquetra</i> | do. | P | |
| | 9. | <i>Sargassum tenerrimum</i> | do. | P | |
| | 10. | <i>Padina tetrastrumatica</i> | do. | P | |
| | 11. | <i>Turbinaria</i> sp. | do. | P | |
| | 12. | <i>Laurencia</i> sp. | do. near Vomani pt. more common | R | |
| | 13. | <i>Gelidium acerosa</i> | do. | R | |
| | 14. | <i>Gracilaria foliifera</i> | do. | R | |
| | 15. | <i>Hypnea musciformis</i> | do. | R | |
| | 16. | <i>Sargassum swartzii</i> | pools of lower littoral | P | |
| | 17. | <i>Sargassum johnstoni</i> | do. | P | |
| | 18. | <i>Scinaia indica</i> | do. often in the same pool | R | |
| | 19. | <i>Champia indica</i> | do. | R | |
| | 20. | <i>Halimeda tuna</i> | do. | C | |
| | 21. | <i>Bryopsis plumosa</i> | do. | C | |
| | 22. | <i>Spongomorpha indica</i> | do. on the base or sides | C | |
| | 23. | <i>Pocockiella variegata</i> | do. inner margin of rocks | P | |
| | 24. | <i>Galaxura oblongata</i> | do. | R | |
| | 25. | <i>Amphiroa</i> sp. | do. | R | |
| | 26. | <i>Caulerpa scalpelliformis</i> | do. on the sandy sides | C | |
| | 27. | <i>Caulerpa taxifolia</i> | do. do. | C | |
| | 28. | <i>Udotea indica</i> | on the right side of the reef, near the pool | C | |
| | 29. | <i>Acanthophora muscoides</i> | in the lower littoral, often cast ashore | R | |
| | 30. | <i>Rosenvingeia intricata</i> | do. pools, in tufts often cast ashore | P | |
| | 31. | <i>Dictyosphaeria cavernosa</i> | on the margin of the rocky pools of lower littoral | C | |
| | 32. | <i>Polysiphonia</i> sp. | in the lower littoral, sand cover- ed areas | R | |
| | 33. | <i>Leyringia borgeseni</i> | overhanging into the water level | P | |
| | 34. | <i>Iyengaria stellata</i> | on the rocks | P | |
| | 35. | <i>Colpomenia sinuosa</i> | do. | P | |
| | SUBTIDAL FRINGE | 36. | <i>Stoechospermum marginatum</i> | submerged areas of the reef on the right side | P |
| | | 37. | <i>Dictyopteris australis</i> | do. | P |
| | | 38. | <i>Spatoglossum variabilis</i> | do. | P |
| 39. | | <i>Codium dwarkense</i> | do. | C | |
| 40. | | <i>Halymenia venusta</i> | do. | R | |
| 41. | | <i>Sebdenia polydactyla</i> | do. | R | |
| 42. | | <i>Helminthocladia clavadosii</i> | do. | R | |
| 43. | | <i>Coelarthrum muelleri</i> | do. | R | |

TABLE II—contd.

SHOWING THE COMMON FLORA AND FAUNA OF OKHA REEF AND THE ECOLOGICAL DISTRIBUTION—contd.

| Zone | S. No. | Name | Habitat | Taxonomy |
|--|--------|--------------------------------|--|----------|
| | 44. | <i>Cryptonemia undulata</i> | Submerged areas of the reef on the right side | R |
| | 45. | <i>Heterosiphonia muelleri</i> | do. | R |
| | 46. | <i>Botryocladia leptopoda</i> | do. | R |
| | 47. | <i>Asparagopsis taxiformis</i> | do. | R |
| | 48. | <i>Halymenia porphyroides</i> | do. | R |
| | 49. | <i>Grateloupia indica</i> | do. | R |
| | 50. | <i>Hypoglossum spathulatum</i> | do. | R |
| | 51. | <i>Ceramium</i> sp. | do. epiphytic | R |
| | 52. | <i>Gastroclonium iyengeri</i> | do. (free living) | R |
| (The habitat is that which favours a luxuriant growth of the algae, though some of them are seen in the littoral areas cast ashore and growing.) | | | | |
| FAUNA | | | | |
| SUPRALITTORAL | 1. | <i>Turbo intercostalis</i> | on the rocks | M |
| | 2. | <i>Turbo coronatus</i> | do. | M |
| | 3. | <i>Cerithidea fluviatilis</i> | do. in pools | M |
| MIDLITTORAL | 4. | <i>Patella radlata</i> | in the crevices of rocks of upper-part | M |
| | 5. | <i>Chiton</i> sp. | do. | M |
| | 6. | <i>Nerita rumphii</i> | on the rocks, upper part | M |
| | 7. | <i>Nerita albicollis</i> | do. | M |
| | 8. | <i>Astrea semicostata</i> | do. in crevices also | M |
| | 9. | <i>Atergatis integerrimus</i> | among the rock crevices | A |
| | 10. | <i>Grapsus strigosus</i> | do. common on the Vomani point area | A |
| | 11. | <i>Pilumnus vesperillo</i> | pools and rock bases, midreef | A |
| | 12. | <i>Matuta lunaris</i> | do. sandy areas | A |
| | 13. | <i>Hyastenus planatus</i> | in rocky area, among seaweed growth of pools | A |
| | 14. | <i>Neptunus pelagicus</i> | do. in pools, swimming crab | A |
| | 15. | <i>Charybdis natator</i> | do. | A |
| | 16. | <i>C. annulata</i> | do. | A |
| | 17. | <i>Actaea savignii</i> | do. among seaweeds | A |
| | 18. | <i>Leptodius exaratus</i> | midreef, sandy areas | A |
| | 19. | <i>Gelasimus annulipes</i> | in the rock pools of lower littoral (not so common) | A |
| | 20. | <i>Sesarma quadrata</i> | do. | A |
| | 21. | <i>Ligia</i> sp. | on the seaweeds | A |
| | 22. | <i>Stoichactis</i> sp. | lower midlittoral, green with black bands | CO |
| | 23. | <i>Ixalactis</i> sp.? | pinkish coloured, common on mid and lower reef, in sandy and rocky areas alike | CO |
| | 24. | <i>Zoanthus</i> sp. | lower areas of midreef | CO |
| | 25. | <i>Lobophytum</i> sp.? | on the margins of rocks and rocky areas of lower reef | CO |
| | 26. | <i>Sclerophytum</i> sp.? | do. | CO |
| | 27. | <i>Neries</i> sp. | in the crevices of rocks and under rocks, also on the seaweeds | AN |
| | 28. | <i>Herichthys</i> sp.? | the lower reef, sandy areas | U |
| | 29. | <i>Sabella</i> sp. | inside the rocks bordering the pools, in tubes | AN |

TABLE II—contd.

SHOWING THE COMMON FLORA AND FAUNA OF OKHA REEF AND THE ECOLOGICAL DISTRIBUTION—contd.

| Zone | S. No. | Name | Habit | Taxonomy |
|------|--------|-------------------------------|---|----------|
| | 30. | <i>Serpula</i> sp. | on the rocks, mid and lower reef | AN |
| | 31. | <i>Polynoe</i> sp. | lower littoral, crevices of rocks | AN |
| | 32. | <i>Eurythoe complanata</i> | under rock pieces of lower reef, on right side, and in the pool bottom | AN |
| | 33. | <i>Trochus</i> sp. | lower littoral | M |
| | 34. | <i>Cerithium</i> sp. | do. | M |
| | 35. | <i>Cyprea ocellata</i> | do. in pool margins | M |
| | 36. | <i>C. lynx</i> | do. | M |
| | 37. | <i>C. carneola</i> | do. (not so common) | M |
| | 38. | <i>C. moneta</i> | do. | M |
| | 39. | <i>Cyprea arabica</i> | under the rock in the lower littoral | M |
| | 40. | <i>Turritella acutangula</i> | found in the lower reef | M |
| | 41. | <i>Thais rudolphi</i> | do. | M |
| | 42. | <i>Nassa hepatica</i> | do. margin or rock pools | M |
| | 43. | <i>Cantharus undosus</i> | do. | M |
| | 44. | <i>Oliva gibbosa</i> | do. | M |
| | 45. | <i>Bursa granulosa</i> | do. | M |
| | 46. | <i>Cerithidea fluviatilis</i> | do. | M |
| | 47. | <i>Kentrodoris funebris</i> | lower littoral, among seaweeds in pools | M |
| | 48. | <i>Melibe rangli</i> | do. | M |
| | 49. | <i>Oncidium verruculatum</i> | do. | M |
| | 50. | <i>Aplysia benedicti</i> | do. | M |
| | 51. | <i>Octopus</i> sp. | do. often found hiding in the crevices of rocks or in sandy streams | M |
| | 52. | <i>Squilla</i> sp. | lower littoral found under rocks | A |
| | 53. | <i>Diogenes</i> sp. | do. found in empty shell | A |
| | 54. | <i>Sepia</i> sp. | lower part of the reef, the cuttle-bones are found cast ashore on the sandy beach | M |
| | 55. | <i>Holothuria pardalis</i> | found under stones and rock pieces | E |
| | 56. | <i>Pentaceros</i> sp. | in the pools of the lower reef | E |
| | 57. | <i>Patira</i> sp.? | do. | E |
| | 58. | <i>Macrophialthrix</i> sp.? | lower littoral, under stones | E |
| | 59. | <i>Porpita</i> sp. | do. in pools (not so common) | CO |
| | 60. | <i>Physalia utricularis</i> | do. often cast ashore in premonsoon weather conditions to the upper littoral | CO |
| | 61. | <i>Batrachus grunniens</i> | found under the rocks of stones | F |
| | 62. | <i>B. gangens</i> | do. | F |
| | 63. | <i>Boleophthalmus</i> sp. | in the pools on the mid and lower reef | F |
| | 64. | <i>Tetrodon lunaris</i> | do. | F |
| | 65. | <i>Epinephelus merra</i> | under and inside crevices of rocks in pools | F |
| | 66. | <i>Chrysophrys</i> spp. | in the pools of lower littoral | F |
| | 67. | <i>Vermetes</i> sp. | in the lower littoral on the rocks on the right side of the reef | M |

TABLE II—*contd.*
 SHOWING THE COMMON FLORA AND FAUNA OF OKHA REEF AND THE ECOLOGICAL
 DISTRIBUTION—*contd.*

| Zone | S. No. | Name | Habitat | Taxonomy |
|-----------------|--------|------------------------------|---|----------|
| SUBTIDAL FRINGE | | | | |
| | 68. | <i>Gyrostoma</i> sp. | in the sandy area on the right side of reef | CO |
| | 69. | <i>Peachia</i> sp. | do. | CO |
| | 70. | <i>Auleta elongata</i> ? | in the submerged areas of the reef on right side | PO |
| | 71. | <i>Esperella plumosa</i> | do. | PO |
| | 72. | <i>Conus piperatus</i> | in the lower part of the reef, in subtidal pools as well as the submerged area on right-hand side | M |
| | 73. | <i>Dendrostomum</i> sp. | crevices of rocks | S |
| | 74. | <i>Ianthina</i> sp. | in the submerged area on right-hand side (not so common) | M |
| | 75. | <i>Plotossus anguillaris</i> | on the right side, in shoals or otherwise | F |
| | 76. | <i>Narcine timlei</i> | do. | F |
| | 77. | <i>Dasyatis uarnak</i> | do. | F |
| | 78. | <i>Sinum cuvierianum</i> | do. on the rocks | M |

Abbreviations as in Table I.

TABLE III
 SHOWING THE COMMON FLORA AND FAUNA ON THE ADATRA REEF AND
 THE ECOLOGICAL DISTRIBUTION

| Zone | S. No. | Name | Habitat | Taxonomy |
|---------------|--------|----------------------------------|---|----------|
| FLORA | | | | |
| SUPRALITTORAL | 1. | <i>Boodlea composita</i> | on the rocks | C |
| MIDLITTORAL | 2. | <i>Ulva lactuca</i> | do. and pools | C |
| | 3. | <i>Enteromorpha</i> sp. | epiphytic | C |
| | 4. | <i>Polysiphonia</i> sp. | in the sandy on the rocks or pools | R |
| | 5. | <i>Sargassum tenerrimum</i> | in the pools | P |
| | 6. | <i>Chondria armata</i> | do. | R |
| | 7. | <i>Hypnea musciformis</i> | do. | R |
| | 8. | <i>Acanthophora muscoides</i> | do. submerged pools | R |
| | 9. | <i>Stoichospermum marginatum</i> | do. | P |
| | 10. | <i>Udotea indica</i> | in the sandy areas of the reef | C |
| | 11. | <i>Halimeda tuna</i> | in the pools | C |
| | 12. | <i>Pocockiella variegata</i> | on the inner margin of the pools | P |
| | 13. | <i>Heterosiphonia muelleri</i> | in the pools of the submerged area | R |
| | 14. | <i>Caulerpa racemosa</i> | on the sandy bottom of the pools, the margins | C |
| | 15. | <i>C. scalpelliformis</i> | do. | C |
| | 16. | <i>C. taxifolia</i> | do. | C |

TABLE III—contd.

SHOWING THE COMMON FLORA AND FAUNA ON THE ADATRA REEF AND THE ECOLOGICAL DISTRIBUTION—contd.

| Zone | S. No. | Name | Habitat | Taxonomy | |
|-----------------|--------|--------------------------------|---|--|----|
| SUBTIDAL FRINGE | 17. | <i>Botryocladia leptopoda</i> | in the submerged areas of the reef on the right side | R | |
| | 18. | <i>Asparagopsis taxiformis</i> | do. | R | |
| | 19. | <i>Padina</i> spp. | do. | P | |
| | 20. | <i>Dicryopteris australis</i> | do. | P | |
| FAUNA | | | | | |
| SUPRALITTORAL | 1. | <i>Turbo intercostalis</i> | on upper rocks | M | |
| MIDLITTORAL | 2. | <i>Lobophytum</i> sp.? | margins of pools, upper midreef | CO | |
| | 3. | <i>Scelerophytum</i> sp.? | exposed areas; do. | CO | |
| | 4. | <i>Zoanthus</i> sp. | do. | CO | |
| | 5. | <i>Stoichactis</i> sp. | midreef | CO | |
| | 6. | <i>Ixalactis</i> sp. | do. | CO | |
| | 7. | <i>Lytocarpus</i> sp. | in the pools with coral growth | CO | |
| | 8. | <i>Sertularia</i> sp. | do. | CO | |
| | 9. | <i>Dendronephthya</i> sp. | do. and a sandy base | CO | |
| | 10. | <i>Cassiopea</i> sp. | in the mud covered areas and turbid area on the left side of the reef, near the defunct jetty of Adatra | CO | |
| | | 11. | <i>Auletta elongata</i> ? | in the coral pools | PO |
| | | 12. | <i>Esperella plumosa</i> | do. | PO |
| | | 13. | <i>Eurythoe complanata</i> | under the scattered rock pieces | AN |
| | | 14. | <i>Nereis</i> sp. | do. also in the crevices of rock | AN |
| | | 15. | <i>Sabella</i> sp. | inside the rocks | AN |
| | | 16. | <i>Serpula</i> sp. | on rock (not so common) | AN |
| | | 17. | <i>Cerithidea fluviatilis</i> | sides of the rocky pools | M |
| | | 18. | <i>Lithophagus</i> sp. | inside the rocks; (rocks to break open to collect the animals), rarely under rocks | M |
| | | 19. | <i>Ostrea cuculata</i> | on the gravel mixed right side of the reef | M |
| | | 20. | <i>Cypraea ocellata</i> | under the rocks | M |
| | | 21. | <i>C. onyx</i> | do. towards the lower littoral | M |
| | | 22. | <i>C. lynx</i> | do. | M |
| | | 23. | <i>Vermetes</i> sp. | inside the coiled tubes on the rock | M |
| | | 24. | <i>Placuna placenta</i> | in the lower areas of gravel mud | M |
| | | 25. | <i>Eolls</i> sp. | in the pools among seaweeds | M |
| | | 26. | <i>Kentrodoris funebris</i> | do. | M |
| | | 27. | <i>Herdmania</i> sp.? | in the lower littoral: not so common | U |
| | | 28. | <i>Oncidium verruculatum</i> | do. | M |
| | | 29. | <i>Octopus</i> sp. | in the submerged areas; pools | M |
| | | 30. | <i>Sepia</i> sp. | do. not so common | M |
| | | 31. | <i>Grapsus strigosus</i> | on the upper part of midreef | A |
| | | 32. | <i>Atergatis integerrimus</i> | in the pools | A |
| | | 33. | <i>Atergatis roseus</i> | lower littoral pools | A |
| | | 34. | <i>Ocypoda rotundata</i> | in the sandy areas; burrowing crab | A |
| | | 35. | <i>Leucosia sima</i> | towards the lower level on the reef | A |
| | | 36. | <i>Leptodius</i> sp. | do. | A |

TABLE III—*contd.*SHOWING THE COMMON FLORA AND FAUNA ON THE ADATRA REEF AND THE ECOLOGICAL DISTRIBUTION—*contd.*

| Zone | S. No. | Name | Habitat | Taxonomy |
|-----------------|--------|-----------------------------------|--|----------|
| | 37. | <i>Pilumnus vesperillo</i> | in the pools | A |
| | 38. | <i>Diogenes</i> sp. | in the dead shells ; not so common | A |
| | 39. | <i>Squilla</i> sp. | under the rocks and in crevices | A |
| | 40. | <i>Panulirus plophthagus</i> | in the areas of rock crevices—upper littoral of right side | A |
| | 41. | <i>Scyllarus</i> sp. | in the gravel areas ; not so common | A |
| | 42. | <i>Holothuria pardalis</i> | under the rocks ; in pools | E |
| | 43. | <i>H. atra</i> | in the pools with sandy bottom | E |
| | 44. | <i>Antedon</i> sp. | do. | E |
| | 45. | <i>Macrophiothrix</i> sp.? | under the rocks | E |
| | 46. | <i>Ophioneis</i> sp. | do. | E |
| | 47. | <i>Anthenea</i> sp. | in the pools in rocky areas | E |
| | 48. | <i>Pentaceros</i> sp. | do. | E |
| | 49. | <i>Clypeaster</i> sp. | in the gravel mixed mud areas | E |
| | 50. | <i>Batrachus gangens</i> | in the pools or under rocks | F |
| | 51. | <i>B. grunniens</i> | do. | F |
| | 52. | <i>Pseudoscinaea melanostigma</i> | in the pools hiding under rocks | F |
| | 53. | <i>Syngnanthus serratus</i> | in the pools with gravel bottom | F |
| | 54. | <i>Epinephelus merra</i> | in the pools in rock crevices | F |
| | 55. | <i>Anguilla</i> sp. | in the sandy bottom of rock pools | F |
| | 56. | <i>Plotosus anguillaris</i> | in the pools | F |
| | 57. | <i>Tetrodon lunaris</i> | do. | F |
| | 58. | <i>T. leopardus</i> | do. | F |
| | 59. | <i>Hippocampus trimaculatus</i> | in the submerged areas on the left side | F |
| | 60. | <i>Solea elongata</i> | in the sandy bottom of pools ; also of rock bottom | F |
| SUBTIDAL FRINGE | 61. | <i>Thalamita polssoni</i> | found in the lower regions | A |

Abbreviations as in Table I.

TABLE IV

SHOWING THE FLORA AND FAUNA OF HANUMAN-DANDI REEF AND THE ECOLOGICAL DISTRIBUTION

| Zone | S. No. | Name | Habitat | Taxonomy |
|---------------|--------|---------------------------|------------------------------|----------|
| FLORA | | | | |
| SUPRALITTORAL | 1. | <i>Boodlea composita</i> | on the rocks | C |
| MIDLITTORAL | 2. | <i>Caulerpa racemosa</i> | in the pools | C |
| | 3. | <i>C. taxifolia</i> | do. | C |
| | 4. | <i>C. scalpelliformis</i> | do. | C |
| | 5. | <i>Acetabularia</i> sp. | do. along the bottom | C |
| | 6. | <i>Enteromorpha</i> sp. | epiphytic on the other algae | C |

TABLE IV—*contd.*SHOWING THE FLORA AND FAUNA OF HANUMAN-DANDI REEF AND
THE ECOLOGICAL DISTRIBUTION—*contd.*

| Zone | S. No. | Name | Habitat | Taxonomy |
|-----------------|--------|----------------------------------|--|----------|
| | 7. | <i>Ulva lactuca</i> | on the rocks in pools | C |
| | 8. | <i>Halimeda tuna</i> | in the pools | C |
| | 9. | <i>Codium dwarkense</i> | do. over lower littoral | C |
| | 10. | <i>Bryopsis plumosa</i> | do. | C |
| | 11. | <i>Udotea indica</i> | shallow water areas | C |
| | 12. | <i>Padina tetrastromatica</i> | in the pools of midlittoral | P |
| | 13. | <i>Sargassum tenerrimum</i> | do. | P |
| | 14. | <i>Pocockiella variegata</i> | do. on the margin | P |
| | 15. | <i>Grateloupia indica</i> | in the lower reef pools | R |
| | 16. | <i>Halymenia venusta</i> | do. also often cast ashore | R |
| | 17. | <i>Asparagopsis taxiformis</i> | do. | R |
| | 18. | <i>Botryocladia leptopoda</i> | do. | R |
| | 19. | <i>Laurencia</i> sp. | do. | R |
| | 20. | <i>Iyengaria stellata</i> | on the sand covered rock areas | P |
| | 21. | <i>Colpomenia sinuosa</i> | do. | P |
| | 22. | <i>Leverengia borgeseni</i> | the lower reef; sandy areas | P |
| | 23. | <i>Polysiphonia</i> sp. | do. | R |
| | 24. | <i>Acanthophora muscoides</i> | do. in pools | R |
| | 25. | <i>Hypnea musciformis</i> | do. in pools | R |
| SUBTIDAL FRINGE | 26. | <i>Gracilaria foliifera</i> | do. do. | R |
| | 27. | <i>Sebdenia polyadactyla</i> | lower part; in pools | R |
| | 28. | <i>Spatoglossum variabile</i> | do. | P |
| | 29. | <i>Ceramium</i> sp. | do. also found in the midreef pools | R |
| | 30. | <i>Stoechospermum marginatum</i> | do. | P |
| FAUNA | | | | |
| SUPRALITTORAL | 1. | <i>Turbo intercostalis</i> | on the rock | M |
| MIDLITTORAL | 2. | <i>Patella radiata</i> | in the crevices of rocks and pools | M |
| | 3. | <i>Nerita albicelli</i> | on the rocks; in pool margins | M |
| | 4. | <i>Natica lamarckii</i> | do. | M |
| | 5. | <i>Monodonta australis</i> | do. midlittoral | M |
| | 6. | <i>Astrea semicostata</i> | in the crevices of rocks and on the margin of pools; midreef | M |
| | 7. | <i>Euchelus asper</i> | do. | M |
| | 8. | <i>Turritella acutangula</i> | on the midreef | M |
| | 9. | <i>T. columnaris</i> | do. | M |
| | 10. | <i>Vermetes</i> sp. | lower littoral | M |
| | 11. | <i>Nassa hepatica</i> | rocky pools of midreef | M |
| | 12. | <i>N. thesites</i> | do. | M |
| | 13. | <i>Oliva lepida</i> | in the rocky pools; lower reef | M |
| | 14. | <i>O. nebulosa</i> | do. | M |
| | 15. | <i>Duplicaria duplicata</i> | do. do. | M |
| | 16. | <i>Architectonia laevigata</i> | found cast ashore on the mid-reef | M |
| | 17. | <i>Cerithidea fluviatilis</i> | around pool margins do. | M |
| | 18. | <i>Telescopium telescopium</i> | lower reef | M |
| | 19. | <i>Sinum cuvierianum</i> | midreef; around pools and on rocks | M |
| | 20. | <i>Cardium</i> sp. | lower reef | M |
| | 21. | <i>Gafrarium divaricata</i> | do. | M |

TABLE IV—*contd.*SHOWING THE FLORA AND FAUNA OF HANUMAN-DANDI REEF AND
THE ECOLOGICAL DISTRIBUTION—*contd.*

| Zone | S. No. | Name | Habitat | Taxonomy |
|-----------------|--------|-----------------------------|--|----------|
| | 22. | <i>Arca gubernaculum</i> | lower reef | M |
| | 23. | <i>Gardita bicolor</i> | do. | M |
| | 24. | <i>Bursa granularis</i> | do. | M |
| | 25. | <i>Cantharus undosus</i> | do. | M |
| | 26. | <i>Murex adustus</i> | do. | M |
| | 27. | <i>Thais rudolphi</i> | do. | M |
| | 28. | <i>Oliva gibbosa</i> | do. | M |
| | 29. | <i>Octopus</i> sp. | do. in pools and rock crevices | M |
| | 30. | <i>Sepia</i> sp. | do. do. | M |
| | 31. | <i>Aplysia benedicti</i> | pools; among seaweeds, lower reef | M |
| | 32. | <i>Ixalactis</i> sp.? | lower reef; not so common | CO |
| | 33. | <i>Stoichactis</i> sp. | do. | CO |
| | 34. | <i>Zoanthus</i> sp. | do. | CO |
| | 35. | <i>Lobophytum</i> sp.? | lower reef | CO |
| | 36. | <i>Scelerophytum</i> sp.? | do. | CO |
| | 37. | <i>Esperella plumosa</i> | in pools of lower reef | PO |
| | 38. | <i>Auleta elongata</i> ? | do. | PO |
| | 39. | <i>Elysia grandifolia</i> | in the pools among seaweeds; mid and lower reef | M |
| | 40. | <i>Gelassinus annulepes</i> | in the pools; lower reef | A |
| | 41. | <i>Scylla serrata</i> | do. on sandy areas; not so common | A |
| | 42. | <i>Charybdis annulata</i> | in pools of lower reef | A |
| | 43. | <i>Pilumnus vespertilio</i> | do. among seaweeds | A |
| | 44. | <i>Neptunes pelagicus</i> | in the pools of lower reef | A |
| | 45. | <i>Sesarma oceanica</i> | do. | A |
| | 46. | <i>Gontosoma annulata</i> | do. | A |
| | 47. | <i>Eriphia laevimanus</i> | do. | A |
| | 48. | <i>Panulirus pliothagus</i> | do. not so common | A |
| | 49. | <i>Squilla</i> sp. | under stones or rock; lower reef | A |
| | 50. | <i>Eurythoe complanata</i> | do. | AN |
| | 51. | <i>Nereis</i> sp. | do. and also on sea- weeds | AN |
| | 52. | <i>Ophionereis</i> sp. | do. | E |
| | 53. | <i>Tetrodon</i> sp. | in the pools of lower reef | F |
| | 54. | <i>Epinephelus merra</i> | Under or in crevices of rocks; pools | F |
| SUBTIDAL FRINGE | 55. | <i>Sabella</i> sp. | inside the rocks, in tubes | AN |
| | 56. | <i>Sarpula</i> sp. | on the rocks, in tubes | AN |
| | 57. | <i>Charcharias</i> sp. | in the pool and submerged areas | F |
| | 58. | <i>Anthenes</i> sp. | do. | E |
| | 59. | <i>Trochus radiatus</i> | on rocks | M |

Abbreviations as in Table I.

TABLE V
SHOWING THE COMMON FLORA AND FAUNA OF BALAPUR REEF AND
THE ECOLOGICAL DISTRIBUTION

| Zone | S. No. | Name | Habitat | Taxonomy | |
|---------------|-----------------|---------------------------------|---|--------------------------------|----|
| FLORA | | | | | |
| MIDLITTORAL | 1. | <i>Hypnea</i> sp. | in the gravel mixed area of reef | R | |
| | 2. | <i>Cladophora fascicularis</i> | do. in pools | C | |
| FAUNA | | | | | |
| SUPRALITTORAL | 3. | <i>Balanus</i> sp. | uppermost part of the reef. | A | |
| MIDLITTORAL | 4. | <i>Lingula anatina</i> | in the holes on the gravel—upper reef | BR | |
| | 5. | <i>Ostrea cuculata</i> | on the midreef | M | |
| | 6. | <i>Placuna placenta</i> | do. | M | |
| | 7. | <i>Solen</i> sp. | near the <i>Lingula</i> zone—upper reef | M | |
| | 8. | <i>Solenocurtis</i> sp. | do. | M | |
| | 9. | Echuiroid worms | do. | EI | |
| | 10. | <i>Macrophthalmus pacificus</i> | upper midreef | A | |
| | 11. | <i>Boleophthalmus</i> sp. | in the loose mud of midreef | F | |
| | 12. | <i>Pinna vexillum</i> | midreef in the muddy area | M | |
| | 13. | <i>P. bicolor</i> | do. | M | |
| | 14. | <i>Telescopium telescopium</i> | do. | M | |
| | 15. | <i>Cerithium obeliscus</i> | do. | M | |
| | 16. | <i>C. scabridum</i> | do. | M | |
| | 17. | <i>Babylonia spirata</i> | do. | M | |
| | 18. | <i>Murex</i> sp. | do. | M | |
| | 19. | <i>Heramania</i> sp.? | do. lower reef | U | |
| | 20. | <i>Tetilla dactyloides</i> | do. do. | PO | |
| | 21. | <i>Cerianthus</i> sp. | do. in the loose mud | CO | |
| | 22. | <i>Phoronis australis</i> | commensal in the <i>Cerianthus</i> tube | PH | |
| | 23. | <i>Stoichactis</i> sp. | the gravel part of the loose mud of lower reef | CO | |
| | 24. | <i>Gelassimus annulepes</i> | in the loose mud portion of lower reef | A | |
| | 25. | <i>Placomopherus ceylanicus</i> | do. | M | |
| | 26. | <i>Oncidium verruculatum</i> | do. in pools | M | |
| | 27. | <i>Ophiothrix</i> sp.? | do. | E | |
| | 28. | <i>Asteropecten</i> sp. | do. | E | |
| | 29. | <i>Melibe rangii</i> | do. not so common | M | |
| | 30. | <i>Dendronephthya</i> sp. | do. do. | CO | |
| | SUBTIDAL FRINGE | 31. | <i>Acaudina molpadioides</i> | do. do. | E |
| | | 32. | <i>Clypeaster</i> sp. | on the loose mud of lower part | E |
| | | 33. | <i>Cassiopee</i> sp. | do. | CO |
| 34. | | <i>Pennatula</i> sp. | on the low tide mark | CO | |
| 35. | | <i>Virgularia runghii</i> | do. | CO | |
| 36. | | <i>Bunodactis</i> sp. | do. not so common | CO | |
| 37. | | <i>Dendrostromum</i> sp. | towards low water level along sandy submerged areas | S | |

Abbreviations as in Table I.

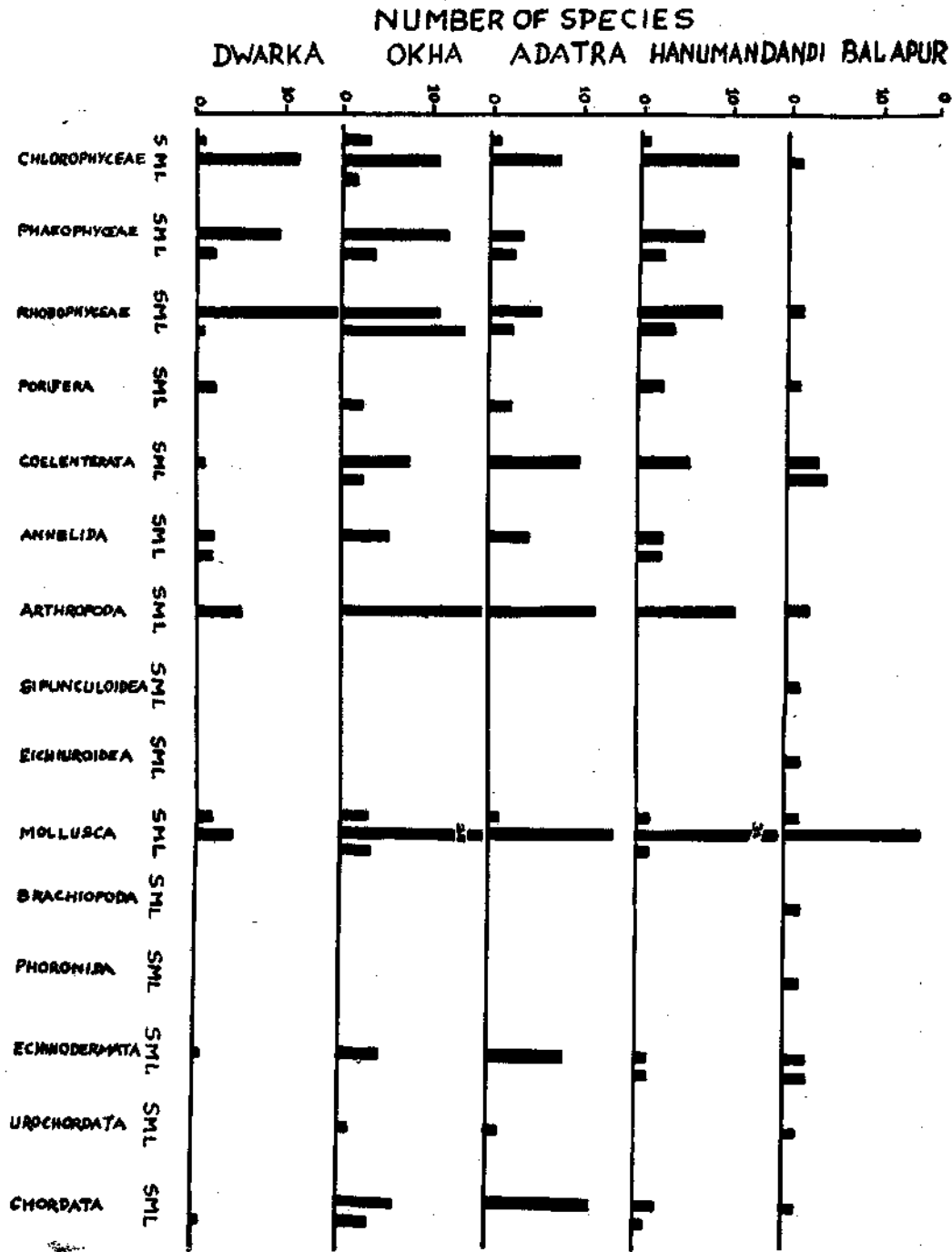


FIG. 2. Showing the zonation of the flora and fauna on the Okha coast.

other reefs this limit is relatively small. The mid-reef and the lower reef really support the core of the biological luxuriance.

Flora

Among the algae, Chlorophyceae and Rhodophyceae are represented on all the reefs and Rhodophyceae with 30 species has the optimum distribution. The more prolific growth of algae is seen in deep puddles. The lower littoral and the subtidal fringe are very rich in algae, thereby suggesting that the sublittoral areas too are rich in vegetation. The area-wise distribution shows that the Okha reef with 81.2% of the total number of species of algae available on the entire coast is the best place for a varied collection, closely followed by the Dwarka reef. The Okha reef has a relative percentage composition of 24.2, 43.4 and 44.2 of Chlorophyceae, Phaeophyceae and Rhodophyceae respectively.

The seasonal succession of the algae in general, follows certain trends. The growth starts with the post south-west monsoonal sproutings of the germlings of the green algae and the regeneration of the rhizome of the brown algae like *Sargassum* and *Cystoseira*. Both grow well upto the end of March though the former shows signs of an early decline with the rise of the temperature. The red algae start appearing in good quantities on the reef by the middle of October and last to the end of April. Most of them are seen growing only in the deep puddles and the submerged areas of the lower littoral and subtidal fringe, though often found cast ashore on the entire reef at the flow tide.

Fauna

The Okha coast has four distinct types of substrata on the intertidal area, viz., rocky, sandy, gravelly and muddy. The fauna on them represent the twelve phylar divisions of Porifera, Coelenterata, Annelida, Arthropoda, Sipunculoidea, Echiuroidea, Mollusca, Brachiopoda, Phoronida, Echinodermata, Urochordata and Chordata, indicating the diversity of a marine animal assemblage. The first impression gained by an analysis is the overwhelming dominance of the Mollusca, contributing nearly 42% of the total fauna, and seen in all levels of zonation and thriving well on all the four substrata (Fig. 3). Arthropoda and Coelenterata are well distributed though the former has an edge over the latter by a 20% dominance. The common animals of the Balapur reef has a strength of 35 species embracing all the phyla except Annelida, (obviously there may be less common forms). Most of these mud-dwellers are not encountered anywhere else on this coast and some of them like *Virgularia rumphii* have no other known distribution on the Indian coast. The animals here are distributed over the rocky, gravelly and muddy environs, both in sedentary and free-living habitats. The observations indicate that the representative collection is best done from Okha, Adatra and Balapur reefs to be adequate for a study of the systematics, distribution and zonation of the fauna of the coast.

Plankton and Shore Fishes

The plankton of Okha is rich in diatoms, ctenophores, copepods, arrow-worms and larval stages of many animals of the littoral areas, and show definite trends in seasonal changes. A detailed account of this will be available when the studies now progressing are completed.

The richness of the intertidal biota and the abundance of littoral benthic diatoms, (Misra, 1956) and the inshore plankton are supplemented by 34 species of shore fishes most of which are mullets, perches, clupeids, sciaenids and catfishes. The

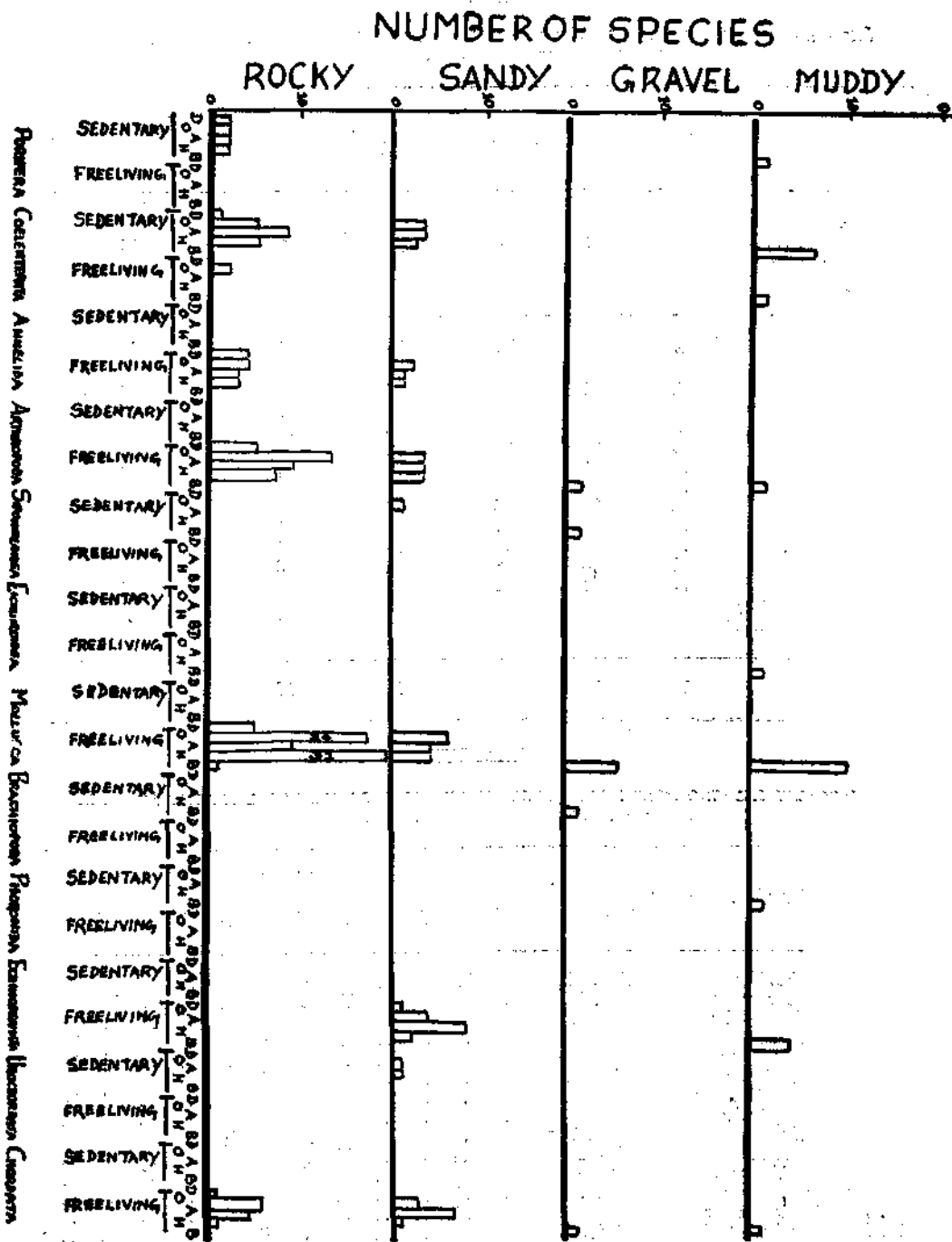


FIG. 3. Showing numerical strength and habitat of the animal groups on the Okha coast.

TABLE VI
SHOWING THE DISTRIBUTION OF THE COMMON MEMBERS OF THE FLORA AND FAUNA ON
THE FIVE COLLECTION GROUNDS OF OKHA

| | Dwarka | Okha | Adatra | Hanuman- Dandi | Balapur | Number of species in each group available on the whole coast |
|---|--------|------|--------|-------------------|---------|--|
| FLORA | | | | | | |
| Chlorophyceae | 12 | 14 | 8 | 11 | 1 | 16 |
| Phaeophyceae | 11 | 15 | 5 | 8 | .. | 18 |
| Rhodophyceae | 19 | 23 | 7 | 11 | 1 | 30 |
| | 42 | 52 | 20 | 30 | 2 | 64 |
| FAUNA | | | | | | |
| Porifera | 2 | 2 | 2 | 2 | 1 | 3 |
| Coelenterata | 1 | 9 | 9 | 5 | 7 | 17 |
| Annelida | 4 | 5 | 4 | 4 | .. | 6 |
| Arthropoda | 5 | 15 | 12 | 10 | 2 | 26 |
| Sipunculoidea | .. | 1 | .. | .. | 1 | 1 |
| Echnicoidea | .. | .. | .. | .. | 1 | 1 |
| Mollusca | 6 | 32 | 14 | 33 | 15 | 60 |
| Phoronida | .. | .. | .. | .. | 1 | 1 |
| Brachyopoda | .. | .. | .. | .. | 1 | 1 |
| Echinodermata | 1 | 4 | 8 | 2 | 4 | 12 |
| Urochordata | .. | 1 | 1 | .. | 1 | 1 |
| Chordata (Pisces) (intertidal areas) | 1 | 9 | 11 | 3 | 1 | 15 |
| | 20 | 78 | 61 | 59 | 35 | 144 |

TABLE VII

STATEMENT SHOWING MONTHWISE DETAILS OF FISH SOLD IN THE LOCAL MARKET AT OKHA
DURING THE YEAR 1969-70 (RANDOM SAMPLING)

| S.No. | Scientific name | Local name (Gujarati) | Months | | | | | | | | | | | |
|-------|-----------------------------|--------------------------|--------|----|----|----|----|----|----|----|----|----|----|----|
| | | | J | F | M | A | M | J | J | A | S | O | N | D |
| 1. | <i>Lates calcarifer</i> | Dangri | .. | R | .. | .. | F | F | F | R | .. | .. | .. | R |
| 2. | <i>Gerres filamentosus</i> | Morli | .. | .. | C | .. | F | C | C | .. | .. | C | F | C |
| 3. | <i>Chrysophrys sarba</i> | Khrod | .. | .. | .. | .. | .. | .. | .. | .. | C | A | R | .. |
| 4. | <i>Sparus cuculoril</i> | Chhayo | .. | .. | .. | .. | R | F | F | .. | .. | .. | .. | R |
| 5. | <i>Scatophagus argus</i> | Kuyi | .. | .. | .. | .. | .. | F | R | F | .. | .. | F | R |
| 6. | <i>Pomadysys furcatus</i> | Kokkar | .. | .. | .. | .. | .. | F | F | .. | .. | .. | .. | .. |
| 7. | <i>Lutjanus fulviflamma</i> | Toosa | .. | .. | .. | .. | .. | F | F | .. | .. | .. | C | F |
| 8. | <i>Argyrops spinifer</i> | Dotar | F | .. | .. | F | .. | F | F | .. | .. | .. | F | .. |
| 9. | <i>Leiognathus sp.</i> | Chandlea | .. | .. | .. | .. | C | A | A | F | .. | .. | .. | .. |
| 10. | <i>Siganus oramin</i> | Kasad | .. | .. | .. | .. | F | F | F | F | C | A | .. | .. |
| 11. | <i>Scomberoides tala</i> | Bangada | .. | .. | .. | .. | .. | .. | .. | .. | .. | F | F | R |
| 12. | <i>Caranx sexfaciatus</i> | do. | .. | F | .. | .. | .. | F | F | R | .. | .. | .. | .. |
| 13. | <i>Megalaspis cordyla</i> | do. | .. | F | .. | .. | .. | F | F | R | .. | .. | .. | .. |
| 14. | <i>Engraulis hamiltoni</i> | Pafat | .. | .. | .. | .. | .. | F | F | .. | .. | .. | .. | .. |

TABLE VII—contd.

STATEMENT SHOWING MONTHWISE DETAILS OF FISH SOLD IN THE LOCAL MARKET AT OKHA DURING THE YEAR 1969-70 (RANDOM SAMPLING)—contd.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|-----|------------------------------------|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|
| 15. | <i>Nematalosa nasus</i> | Palli | A | F | C | F | F | F | F | C | C | F | R | R |
| 16. | <i>Echeneis naucratus</i> | Mengria | .. | .. | .. | .. | .. | R | R | .. | .. | .. | .. | .. |
| 17. | <i>Pseudorhombus arsius</i> | Khetar | .. | .. | .. | .. | .. | R | R | R | .. | .. | R | .. |
| 18. | <i>Platycephalus indicus</i> | Kukri | .. | R | .. | .. | .. | F | F | F | F | R | R | R |
| 19. | <i>Trichiurus muticus?</i> | Lapdi | .. | .. | .. | .. | .. | R | R | R | .. | .. | F | R |
| 20. | <i>Sillago sihama</i> | Vekarkungi | .. | .. | .. | .. | .. | .. | .. | F | .. | .. | R | .. |
| 21. | <i>Hemiramphus georgii</i> | Kunga | .. | .. | .. | .. | R | F | .. | .. | .. | .. | R | .. |
| 22. | <i>Epinephelus merra</i> | Selli | .. | .. | .. | R | R | R | R | .. | .. | .. | .. | .. |
| 23. | <i>Tachysurus</i> sp. | Khaga | .. | R | .. | .. | C | C | C | C | .. | .. | C | F |
| 24. | <i>Pseudosciaena diacanthus</i> | Ghol | .. | .. | .. | .. | .. | F | F | R | .. | .. | .. | .. |
| 25. | <i>Eleutheronema tetradactylus</i> | Ravas/ Soeri | .. | .. | .. | .. | .. | F | F | F | .. | .. | F | F |
| 26. | <i>Mugil speigleri</i> | Gandhia | C | A | A | C | C | A | A | A | A | A | A | A |
| 27. | <i>Chelon oligolepis</i> | Karochi | C | A | A | C | C | A | A | A | A | A | A | A |
| 28. | <i>Valamugil seheli</i> | Mankan | A | A | C | .. | .. | .. | .. | .. | .. | .. | A | A |
| 29. | <i>Chanos chanos</i> | Sani/Sana | R | F | C | F | F | F | F | C | F | F | C | C |
| 30. | <i>Elops saurus</i> | Kalru | R | F | F | F | F | R | R | .. | .. | R | .. | F |
| 31. | <i>Plectorhynchus</i> sp. | Dani | F | .. | .. | F | .. | .. | F | .. | .. | .. | F | .. |
| 32. | <i>Rhinobatus</i> sp. | Dos | R | .. | .. | .. | .. | .. | F | .. | .. | .. | .. | .. |
| 33. | <i>Dasyatis uarnak</i> | Patra | F | .. | .. | .. | .. | .. | F | .. | .. | .. | .. | .. |

R means Rare (less than 50)
 F means Few (more than 50, less than 100)
 C means Common (more than 100, less than 150)
 A means Abundant (more than 150)

monthwise fluctuation in their availability is discernible from the Table VII. The fishes are caught by gillnets, castnets and hook and line. The castnets are operated at the flood tide, at Okha and Adatra and the gillnets are operated in waters off Balapur in the Poshitra Bay and off Dwarka, 2-3 kms., away from the shore. The mullet with three species is the fish available round the year in considerable quantities for local consumption. The fishes are sold in the local market between 0600 to 0900 hours.

Besides fishes, the swimming crab *Neptunes pelagicus* and *Scylla* sp. are the two other crustaceans sold in the market in good numbers.

SUMMARY

The observations made on the shore ecology of the Okha coast from collections of flora and fauna of the collection grounds, Dwarka, Okha, Adatra, Hanumandandi and Balapur are reported. The distribution, habitat and the zonation of 64 species of algae and 144 species of animals and the monthwise fluctuation of the 34 species of shore fishes are discussed.

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