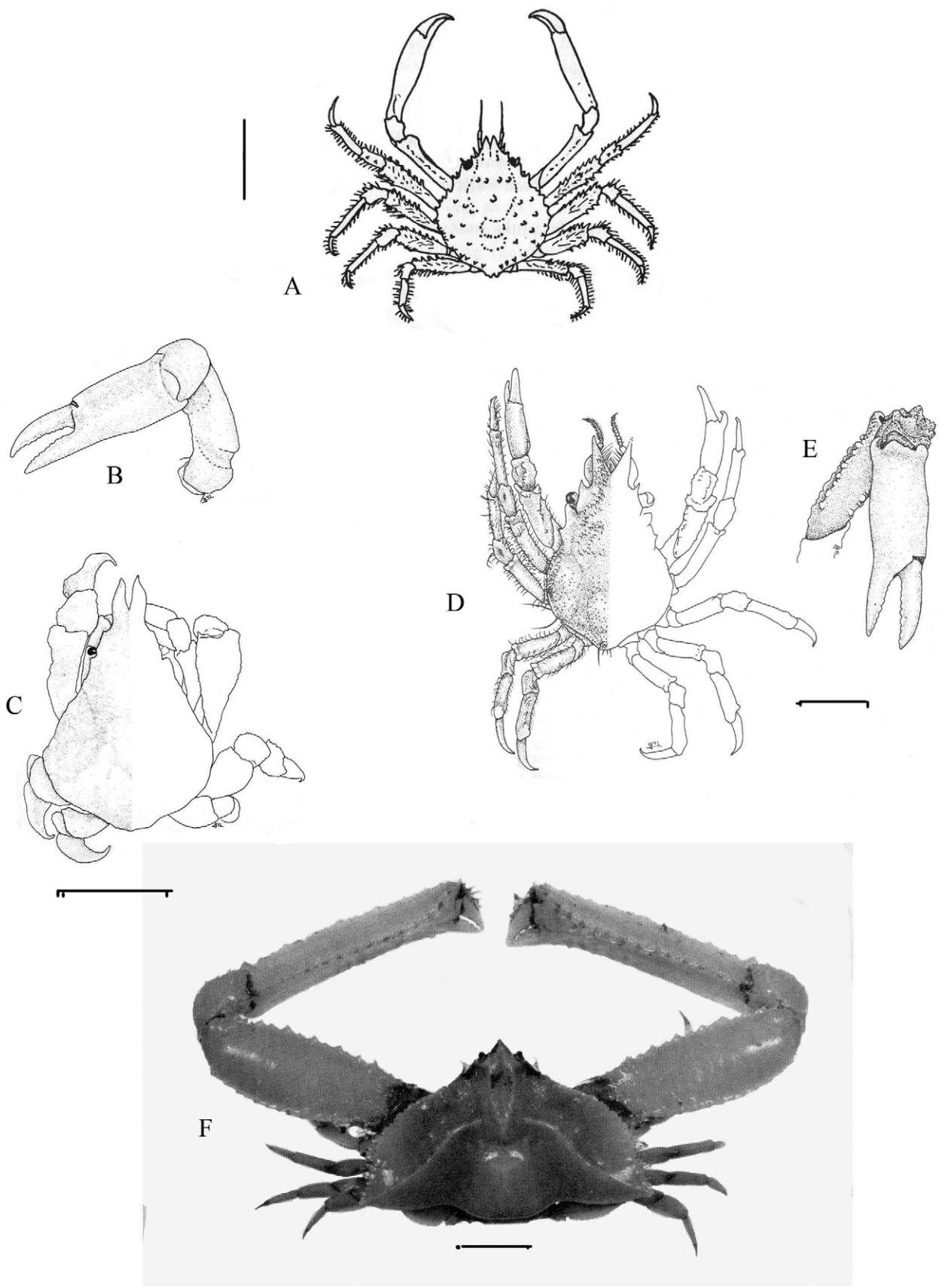

FIGURE 52. Families Pisidae and Parthenopidae. A, *Herbstia parvifrons* Randall, 1839. B, C, *Pelia tumida* (Lockington, 1877); B, cheliped; C, crab in dorsal view. D, E, *Scyra acutifrons* Dana, 1851; D, crab in dorsal view, showing setae of left side; E, cheliped. F, *Latolambrus occidentalis* (Dana, 1854). Scales: F = 5mm, A, C, D = 10 mm. A from Schmitt 1921; B–E from Hendrickx 1999; F from Garth 1958.

Range. Kachemak Bay, Cook Inlet, Alaska to Point San Carlos, Baja California. Type locality "Oregon."

Remarks. *Scyra acutifrons* usually does not decorate, but instead is encrusted by sponges, barnacles, bryozoans or tunicates. Garth & Abbott (1980) reported that they rest with the anterior region aimed downward, but I have not observed any consistent posture in these crabs.

Garth (1958) noticed that there were two distinct types of this crab. The "northern form" has a raised carapace with the gastric region deeply separated from the cardiac and branchial regions, and a broad rostrum. The "southern form" has a more rounded carapace and a narrow rostrum.

It is easy to confuse this species with similar subtidal spider crabs. Juvenile *Loxorhynchus* spp. are much more setose than *S. acutifrons*, decorate themselves, and possess a down-curved rostrum. The rostrum of *Oregonia gracilis* is much more elongate than that of *S. acutifrons*.

Ricketts *et al*. (1985) claimed that *S. acutifrons* was "uncommon below Pacific Grove", but this is not so. The crab is common on subtidal rocks and jetties along the mainland coast of Los Angeles County, California, but rarely is found on the islands of southern California.

SUPERFAMILY PARTHENOPOIDEA Macleay, 1838

Family Parthenopidae MacLeay, 1838

Members of the family Parthenopidae commonly are called elbow crabs. The elongate chelipeds, folded across the front, suggest the name. These sand-dwelling crabs, mostly tropical in distribution, are represented in California by only one species.

Parthenopid crabs have retractile eyes with small and well-defined orbits. The basal antennal segment is small and deeply imbedded between the inner angle of the orbit and the pits at the bases of the first antennae. The first antennae fold somewhat obliquely, not vertically. The distinctive chelipeds have fingers bent at an angle. Pereopods 2–5 are short, flattened and have broad segments.

Elbow crabs can dig into sand and remain motionless with only the eye, apex of the rostrum and a respiratory passage exposed. Their cryptic coloration renders them further difficult to detect.

Latolambrus Tan & Ng, 2007

Latolambrus occidentalis (Dana, 1854)

(Fig. 52F)

Cryptopodia occidentalis Dana, 1854: 430.

Heterocrypta occidentalis. — Holmes 1900: 44. — Rathbun 1904: 170; 1925: 559, pls. 204, 205. — Weymouth 1910: 21, pl. 2, figs. 4, 5. — Schmitt 1921: 192, 119. — Johnson & Snook 1927: 363, fig. 316. — Garth 1958: 476, pl. Z, figs. 14, 14a; pl. 55, fig. 2. — Ricketts *et al*. 1985: 321, fig. 246. — Jensen 1995: 34, fig. 53. — Hendrickx 1999: 251, pl. 8C. — Kuris et al. 2007: 641, pl. 319 I.

Latulambrus occidentalis. — Tan & Ng 2007: 106.

Latcrypta occidentalis. — Tan & Ng 2007: 106, fig. 8. (Error, Corrigenda in Tan & Ng 2007).

Diagnosis. Rostrum subtriangular, subacute, short. Carapace broadly triangular; median region narrow, flattened upper surface bounded by 2 granulated ridges, converging to triangular point posteriorly. Cardiac region with 3-sided elevation, edges usually granulated. Posterolateral regions large, with S-shaped, granulated crest, pair minute tubercles in front of anterior bend of crest. Anterolateral margins straight to slightly concave in front, convex near middle, posterior portion extending outwards, backwards, arching over legs; teeth on anterior part small, irregular, but becoming larger posteriorly, there furnished with secondary denticles. Posterolateral margins transverse; posterior margin not produced over abdominal segments. Chelipeds long, triangular in cross-section; sides of merus convex, edge sharply granulate to toothed; carpus with 3–4 granulate lines; hand about as long as merus, angles prominent, dentate; sides convex; dactyl short but longer than fixed finger, when closed, outer margin at right angle to long axis of palm. Chelipeds folding against long triangular concave area of body, this area fringed by setae. Pereopods 2–5 compressed, strongly ridged above; dactyls narrow, curved. Male carapace length 21.0 mm, width 34.0 mm; female length 17.3 mm, width 26.8 mm.

Color in life. Grayish or brownish, sometimes with minute spots of white, purple; camouflaged like sand. Lower surface light yellow.

Habitat and depth. Sand, sand mixed with shell, rock, or mud; intertidal zone to 175 m, but usually at less than 100 m.

Range. Drake's Bay, Marin County, California to Dewey Channel, Baja California; also Gorda Bank, Gulf of California and Boca de Piedras, Sinaloa, Mexico. Type locality Monterey, California.

Remarks. The drawing by Dana (1854), copied by Schmitt (1921: fig. 119), is inaccurate. The inner crest of the cheliped and its dentate margin extends to the large teeth just distal to the margin of the dactyl. The dentate margins of the chelipeds are suggested vaguely. Hendrickx (1999: fig. 138H) provided a sketch of the carapace.

SUPERFAMILY CANCROIDEA Latreille, 1802

Family Cancridae Latreille, 1802

The rock crabs, among the largest species of crabs in California or Oregon, have broad, oval carapaces and strong chelae. The front has several teeth, including a median tooth. The antennules fold back longitudinally. The antennal flagella are short and bear setae, especially in small animals. The third maxillipeds overlap the endostome. In many species, the ventrolateral parts of the body bear dense setae.

Species of cancrids inhabit both rocky and sandy bottoms, or areas of rocks lying among sand. *Metacarcinus magister* (Rathbun, 1897) and *M. gracilis* (Dana, 1852), which usually live on open sand, have especially flattened appendages with long dactyls. Other species tend to have more rounded appendages with shorter dactyls, which often bear stiff setae or spines. *Metacarcinus magister* is the object of a commercial fishery, primarily from San Francisco, California northward. Natural predators of cancrids include octopuses, large fishes and the sea otter. See Garth & Abbott (1980) for a lengthy account of the natural history of these crabs.

Until recently, the most comprehensive recent work on species of cancrids was that of Nations (1975). New morphological and molecular work by Schweitzer & Feldmann (2000) elevated the subgenera used by Nations to distinct generic status.

The key follows those of Schmitt (1921) and Rathbun (1930), but incorporates the recent changes in generic nomenclature. A carapace is said to be areolated if it displays prominent elevated areas. The guide by Phillips (1939) is useful for identification of larger species.

Key to species of family Cancridae

1. Front markedly projecting beyond outer orbital angles, with 5 subequal teeth. Carapace with 5 broad anterolateral teeth ..... *Cancer productus*
– Front not markedly projecting beyond outer orbital angles, with 5 or more unequal teeth. Carapace with 5 or more curved, acute or widely separated anterolateral teeth 2
2. Adults small, carapace length not more than 40 mm. Carapace with sharply elevated regions bearing coarse, rounded granules. Chelipeds with granulated tubercles or spines on upper part of manus, carpus 3
– Adults large, carapace length more than 40 mm. Carapace smooth or with small granules concentrated on moderately raised areas. Chelipeds smooth or with sharp spines or granules 4
3. Carapace widest at seventh or eighth tooth, with conspicuous raised, granulate areas, 12 or 13 anterolateral teeth, anterolateral margin not meeting posterolateral margin at distinct angle. Small, rarely south of Point Arena, California ..... *Glebocarcinus oregonensis*
– Carapace widest at ninth anterolateral tooth, with raised, granulate areas but not as prominent as in preceding species, 9 or 10 anterolateral teeth, anterolateral margin meeting posterolateral margin at distinct angle. Larger, generally found south of Point Conception ..... *Glebocarcinus amphioetus*
4. Carapace with anterolateral teeth not strongly produced or forward curving, front slightly produced (if at all), with triangular medial tooth, chelipeds smooth to spiny 5
– Carapace with anterolateral teeth strongly produced, curving forward, front moderately produced, with acute medial tooth; chelipeds with sharp spines or granules along carinae of outer, upper surfaces of manus, carpus (may be blunt in very old animals) 7
5. Carapace widest at tenth anterolateral tooth; no eleventh tooth. Usually found north of Point Conception on sand, carapace width to 230 mm ..... *Metacarcinus magister*
– Carapace widest at ninth anterolateral tooth; with tenth, sometimes eleventh tooth. Found north or south of Point Conception on sand or among rocks, carapace width to 91 mm 6
6. Pereopods 2–5 flattened. Fingers of chelipeds without dark color, chela without orange blotch on inner surface of palm. Merus of third maxilliped rounded anteriorly ..... *Metacarcinus gracilis*

– Pereopods 2–5 rounded in cross section. Fingers of chelipeds ending in dark color, chela with orange blotch on inner surface of palm. Merus of third maxilliped not rounded anteriorly ..... *Metacarcinus anthonyi*

7. Carpus of cheliped with single spine at distal end, hand smooth or granulated. Inner surface of cheliped with red spots ..... *Romaleon antennarius*

– Carpus of cheliped with two spines at distal end, hand roughened, armed with two spines (may be inconspicuous). Inner surface of cheliped without red spots 8

8. Tenth anterolateral tooth conspicuous, eleventh present; dactyl of cheliped spiny. Carapace with prominently raised areas ..... *Romaleon branneri*

– Tenth anterolateral tooth inconspicuous, eleventh not present; dactyl of cheliped not spiny. Carapace with slightly raised areas ..... *Romaleon jordani*

Cancer Linnaeus, 1758

Cancer productus Randall, 1840

(Fig. 54G, H; Pl. 13E)

Cancer productus Randall, 1840: 116. — Rathbun 1904: 175, 1930: 203, text fig. 32. — Weymouth 1910: 40, pl. 8, figs. 20–24. — Schmitt 1921: 220, text fig. 136. — Johnson & Snook 1927: 378, figs. 306, 307, 330. — Phillips 1939: 27, fig. 19. — Nations 1975: 40, figs. 13A, 13B, 14A, 14B, 39-1, 39-2. — Word & Charwat 1975: 53.—Garth & Abbott 1980: 607, fig. 25.22. — Hart 1982: 206, fig. 84. — Ricketts *et al*. 1985: 134, fig. 105. — Jensen 1995: 27, fig. 32. — Schweitzer & Feldmann 228. — Kuris *et al*. 2007: 641, pl. 320, fig. D.

Diagnosis. Front markedly produced beyond outer orbital angles, with 5 subequal teeth, fronto-orbital width about 0.2 times width of carapace. Carapace very broad, widest at anterolateral tooth 9 tooth 10 present. Surface of carapace somewhat convex, smooth to minutely granulate. Carpus of cheliped with large tooth at antero-internal angle, smaller one at upper hinge joint, palm with ridge along dorsal surface, granulate ridges on palm. Carapace length to 66.4 mm.

Color in life. Juveniles highly variable: carapace red, orange, striped with white, red; mottled, gray or gray with median stripe of red; legs striped or red; see color photographs by Garth & Abbott (1980: figs. 25.22a–25.22h) and Jensen (1995: fig. 32). Adult dark red above, white to yellowish below. Chelae with dark apices.

Habitat and depth. Tide pools, rocks in sand, rocky reefs, breakwaters; intertidal zone to 79 m.

Range. Kodiak I., Alaska to San Diego, California. Older reports from Magdalena Bay, Baja California are unconfirmed. Type locality "western America."

Remarks. The red rock crab can have a carapace width of up to 173.5 mm. The exoskeleton is heavily calcified. The crab is one of the largest intertidal crabs in California and Oregon, as well as one of the heaviest. It is edible but not sufficiently common to support a commercial fishery.

Glebocarcinus Nations, 1975

Glebocarcinus amphioetus (Rathbun, 1898)

(Fig. 53B, C)

Cancer amphioetus Rathbun, 1898a: 582. — Rathbun 1904: 175, pl. 6, fig. 3; 1930: 205, pl. 91. — Schmitt 1921: 223, pl. 36, figs. 1, 2. — Johnson & Snook 1927: 378. — Sakai 1965: 105, pl. 48, fig. 1. — Nations 1975: 30, figs. 15AB, 16AB, 30-7, 30-8. — Word & Charwat 1975: 41.—Garth & Abbott 1980: 604. — Jensen 1995: 29.
Glebocarcinus amphioetus.—Schweitzer & Feldmann 200: 235.

Diagnosis. Carapace smooth, strongly areolated, front with 5 median teeth, median tooth small; anterolateral margins with 9 flat, broadly triangular teeth, tiny tooth 10. Third maxilliped with merus truncated anteriorly. Body not setose. Carpus of cheliped with 2 teeth, one at distal end, second below it on inner angle; hand of cheliped with 1–2 spines on upper margin, 3 longitudinal ridges on outer surface. Pereopods 2–5 stout. Male carapace length 22.2 mm, female 27.5 mm.

Color in life. Reddish brown, lighter beneath; fingers of chelae dark, with color reaching more than half of length of outer margin.

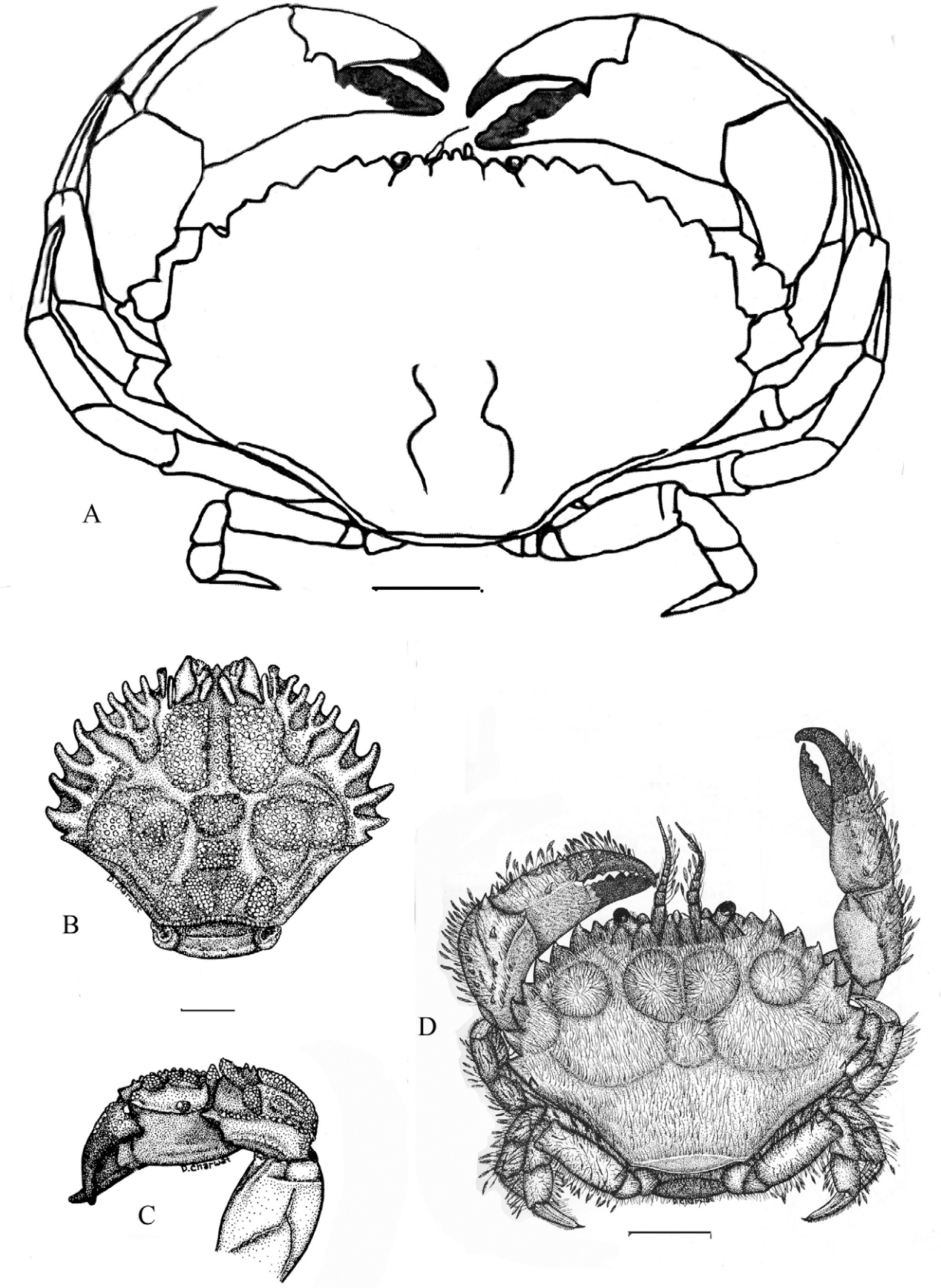

FIGURE 53. Family Cancridae. A, *Metacarcinus anthonyi* (Rathbun, 1897). B, C, *Glebocarcinus amphioetus* (Rathbun, 1898); B, carapace; C, right chela. D, *Glebocarcinus oregonensis* (Dana, 1852). Scales: B, C, D = 10 mm; A = 20 mm. A after photo by Phillips 1939, B–D from Word & Charwat 1975.

Habitat and depth. On rocks, sand, shells, mud, intertidal to 148 m, usually subtidal.

Range. El Segundo, California to Magdalena Bay, Baja California; Gulf of California, Japan, Korea, and northern China. Type locality "off the Korean coast."

Glebocarcinus oregonensis (Dana, 1852)

(Fig. 53D)

Trichocera oregonensis Dana, 1852: 86.
Trichocarcinus oregonensis. — Holmes, 1900: 54.
Cancer oregonensis. — Rathbun 1904: 178, pl. 7, fig. 1; 1930: 226, pl. 96. — Weymouth 1910: 49, pl. 11, fig. 34. — Schmitt 1921: 234, pl. 36, figs. 3, 4. — Johnson & Snook 1927: 383, fig. 337. — Nations 1975: 38, figs. 17E, F, 18E, F, 30-1, 30-2. — Word & Charwat 1975: 51.—Wicksten 1979d: 1181 .— Garth & Abbott 1980: 607, fig. 25.21 .— Hart 1982: 210, fig. 86. — Ricketts *et al.* 1985: 305, fig. 237. — Jensen 1995: 29, fig. 36. — Kuris *et al*. 2007: 641.
Glebocarinus oregonensis. — Schweitzer & Feldmann 2000: 234.

Diagnosis. Carapace rounded, anterolateral, posterolateral margins not meeting at distinct angle, widest at tooth 7 or 8, 12–13 anterolateral teeth. Ornamentation of dorsal surface of carapace variable; from moderately raised areas to pronounced tuberculate patches. Merus of third maxilliped with antero-external angle produced. Carpus of cheliped with spine at antero-internal angle with tooth below it; hand thick, high; upper edge of palm with 2 rows small tubercles; outer surface with 5 granulated lines. Carapace length to 36.5 mm.

Color in life. Usually dark red-brown above, lighter below; pereopods 2–5 may have bands of light color. In some individuals, carapace entirely gray or with red spots or bands of orange or yellow. Chelipeds with dark apices. The color notes are from crabs from Trinidad, Humboldt County, California; see also color photograph by Jensen (1995).

Habitat and depth. Among rocks, tide pools, in barnacle shells, among mussels on pilings, intertidal zone to 435 m.

Range. St. George I., Pribilof Is. to off Palos Verdes Peninsula, California, but rarely found south of Point Arena, Mendocino County, California. Common in tide pools from Humboldt County, California northward. Type locality Puget Sound.

Metacarcinus A. Milne-Edwards, 1862

Metacarcinus anthonyi (Rathbun, 1897)

(Fig. 53A, Pl. 13F)

Cancer anthonyi Rathbun, 1897: 111. — Rathbun 1904: 176, pl. 6, fig. 2; 1930: 218, pl. 94, fig. 3. — Weymouth 1910: 49, pl. 11, fig. 33. — Schmitt 1921: 227, pl. 35, fig. 1.— Johnson & Snook 1927: 379, fig. 334. — Phillips 1939: 29, fig. 20. — Nations 1975: 32, figs. 13E, F, 14E, F, 35-5, 35-6. — Word & Charwat 1975: 44.—Garth & Abbott 1980: 604, fig. 25.17. — Wicksten 1980c: 360. —Jensen 1995: 28, fig. 33. — Kuris *et al*. 2007: 642.
Metacarcinus anthonyi. — Schweitzer & Feldmann 2000: 235.

Diagnosis. Front narrow, not produced, with 3 teeth. Carapace granulate, convex, widest at anterolateral tooth 9, anterolateral teeth broad, last 3 teeth with sharp apices; anterolateral tooth 10 indistinct. Merus of third maxillipeds oblong, anterior margins slightly oblique. Carpus of chelipeds with single distal spine; hand smooth or granulated, without spines. Pereopods 2–5 sparsely setose to smooth. Male carapace length 52.1 mm.

Color in life. Brownish-red to yellowish-orange, lighter beneath, without spots; blotch of orange on inner surface of palm of chela, fingers of chela black. Juveniles may have mottled carapace with markings of white, brown or tan. The color notes are from crabs from Cabrillo Beach, Los Angeles County, California.

Habitat and depth. Tide pools, among rocks in bays, estuaries, intertidal zone to 132 m.

Range. Humboldt Bay, California to Magdalena Bay, Baja California, but uncommon north of Los Angeles County, California. Type locality Long Beach, California.

Remarks. The yellow crab is a large, heavily calcified intertidal crab. It seems to prefer slightly warmer waters than *C. productus* and *Romaleon antennarius* (Stimpson, 1856); the other similar large crabs that live in rocky habitats. Records north of San Pedro usually come from bays and harbors rather than the open coast.

Metacarcinus gracilis (Dana, 1852)

(Fig. 54E, F; Pl. 13G)

Cancer gracilis Dana, 1852: 73. — Holmes 1900: 52. — Rathbun 1904: 177; 1930: 219, pl. 95, text fig. 34. — Weymouth 1910: 42, pl. 9, figs. 26–28. — Schmitt 1921: 232, pl. 35, fig. 2. — Johnson & Snook 1927: 381, fig. 336. — Phillips 1939: 23, fig. 17. — Nations 1975: 34, figs. 17C, D, 18C, D, 36-1, 36-2. — Word & Charwat 1975: 48.—Garth & Abbott 1980: 604, fig. 25.18. — Wicksten 1980c: 360. —Hart 1982: 214, fig. 88. — Ricketts *et al*. 1985: 543. — Jensen 1995: 28, fig. 34. — Kuris *et al*. 2007: 642.

Metacarcinus gracilis. — Schweitzer & Feldmann 2000: 235.

Diagnosis. Carapace strongly convex, front not produced, with 3 median teeth. Anterolateral teeth of carapace low, not pointed, carapace granulated, widest at tooth 9; small anterolateral tooth 10. Merus of third maxillipeds elongated, rounded anteriorly. Carpus of cheliped with 2 teeth, one above at distal angle, second below it. Palm with rows of minute spinules, movable finger roughened dorsally but without large teeth. Pereopods 2–5 slender, dactyls elongated. Carapace length 27.3 mm.

Color in life. Carapace brownish to gray, lower surface, much of legs yellowish; purple marks on pereopods 2, 3. Apices of chelae white. The color notes are from crabs from Cabrillo Beach, Los Angeles County; and Princeton Harbor, San Mateo County; California.

Habitat and depth. Mud flats, sandy beaches and offshore areas, eel grass beds, intertidal zone to 174 m.

Range. Prince William Sound, Alaska to Playa Maria Bay, Baja California, Mexico. Type locality San Francisco, California.

Remarks. Megalops larvae and juveniles of this crab have been found on large medusae.

Metacarcinus magister (Dana, 1852)

(Fig. 54C, Pl. 14A)

Cancer magister Dana, 1852 : 73. — Holmes 1900: 50. — Rathbun 1904: 177; 1930: 222, text figs. 35, 36. —Weymouth 1910: 42, pl. 9, fig. 25. — Schmitt 1921: 229, text fig. 138. — Johnson & Snook 1927: 379, fig. 335. — Phillips 1939: 21, fig. 15. — Nations 1975: 37, figs. 17AB, 18AB, 23, 34-1, 34-2. — Garth & Abbott 1980: 605, Fig. 25.20. — Hart 1982: 212, fig. 87. — Ricketts *et al*. 1985: 199, fig. 170. — Jensen & Armstrong 1987: 216. — Jensen 1995: 27, fig. 31. — Kuris *et al*. 2007: 641.

Metacarcinus magister. — Schweitzer & Feldmann 2000: 235.

Diagnosis. Front of carapace not produced, with 3 small median teeth. Carapace granulate, widest at anterolateral tooth 10, no eleventh tooth, anterolateral teeth serrate anteriorly. Carpus of cheliped with single distal tooth, palm with dorsal serrate ridge having conspicuous teeth, ridges on sides; movable finger with dorsal teeth, lateral ridges. Merus of third maxilliped widened distally, its anterior margin forming obtuse angle with outer margin. Pereopods 2–5 broad, flat. Carapace length 120.7 mm.

Color in life. Carapace brown to gray, lower surface, appendages creamy white to yellowish. Fingers of chelipeds light-colored. The color notes are from crabs from Princeton Harbor, San Mateo County; and Coyote Point, San Francisco Bay, California.

Habitat and depth. Bays, harbors, sandy beaches, eelgrass flats, sandy areas of continental shelf, low intertidal zone to 230 m.

Range. North and east of St. George I., Pribilof Is. to Pismo Beach, California. Old records from Santa Barbara, California and Magdalena Bay, Baja California are unconfirmed. Type locality San Francisco Bay.

Remarks. The Dungeness crab is the most important commercial crab of the Pacific coast of the United States. Adult crabs usually are trapped off shore, but juveniles often can be found in bays and harbors at low tide. Very small juveniles and megalops larvae sometimes ride on medusae and the by-the-wind sailor *Velella* sp. (Wickham 1979).

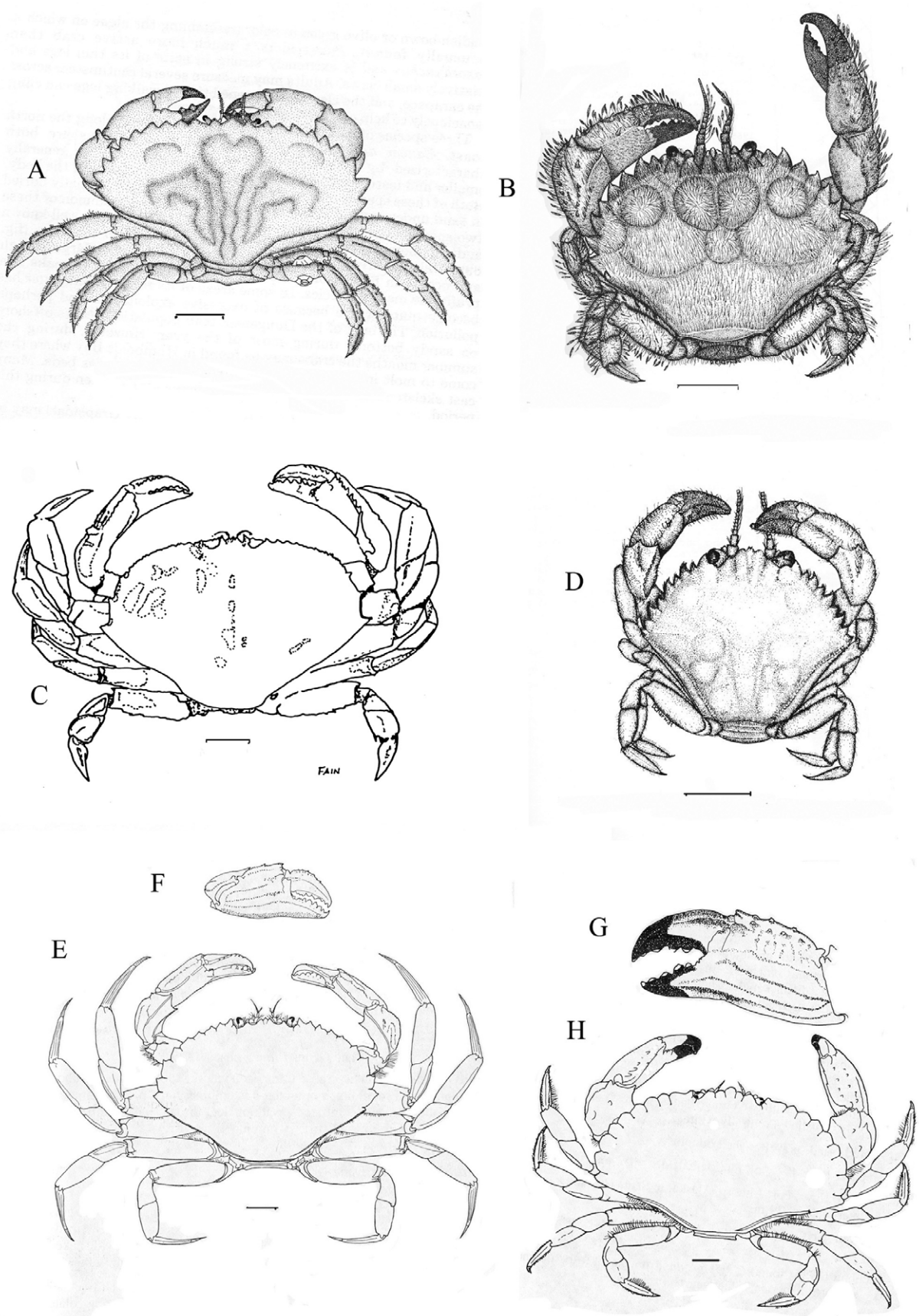

FIGURE 54. Family Cancridae. A, *Romaleon antennarius* (Stimpson, 1856). B, *Romaleon branneri* (Rathbun, 1926). C, *Metacarcinus magister* (Dana, 1852). D, *Romaleon jordani* (Rathbun, 1900); juvenile. E, F *Metacarcinus gracilis* (Dana, 1852); E, dorsal view; F, chela. G, H *Cancer productus* Randall, 1840; G, chela; H, dorsal view. Scales: B, D, E, H = 10 mm; A = 20mm, C = 30 mm. A from Brusca & Brusca 1978, B, D from Word & Charwat 1975; C by G.F. Hubbard, E–H from Hart 1982.

Romaleon Gistl, 1848

Romaleon antennarius (Stimpson, 1856)
(Fig. 54A, Pl. 13H)

Cancer antennarius Stimpson, 1856: 96. — Holmes 1900: 49. — Rathbun 1904: 176; 1930: 210, pl. 92, pl. 93, fig. 2; text fig. 33. — Weymouth 1910: 47, pl. 10, fig. 31. — Schmitt 1921: 224, pl. 35, fig. 3; pl. 36, fig. 8; text fig. 137. — Johnson & Snook 1927: 378, figs. 331, 332. — Nations 1975: 31, figs. 13C, D, 14C, D, 32-5, 32-6. — Garth & Abbott 1980: 602, fig. 25.16. — Word & Charwat 1975: 42.—Ricketts *et al*. 1985: 133, fig. 104. — Breen & Wicksten 1990: 10. — Jensen 1995: 28, fig. 35. — Kuris *et al*. 2007: 642, pl. 320, fig. H.
Romaleon antennarius. — Schweitzer & Feldmann 2000: 243.

Diagnosis. Carapace smooth, front not produced, with 3 median teeth. Carapace widest at anterolateral tooth 8, 11 anterolateral teeth present. Merus of third maxillipeds with distal margin nearly transverse, angles rounded. Chelipeds may be slightly unequal in size. Carpus of cheliped with single spine above, carpus, palm bearing faint ridges, movable finger smooth. Pereopods 2–5 stout, usually setose. Juveniles may be more setose than adults. Male carapace length 61.7 mm, female to 54.1 mm.

Color in life. Dark reddish above, yellowish with red spots below. Fingers of chelae dark. The color notes are from crabs from Moss Beach, San Mateo County, California.

Habitat and depth. Under rocks set in sand, tide pools, among sea grasses, breakwaters, rocky reefs; intertidal zone to 40 m.

Range. Coos Bay, Oregon to Todos Santos Is., Baja California. Reports from British Columbia are unconfirmed. Type locality San Francisco Bay.

Remarks. The rock crab is one of the most common larger crabs in California and Oregon. It is taken by sport fishermen as well as predatory fishes, octopuses and sea otters.

Romaleon branneri (Rathbun, 1926)
(Fig. 54B)

Cancer branneri Rathbun, 1926: 63; 1930: 211, pl. 93, fig. 1 (extensive synonymy). — Nations 1975: 33, figs. 15E, F, 16E, F, 31-1, 31-2. — Word & Charwat 1975: 46.—Garth & Abbott 1980: 605. — Hart 1982: 208, fig. 85. — Jensen 1995: 29, fig. 37. — Kuris *et al*. 2007: 641.
Cancer gibbosulus. — Rathbun 1904: 176. — Weymouth 1910: 43, pl. 10, fig. 29. — Schmitt 1921, pl. 36, fig. 7. — Johnson & Snook 1927: 378. [Not *Cancer gibbosulus* (De Hann, 1835); east Asian species].
Romaleon branneri. — Schweitzer & Feldmann 2000: 243.

Diagnosis. Carapace markedly areolated, sparsely setose with coarse setae. Front with 5 acute teeth, anterolateral margin with 9 forward-curving teeth, all but first 2 teeth tipped with spines; tenth, eleventh teeth present. Merus of third maxillipeds abruptly truncated. Chelipeds setose, carpus with 2 teeth, one above at distal end, second below it at inner angle; upper surface of hand with 2 rows of 3–5 spines; outer surface of hand with 5 ridges marked with setae, small spines; upper margin of movable finger spinous. Pereopods 2–5 setose; dactyls somewhat long, straight, tipped with spines. Male carapace length to 35.5 mm.

Color in life. Variable: carapace whitish with irregular reddish blotches to dark reddish brown, fingers of chelae dark, pereopods 2–5 light-colored, banded with red. The color notes are from crabs from Redondo Beach, California.

Habitat and depth. On sandy mud, coarse sand or shells, intertidal zone to 80 m.

Range. Port Althorp, Alaska to Cedros I., Baja California, Mexico. Type locality San Francisco, California.

Remarks. This small crab is very abundant at Redondo Beach, California.

***Romaleon jordani* (Rathbun, 1900)**
(Fig. 54D)

Cancer jordani Rathbun, 1900: 133; 1904: 176, pl. 6, fig. 4; 1930: 215, pl. 94, figs. 1, 2. — Weymouth 1910: 45, pl. 10, fig. 30. — Schmitt 1921: 228, pl. 36, figs. 5, 6. — Johnson & Snook 1927: 379, fig. 333. — Nations 1975: 36, fig. 15C, D, 16C, D, 31-3, 31-4. — Word & Charwat 1975: 50. — Garth & Abbott 1980: 605, fig. 25.19. — Jensen & Armstrong 1987: 216. — Jensen 1995: 29, fig. 38. — Kuris *et al*. 2007: 642.
Romaleon jordani. — Schweitzer & Feldmann 2000 : 243.

Diagnosis. Carapace slightly areolated, setose. Front with 5 teeth, almost hidden by setae, median tooth very small; anterolateral carapace margin with 9 prominent teeth, often alternating in size; tooth 10 present in older specimens. Merus of third maxilliped obliquely truncated. Carpus of cheliped with 2 spines, palm of cheliped with 2 superior, 5 external ridges, fringed with setae, several spines on upper ridges, movable finger without spines. Male carapace length 25.4 mm, female 15.5.

Color in life. Mottled with light brown, tan, lower surface yellowish, setae brownish to golden, fingers of chelae dark; see color photograph by Jensen (1995).

Habitat and depth. On sand or among kelp holdfasts, lowest intertidal zone to 104 m. Juveniles often cling to large medusae.

Range. Between Sekiu and Neah Bay, Washington to Cape Thurloe, Baja California. Type locality Monterey Bay, California.

Remarks. The illustration shows a juvenile, which has a more narrow carapace than an adult, and omits some of the dense setae usually seen in this species.

SUPERFAMILY PORTUNOIDEA Rafinesque, 1815

Family Portunidae Rafinesque, 1815

The swimming crabs are most abundant in warm temperate to tropical seas. Three native species, only one of them common, may be found in California. The Atlantic green crab *Carcinus maenas* has been introduced into bays. Individuals or parts of the exoskeleton of *Callinectes sapidus* Rathbun, 1896; the Atlantic blue crab, have been reported in San Francisco and Half Moon Bays, California, and rarely elsewhere. This crab has been shipped to fish markets alive from the eastern coast and Gulf of Mexico of the U.S.A. There is no evidence that this estuarine species is established anywhere on the west coast of North America. Kuris *et al.* (2007, pl. 319 M) provided an illustration. There are two old records of *Callinectes bellicosus* (Stimpson, 1859) from San Diego and Point Loma (Garth & Stephenson 1966: 47), but this crab generally is found from San Quintin Bay, Baja California south to the southern Gulf of California, Mexico.

Swimming crabs usually have a carapace that is wider than long. There is no rostrum. The carapace bears lateral teeth, the posterior of which may be considerably larger than the anterior teeth. The orbit is complete. The first antennae fold obliquely or transversely. The chelae are toothed; the cheliped bears spines. As the common name suggests, most swimming crabs can swim strongly by means of paddle-like dactyls of the fifth pereopods. Common near shore species can dig rapidly into sand.

Except for *Carcinus maenas*, species of the Portunidae of the eastern Pacific have been discussed in detail in the work by Garth &Stephenson (1966). The descriptions and key given here are in large part derived from the 1966 work, which contains further information on anatomy, ranges and classification.

Key to species of family Portunidae

1. Eyestalk extremely long, 0.3 or more of carapace breadth . . . . . *Euphylax dovii*
– Eyestalk not as long, much less than 0.3 of carapace breadth 2
2. Carapace narrow, 5 anterolateral teeth; pereopods 5 without flattened swimming paddles . . . . . *Carcinus maenas*
– Carapace broad, 9 anterolateral teeth, pereopods 5 with flattened swimming paddles 3
3. Male abdomen triangular; anteroexternal angle of merus of third maxilliped not strongly produced laterally . . . . . *Portunus xantusii*
– Male abdomen shaped like inverted T; anterolateral angle of merus of third maxilliped strongly produced laterally . . . . . *Callinectes arcuatus*

Callinectes Stimpson, 1860

Callinectes arcuatus Ordway, 1863
(Fig. 55A)

Callinectes arcuatus Ordway, 1863: 578. — Rathbun 1930: 121, pl. 52, text figs. 15h, 16h, 17f, 18g. — Garth & Stephenson 1966: 43, pl. V, fig. A; pl. VIII, fig. A; pl. X, fig. A; pl. XII, fig. D. — Garth & Abbott 1980: 603, fig. 25.15. — Jensen 1995: 32, fig. 47.

Diagnosis. Carapace with surface moderately finely granulate, regions well marked. Front with 4 triangular teeth, orbital region with inner supraorbital lobes square-cut, inner supraorbital fissure closed, suborbital tooth prominent. Anterolateral teeth stout, first 4 blunt; 5–7 sharp, tooth 8 very sharp, tooth 9 moderately long. Cheliped with carina of hand granular. Pereopod 5 with swimming paddle. Male carapace length to 51.3 mm, female to 43.3 mm.

Color in life. Carapace olive gray-green, chelipeds olive green dorsally, whitish ventrally, apices yellow-brown; legs turquoise with olive stain, setae golden; fifth legs olive green with turquoise tints, paddles with black stain (Garth & Stephenson 1966).

Habitat and depth. Bays and estuaries, sand, mud or shell bottoms, intertidal zone to 28 m.

Range. Los Angeles Harbor, California to off Puerto Pizarro, Peru. Type locality Cape San Lucas.

Remarks. In California, scattered populations have been reported in recent years at Anaheim Slough and in San Diego County.

Carcinus Leach, 1814

Carcinus maenas (Linnaeus, 1758)
(Fig. 55B)

Cancer maenas Linnaeus, 1758: 627.
Carcinides maenas. — Rathbun 1930: 15, fig. 4.
Carcinus maenas. — Ingle 1980: 100, figs. 44, 44a, pl. 12b (extensive synonymy).—Williams 1984: 356, fig. 289. — Ricketts *et al*. 1985: 296, fig. 231. — Jensen 1995: 33, fig. 49. — Kuris *et al*. 2007: 642.

Diagnosis. Carapace about 0.75 times as long as broad. Front with 3 broad teeth, anterolateral margin with 5 strong teeth. Third maxilliped with anteroexternal angle not produced. Chelipeds slightly unequal, nearly smooth except for 2 ridges on upper surface of hand; merus short, carpus with broad internal tooth or angle. Pereopods 2–5 smooth, unarmed, dactyl of pereopod 5 lance-shaped, not forming swimming paddle. Male, female carapace length to 60 mm.

Color in life. Carapace dark green, bluish to reddish, sometimes China white; legs varying to yellowish white to tile white or violet; juveniles often more colorful, polymorphic in pigmentation than adults. Williams (1984: 356) gave a lengthy description of the cold patterns.

Habitat and depth. Bays, tide pools; among rocks, oysters, gravel or shells, intertidal to 200 m, but usually shallow. Tolerant of low salinity.

Range. Northumberland Strait to Virginia in North America; Kvaenangen, Norway, Baltic Sea and North Sea to Mauritania. Introduced into San Francisco Bay, California and Willapa Bay, Washington; also Australia, Burma, Red Sea, Madagascar, India, and Ceylon. Type locality Marstrand north of Goteborg, west coast of Sweden.

Remarks. Hardy and a prolific breeder, the green crab easily can be spread by human activity. It is a predator on clams and oysters, and thus is considered a pest by fishermen. The range of this species is spreading rapidly.

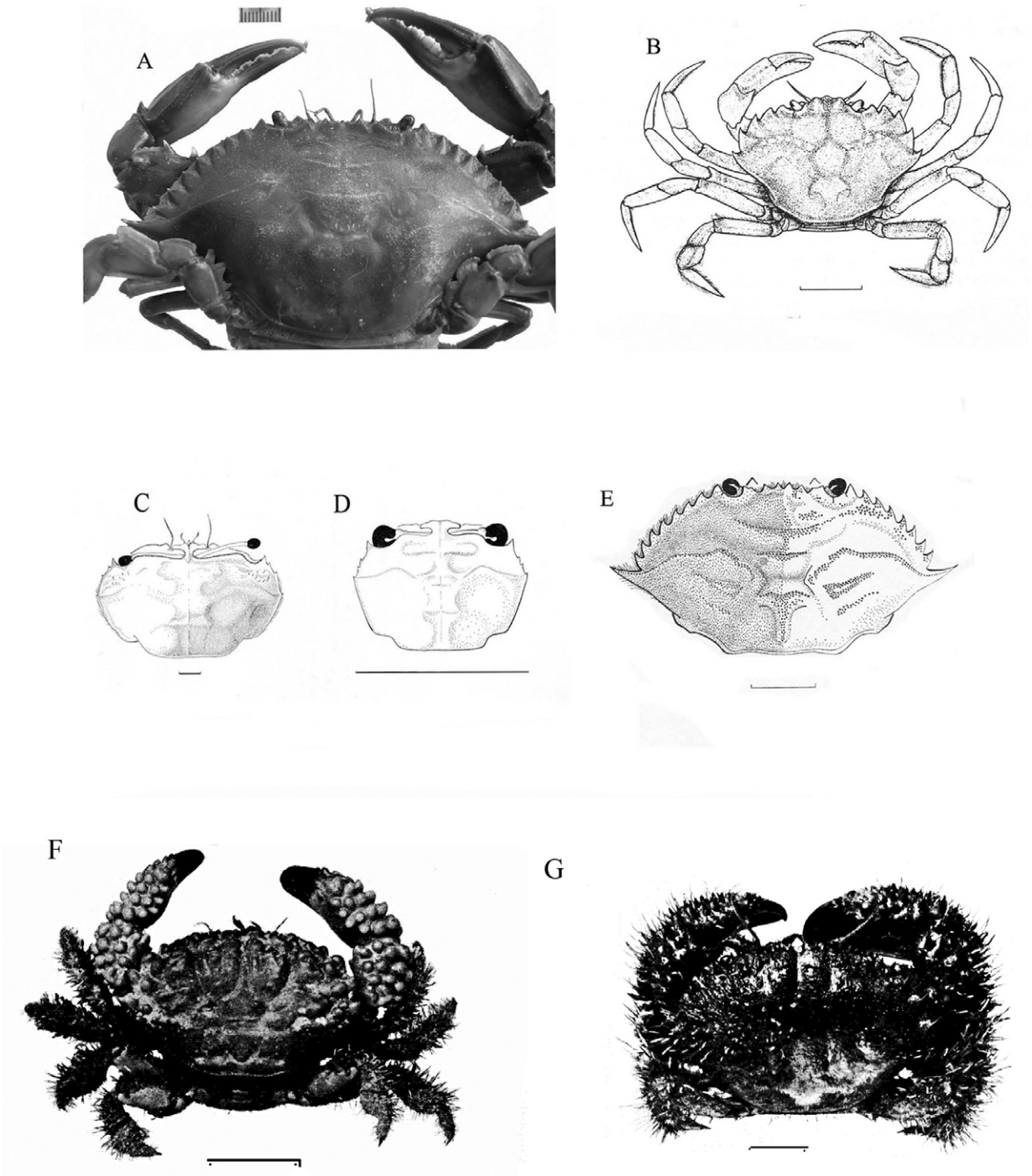

FIGURE 55. Families Portunidae, Xanthidae and Pilumnidae. A. *Callinectes arcuatus* Ordway, 1863. B, *Carcinus maenas* (Linnaeus, 1758). C, D *Euphylax dovii* Stimpson, 1860; C, adult; D, juvenile. E, *Portunus xantusii xantusii* (Stimpson, 1860); carapace. F, *Paraxanthias taylori* (Stimpson, 1860). G, *Pilumnus spinohirsutus* (Lockington, 1877). Scales: A, C, D, E, F, G = 10 mm, B = 20 mm. A photo by Camm Swift, B from Williams 1983, C–E from Garth & Stephenson 1966, F, G from Rathbun 1917.

Euphylax Stimpson, 1860

Euphylax dovii Stimpson, 1860
(Fig. 55C, D)

Euphylax dovii Stimpson, 1860: 226, pl. 5, figs. 5, 5a. — Rathbun 1930: 147, pl. 65. — Garth & Stephenson 1966: 64, pl. VI, figs. A, B; pl. VIII, fig. F, pl. X, figs. F, G; pl. XII, fig. G, text fig. 3a. — Word 1976: 161, fig. 1. — Chivers 1979: 276.

Diagnosis. Carapace relatively long, roughly ovoid; widest near middle, cardiac, branchial regions swollen. Front narrow, T-shaped, with median notch. Orbital region broad, length of eyestalk over 0.66 times carapace breadth. Four-five anterolateral teeth or lobes; first most stout, last most protruding. Third maxilliped with anteroexternal angle laterally produced. Chelipeds long, hands compressed. Fingers with well spaced large teeth, movable finger with dorsal carina. Pereopods 2–4 elongate; dactyls broad, flat. Merus of pereopod 5 with subterminal spine on posterior margin, dactyl forming swimming paddle. Male carapace length to 52.8 mm, female to 25.9 mm.

Color in life. Carapace and merus of all legs deep purple, rest of appendages wine red; undersides blue, sternum white, abdomen brownish (Garth & Stephenson 1966).

Habitat and depth. Mud or sand, intertidal zone to 65 m but often taken well offshore; capable of swimming long distances.

Range. Monterey Bay, California to Gulf of Guayaquil, Peru. Type locality "western coast of Central America." This crab rarely occurs in California.

Portunus Weber, 1795

Portunus xantusii xantusii (Stimpson, 1860)

(Fig. 55E, Pl. 14G)

Achelous xantusii Stimpson, 1860: 222.

Portunus xantusii. — Holmes 1900 : 71. — Rathbun 1904: 179; 1930: 50, pl. 18. — Weymouth 1910: 49, pl 12, fig. 35. — Schmitt 1921: 237, text fig. 141. — Johnson & Snook 1927: 384, fig. 339. — Ricketts *et al*. 1985: 322, fig. 248. — Jensen 1995: 32, fig. 46.

Portunus xantusii xantusii. — Garth & Stephenson, 1966: 32, pl. IV, fig. A; pl. VII, fig. B; pl. IX, fig. B; pl. XI, fig. B. — Garth & Abbott 1980: 602, fig. 25.14.

Diagnosis. Carapace broad, pilose, posterolateral cornerrounded. Front advanced, with 4 lobes. Orbital region with inner supraorbital angle partially subdivided, supraorbital fissures open to closed. Supraorbital tooth acute to blunt, suborbital fissure open. Anterolateral tooth 1 blunt, tooth 5 stouter than teeth 4 or 6, tooth 9 long. Third maxilliped with anteroexternal angle of merus not produced laterally. Chelipeds moderately long, robust, with 4–6 spines on anterior border. Carpus with inner, outer spines moderatel well developed, fingers of chela short and stout. Pereopod 5 with posterodistal border of merus having spinules. Male carapace length to 70.7 mm, female to 55.9 mm.

Color in life. Speckled with gray, black or white, pereopods 2–5 with white, brown bands; apices of chelae, other legs pinkish (Garth & Stephenson 1966). Camouflaged like sand.

Habitat and depth. Usually on sand, intertidal to 181 m but usually shallow, capable of swimming to surface.

Range. South of Santa Cruz I. and SE of Santa Barbara Point, California to Marquis Point, Baja California; and from San Ignacio Bay to near Piaxtla Point, Sinaloa, Mexico. Type locality Cape San Lucas. Other subspecies range into the Gulf of California and south to Colombia

SUPERFAMILY XANTHOIDEA MacLeay, 1838

Xanthoid crabs demonstrate enormous species diversity in tropical and subtropical regions. Until recently, all of them were considered to belong to only one family, the Xanthidae. Guinot (1971, 1978) and Ng (1998) divided the old family Xanthidae into new families and subfamilies. The work largely was based on morphology of the male gonopods, used in this work to separate the Panopeidae from the Xanthidae in the new sense. *Pilumnus spinohirsutus* (Lockington, 1877) now is placed in the superfamily Pilumnoidea, family Pilumnidae. See Ng (1998) for illustrations of the gonopods, a key to the families and a more recent systematic treatment of xanthoid crabs worldwide.

The tremendous diversity in size, body shape, habitat, commensal associations, and pereopod morphology has created confusion in trying to assemble the xanthoids into natural assemblages. There has been no recent comprehensive systematic work on the xanthoid crabs of the eastern Pacific. The keys to species presented here are artificial. Following Ng (1998), *Malacoplax californiensis* (Lockington, 1877); formerly considered to belong the

family Goneplacidae, now is included in the Panopeidae. The key to the species of *Lophopanopeus* is modified from that of Menzies (1948). Subspecies are treated in the sections on the species.

Xanthoids commonly are called mud, pebble or rubble crabs, appropriate for the many species that hide among shells, under rocks, in kelp holdfasts or among worm tubes. They are most diverse and abundant from Point Conception southward, but *Lophopanopeus bellus* (Stimpson, 1862) ranges as far north as Alaska.

Like species of the family Cancridae, with which they can be confused, xanthoids can be common in intertidal areas, especially in southern California. Among xanthoids, the antennules fold obliquely or transversely, not lengthwise. The flagellum of the antenna is smooth, not setose. The anterolateral teeth of the carapace often are fewer in number or are more blunt than those of cancrids. The chelipeds may differ greatly in size. The fingers may bear a large crushing tooth. Only *Cycloxanthops novemdentatus* (Lockington, 1877) grows to the size of an edible cancrid in this area. Xanthoids rarely inhabit sandy shores or sandy areas of the continental shelf, and do not have flattened appendages, as do some common cancrids.

Schmitt (1921: 248) reported the crab *Heteractaea lunata* (Milne-Edwards & Lucas, 1847) (family Xanthidae) as occurring in San Diego, California. Garth (1957) noted that this is primarily a species of the tropical eastern Pacific, and is associated with corals of the genus *Pocillopora*. These corals do not live in California. There are no new records of this species in California. See Hendrickx (1995c) for the recorded geographic range of this crab in the eastern tropical Pacific. The original locality record may have been in error.

Stimpson (1871) described *Micropanope latimanus* briefly and without illustrations. Rathbun (1930) mentioned that the type was not extant, nor was the material mentioned by Lockington (1877a). The species is included here in the family Xanthidae, to which other species of *Micropanope* have been assigned. This crab may not be correctly assigned to genus. There have been no reports of this crab in California since Rathbun (1930) quoted even earlier reports.

Martin &Velarde (1997:105) reported yet another xanthoid-like crab, *Pilumnoides rotundus* Garth, 1940 off San Diego at 695 m. Other records of this crab come mostly from the Gulf of California with a single record from Cedros I., western Baja California. Garth (1940: pl. 23) gave a description and illustration. Originally placed in the family Xanthidae, this crab now is considered to belong to a separate family, the Pilumnoididae, in the superfamily Pseudozioidea (Ng *et al*. 2008: 179).

Family Panopeidae

Key to species of family Panopeidae

1. Eyestalk elongate. Carapace squarish, chelipeds with hands wide, compressed, with ridges on fingers. Living in muddy bays from Santa Barbara area southward . . . . . *Malacoplax californiensis*
– Eyestalk not elongate. Carapace oval to pentagonal, chelipeds without hands wide, compressed; without ridges on fingers. Living in bays or among rocks, tide pools, may be found north of Santa Barbara 2
2. Fingers of chelae with white apices or white throughout their length. Carpal joints of walking legs not bilobed 3
– Fingers of chelae with black or brown apices. Carpal joints of walking legs slightly to strongly bilobed 4
3. Dactyl of major chela strongly curved. Fingers of chelae light-colored throughout their length. Inroduced into bays . . . . . *Rhithropanopeus harrisii*
– Dactyl of major chela angled downward. Fingers of chelae with proximal dark blotches. Subtidal off Anacapa I., California . . . . . *Eurypanopeus hyperconvexus*
4. No enlarged tooth present at proximal end of cutting edge of dactyl of major cheliped . . . . . *Lophopanopeus frontalis*
– Enlarged tooth present at proximal end of cutting edge of dactyl of major cheliped 5
5. Pereopods 2–5 with carpal, meral segments not pubescent. Carapace smooth. Carpus of chelipeds smooth or pitted, never covered with bumps . . . . . *Lophopanopeus leucomanus*
– Pereopods 2–5 with carpal, meral segments pubescent. Carapace pubescent. Carpus of chelipeds smooth or covered with irregular raised bumps . . . . . *Lophopanopeus bellus*

Eurypanopeus A. Milne-Edwards, 1880

Eurypanopeus hyperconvexus Garth, 1986

(Fig. 56B)

Eurypanopeus hyperconvexus Garth, 1986: 11, fig. 6 A–F.

Diagnosis. Carapace convex, with rough lines forming ridges on carapace of female. Front with shallow notch, closed fissure. Anterolateral teeth 1, 2 fused, low; teeth 3, 4 subequal, tooth 5 short, triangular. Merus of third maxilliped subrectangular. Chelipeds similar. Carpus with inner tooth blunt. Palm somewhat swollen, upper margins with faint double crest. Finger of major chela without large basal tooth, fingers of minor chela longer, more slender than those of major, neither chela with gape. Pereopods 2–5 slender, carpi without lobes, dactyls long. Male carapace length 10.5 mm, female carapace length 9.6.

Color in life. Body not reported. Fingers of chelae with brown bases, color of immovable finger extending short distance on palm, apices white (Garth 1986).

Habitat and depth. Subtidal on rock and sand, 68–79 m.

Range. Known only from type locality, 0.8–1.6 km NW of Anacapa I. Light, California.

Lophopanopeus Rathbun, 1898

Lophopanopeus bellus (Stimpson, 1860)

(Fig. 56G, Pl. 14C)

Xantho bella Stimpson, 1860: 204, pl. 5, fig. 2.

Lophopanopeus bellus. — Rathbun 1898b: 272; 1904: 180; 1930: 320, pls. 150, 151. — Weymouth 1910: 51, pl. 12, fig. 37. — Schmitt 1921: 241, p. 37, fig. 4, text fig. 143. — Johnson & Snook 1927: 387, fig. 343. — Ricketts *et al*. 1985: 305.—Jensen 1995: 19, fig. 7. — Kuris *et al*. 2007: 643.

Lophopanopeus diegensis Rathbun, 1900: 137; 1904: 184, pl. 9, fig. 3; 1930: 327, pl. 153, figs. 6,7, 10; text fig. 49. — Weymouth 1910: 52, pl. 12, fig. 39. — Schmitt 1921: 245, pl. 37, fig. 5, text fig. 146.

Lophopanopeus bellus bellus. — Menzies 1948: 4, pl. 1, figs. 1–5; pl. 5, fig. 38 (extensive synonymy). — Garth & Abbott 1980: 609, fig. 25.2. — Hart 1982: 202, fig. 82.—Campos & de Campos 1989: 175.

Lophopanopeus bellus diegensis. — Menzies 1948: 7, pl. 1, figs. 6–8. — Garth & Abbott 1980: 609. — Hart 1982: 200, fig. 81. — Campos & de Campos 1989: 175.

Diagnosis. Carapace with few granules on anterior regions, front with tiny notch, 3 developed anterolateral teeth, pubescent. Carpus of chelipeds with tubercles or roughened, tubercles continued on palm or not; major chela with enlarged tooth on movable finger. Carpus of pereopods 2–5 slightly to prominently bilobed, carpus, merus pubescent. Male carapace length to 13.7 mm.

Color in life. Bluish, red, yellowish, mottled with red, brown or gray; carapace, appendages may be of contrasting colors. Dark color on fingers of chelae does not extend to palm. The color notes are from crabs from Moss Beach and Pillar Point, San Mateo County, California; see also Garth & Abbott 1980: figs. 25.24a–25.24d.

Habitat and depth. Rocks, under rocks in sand, tide pools, kelp holdfasts, bases of sea grasses, intertidal zone to 73 m.

Range. Resurrection Bay, Alaska to Tortugas Bay, Baja California. Type locality Monterey, California.

Remarks. There are two subspecies of this species. *Lophopanopeus bellus bellus* is the northern form, ranging from Alaska to Tortugas Bay, Baja California. It is most abundant north of Point Conception, California. In this subspecies, the carpus of the chelipeds may be smooth to roughened, but does not bear irregular raised bumps or tubercles. The carpus of pereopods 2–5 is not markedly bilobed and does not have bumps. *Lophopanopeus bellus diegensis* ranges from Monterey Bay to off Cape Tortola, Baja California, but usually is found south of Point Conception. The carpus of the chelipeds bears irregular raised bumps. The carpus of pereopods 2–5 is markedly bilobed and has bumps.

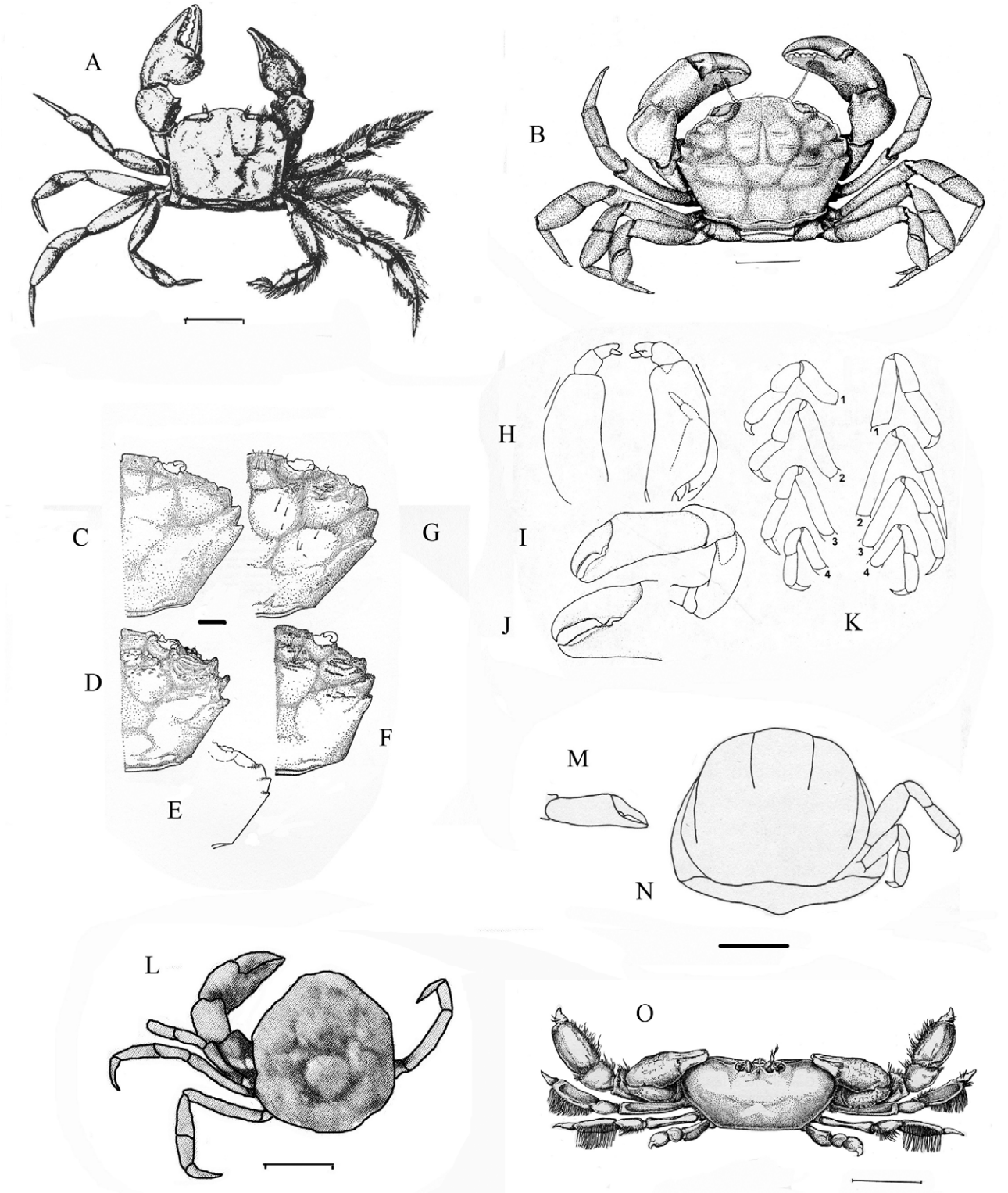

FIGURE 56. Families Panopeidae and Pinnotheridae. A, *Malacoplax californiensis* (Lockington, 1877). B, *Eurypanopeus hyperconvexus* Garth, 1986. C, *Lophopanopeus leucomanus heathii* Menzies, 1948; right side of carapace. D, *Lophopanopeus leucomanus leucomanus* (Lockington, 1877); right side of carapace. E, F, *Lophopanopeus frontalis* (Rathbun, 1893); E, right side of carapace of female; F, right side of carapace of male. G, *Lophopanopeus bellus bellus* (Stimpson, 1860); right side of carapace. H–K, *Enigmatheres canfieldi* (Rathbun, 1918); H, third maxillipeds; I cheliped; J, detail of chela; K, pereopods. L, *Fabia concharum* (Rathbun, 1893); female. M, N, *Fabia subquadrata* Dana, 1851; M, chela; N, adult female in dorsal view. O, *Parapinnixa affinis* Holmes, 1900. Scales: H = 0.57 mm, L = 1 mm, C–G, O = 2 mm, B= 5 mm, A, N =10 mm. A, L–N from Schmitt 1921, B from Garth 1986, C–G from Menzies 1948, H–K from Campos 2002, O from Glassell 1933.

Lophopanopeus frontalis (Rathbun, 1894)
(Fig. 56E, F)

Lophozozymus frontalis Rathbun, 1894: 236.
Lophoxanthus frontalis. — Holmes 1900: 64, pl. 1, figs. 5, 6.
Lophopanopeus frontalis. — Rathbun 1904: 181, pl 7, fig. 8; 1930: 323, pl. 152. — Schmitt 1921: 242, pl. 37, fig. 3; text fig. 144. — Johnson & Snook 1927: 387. — Menzies 1948: 16, pl. 3, figs. 17–29, pl. 4, figs. 30–32, pl. 5, figs. 36, 37. — Garth & Abbott 1980: 610, fig. 25.26. — Ricketts *et al*. 1985: 296. — Jensen 1995: 19, fig. 8.

Diagnosis. Carapace almost smooth, somewhat broader than long. Front prominent, with median notch; with 3 developed anterolateral teeth. Chelipeds with carpus, hand smooth, hand with large lobe on upper margin, dactyl without enlarged tooth. Pereopods 2–5 with carpus slightly bilobed, propodus with convex anterior margin. Male carapace length 17.2 mm.

Color in life. Yellowish-brown, fingers of chela black, dark color extending to palm (Menzies 1948, Garth & Abbott 1980: fig. 25.26).

Habitat and depth. Among rocks and among mussels on pilings, intertidal zone to 37 m.

Range. Santa Monica Bay, California to Magdalena Bay, Baja California. Type locality San Diego.

Lophopanopeus leucomanus (Lockington, 1877)
(Fig. 56 C, D)

Xanthodes leucomanus Lockington, 1877a: 32.
Lophopanopeus heathii Rathbun, 1900: 137; 1904: 182, pl. 7, fig. 9. — Weymouth 1910: 51, pl. 12, fig. 38. — Schmitt 1921: 243, pl. 37, fig. 1. — Johnson & Snook 1927: 387, fig. 342.
Lophopanopeus leucomanus. — Rathbun 1904: 182; 1930: 324, pl. 153, figs. 5, 9; pl. 154, fig. 4. — Schmitt 1921: 243, pl. 37, fig. 6, text fig. 145. — Johnson & Snook 1927: 386, fig. 341. — Jensen 1995: 20, fig. 10. — Kuris *et al*. 2007: 643.
Lophopanopeus leucomanus heathii. — Menzies 1948: 13, pl. 2, figs. 15, 16; pl. 5, fig. 34. — Garth & Abbott 1980: 610. — Ricketts *et al*. 1985: 169, fig. 137.
Lophopanopeus leucomanus leucomanus. — Menzies 1948: 10, pl. 2, figs. 9-14; pl. 5, fig. 35 (extensive synonymy). — Campos & de Campos 1989: 175.

Diagnosis. Carapace with anterior half irregularly roughened; granulated patch on hepatic region, front with shallow notch, 3 developed anterolateral teeth. Carpus of chelipeds smooth to pitted. Movable finger of major chela with strong basal tooth. Carpus of pereopods 2–5 slightly to strongly bilobed, without pubescence, propodus broad. Male carapace length to 12.2 mm.

Color in life. White, dark red, brown, gray or mottled; pereopods may have different color than carapace; fingers of chelae with dark color not extending back on palm. See Garth & Abbott 1980: figs. 25.25b–25.25f.

Habitat and depth. Among rocks, tide pools, among tube mollusks, intertidal zone to 200 m.

Range. Moss Beach, San Mateo County, California to Cedros I., Baja California, Mexico. Type locality Monterey, California.

Remarks. There are two subspecies of this species. The typical form, *L. leucomanus leucomanus*, ranges from Carmel to Cedros I.. The carpus of the cheliped bears a network of lines ("reticulating ridges"), which extend to the palm of the chela. The carpus of pereopods 2–5 is bilobed. *Lophopanopeus leucomanus heathii* ranges from Moss Beach to La Jolla, California. It does not have the reticulating ridges on the carpus, and the carpus of the walking legs is barely bilobed.

Malacoplax Guinot, 1969

Malacoplax californiensis (Lockington, 1877)
(Fig. 56A)

Eucrate ? *californiensis* Lockington, 1877a: 33.
Speocarcinus californiensis. — Holmes 1900: 77. — Rathbun 1904: 190, pl. 9, fig. 1; 1917: 42, text fig. 16, pl. 10, figs. 2–3. —

Schmitt 1921: 249, fig. 148, pl. 34, fig. 7. — Johnson & Snook 1927: 389, fig. 346.
Malacoplax californiensis. — Guinot 1969: 259, fig. 27. — Garth & Abbott 1980: 612, fig. 25.30. — Ricketts *et al*. 1985: 357, fig. 274. — Hubbard & Dugan 1989: 55. — Jensen 1995: 33, fig. 50.

Diagnosis. Carapace nearly smooth, width of front over 0.25 times width of carapace, front notched in center; anterolateral carapace margins strongly curved, furnished with 3 teeth apiece. Third maxillipeds diverging anteriorly. Chelipeds unequal; carpus with spine on antero-internal angle, ridge at distal end of outer surface; hands wide, compressed; upper edge acute, sharply granulated, fingers ridged, nearly straight. Pereopod 5 upturned, relatively short. Carapace length 20.8 mm.

Color in life. Brownish to white, chelae with apices of fingers black (Jensen (1995). The photograph by Garth & Abbott (1980) appears to be that of a preserved specimen.

Habitat and depth. Usually middle to low intertidal zones of mud flats, intertidal zone to 33 m.

Range. Morro Bay, California to Magdalena Bay, Baja California; but usually south of Point Conception. Type locality San Diego, California.

Remarks. *Malacoplax californiensis*, the California burrowing crab, is uncommon and may be endangered by habitat destruction.

Rhithropanopeus Rathbun, 1898

Rhithropanopeus harrisii (Gould, 1841)
(Pl. 14B)

Pilumnus harrisii Gould, 1841: 326.
Rhithropanopeus harrisii. — Rathbun 1898b: 273; 1930: 456, pl. 183, figs. 7, 8. — Garth & Abbott 1980: 610, fig. 25.27. — Williams 1984: 401, figs. 316-317. — Ricketts *et al*. 1985: 296. — Jensen 1995: 18, fig. 5. — Kuris *et al*. 2007: 642.

Diagnosis (after Williams 1984). Carapace subquadrate, about as long as wide, sparsely pubescent toward anterolateral angles, lines of granules across carapace. Front almost straight, slightly notched.First anterolateral tooth fused with postorbital angle, followed by 2–3 other anterolateral teeth. Chelipeds unequal. Carpus with moderately developed internal tooth. Major chela with short fixed finger, strongly curved dactyl. Minor chela with proportionately longer fixed finger, long straight dactyl. Pereopods 2–5 long, slender, compressed, somewhat setose. Male carapace length 15.6 mm, female carapace length 12.4 mm.

Color in life. Brown to pale gray or yellowish above, pale below; fingers of chelae light-colored throughout their length. The color notes are from crabs from various locations in Texas.

Habitat and depth. Rocks, oyster shells, or debris, often in estuarine areas, intertidal zone to 36.6 m, but usually shallow.

Range. Native to southwestern Gulf of St. Lawrence, Canada to Veracruz, Mexico; introduced into parts of Europe and San Francisco and Coos Bays on west coast of U.S.A. Type locality Cambridge Marshes and Charles River, Massachusetts.

Family Xanthidae

Key to Species of family Xanthidae

1. Carapace, chelipeds with prominent rounded tubercles . . . . . *Paraxanthias taylori*
– Carapace, chelipeds without prominent rounded tubercles. 2
2. Width of fronto-orbital border less than half of greatest width of carapace. Anterolateral margin of carapace with 8–10 teeth. Carapace broadly oval . . . . . *Cycloxanthops novemdentatus*
– Width of fronto-orbital border half or more of greatest width of carapace. Anterolateral margin of carapace with fewer than 8 teeth. Carapace not broadly oval . . . . . *Micropanope latimanus*

Cycloxanthops Rathbun, 1897

Cycloxanthops novemdentatus (Lockington, 1877)
(Pl. 14C)

Xanthodes ? *novem-dentatus* Lockington, 1877a: 32.
Cycloxanthops rugosa Holmes, 1900: 59.
Cycloxanthops rugosus. — Rathbun 1904: 180. — Schmitt 1921: 240.
Cycloxanthops novemdentatus. — Holmes 1900: 56, pl. 1, fig. 2. — Rathbun 1904: 180, pl. 7, fig. 10; 1930: 292, pl. 134, fig. 1; pl. 135, figs. 2, 3, text fig. 46 (extensive synonymy). — Weymouth 1910: 50, pl. 12, fig. 36. — Schmitt 1921: 239, pl. 37, fig. 7, text fig. 142. — Johnson & Snook 1927: 386, fig. 340. — Garth & Abbott 1980: 608, fig. 25.23. — Ricketts *et al*. 1985: 172, fig. 141. — Jensen 1995: 18, fig. 6. — Kuris *et al*. 2007: 642.

Diagnosis. Carapace broad, slightly convex, somewhat roughened toward anterior; front with deep, closed median notch (more evident in smaller individuals), anterolateral margin with 8–9 teeth besides postorbital tooth. Merus of third maxillipeds obliquely truncate at anterior end. Carpus of chelipeds roughened, with 2 blunt teeth at antero-internal angle; hand roughened above, upper, lower margins nearly parallel; fingers long, grooved; not gaping. Pereopods 2–5 with setose margins, dactyls longer than propodi. Carapace length 23.9 mm.

Color in life. Brown, purple or red, rarely white; fingers of chelipeds black, teeth along inner chela margins white (Jensen 1995).

Habitat and depth. Tide pools, rocks, among sea grasses or tube mollusks, low intertidal zone to 73 m.

Range. Monterey Bay, California to Magdalena Bay, Baja California. Type locality San Diego, California.

Remarks. This is the largest xanthoid crab of California, and the most likely to be confused with a species of the Cancridae.

Micropanope Stimpson, 1871

Micropanope latimanus Stimpson, 1871
Micropanope latimana Stimpson, 1871: 107.
Xanthodes latimanus. — Lockington, 1877a: 31.
Xanthias latimanus. — Holmes 1900: 66. — Rathbun 1904: 185. — Schmitt 1921: 247.
Micropanope latimanus. — Rathbun 1930: 433 (extensive synonymy).

Diagnosis (after Rathbun 1930). Carapace moderately convex, smooth except for granules along anterior, antero-lateral margins. Front broad. Chelipeds unequal, minor chela with fingers more deflexed than those of major chela; angular. Palms broader than long, smooth, polished; strongly protuberant at postero-inferior angle. Fingers black, as long as palm, deflexed. Pereopods 2–5 with slender dactyls, with sparse setae. Carapace length 7.1 mm. There is no information on the number of lateral teeth of the carapace.

Color in life. "Marbled" (Lockington 1877).

Habitat and depth. Not reported.

Range. San Diego, California , Cape San Lucas, Baja California; and in Gulf of California from Mulege Bay, Port Escondido and San Jose I. Type locality Cape San Lucas.

Remarks. All of the specimens of this species seem to have been lost or destroyed. Stimpson's material, Lockington's types and any other early specimens of the California Academy of Sciences probably were burned. There are no illustrations at all of this species. The few records seem to indicate that the species should occur more frequently in Baja California Sur than in California, U.S.A. Garth (1986) noted that the genus *Micropanope* probably needs revision.

A. Milne-Edwards (1880, quoted by Rathbun 1917) suggested that *M. latimanus* might be a junior synonym of *Glyptoplax pugnax* Smith, 1870 (family Panopeidae), a species reported from Costa Rica and Panama. A different species, *Glyptoplax consagae* Hendrickx 1989, has been collected in the northern Gulf of California. There are no verified reports of either species of *Glyptoplax* in the southern Gulf of California, the Pacific coast of Baja California or California, U.S.A.

Paraxanthias Odhner, 1925

Paraxanthias taylori (Stimpson, 1860)
(Fig. 55F, Pl. 14E)

Xanthodes taylori Stimpson, 1860: 208, pl. 3, fig. 3.
Xanthias taylori.—Holmes 1900: 65. — Rathbun 1904: 185. — Weymouth 1910: 52, pl. 13, fig. 40. — Schmitt 1921: 246, fig. 147. — Johnson & Snook 1927: 389, fig. 344.
Paraxanthias taylori. — Rathbun 1930: 466, pl. 188, pl. 189, fig. 1. — Garth & Abbott 1980: 611, fig. 25.28. — Ricketts *et al*. 1985: 172, fig. 142. — Jensen 1995: 19, fig. 9. — Kuris *et al.* 2007: 642, pl. 320B.

Diagnosis. Carapace nearly flat posteriorly, front divided by wide, rounded notch, with 4 or 5 anterolateral teeth, anterior half of carapace bearing bumps or tubercles. Chelipeds often unequal, carpus covered with rounded tubercles, hand with tubercles in 7–8 longitudinal rows; fingers stout, black; gaping in major chela. Pereopods 2–5 covered with stiff setae. Carapace length 24.6 mm.

Color in life. Dark red, lighter below, fingers black. See color photograph by Jensen (1995) and pl. 14E.

Habitat and depth. Among rocks, kelp holdfasts or among tube mollusks, intertidal zone to 100 m.

Range. Monterey, California to Magdalena Bay, Baja California. Type locality Monterey.

Remarks. The lumpy rubble crab is most common from Santa Monica Bay southward into Baja California.

SUPERFAMILY PILUMNOIDEA Samouelle, 1819

Family Pilumnidae Samouelle, 1819
Pilumnids can be distinguished easily from xanthoids by their coarse setae. Like xanthoids, they are most abundant in warm temperate and tropical areas, and generally live among rocks, corals or shells. Ng *et al*. (2008: 135) gave additional taxonomic references on these crabs.

Pilumnus Leach, 1815

Pilumnus spinohirsutus (Lockington, 1877)
(Fig. 55G, Pl. 14F)

Acanthus spino-hirsutus Lockington, 1877a: 32.
Pilumnus spino-hirsutus. — Holmes 1900: 67.
Pilumnus spinohirsutus. — Rathbun 1904: 185, pl. 7, fig. 2; 1930: 503, pl. 203. — Schmitt 1921: 247, pl. 37, fig. 10.—Johnson & Snook 1927: 389, fig. 345. — Garth & Abbott 1980: 611, fig. 25.29. — Ricketts *et al.* 1985: 172, fig. 143. — Jensen 1995: 18, fig. 4.

Diagnosis. Carapace strongly convex, covered with stiff setae; median frontal lobes truncated, separated by prominent notch; each frontal lobe armed with 4 or 5 spines; orbits armed with strong spines; 5 anterolateral spines. spines. Chelipeds unequal, setose, carpus with spines, hand with several series of spines, fingers dark colored. Carapace length 25.4 mm.

Color in life. Pale brown, red, golden brown. Transverse ridge in front of mouth area with bright red tint. The color notes are from crabs from Redondo Beach and San Pedro, Los Angeles County, California.

Habitat and depth. Among rocks or tube mollusks, tide pools, breakwaters, harbors; intertidal zone to 25 m.

Range. Venice, Los Angeles County, California to Magdalena Bay, Baja California. Type locality San Diego, California.

Remarks. This crab usually is well hidden under rocks or in holes. It seems to prefer warmer waters. It is common near outlets of a power plant in King Harbor at Redondo Beach, California.

SUPERFAMILY PINNOTHEROIDEA de Haan, 1833

Family Pinnotheridae de Haan, 1833

The pea crabs generally are commensals of larger invertebrates, including polychaete and echiuroid worms, pelecypods, large chitons, keyhole limpets, sea urchins, sea cucumbers, and ascidians. The species generally associate with only one general type of host: those that live with polychaetes usually do not associate with mollusks and vice versa, for example. The associations do not seem to be species-specific.

Pinnotherids have a rounded to rectangular carapace, often wider than long. Usually, the carapace is soft. Most pinnotherids are colored whitish to yellowish, but some, such as *Opisthopus transversus* Rathbun, 1893; may have a spotted carapace and banded legs. The front, eye and orbits may be reduced. The antennules fold transversely.

Sexual dimorphism is pronounced in certain pinnotherids, with males being smaller and having a less inflated body than the females. In others, the chelae of the male are sturdier than those of the female. Pereopods 2–5 may differ in size and shape from anterior to posterior. The dactyls of pereopods 2–5 may be modified for crawling, grasping, or gripping the surface of a host.

Members of the family Pinnotheridae lately have undergone taxonomic revision. The generic placement of tropical species has been revised; males and females of sexually dimorphic groups have been matched so that some names applied only to one sex have been put into synonymy. For references prior to 1970, the account by Schmitt *et al*. (1973) remains valuable. The key given here follows the work of Davidson (1968) and Zmarzly (1992). Zmarzly's study of species of *Pinnixa* should be consulted for additional anatomical details and illustrations. A key by Campos-Gonzalez (2007) to the intertidal pinnotherids of central California to Oregon includes new drawings and valuable information. That key includes several species, such as *Parapinnixa affinis* Holmes, 1900; that have not been reported north of Point Conception.

Pinnotheres holmesi Rathbun, 1918 and *Pinnotheres nudus* Holmes, 1895 (part) seem to be synonyms of the Atlantic oyster crab *Zaops geddesi* (Miers, 1880). This crab may have been introduced with the oyster *Crassostrea virginica* in the early twentieth century but has not been reported in the area since then. *Pinnotheres nudus* as originally described, however, may be a synonym of *Opisthopus transversus*.

Key to species of family Pinnotheridae

1. Ischium of third maxillipeds rudimentary or indistinguishably fused with merus; palp not more than 0.5 times as large as merus-ischium. Carapace rounded, subquadrate or broadly transverse 2
– Ischium of third maxillipeds usually distinct from merus, although smaller, sometimes imperfectly joined with it; palp of larger size, usually about as large as merus-ischium. Carapace broadly transverse 6
2. Carapace much broader than long, anterior margin nearly straight. Pereopods 2–5 diminishing in length from anterior to posterior, pereopod 5 very small . . . . . *Parapinnixa affinis*
– Carapace suborbicular or subquadrate, not strikingly wider than long. Pereopods 2–5 not successively diminishing in length from anterior to posterior 3
3. Carapace without 2 longitudinal, impressed lines leading posteriorly from middle of upper margin of orbit. Symbiotic with ascidians . . . . . *Pinnotheres pugettensis*
– Carapace with 2 longitudinal, impressed lines leading posteriorly from middle of upper margin of orbit. Usually symbiotic with pelecypods, occasionally echinoderms, rarely ascidians 4
4. Female: pereopods 3 unlike, right longer than left. Commensal in keyhole limpet, *Megathura crenulata* . . . . . *Enigmatheres canfieldi*
– Female: pereopods 3 alike. Symbiotic with pelecypods, echinoderms, rarely ascidians 5
5. Female: Front sharply deflexed with transverse sulcus across vertical front between orbits; hand of cheliped widening distally, bearing two rows of setae along lower margin. Male: terminal abdominal segment semi-circular, immovable finger of chela bearing large serrate lobe on upper margin. Alaska to La Jolla, California . . . . . *Fabia subquadrata*
– Female: Front sharply deflexed but lacking transverse sulcus across vertical front between orbits; hand of cheliped not widening distally, bearing one row of setae along lower margin. Male: terminal abdominal segment widening distally with distal margin slightly deflexed, immovable finger of chela bearing 2 small teeth or lobes on upper margin. San Pedro, California to Magdalena Bay . . . . . *Fabia concharum*
6. Carapace about as wide as long, suborbicular. Pereopods 2–5 more or less subequal, pereopod 3 longest. Carapace spotted red to purple. . . . . *Opisthopus transversus*
– Carapace much wider than long. Pereopod 4 longest. Carapace whitish to brown, not spotted 7
7. Pereopod 4 not markedly longer than others, legs more or less subequal. Carapace hard, granulate anteriorly; lower anterolateral margin curving gradually into posterolateral margin . . . . . *Scleroplax granulata*
– Pereopod 4 markedly longer, larger than others. Carapace usually soft, if hard, not granulate; lower anterolateral margin forming angle with posterolateral margin 8
8. Carapace strongly convex, hard, 1.5 times as wide as long. Often symbiotic with holothurians . . . . . *Pinnixa barnharti*

– Carapace flat or slightly convex, more than 1.5 times as wide as long. Not symbiotic with holothurians 9
9. Dactyl of pereopod 5 shorter than propodus 10
– Dactyl of pereopod 5 equal to or longer than propodus 14
10. Apex of dactyl of pereopod 5 falling short of or just reaching distal end of merus of pereopod 4 when both legs extended . . 11
– Apex of dactyl of pereopod 5 reaching beyond distal end of merus of pereopod 4 when both are extended. 12
11. Posteroventral margin of ischium of pereopod 5 with 2–3 large tubercles; margins of pereopod 5 with long fringe of setae . . . . . *Pinnixa longipes*
– Posteroventral margin of ischium of pereopod 5 without tubercles; pereopod 5 without long fringe of setae . .*Pinnixa tubicola*
12. Ventral margin of propodus of pereopod 4 with 2 ridges, ridges granulate or serrate; dactyl of pereopod 4 spinous, slightly curved . . . . . *Pinnixa tomentosa*
– Ventral margin of propodus of pereopod 4 without ridges; dactyl of pereopod 4 smooth, strongly curved. 13
13. Male: fixed finger of chela slightly deflexed relative to palm; inner margin of dactyl of chela toothless. Female: fixed finger slightly deflexed; slight gape visible between opposing margins of fingers of chela when fingers tightly closed . . . . . *Pinnixa littoralis*
– Male: fixed finger of chela straight relative to palm; inner margin of dactyl of chela with single blunt triangular tooth. Female: fixed finger nearly straight; opposing margins of fingers of chela meeting tightly, no gape . . . . . .*Pinnixa faba*
14. Anterolateral aspect of carapace with granulate or serrate ridge 15
– Anterolateral aspect of carapace smooth, round; without granulate or serrate ridge 19
15. Fixed finger of chela angled obliquely downward relative to palm 16
– Fixed finger of chela straight or curving upward; not deflexed 17
16. Length of propodus of pereopod 4, l.5–2 times its width . . . . . *Pinnixa occidentalis*
– Length of propodus of pereopod 4, at least 2.5 times its width . . . . . *Pinnixa scamit*
17. Anterior face of chela entirely smooth, without granules or with line of coarse granules just above ventral margin of propodus, scattered granules over rest of propodus. . . . . *Pinnixa schmitti*
– Anterior face of chela with line of tubercles or granules above ventral margin, rest of palm smooth or granulate 18
18. Anterior face of chela with line of tubercles just above ventral margin, largely confined to region where fixed finger meets palm; rest of palm smooth . . . . . *Pinnixa hiatus*
– Anterior face of chela with prominent line of densely packed granules forming ridge above ventral margin, running most of length of propodus; dorsal margin of propodus granulate . . . . . *Pinnixa franciscana*
19. Inner margin of dactyl of chela with single small triangular tooth at midpoint . . . . . *Pinnixa weymouthi*
– Inner margin of dactyl of chela toothless 20
20. Fingers of chela long, about twice as long as length of palm; apex of dactyl of pereopod 5 falling short of distal end of carpus of pereopod 4 when both legs extended . . . . . *Pinnixa forficulimanus*
– Fingers of chela short, about as long as length of palm; apex of dactyl of pereopod 5 exceeding distal end of carpus of pereopod 4 when both legs extended . . . . . *Pinnixa minuscula*

Enigmatheres Campos-Gonzalez, 2002

Enigmatheres canfieldi (Rathbun, 1917)

(Fig. 56H–K)

Fabia canfieldi Rathbun, 1917: 106, text fig. 57, pl. 24, figs. 5, 7. — Schmitt 1921: 254, pl. 39, figs. 5, 6. — Schmitt *et al*. 1973: 22.

Enigmatheres canfieldi. — Campos-Gonzalez 2002: 31, fig. 1.

Diagnosis. Female: Carapace broad, soft. Front without setae, with short, longitudinal median depression. Second segment of palp of third maxilliped small, shorter, narrower than first segment, terminal segment attached at middle. Palm of chela increasing in width to distal end, fingers long, inclined downward, lower margin of propodus sinuous, fingers not gaping, setose on upper surface, prehensile tooth at middle of dactyl, smaller one at base of fixed finger. Pereopods 2–5 slender, subcylindrical. Pereopod 2 stouter than others, propodi slightly curved, dactyls short, slender. Length of pereopod 3 on right side about 0.3 times longer than length of pereopod 3 on left. Dactyls with hooked apices except on right pereopod 3, with dactyl long, straight. Carapace length about 5 mm. Male has not been described.

Color in life. Not reported.

Habitat and depth. In mantle cavity of keyhole limpet, *Megathura crenulata* (G.B. Sowerby, 1825). Depth not reported but probably low intertidal or subtidal zone, where the limpet lives.

Range. Known only from type locality, Monterey, California.

Remarks. Except for the peculiarly elongated legs and their asymmetry, this crab closely resembles the

polymorphic crab *Fabia subquadrata* Dana, 1851. That species usually associates with pelecypods. More study is needed to determine whether or not this is truly a distinct species.

Fabia Dana, 1851

Fabia concharum (Rathbun, 1893)

(Fig. 56L)

Cryptophrys concharum Rathbun, 1893: 250 (part).—Rathbun 1904: 188, pl. 7.— Weymouth 1910: 60.
Raphonotus lowei Rathbun, 1900c: 590; 1904: 186, text fig. 93.
Fabia lowei Rathbun 1917: 104, pl. 24, figs. 2, 4, text fig. 55. — Schmitt 1921: 254, pl. 39, figs. 3, 4, text fig. 151. — Johnson & Snook 1927: 391.
Pinnotheres concharum. — Rathbun 1917: 86, pl. 20, figs. 3–6, text fig. 42 (part). — Schmitt 1921: 252, pl. 38, figs. 1–4.
Fabia concharum. — Davidson 1968: 87, fig. 1B, 1C, 1E, 1F (extensive synonymy). — Schmitt *et al*. 1973: 23. — Garth & Abbott 1980: 613, fig. 25.32.

Diagnosis. Carapace subpentagonal, slightly longer than broad, smooth, rigid, with ridge of coarse setae along anterior, anterolateral margins. Female front sharply deflexed, lacking transverse sulcus across vertical front between orbits. Orbits circular, antennules large, nearly transverse. Palp of third maxilliped very small, merus produced on distomedial margin. Hand of cheliped not widened distally, bearing one row of setae along lower margin. Pereopods 2–4 subequal, pereopod 5 shortest, dactyls about as long as propodi, ending in curved hooks. Male abdomen with terminal segment widening distally, sixth segment hairless with margins subparallel, abdomen considerably wider near proximal end than at distal end. Male carapace length 3.0 mm, female 10.0 mm.

Color in life. Pale brown (Garth & Abbott 1980: fig. 25.32).

Habitat and depth. Commensal in mantle cavities of pelecypods, intertidal to subtidal. zones. Males may move between hosts.

Range. San Pedro, California to Turtle Bay, Baja California. Type locality San Diego Bay, California.

Remarks. Davidson (1968) explained the confusion between this species and *Fabia subquadrata*.

Fabia subquadrata Dana, 1851

(Fig. 56M, N)

Fabia subquadrata Dana, 1851: 253. — Holmes 1900: 87 (part). — Rathbun 1917: 102, pl. 24, figs. 1, 3; text fig. 53 (part) — Schmitt 1921: 253, pl. 39, figs. 1, 2; text fig. 150. — Johnson & Snook 1927: 391, fig. 347. — Davidson 1968: 85, fig. 1A. 1D, 1G, 1H. — Schmitt *et al*. 1973: 24. — Garth & Abbott 1980: 612, fig. 25.31. — Hart 1982: 226, fig. 93. — Ricketts *et al*. 1985: 221, fig. 179. — Campos 1986: 238. — Jensen 1995: 30, fig. 39. — Campos-Gonzalez 2007: 644, pl. 321 B3.
Raphonotus subquadratus. — Rathbun 1904: 186. — Weymouth 1910: 55, fig. 2.

Diagnosis. Carapace smooth, membranous, subquadrate; soft in adult female, hard in male. Female front sharply deflexed with transverse sulcus across vertical front between orbits. Anterolateral margin rounded, marked by round cluster of pits, male with dense pubescence along margin. Antennules in very wide grooves. Male with large orbits. Palp of third maxilliped about as long as adjacent segment, merus with small point on distomedial margin. Palm of chela widened distally, bearing 2 rows of setae along lower margin. Immovable finger with large serrate lobe on upper margin; dactyl with 1 large tooth on lower margin, upper margin with tuft of dense setae. Pereopods 2–5 with segments flattened, margins densely pubescent, dactyls large, subequal, curved. Male abdomen with terminal segment semi-circular, lateral margins of penultimate segment distally depressed, broader at proximal end than distal but not markedly so. Male carapace length to 7.3 mm, female to 16.2 mm.

Color in life. Translucent whitish to yellowish, at times with dark areas on carapace (Jensen 1995).

Habitat and depth. Usually commensal in pelecypods, especially mussels, *Mytilus* spp., and soft-shell clams, *Mya arenaria* Linnaeus, 1758. Also reported from other pelecypods, rarely sea urchins, ascidians; intertidal zone to 220 m. Garth & Abbott (1980) gave a list of hosts.

Range. Akutan Pass, Aleutian Is. to Todos Santos Bay, Baja California, Mexico. Type locality Puget Sound.

Remarks. The grooved mussel crab perhaps is the largest and best known of the pinnotherids of the western coast of North America. Its change of size, shape and habitat during its life cycle can cause confusion with other species. Smaller individuals are more setose and can swim. The first host usually is a clam. The crabs produce hard shells prior to molting, accomplished while the crabs swarm into the plankton. Ovigerous females develop a large, soft exoskeleton later when they move to a larger host, often a mussel. Males remain hard-shelled. Garth & Abbott (1980) gave additional information and references on the life cycle.

Opisthopus Rathbun, 1893

Opisthopus transversus Rathbun, 1893
(Fig. 57A, Pl. 15B)

Opisthopus transversus Rathbun, 1893: 252; 1904: 188, text fig. 95; 1917: 173, pl. 37, figs. 4, 5; text fig. 110. — Holmes 1900: 97. — Weymouth 1910: 61, text fig. 9. —Schmitt 1921: 268, pl. 44, figs. 4, 5, text fig. 158. — Johnson & Snook 1927: 394, fig. 350. — Schmitt *et al*. 1973: 131. — Garth & Abbott 1980: 618, fig. 25.42. — Ricketts *et al*. 1985: 105, fig. 80. — Campos-Gonzalez *et al*. 1992: 754. — Jensen 1995: 31,fig. 44.—Campos-Gonzalez & Manning 2000: 799. — Campos-Gonzalez 2007: 644, fig. 321 C1.

Pinnotheres nudus Holmes 1895: 563, figs. 1–5. — Rathbun 1917: 83, fig. 40. — Schmitt 1921: 252, fig. 149. — Johnson & Snook 1927: 391. — Schmitt *et al*. 1973: 60.

Not *Pinnotheres nudus* Weymouth, 1910: 53, fig. 1; =*Zaops geddesi* (Miers, 1880); Atlantic species; see Campos & Manning 2000: 803.

Diagnosis. Carapace somewhat rounded, convex, moderately hard. Front deflexed, almost straight, with slight median groove. Antennules well developed, set in deep notches. Third maxilliped with ischium well developed, merus broad, palp 3-jointed, last joint articulated on inner side of preceding joint. Chelae short, stout. Pereopods 2–5 similar to each other, segments rather broad, dactyls curved, small. Abdomen of male narrow at base, tapering from third segment to end; abdomen of female wide, long. Male carapace length to 10 mm, female to 17 mm.

Color in life. Carapace mottled with vermilion to deep red, legs banded with red to purple, background white to cream. The color notes are from crabs from Cabrillo Beach, Los Angeles County, California.

Habitat and depth. Commensal in mantle cavities of pelecypods, gastropods (including large opisthobranchs), and giant chiton *Cryptochiton stelleri* (von Middendorff, 1847); in cloacae of sea cucumbers, and with polychaete *Chaetopterus variopedatus*; intertidal to subtidal zones.

Range. Monterey, California to San Ignacio Lagoon, Baja California; San Felipe, Baja California (Gulf of California). Type locality Monterey.

Remarks. Evidence suggests that the color of the crab is dependent on the habitat and host. Crabs that inhabit suspension-feeding pelecypods tend to have less color than those that live in deposit-feeding or grazing hosts. Garth & Abbott (1980) gave further information and references.

After storms, the mottled pea crab may be cast ashore alive and away from a host. The crabs can crawl easily. It is not known if they move from host to host under normal conditions.

Parapinnixa Holmes, 1895

Parapinnixa affinis Holmes, 1900
(Fig. 56O)

Parapinnixa affinis Holmes, 1900: 95. — Rathbun 1917: 111. — Schmitt 1921: 255. — Glassell 1933: 321, pls. 20, 21. — Schmitt *et al*. 1973: 31. — Garth & Abbott 1980: 614, fig. 25.33. — Campos-Gonzalez *et al*. 1992: 756. — Campos-Gonzalez 2007: 644.

Diagnosis (after Glassell, 1933). Carapace smooth, shining; transversely oval, anterolateral corner dilated, making straight line at anterior margin. Front broad, triangular, with short median groove. Orbit oval, inner hiatus wide, partly filled by basal segment of small, short antenna. Antennule folding obliquely. Buccal area small, broadly triangular. Ischium of third maxilliped rudimentary, merus large, triangular, with 3-segmented palp. Cheliped stout, smooth, hand dilated, dactyl hooked at apex, armed with small tooth near middle of inner margin, upper side

smooth; fixed finger with 2 distal teeth, large triangular tooth extending from apex to proximal side of center. Single row setae extending longitudinally from margin of carpus to fixed finger, gape of dactyl with fringe short setae. Pereopod 2 larger than others; dactyl short, stout. Pereopods 3, 4 comparatively slender, with slightly longer dactyls. Pereopod 5 small, reaching about to apex of merus of preceding pair, dactyls short, stout, slightly hooked. Merus of pereopods 3–5 compressed, broad. Abdomen with 7 segments, widest at segment 3, segment 7 nearly twice as long as broad. Carapace length to 3.6 mm long.

Color in life. Carapace light amber with mottling of dark ochre, protogastric, cardiac regions light orange; rarely white. Legs pale ochre with greenish tinge, dactyl yellow with white apex. Setae on pereopods 3, 4 reddish brown (Glassell 1933).

Habitat and depth. Bays and harbors, low intertidal zone among mud, sand, shells, algae; living in tube with polychaetes *Amphitrite* sp., *Neoleprea californica* Moore, 1904; and *Loimia* sp.

Range. San Pedro to San Diego, California; La Bajada, Tortugas Bay, Baja California, Mexico. Most reports are from Newport Bay, Orange County, California. Reports from Sakhalin and the Kurile Is. may refer to *Parapinnixa yokoyai* Glassell, 1933. Type locality Deadmans I., San Pedro, California.

Remarks. Although Glassell (1933) was able to study "hundreds" of this crab, the California bay pea crab has rarely been reported since then. The type locality, Deadmans I., was destroyed during development inside Los Angeles Harbor. Other protected bays of southern California have undergone various types of habitat destruction which probably adversely affected this and other crabs.

Pinnixa White, 1846

Pinnixa barnharti Rathbun, 1917
(Fig. 57E)

Pinnixa barnharti Rathbun, 1917: 149, fig. 91, pl. 32, text fig. 91. — Schmitt 1921: 261, pl. 41 — Schmitt *et al.* 1973: 103. — Garth & Abbott 1980: 614, fig. 25.34. — Ricketts *et al*. 1985: 338. — Zmarzly 1992: 679, figs. 2, 3. — Jensen 1995: 31. — Campos-Gonzalez 2007: 644, pl 322 A.

Diagnosis. Carapace hexagonal, calcified, convex, anterolateral margin with line of fine granules, surface coarsely pubescent towards sides, furrow behind gastric region shallow, 3 deep pits on each side anteriorly, posterior margin concave. Lobes of front prominent, arcuate. Orbits broadly oval. Length of antenna as long as width of front, one orbit. Chelipeds large, merus setose above, chelae dilated toward fingers, sinus in lower margin near base of subhorizontal fixed finger, apex obliquely truncate, lower corner armed with short, sharp tooth, dactyl oblique, making gape with fixed finger, strong tooth in middle of dactyl, fringe of setae above, patch of setae in gape. Pereopods 2– 5 thick, merus setose, propodus tapering, dactyl short, relatively straight. Pereopod 2 nearly as long as pereopod 3, pereopod 4 longest, propodus of pereopods 4, 5 setose below, carpus, propodus of pereopod 5 setose above. Carapace length to 10.7 mm.

Color in life. Creamy to brownish with brown mottling. The color ntoes are from a crab from Abalone Cove, Palos Verdes Peninsula, Los Angeles County, California.

Habitat and depth. Bays, sandy areas, living in cloacae of holothuroids, especially *Caudina* spp., low intertidal to subtidal zones.

Range. Puget Sound; Venice, California to Ballenas Bay, Baja California; Zihuatanejo, Guerrero, Mexico. Type locality Venice, California. Most recent records come from southern California.

Pinnixa faba (Dana, 1851)
(Fig. 57F, G)

Pinnotheres faba Dana, 1851: 253.
Pinnixa faba. — Holmes 1900: 93. — Rathbun 1904: 188; 1917: 142, pl. 31, figs. 1–4, text figs. 27, 88. — Weymouth 1910: 59, text fig. 7 (part). — Schmitt 1921: pl. 40, figs. 1–4, text fig. 154. — Johnson & Snook 1927: 393. — Zullo & Chivers 1969: 72, fig.2. — Schmitt *et al*. 1973: 108. — Garth & Abbott 1980: 615, fig. 25.3. — Hart 1982: 234, fig. 97. — Ricketts

et al. 1985: 377. — Zmarzly 1992: 682, fig. 4. — Schneider 1993: 842.—Jensen 1995: 30, fig. 41. — Campos-Gonzalez 2007: 645, pl. 323 A3.

Diagnosis. Carapace 1.5–1.9 times as long as wide, strongly convex, truncated at sides, no transverse ridge behind gastric area, anterolateral margins marked by low ridge. Orbits oval. Female more rotund than male, with bilobed frontal region. Hands of chelipeds flattened, pubescent on inner side between fingers; fingers of female short, straight, those of male curved, gaping. Male chela more robust than that of female. Pereopods 2–5 robust, carpus, propodus about equal in length; dactyl shorter than propodus, somewhat curved. Pereopod 4 longest. Dactyl of pereopod 5 reaching middle of carpus of pereopod 4. Female carapace length 11.7 m, male smaller.

Color in life. Brown to brownish red, dirty white, yellowish to pure white; see color photograph by Jensen (1995).

Habitat and depth. Usually symbiotic in mantle cavity of pelecypods, rarely gastropods, holothuroids, ascidians; in sheltered intertidal areas. A late Pleistocene fossil of this species was found in the shell of *Tresus capa*x (Zullo & Chivers 1968).

Range. Prince of Wales I., Alaska to Camalu Point, Baja California, Mexico. Type locality Puget Sound, Washington.

Remarks. The mantle pea crab is a common pinnotherid of intertidal habitats. It can be confused with *P. littoralis*. Males of *P. faba* have characteristic chelae in which the fixed fingers are straight and tapering to a conical apex. In *P. littoralis*, the fixed fingers are slightly deflexed and have excavated apices. Females of *P. faba* have fingers of the chelae without gapes; in *P. littoralis*, the fingers gape slightly when closed. Zmarzly (1992) gave further details on differentiation of *P. faba* from *P. littoralis*.

Pinnixa forficulimanus Zmarzly, 1992

(Fig. 57H–J)

Pinnixa forficulimanus Zmarzly, 1992: 685, fig. 6.

Diagnosis. Carapace 1.8–2.2 times as wide as long, flattened, shiny, dorsal surface with shallow pits, anterolateral region smooth, lacking ridge. Slight depression in gastric region. Frontal margin straight; median groove not well developed. Chela small, scissors-like, with long, thin fingers. Length of fingers about twice length of palm, apices crossing when closed. Palm of chela sparsely setose, dorsal margin of dactyl also setose. Pereopods 2–5 similar in form and flattened, with smooth margins, dactyls slender, straight to slightly curved. Pereopod 4 more robust than others. Apex of dactyl of pereopod 5 reaching middle of carpus of pereopod 4. Carapace length about 2 mm.

Color in life. Carapace translucent, organs visible within, with brown coloration (Zmarzly 1992).

Habitat and depth. Sandy areas, 12–46 m. Symbiotic associations unknown.

Range. Santa Cruz to San Diego, California. Type locality Santa Cruz, California.

Pinnixa franciscana Rathbun, 1917

(Fig. 57K, L)

Pinnixa franciscana Rathbun, 1917: 161, pl. 35, figs. 1–4, text fig. 100. — Schmitt 1921: 263, pl. 42, figs. 1–4. — Schmitt *et al*. 1973: 110. — Garth & Abbott 1980: 671, fig. 25.38. — Ricketts *et al*. 1985: 307, fig. 238. — Zmarzly 1992: 687, fig. 7. — Campos-Gonzalez 2007: 646, pl. 325 A3.

Diagnosis. Carapace about twice as wide as long, pitted, with blunt, straight cardiac ridge; granulate ridge running from orbit to branchial region. Palm of chela densely granulate, with ridge just above lower edge continued to end of fixed finger, finger fringed with setae, line of granules through middle. Fingers wide, slightly gaping, apices crossing, dactyl with large triangular tooth, fixed finger also with tooth. Dactyls of pereopods 2–5 slender. Pereopod 2 reaching middle of dactyl of pereopod 3. Pereopod 4 much larger than others, with dorsal margin of merus, carpus, propodus serrate; ventral margin of merus also serrate. Pereopod 5 setose, reaching middle of carpus of pereopod 4. Female carapace length 5.7 mm.

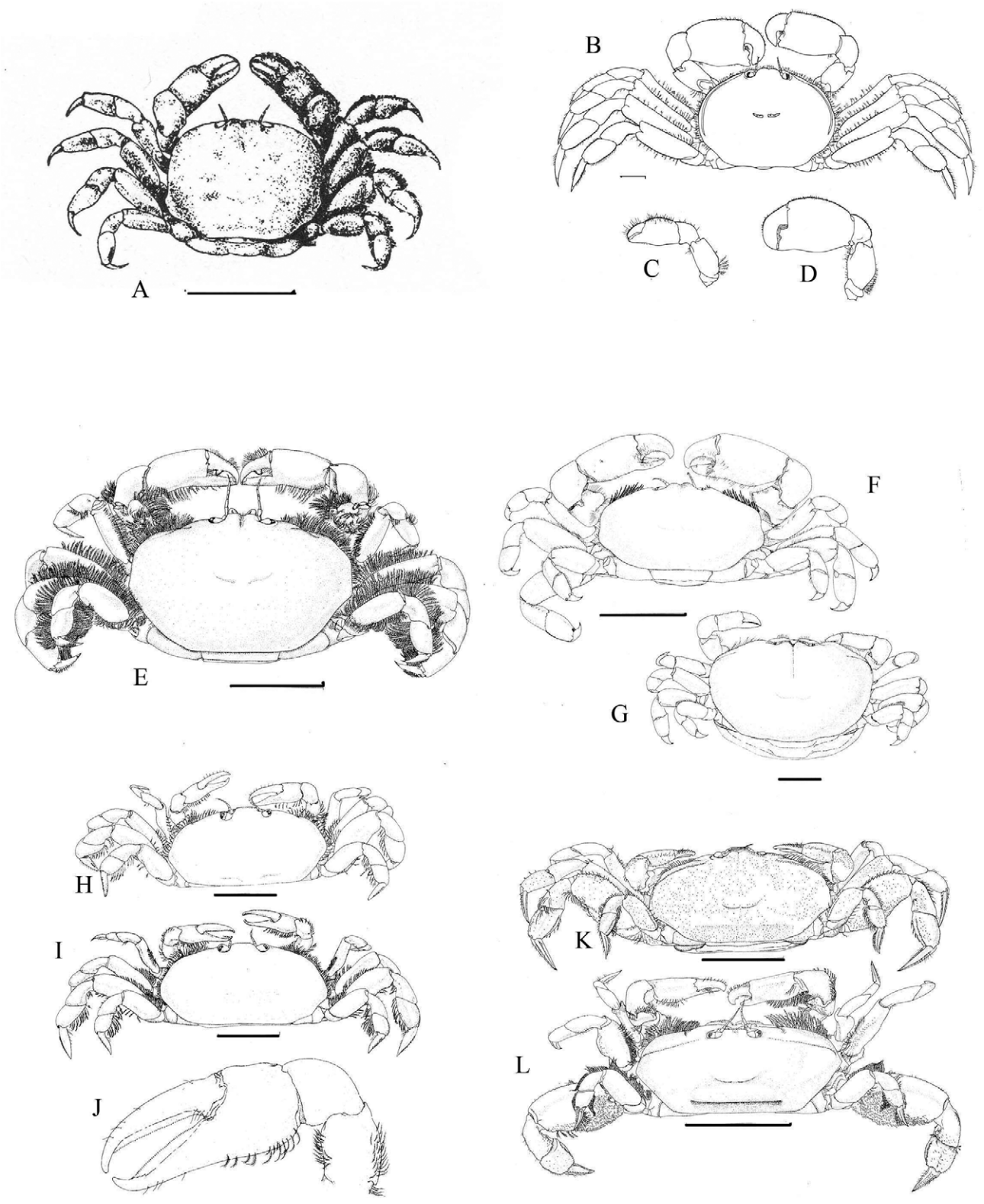

FIGURE 57. Family Pinnotheridae. A, *Opisthopus transversus* Rathbun, 1893; B–D, *Scleroplax granulata* Rathbun, 1893; B, dorsal view; C, right cheliped of female; D, right cheliped of mature male. E, *Pinnixa barnharti* Rathbun, 1918. F, G *Pinnixa faba* (Dana, 1851); F, male; G, female. H–J, *Pinnixa forficulimanus* Zmarzly, 1992; H, male; I, female; J, cheliped. K, L, *Pinnixa franciscana* Rathbun, 1918; K, female; L, male. Scales: B, H, I = 2 mm; C, G, K, L = 5 mm; A, F = 7 mm. A from Schmitt 1921, B–D from Hart 1982, E-L from Zmarzly 1992.

Color in life. Dirty brown to golden brown. The color notes are from crabs from Princeton Harbor, San Mateo County, California.

Habitat and depth. Sandy mud, symbiotic with echiurans, polychaetes, callianassid shrimp; intertidal zone to 47 m.

Range. San Francisco Bay, California to Turtle Bay, Baja California. Type locality east of Point San Quentin, San Francisco Bay (*Albatross* sta. D5709).

Pinnixa hiatus Rathbun, 1917

(Fig. 58A, B)

Pinnixa hiatus Rathbun, 1917: 164, pl. 36, figs. 1–4, text fig. 102. — Schmitt 1921: 265, pl. 43, figs. 1–4. — Schmitt *et al*. 1973: 111. — Zmarzly 1992: 690, fig. 8.

Diagnosis. Carapace about twice as wide as long, anterolateral margin without definite angle, marked by raised and granulate ridge up to hepatic region; posterior margin long, straight; front advanced, widely emarginate. Surface smooth, sparingly punctate, groove behind gastric region. Subhepatic region prominent. Chelae robust. Palm suboblong, upper margin convex, lower margin of palm, fixed finger with granulate ridge on distal half just above lower edge. Dactyl curved, with ridge and tooth near middle. Fixed finger shorter than dactyl, curving up toward it, having large tooth; in male, finger deeply excavate at distal apex, forming notch into which apex of dactylus can insert. Fingers gaping when closed. Anterior edge of merus, posterior of propodus of pereopods 2–5 finely serrate, posterior edge of merus coarsely granulate, dactyls elongate, slender. Pereopod 2 most slender. Posterior margin of pereopod 3, both margins of pereopod 5 fringed with setae. Female carapace length 3.6 mm.

Color in life. Not reported.

Habitat and depth. In green sand or mud, 27–100 m. Symbiotic associations unknown.

Range. Goleta, Santa Barbara County to San Diego and offshore islands, California. Type locality off Santa Catalina I., California.

Pinnixa littoralis Holmes, 1894

(Fig. 58D, E)

Pinnixa littoralis Holmes, 1894: 571, pl. 20, figs. 14–16. — Rathbun 1904: 188; 1917: 145, pl. 31, figs. 5–8, text fig. 89, 90. — Weymouth 1910: 58 (part). — Schmitt 1921: 260, pl. 40, figs. 5–8, text fig. 155. — Johnson & Snook 1927: 393, figs. 349, 356. —Garth & Abbott 1980: 616, fig. 25.36 —Hart 1982: 236, fig. 98. — Ricketts *et al*. 1985: 377. — Campos-Gonzalez 1986: 238. — Zmarzly1992: 693, fig. 9. — Jensen 1995: 31, fig. 42.

Diagnosis. Carapace about twice as long as wide, pointed at sides, flattened above, with transverse depression behind median region. Orbits pointed at outer angle. Hands of chelipeds compressed, fingers gaping, especially in adult male, dactyl strongly curved, fingers usually without teeth. Pereopods 2–5 slender, pereopod 4 thickest. Propodus of pereopods 2–5 elongate, dactyl strongly curved, shorter than propodus. Merus of pereopod 4 broad. Dactyl of pereopod 5 slightly exceeding end of merus of pereopod 4 when extended. Carapace length 4.5 mm.

Color in life. Grayish white, pereopods 2–5 often with brownish-tipped (Schmitt 1921).

Habitat and depth. Usually living in mantle cavity of pelecypods, rarely with tube anemones (order Ceriantharia); intertidal to 91 m.

Range. Sitka, Alaska to Santa Maria, Baja California, Mexico. Type locality Bodega Bay, California.

Remarks. Juveniles of *P. littoralis* and *P. faba* may be nearly impossible to differentiate (Zmarzly 1992).

Pinnixa longipes (Lockington, 1877)

(Fig. 58C)

Tubicola longipes Lockington, 1877c: 55.

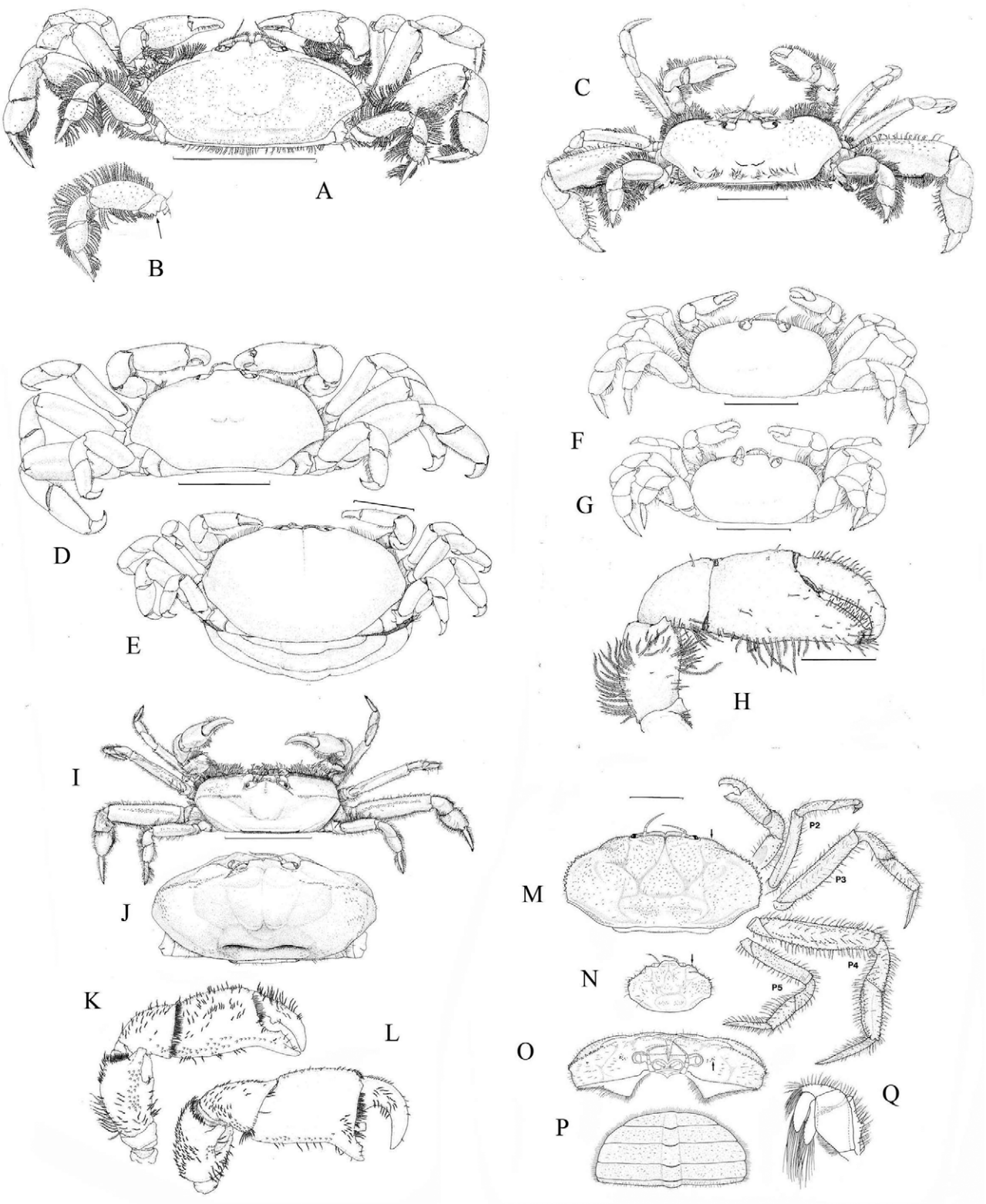

FIGURE 58. Family Pinnotheridae. A, B, *Pinnixa hiatus* Rathbun, 1918; A, entire crab; B, detail of pereopod 5. C, *Pinnixa longipes* (Lockington, 1877). D, E, *Pinnixa littoralis* Holmes, 1894; D, male; E, female. F–H, *Pinnixa minuscula* Zmarzly, 1992; F, female; G, male; H, male cheliped. I–L, *Pinnixa occidentalis* Rathbun, 1893; I, male; J, carapace of juvenile male; K, female cheliped; D, male cheliped. M–Q, *Pinnixa scamit* Martin & Zmarzly, 1994; M, female carapace and appendages; N, carapace of immature crab; O, carapace in frontal view; P, female abdomen; Q, third maxilliped. Scales: F, G, M = 2 mm; C = 2.5 mm, A, I 4 mm; D = 4 mm, E = 5 mm. A–L from Zmarzly 1992, M–Q from Martin & Zmarzly 1994.

Pinnixa longipes. — Holmes 1900: 92. — Rathbun 1904: 188; 1917: 137, figs. 80, 81. — Weymouth 1910: 58, text fig. 6. — Schmitt 1921: 257, text fig. 152. — Johnson & Snook 1927: 392, fig. 348. — Schmitt *et al*. 1973: 113. — Garth & Abbott 1980: 617, fig. 25.38. — Ricketts *et al*. 1985: 307, fig. 238. — Zmarzly 1992: 695, fig. 10. — Campos-Gonzalez 2007: 645, pl. 322 B1.

Diagnosis. Carapace more than twice as long as wide, with acute lateral angle, somewhat flattened, with transverse depression behind gastric area. Frontal area concave, dissected by deep longitudinal groove. Anterolateral region smooth, rarely with weakly granulate ridge. Body entirely surrounded by fringe of long plumose setae. Chelipeds small, short, setose; chelae stout, those of mature male more robust than female.Inner margin of dactyl with single triangular tooth; inner margin of fixed finger irregularly serrated. Gape present when fingers closed.Anterior face of propodus with tubercles just above ventral margin. Pereopods 2, 3 slender, similar; with long, slender, nearly straight dactyls nearly equal to length of propodi. Pereopod 4 enormously developed relative to other legs. Posterovental margin of ischium tuberculate. Dorsal margin of merus smooth to serrate, posteroventral margin of merus denticulate, produced as shelf. Ventral margin of propodus granulate. Dactyl short, thick. Pereopod 5 short, not reaching end of merus of pereopod 4, slender, more stout than pereopods 2, 3; dactyl short, stout. Carapace length 3.2 mm.

Color in life. Pale brownish to yellowish white; see color photograph by Garth & Abbott (1980: fig. 25.37).

Habitat and depth. Sandy sediments, living with polychaete worms *Axiothella rubrocincta*, *Pectinaria californiensis* Hartman, 1941; *P. granulata* (Linnaeus, 1757); and *Pista elongata* Moore, 1909; rarely echiurans; intertidal zone to 128 m. In southern California, common at 45 m.

Range. Bodega Bay, California to Ensenada, Baja California, Mexico. Type locality Tomales Bay, California.

Pinnixa minuscula Zmarzly, 1992

(Fig. 58F–H)

Pinnixa minuscula Zmarzly, 1992: 697, fig. 11.

Diagnosis. Carapace oval, 1.7–2.0 times as wide as long, surface smooth, flat; anterolateral region smooth, without ridge, slight depression in gastric region.Ventrally directed edge of anterolateral region granulate, sometimes with long plumose setae. Chelae sexually dimorphic. Female, immature male with fingers about equal in length to palm, apices of fingers curving inward, apex of dactyl closing into toothed pocket on fixed finger. Dorsal margin of dactyl with 6–10 tubercles, sparsely setose. Inner margin of dactyl concave, with small serrations. Fixed finger robust, with small serrations. No gape when closed. Mature male with more robust chela, palm wider than in female, fingers relatively shorter. Pereopods 2–5 flattened, with long slender dactyls. Pereopod 4 most robust, its propodus with 4–6 sharp spines on ventral margin. Dactyl of pereopod 5 reaching distal end of carpus of pereopod 4. Carapace length about 2 mm.

Color in life. Carapace somewhat translucent, internal organs visible within, otherwise orange brown (Zmarzly 1992).

Habitat and depth. Sandy substrates, 27–50 m. Symbiotic associations unknown.

Range. Goleta, Santa Barbara County to San Diego, California. Type locality San Diego.

Pinnixa occidentalis Rathbun, 1893

(Fig. 58I–L)

Pinnixa occidentalis Rathbun, 1893: 248; 1904: 187, pl. 7, fig. 4, pl. 9, figs. 6, 6a (part); 1917: pl. 34, fig. 1, text fig. 96. — Holmes 1900: 8. — Weymouth 1910: text fig. 3. — Schmitt 1921: 262, pl. 42, figs. 5, 6; text fig. 156. — Schmitt *et al*. 1973: 115. — Hart 1982: 242, fig. 101. — Zmarzly 1992: 700, fig. 12. — Campos-Gonzalez 2007: 646.

Pinnixa californiensis Rathbun, 1893: 249; 1904: 187, pl. 7, fig. 3. — Holmes 1900: 90. — Weymouth 1910: 56 (part).

Diagnosis. Carapace about twice as long as wide, dorsal surface pitted, irregular. Carapace with cardiac crest, crest bilobed in males; anterolateral margin with granulated ridge running from orbit diagonally outward, backward; crossing hepatic region. Chelipeds stout, setose, immovable finger short, markedly deflexed, with stout tooth in

middle, small tooth near apex; dactyl much curved, with or without tooth at middle. Male chela more robust than that of female, with proportionally shorter fixed finger having stout, flat tooth proximally. Pereopods 2–5 setose, dactyls slender. Pereopod 2 shorter than chelipeds, pereopod 3 longer stronger than pereopod 2; pereopod 4 longest, pereopod 5 with dactyl as long as propodus, reaching carpus of pereopod 4. Male carapace length 9.5 mm, female 10.5 mm.

Color in life. Dirty white. The color note is based on specimens taken in box cores off Santa Barbara County, California.

Habitat and depth. In green sand or mud, free-living or symbiotic with echiuroid worms (*Echiurus alaskanus* Fisher, 1948; *Listriolobus pelodes* Fisher, 1946), shallow subtidal zone to 439 m. Very common along continental shelf of southern California.

Range. Unalaska to Magdalena Bay, Baja California. Unverified report from "Gulf of California." Type locality south of Unimak I., Alaska.

Remarks. Hart (1982) suggested that *P. occidentalis* might in fact represent a species complex.

Pinnixa scamit Martin & Zmarzly, 1994

(Fig. 58M–Q)

Pinnixa scamit Martin & Zmarzly, 1994: 354, figs. 1, 2. — Campos-Gonzalez *et al.* 1998: 378, fig. 5. — Campos-Gonzalez 2007: 646.

Diagnosis. Carapace twice as wide as long, highly sculptured, with anterolateral ridge bearing pronounced, slightly anteriorly-curved teeth; frontal margin with deep median cleft; cardiac ridge present and granular. Chelipeds slightly dimorphic, left larger. Fixed finger slightly deflexed, its length nearly half of length of palm. Dactyl, fixed finger each with pronounced tooth at approximately midlength, row small transparent teeth merging distally into sharp ridge along cutting edges. Palm with scattered short setae, granules on outer surface, serrate ridge on dorsal border. Carpus, merus with acute teeth on dorsolateral, dorsodistal surfaces. Pereopods 2–5 long, slender. Each pereopod with row of well developed teeth on dorsal, ventral borders of merus, carpus, propodus. Dactyls more or less straight. Pereopod 4 longest, its propodus with ventral margin bearing two ridges. Carapace width 7.4 mm.

Color in life. Not reported.

Habitat and depth. Slime-clay bottom, 27–48 m, 3ll m. Commensal associations unknown, but specimens from Todos Santos Bay taken in samples with numerous polychaetes (Campos-Gonzalez *et al*. 1998).

Range. Western Santa Barbara Channel, SSW of Point Arguello, California (type locality) and Todos Santos Bay, Baja California, Mexico.

Remarks. This species is included in the key to intertidal pinnotherids of central California and Oregon by Campos (2007), but there are no records of the crab north of Point Arguello.

Pinnixa schmitti Rathbun, 1918

(Fig. 59A)

Pinnixa schmitti Rathbun, 1918: 162, pl. 35, figs. 6,7, 9; text fig. 101. — Schmitt 1921: pl. 42, figs. 7–9, text fig. 157. — Schmitt *et al*. 1973: 120. — Garth & Abbott l980: 617. — Wicksten 1980c: 360.—Hart 1982: 244, fig. 102. — Ricketts *et al.* 1985: 387. — Zmarzly 1992: 702, figs. 13, 14. — Campos-Gonzalez 2007: 646, pl. 325 B3.

Diagnosis. Carapace 1.8–2.2 times wider than long, laterally truncate; with prominent ridge of small, tightly packed granules curving along dorsal surface ending at hepatic region. Numerous scattered granules along frontolateral parts of carapace. Perimeter of dorsal carapace pitted. Gastric region with transverse depression. Palm of chela swollen, upper, lower surfaces sinuous to slightly convex; outer, upper surfaces granulate in female, shiny, smooth in mature male. Apices of fingers of chela curving inward, without gape in female, with small gape in male. Inner margin of dactyl with small proximal tooth, fixed finger with several small teeth toward proximal end. Carpus of female cheliped scalloped. Pereopods 2–5 setose, with relatively long, slender dactyls. Rows of granules on merus of pereopods 2–5, also on carpus, propodus of pereopods 4, 5. Pereopod 4 longest, pereopod 5 reaching carpus of pereopod 4. Carapace length 5 mm.

Color in life. Not reported.

Habitat and depth. In sand, common in bays, symbiotic with echiuroids, holothuroids, polychaetes, callianassids, rarely ophiuroids; intertidal zone to 146 m

Range. Port Levasheff, Unalaska, Alaska to San Diego, California. Type locality San Francisco Bay, California.

Pinnixa tomentosa Lockington, 1877

(Fig. 59B, C)

Pinnixa tomentosa Lockington, 1877d: 156. — Rathbun 1917: 141, pl. 30, fig. 8, text figs. 85, 86. — Schmitt 1921: 258, text fig. 153. — Schmitt *et al*. 1973: 121. — Scanland & Hopkins 1978: 636, figs. 1A–C, 2A–C. — Garth & Abbott 1980: 617. — Zmarzly 1992: 706, fig. 15. — Campos-Gonzalez 2007: 645.

Diagnosis. Carapace 1.7–2.5 times as long as wide, rounded, sloping toward margins; shallow depression behind gastric region, cardiac region swollen. Transverse depression behind margin of front; anterolateral margin with granulated line on branchial region. Carapace, pereopods setose. Hand of chela oblong, margins convex. Fingers with hooked apices, each with small tooth near midpoint, not gaping when closed. Pereopod 2 slender, short; pereopod 3 nearly as long as pereopod 4 but less stout, dactyls of pereopods 2, 3 slender, slightly curved. Dactyls of pereopods 4, 5 stout, short, not hooked. Pereopod 4 broad, propodus nearly square, pereopod 5 similar to pereopod 4 but much smaller, reaching to end of merus of pereopod 4. Female carapace length 7.5 mm, male smaller.

Color in life. Carapace mottled brown and cream, appendages light tan (Scanland & Hopkins 1978).

Habitat and depth. Symbiotic with polychaetes, especially *Chaetopterus variopedatus*; intertidal to 21 m.

Range. Monterey, California to Cape San Lucas, Baja California; in Gulf of California at San Felipe, Point Cholla, and Angeles Bay. Type locality Angeles Bay, Gulf of California. Most records are from southern California.

Pinnixa tubicola Holmes, 1894

(Fig. 59F, G; Pl. 15C)

Pinnixa tubicola Holmes, 1894: 569, pl. 20, figs. 17, 18; 1900: 91. — Rathbun 1904: 187; 1917: 165, fig. 103, pl. 36, figs. 5–8. — Weymouth 1910: 57, text fig. 4. — Schmitt 1921: 265, pl. 43, figs. 5–8. — Johnson & Snook 1927: 394. — Schmitt *et al*. 1973: 122. — Scanland & Hopkins 1978: 636, figs. 1D–F, 2D–F .— Garth & Abbott 1980: 617, fig. 25.39. — Hart 1982: 238, fig. 99. — Ricketts *et al*. 1985: 82. — Zmarzly 1992: 709, fig. 16. — Jensen 1995: 31, fig. 43. — Campos-Gonzalez 2007: 645, pl. 322 C1.

Diagnosis. Carapace subcylindrical, 2.5 times wide as long in female to twice as wide as long in male, transverse depression behind gastric region, from which carapace curves sharply downward; outer portion of anterolateral margin defined by ridge. Chelipeds small, hand oblong, fingers hooked at apices, inner margins meeting when closed, immovable finger curved upward distally; lower margin of palm convex. Pereopod 2 slender with slender dactyls equal in length to propodi. Pereopod 3 longer, stouter than pereopod 2, with relatively stouter dactyls. Pereopod 4 stout, little longer than pereopod 3, with short, stout dactyls. Pereopod 5 similar to but shorter than third, not exceeding end of merus of pereopod 4. Propodi of pereopods 3, 4 inflated, only slightly longer than wide. Length of carapace 4 mm.

Color in life. Golden brown with spots of bluish gray or white on dorsal surface, lighter , uniform in color on ventral surface (Schmitt 1921).

Habitat and depth. Sand or mud, symbiotic with polychaetes, often living in male-female pairs; intertidal zone to 57 m.

Range. Prince Rupert, British Columbia to Blanca Bay, Baja California; unverified reports from "Alaska." Type locality not specified; type material from Trinidad (Humboldt County), Cape Mendocino, and Bodega Bay, California.

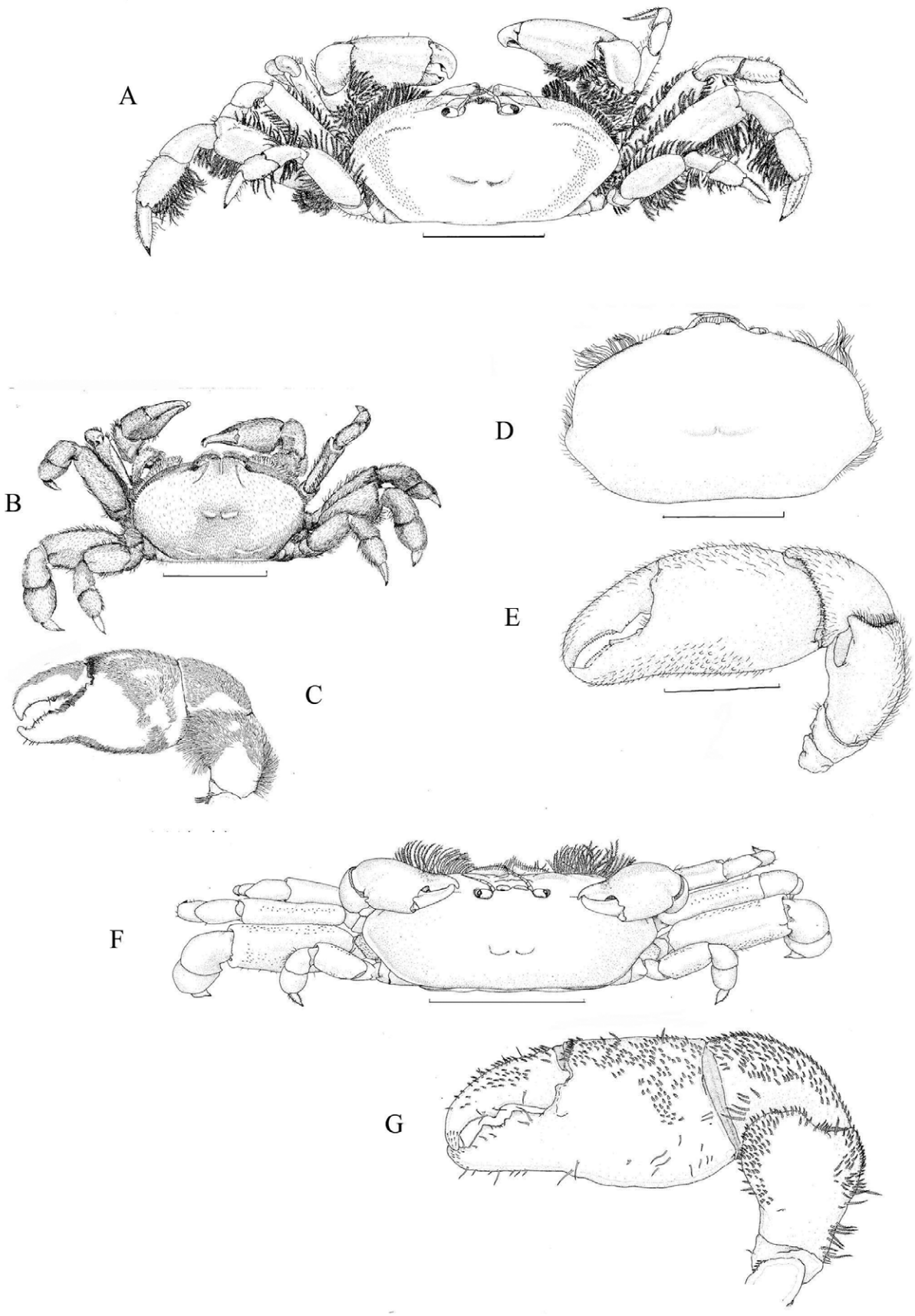

FIGURE 59. Family Pinnotheridae. A, *Pinnixa schmitti* Rathbun, 1918. B, C, *Pinnixa tomentosa* Lockington, 1877; B, dorsal view; C, male cheliped. D, E, *Pinnixa weymouthi* Rathbun, 1918; D, carapace, E, cheliped. F, G, *Pinnixa tubicola*. F, entire crab; G, cheliped. Scales: D = 2 mm, A = 3 mm, B, F = 5 mm. From Zmarzly 1991.

Pinnixa weymouthi Rathbun, 1910
(Fig. 59D, E)

Pinnixa californiensis Weymouth, 1910: 56 (part, see Rathbun 1917).
Pinnixa weymouthi Rathbun, 1917: 166, pl. 36, figs. 9,10, text fig. 104. — Schmitt 1921: 266, pl. 43, figs. 9, 10. — Schmitt *et al*. 1973: 124. — Garth & Abbott 1980: 618, fig. 25.40. — Zmarzly 1992: 710, fig. 17. — Campos-Gonzalez 2007: 646, pl. 323 C.

Diagnosis. Carapace smooth, sides subtruncate, anterolateral angels prominent; front advanced but deflexed, weakly bilobed; transverse depression in gastric region. Palm of chela with short coarse setae, scattered granules. Dactyl setose dorsally, longer than fixed finger, with small triangular tooth toward proximal end, row of small teeth near apex of dactyl. Fixed finger with triangular tooth at middle, small teeth opposite those of dactyl. Fingers with small gape proximally when closed. Pereopods 2–5 fringed with setae, with nearly straight dactyls.Ventral margin of propodus of pereopod 3 with 6 spines, that of pereopod 4, 5 with 4 spines. Pereopod 4 longest, thickest. Dactyl of pereopod 5 extending to carpus of third leg. Male carapace length 3.3 mm, female not reported.

Color in life. Yellowish white; see color photograph by Garth & Abbott (1980: fig. 25.40).

Habitat and depth. In polychaete tubes, low intertidal zone to 10 m.

Range. Monterey and Pacific Grove, California. Type locality Monterey Bay, California.

Remarks. Weymouth (1910) did not seem to know that Rathbun (19893) had used the name *Pinnixa californiensis*. That name now is considered to be a junior synonym of *Pinnixa occidentalis*. Garth & Abbott (1980) gave the only figure of this species that was based on a specimen other than the type material.

Pinnotheres Bosc, 1802

Pinnotheres pugettensis Holmes, 1900
(Fig. 60A, B)

Pinnotheres pugettensis Holmes, 1900: 86. — Rathbun 1904: 185; 1917: 63, pl. 17, figs. 7, 8; pl. 18, fig. 1, text fig. 39. — Johnson & Snook 1927: 390. — Schmitt *et al*. 1973: 82. — Garth & Abbott 1980: 613. — Hart 1982: 232, fig. 96. — Jensen 1995: 32, fig. 45.

Diagnosis. Female: carapace soft, smooth, subpentagonal. Front triangular, curved downwards. Orbits nearly circular. Antennae short. Third maxillipeds oblique, strongly pubescent; merus narrow with outer margin convex; penultimate joint broad, subquadrate, distally truncated; dactyl inserted at lower proximal edge. Cheliped smooth, merus short, upper margin with setae, hand narrow, elongate, smooth; dactyl, inner side of palm short, pubescent; fingers nearly straight with hooked apices, dactyl with low tooth near base of inner margin. Pereopods 2–5 increasing in length posteriorly, propodi setose, dactyls narrow, compressed, apex forming short, curved claw. Dactyl of pereopod 5 longer than propodus, longer than that of pereopod 4. Carapace length 10 mm. Male: Smaller than female, entire body usually covered by dense brown pile. Carapace slightly longer than wide to about as long as wide, front produced, with medial sulcus, faint grooves along gastric, cardiac regions. Orbits, antennae small. Third maxilliped similar to that of female, last two segments slightly shorter. Abdomen with 7 segments, tapering from proximal end to obtusely pointed apex. Chelipeds robust, chela with groove on inner surface from articulation of dactyl to proximal dorsal edge. Fingers of chelae with acute apices, crossing; fixed finger with row of sharp teeth on cutting edge. Pereopods 2–5 decreasing gradually in length from anterior to posterior, robust, pilose. Pereopods 2–4 with long setae on propodus or propodus, carpus. Dactyls acute, long, subequal in size. Carapace length to 5.8 mm, width to 6.4 mm.

Color in life. Female very pale, almost translucent white to yellowish, outer surface of palm of chela with light-colored net-like pattern. Male light brown (Hart 1982).

Habitat and depth. Symbiotic with large solitary ascidians, sponge *Tethya californiana* (de Laubenfels, 1932); and rock scallop *Crassadomas gigantea* (Gray, 1838); 6–64 m.

Range. Spider Anchorage, British Columbia; Puget Sound, Monterey Bay and King Harbor, Los Angeles County, California. Type locality Puget Sound.

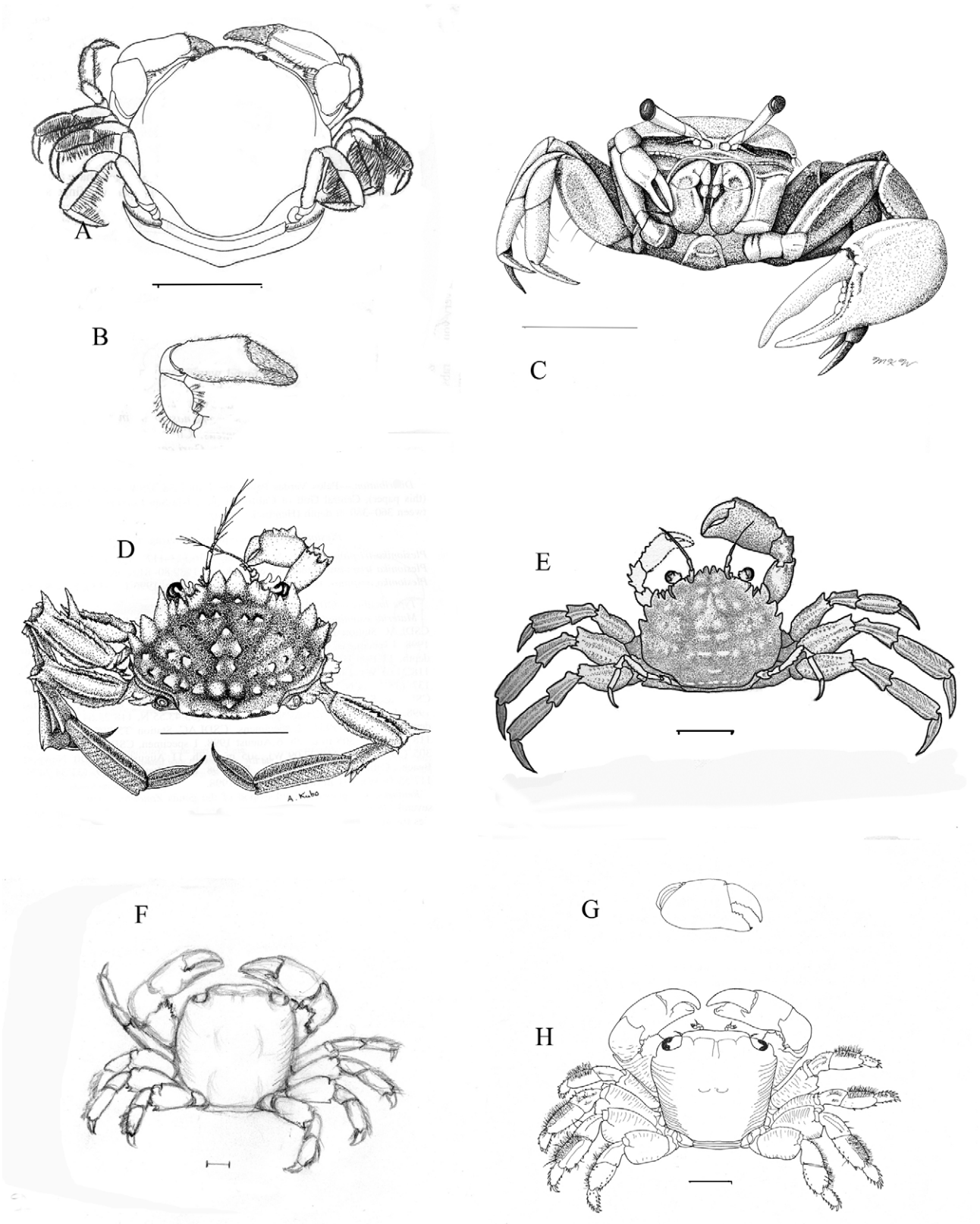

FIGURE 60. Families Pinnotheridae, Ocypodidae, Palicidae, Grapsidae. A, B, *Pinnotheres pugettensis* Holmes, 1900; A, entire crab; B, chela. C, *Uca crenulata crenulata* (Lockington, 1877). D, *Palicus cortezi* (Crane, 1937). E, *Palicus lucasii* Rathbun, 1898. F, *Planes major* (MacLeay, 1838). G, H, *Planes marinus* Rathbun, 1915; G, chela; H, crab in dorsal view. Scales: A, C = 5 mm, D–F, H = 10 m. A, B, G, H from Hart 1982, C drawn from crab from Santa Catalina I., D from Montagne & Cadien 2001, E after Rathbun 1917, F drawn from crab from western Panama.

Scleroplax Rathbun, 1893

Scleroplax granulata Rathbun, 1893
(Fig. 57B–D, Pl. 15A)

Scleroplax granulata Rathbun, 1893: 251; 1904: 188, pl. 7, fig. 5; 1917: 171, pl. 37, figs. 1–3, text fig. 109. — Weymouth 1910: 59, text fig. 85. — Schmitt 1921: 267, pl. 44, figs. 1–3. — Johnson & Snook 1921: 394. — Schmitt *et al*. 1973: 96. — Garth & Abbott 1980: 618, fig. 25.41. — Hart 1982: 228, fig. 94. — Ricketts *et al*. 1985: 384, fig. 300. — Jensen 1995: 30, fig. 40. — Campos-Gonzalez 2006: 33, fig. 1 A–C; 2007: 644, pl. 322 D2.

Diagnosis. Carapace subpentagonal, hard, granulate anteriorly near margins; punctate elsewhere; front narrow, produced, slightly convex. Orbits nearly circular, eyestalk short, thick. Antennules almost transverse. Chela of male swollen, heavy; those of female not as large. Dactyl curved, fixed finger with large tooth, fingers gaping. Pereopods 2–5 slender, granulate. Pereopod 4 longest, its segments narrow, flattened; dactyls slender, almost straight, nearly as long as dactyls. Male abdomen narrow, tapering gradually to broad terminal segment, female abdomen fringed with setae. Male carapace length about 3 mm, female to 6 mm.

Color in life. Grayish white, brownish, yellowish mottled with red-brown (Hart 1982).

Habitat and depth. Bays and harbors, symbiotic with echiuroid worm *Urechis caupo*, ghost shrimps *Neotrypaea californiensis*, *N. gigas*, *Upogebia pugettensis*, and *U. macginitieorum*; intertidal zone to 13 m.

Range. Roller Bay, Vancouver I. to El Coyote Estuary, Abreojos Point, Baja California; off Mazatlán, Sinaloa, Mexico. Type locality Ensenada, Baja California.

SUPERFAMILY OCYPODOIDEA Rafinesque, 1815

Family Ocypodidae Rafinesque, 1815

The ghost crabs and fiddler crabs are common in sandy areas, marshes and mangroves swamps of tropical areas. Only one species lives in southern California. Schmitt (1921:278, fig, 163) reported *Ocypode gaudichaudii* (H. Milne Edwards & Lucas, 1843) from "Lower California", perhaps not recognizing that this geographic area usually refers to Baja California, Mexico. Hendrickx (1995c: 142) reported *O. occidentalis* Stimpson, 1860 from Todos Santos Bay, west coast of Baja California. There are no other reports of this species from north of Magdalena Bay, Baja California. Schmitt (1921: 280, fig. 165) reported *Uca musica* Rathbun, 1914 from California, U.S.A. and Vancouver I., British Columbia. These reports probably are based on incorrect locality records. This species is not known from north of Magdalena Bay, Baja California (Crane 1975: 317). Holmes (1900: 76, as *Uca rectilata*) quoted Lockington (1877) in reporting *Gelasimus rectilatus* Lockington, 1877, as from the " west coast of Lower California." According to Crane (1975: 325), the type material of this species was destroyed and the drawings and description are inadequate to identify the species. Holmes (1900: 77) also mentioned that *Uca stenodactyla* (now *U. stenodactylus* (H. Milne-Edwards & Lucas, 1843) "is reported from San Diego by Ortmann." This record may be due to an error in the collection locality or a misidentification. Crane (1975: 284) reported that *U. stenodactylus* ranges from El Salvador to northern Peru.

These active crabs possess elongated stalked eyes that fold into long transverse orbits. The third maxillipeds almost cover the rounded oral field. The carapace is more or less rectangular and without lateral teeth. Members of the family almost entirely inhabit the intertidal zone. Some may construct deep and elaborate burrows. Crane (1975) gave an exhaustive treatment of the species of *Uca* worldwide.

Uca Leach, 1814

Uca crenulata crenulata (Lockington, 1877)
(Fig. 60C, Pl. 15G)

Gelasimus crenulatus Lockington, 1877: 149.
Uca crenulata. — Holmes 1900: 75, pl. 1, figs. 7–9. — Rathbun 1904: 190; 1917: 409, pl. 146. — Schmitt 1921: 279, fig. 164.

— Johnson & Snook 1927: 399, figs. 357, 358. — Ricketts *et al*. 1985: 354, fig. 273. — Hubbard & Dugan 1989: 55. — Jensen 1995: 34, fig. 51.

Uca crenulata crenulata. — Crane, 1975: 232, pl. 30 E-I, figs. 70D, G, 101. — Garth & Abbott 1980: 622, fig. 25.46. — Bonfil *et al*. 1992: 50, fig. 5B.

Diagnosis (modified from Crane 1975). Frontal region narrow, its width less than 0.3 times width of carapace. Orbits nearly straight, suborbital margins with rounded tubercles. Carapace smooth, moderately convex; lateral margins nearly parallel behind acute anterolateral angles, then converging. Male major cheliped with outer surface finely granulated; inner surface with oblique tuberculate ridge running vertically down from dorsal surface, then bending obliquely to run somewhat parallel to gape; two rows of denticles at base of fixed finger. Fingers of old male cheliped longer than those of younger male. Smaller chela of both sexes with fingers equal, gape narrow. Pereopods 2–5 with pile, merus transversely granulate. Abdomen of male with 7 segments. Carapace length to 13 mm in either sex.

Color in life. Carapace grayish white to pale brown. Major chela of male with merus bright red on exterior surface, inner surface of merus, fingers of chela bright white. Palm, inner part of chela yellowish to white. Minor chela pinkish. Merus of pereopod 2 crimson red; otherwise cream-colored; other pereopods marked with cream. Female chelae brownish to cream-colored. See Crane (1975) for a more detailed color description.

Habitat and depth. Upper parts of mud flats and salt marshes, intertidal zone.

Range. Discontinuous, from Goleta, California to Turtle Bay, Baja California, including Santa Catalina I., California; and San Felipe to La Paz and Guaymas to Tenacatita Bay, western Mexico. Type locality Todos Santos Bay, Baja California. A distinct subspecies, *U. crenulata coloradensis* (Rathbun, 1893), lives at the head of the Gulf of California.

Remarks. Fiddler crabs dig burrows in the upper reaches of mud flats and salt marshes. They manipulate balls of sediment in their mouthparts as they extract detritus and other food material. The burrows, mud balls and tracks are good indication of their presence even if the crabs themselves are not visible. Fiddler crabs today live in California mostly in wildlife refuges and other areas protected from human habitat destruction.

SUPERFAMILY PALICOIDEA Bouvier, 1898

Family Palicidae Bouvier, 1898

Two species of this family have been reported from California, both from specimens collected during an El Niño period of warmer waters. Older works refer to this family as the Cympolidae, but the generic name *Cympolia* has been found to be a homonyn. Holthuis & Gottlieb (1958) and Ng *et al*. (2008: 127) gave further information on the nomenclature of this family. Martin & Davis (2001: 56) included this family among the superfamily Ocypodoidea but noted differing opinions on its superfamilial relationships. I follow Ng *et al*. (2008) in placing the family into a separate superfamily based on the location of the genital openings.

Key to species of family Palicidae

1. Carapace with 4 slender frontal teeth . . . . . *Palicus lucasii*
– Carapace with 2 large triangular frontal teeth . . . . . *Palicus cortezi*

Palicus Philippi, 1838

Palicus cortezi (Crane, 1937)

(Fig. 60D)

Cympolia cortezi Crane, 1937: 75, pl. 8, fig. 25. — Garth 1946: 499, pl. 85, fig. 2.
Palicus cortezi. — Montagne & Cadien 2001: 206, fig. 3.

Diagnosis. Carapace wider than long, with 2 large triangular teeth mesial to large eye, 2 sharp anterolateral teeth,

dorsal surface strongly tuberculate. Right cheliped with dactyl deflexed, propodus with large tubercles along margin, carpus also with strong teeth. Pereopods 2–4 wide, with acute ridges on merus, carpus, propodus, dactyl. Sharp dorsal teeth at distal dorsal, ventral margins of merus. Dactyl ovate tapering to acute apex. Pereopod 5 shorter than other pereopods. Male carapace length 6.2 mm (juvenile specimen), female not reported.

Color in life. Not reported.

Habitat and depth. Rock sand, crushed shell and coral, 61–275 m.

Range. Off Palos Verdes Peninsula, Los Angeles County, California to Wenman I., Galapagos Is. Type locality Santa Inez Bay, Gulf of California, Mexico.

Palicus lucasii Rathbun, 1898

(Fig. 60E)

Palicus lucasii Rathbun, 1898a: 600, pl. 43, fig. 2. — Montagne & Cadien 2001: 207.
Cympolia lucasii. — Rathbun 1917: 193, pl. 44, figs. 1, 2, text fig. 119. — Garth 1946: 500, pl. 87, fig. 1.

Diagnosis. Eyes large. Carapace slightly wider than long, with 4 frontal lobes, anterolateral margin with 2 acute teeth beyond exorbital; supraorbital teeth sharp; dorsal surface of carapace tuberculate. In adult male, right chela heavier than left. Chelipeds of male unequal, right larger than left, both shorter than length of pereopod 2. Pereopods 2–5 wide, merus of pereopods 2, 3 with sharp tooth at distal end; merus of pereopod 4 with rounded lobe. In adult male, pereopods 2 with shaggy setae. Dactyls of pereopods 3, 4 with sinuous margins. Pereopod 5 short, slightly longer than merus of leg 3. Male carapace length to 13.5 mm, female not reported.

Color in life. Carapace with solid median band of blood red extending from front to posterior border. Most of carapace white; anterolateral and preorbital teeth blood red, orbital tooth white. Pereopods 2–4 banded with red, white; apex of dactyl white; reduced leg entirely white (Garth 1946).

Habitat and depth. Muddy and sandy bottoms, 9–111 m.

Range. Off Malaga Cove, Palos Verdes Peninsula, California to Galapagos Is. Type locality off Cape San Lucas, Baja California, Mexico.

SUPERFAMILY GRAPSOIDEA MacLeay, 1838

The shore crabs (families Grapsidae and Varunidae) inhabit intertidal regions or floating objects. Recent molecular studies (Schubart *et al*. 2002) tend to validate the elevation of what were considered to be subfamilies by Rathbun (1917) to the level of full families. Fast moving and hardy, they are conspicuous inhabitants of temperate and tropical regions worldwide. Their eyestalks are not as long as those of the Ocypodidae, but their vision apparently is keen. They usually are scavengers and grazers on algae instead of deposit feeders. They do not construct long burrows, as do the Ocypodidae. The crabs often are sexually dimorphic, with the male being larger and more brightly colored than the female.

Except for the smallest crabs, which tend to be translucent to drab, the grapsoid crabs of California and Oregon have characteristic color patterns. A rare color form, in which the carapace is either entirely china white to yellowish or patched with these colors, and pereopods 2–5 are banded, occurs in both species of *Hemigrapsus*.

Three species of grapsoids are common in intertidal areas of California and Oregon. Another two species rarely occur on floating objects, and may be cast ashore after severe storms. Holmes (1900: 84) described yet another grapsoid, *Grapsodius eximius*, from San Diego, California. This crab resembled a species of *Pachygrapsus*, but had the posterior surface of the orbits "bulging outwards." The species was not illustrated, and the type material seems to have been lost. The crab has not been reported since its description. It may have been an aberrant specimen of a species of *Pachygrapsus*. A record of *Pachygrapsus transversus* (Gibbes, 1850) from California (Schmitt 1921: 271, fig. 160) probably is in error. The species ranges from the southern Gulf of California south to Peru.

Family Grapsidae MacLeay, 1838

Key to species of family Grapsidae

1. Carapace broader than long, somewhat trapezoidal, marked with grooves. Anterior edges of pereopods 2–5 without thick fringe of setae. Intertidal . . . . . *Pachygrapsus crassipes*
– Carapace as long as or longer than broad, subcircular, smooth. Anterior edges of pereopods 2–5 with thick fringe of setae. Pelagic, usually found among floating debris or on sea turtle 2
2. Lateral margins of carapace convex, front with slight median depression. Upper margin of cheliped rounded . . . *Planes major*
– Lateral margins of carapace straight, front straight. Upper margin of cheliped angled . . . . . *Planes marinus*

Pachygrapsus Randall, 1840

Pachygrapsus crassipes Randall, 1840
(Fig. 61A, Pl. 15E)

Pachygrapsus crassipes Randall, 1840: 125, pl. 5, fig. 4. — Holmes 1900: 79. — Rathbun 1904: 189; 1917: 241, pl. 59. — Weymouth 1910: 61, pl. 13, fig. 41. — Schmitt 1921: 270, text fig. 159, pl. 45. — Johnson & Snook 1927: 395, figs. 354, 355. — Garth & Abbott 1980: 619, fig. 25.43. — Ricketts *et al*. 1985: 42, fig. 27. — Jensen 1995: 17, fig. 3. — Kuris *et al*. 2007: 641.

Diagnosis. Carapace nearly square, lateral margins broadest behind orbit, entirely upper surface except cardiac, intestinal regions transversely grooved, sides with single tooth posterior to prominent postorbital tooth. Third maxillipeds with merus lobate at antero-internal angle. Chela of adult male broad, heavy; raised line present on upper side of propodus, smaller line on lower portion of outer surface, apice of fingers spooned. Female chela not as broad as in male. Merus of pereopods 2–5 broad, with tooth on posterodistal angle except on pereopod 5; propodus, dactyl of each leg spinulose. Male carapace length 41 mm, female smaller.

Color in life. Carapace dark green with faint whitish stripes, inner surface of chela white, adult male chela bright red above, white below. The color notes are from crabs from Moss Beach, San Mateo County, California.

Habitat and depth. Upper intertidal rocks, sometimes on docks, pilings or mud flats.

Range. Japan, Korea; Charleston, Oregon to Santa Margarita I. and Alijos Rocks, Pacific coast of Baja California; sporadic in Gulf of California. Type locality "Sandwich Islands", but probably in error. Most of Randall's specimens came from California, especially near Monterey, Los Angeles, and San Diego.

Remarks. *Pachygrapsus crassipes* is one of the most common crabs of California and Oregon. The megalops larvae can ride on drifting seaweed or wood, giving the species great capacity for dispersal. The population in Asia may have been introduced in ballast water from ships.

Planes Bowdich, 1825

Planes major (MacLeay, 1838)
(Fig. 60F)

Nautilograpsus major MacLeay, 1838: 66.
Planes cyaneus Dana, 1851: 250. — Chace 1951: 65; 1966: 646. — Hart 1963: 127; 1982: 216, fig. 89. — Manning & Holthuis 1981: 235.
Planes minutus: Rathbun 1904: 189; 1917: 253, pl. 63 (part). — Weymouth 1910: 63. Pl. 14. — Schmitt 1921: 272, pl. 46. — Johnson & Snook 1927: 397, fig. 353. — Garth 1946: 510.
Not *Planes minutus* (Linnaeus, 1758).
Planes major. — Ng & Ahyong 2001: 97, figs. 6 A, B (extensive synonymy).

Diagnosis. Carapace as long as broad, subcircular, almost smooth but for few faint lines on anterior, lateral regions, single blunt tooth behind postorbital angle, front sinuous. Chela broad, fingers somewhat deflexed, with several oblique lines on dorsal, ventral surfaces; somewhat obscure longitudinal line on lower portion of propodus; one tooth on inner margin of lower finger, 2–3 on dactyl. Pereopods 2–5 broad, somewhat flat, especially propodus,

dactyl; anterior margins with dense fringe of setae, 1–3 spinules on lower distal margin of merus. Carapace length 15 mm.

Color in life. Very variable, mottled with yellowish brown or dark brown, white; or blue (Schmitt 1921).

Habitat and depth. Pelagic among floating debris and barnacles (*Lepas* spp.) or on sea turtles, often near tail of sea turtle.

Range. Widespread between 41° N and 35° S in Pacific; eastern Pacific from off British Columbia to Peru; Indian Ocean, South Atlantic Ocean; rare in North Atlantic and Gulf of Mexico.Type locality Pacific Ocean at 28°N, 174° E (west of Midway I.).

Remarks. Specimens of *P. major* from off the Pacific coast of Panama were encrusted by the naked barnacle *Conchoderma virgatum* (Spengler, 1790). Johnson & Snook (1927, as *P. minutus*) reported that these crabs can swim by sweeping pereopods 2–5 like oars, backward and forward in unison.

Ng & Ahyong (2001) re-examined of the type material of *Nautilograpsus major* and found that its generic designation is a junior synonym of *Planes*, but the species name takes precedence over *P. cyaneus*. See this paper for further discussion of the confused nomenclature of this crab.

Planes marinus Rathbun, 1915
(Fig. 60G, H)

Planes marinus Rathbun, 1915: 120, pl. 3; 1917: 258, pl. 64. — Chace 1966: 646. — Hart 1982: 218, fig. 90.
Pachygrapsus marinus. — Chace 1951: 65. — Edmondson 1959: 169, fig. 8b. — Hart 1963: 127.

Diagnosis. Carapace somewhat broader than long, lateral margins nearly straight, converging posteriorly, one blunt tooth behind postorbital tooth; front more or less straight; surface of carapace marked by grooves. Chelipeds heavy, merus marked by short lines, anterodistal border expanded, dentate; carpus with blunt tooth at inner angle, palm swollen, fingers curved, with teeth. Pereopods 2–5 short, flat, merus broad, anterior border of propodus with dense setae, dactyl short, bearing spines, setae. Male carapace length 9 mm, female carapace length to 15 mm.

Color in life. Variable, carapace bright red-brown with dark striations, chocolate brown or light gray, cheliped gray with pink on merus, carpus; pereopods 2–5 banded with light, dark gray or shades of brown (Hart 1982).

Habitat and depth. On floating objects, usually away from shore.

Range. British Columbia to Baja California, off Oahu, Hawaiian Is.; New Zealand, off St. Helena I. in southern Atlantic. Type locality west of "Lower California."

Remarks. There are fewer reports of this species than of *Planes major* in California and Oregon. It has been taken at sea off British Columbia and been cast ashore in Oregon. *Planes major* and *P. marinus* may co-occur on the same drifting log.

Family Varunidae Milne-Edwards, 1853

Key to species of family Varunidae

1. Carapace about as long as wide, frontal margin toothed, outer margin of chelipeds setose. Introduced into San Francisco Bay area . . . . . *Eriocheir sinensis*
– Carapace considerably more broad than long, frontal margin without teeth, outer margin of chelipeds not setose. Widespread, native 2
2. Pereopods 2–5 setose. Front with deep median sinus. Chelae not spotted with red or purple . . . . . *Hemigrapsus oregonensis*
– Pereopods 2–5 not setose. Front somewhat sinuous. Chelae spotted with red or purple . . . . . *Hemigrapsus nudus*

Eriocheir De Haan, 1835

Eriocheir sinensis H. Milne-Edwards, 1853
(Fig. 61B)

Eriocheir sinensis H. Milne-Edwards, 1853: 177; 1854: 146, pl. IX, fig. 1. — Ingle 1980:123, fig. 76, pl. 24b (extensive

synonymy). — Cohen & Carlton 1995: 95; 1997: 1. — Debelius 1999: 96. — Clark 2006: 17 (Discussion of the correct date of publication of the original species description). — Gollasch 2006: 1, figs. 1–3. — Kuris *et al*. 2007: 641.

Diagnosis (after Ingle 1980). Carapace slightly broader than long. Frontal region with pair prominently bifid, acute, submedian lobes, pair tuberculate dorsal carinae. Anterolateral margin of carapace with 3 well-developed teeth, posterolateral margin with single small tooth, lateral margins slightly convex, divergent distally. Chelipeds robust, dorsal surface tuberculate, outer face of chela with dense setae extending onto proximal part of dactylus, carpus with long spine. Pereopods 2–5 moderately stout, margins of carpus to dactylus setose. Female with chelipeds slightly smaller than those of male. Carapace length to 62 mm.

Color in life. Dorsal surface of carapace grayish-green, pereopods lighter (Ingle 1980).

Habitat and depth. Estuarine, ranging into freshwater at mouths of rivers, shallow.

Range. Native range eastern Asia from Vladivostok to South China, especially China Sea. Introduced into Great Britain, almost all of the Baltic Sea and North Sea, northeastern Atlantic to Mediterranean Sea, Netherlands, Rhine and Seine River drainages in Europe (Ingle 1980, Noel 1992, Gollasch 2006); San Francisco Bay drainage. Sporadic reports from Volga River, Russia; Great Lakes region, U.S.A. Chesapeake Bay, Hudson River, Mississippi River Delta (Gollasch 2006). Type locality "coast of China."

Remarks. This crab is a nuisance, damaging riverbanks and levees by burrowing, competing with native species and serving as an intermediate host of the human liver fluke. Consult on-line databases of introduced marine species for the latest area in which this crab has been reported.

Hemigrapsus Dana, 1851

Hemigrapsus nudus (Dana, 1851)

(Fig. 61C, Pl. 15D)

Pseudograpsus nudus Dana, 1851: 249; 1852: 335; 1855: pl. 20, fig. 7.
Brachynotus nudus. — Holmes 1900: 81.
Hemigrapsus nudus. — Rathbun 1904: 189; 1917: 267, pl. 68. — Weymouth 1910: 62, pl. 14, fig. 42. — Schmitt 1921: 273, text fig. 161, pl. 47. — Johnson & Snook 1927: 395, fig. 351. — Garth & Abbott 1980: 621, fig. 25.44. — Hart 1982: 222, fig. 92. 320 A. — Jensen 1995: 17, fig. 1,

Diagnosis. Carapace more or less square, posteriorly flat, front somewhat sinuous, with two lateral spines posterior to postorbital spines. Chelipeds smooth, fingers curved, with teeth on margins, spooned; larger in male than in female; male chela with patch of pile on inner surface of propodus. Pereopods 2–5 without setae, dactyls short. Length of male carapace to 45 mm, female smaller.

Color in life. Carapace dark red to purple, upper parts of pereopods 2–5 same color as carapace, lower parts yellowish to white; chelae with conspicuous spots of red to purple (Hart 1982).

Habitat and depth. Tide pools, boulder, cobble fields, upper to middle intertidal zone.

Range. Yakobi I., Alaska to Turtle Bay, Baja California, but uncommon south of Point Conception, California. Type locality Puget Sound. Records of this species from the Gulf of California are in error.

Remarks. This is a very common intertidal crab, usually found in areas that are less silty than where one finds *H. oregonensis*.

Hemigrapsus oregonensis (Dana, 1851)

(Fig. 61D, Pl. 15F)

Pseudograpsus oregonensis Dana, 1851: 248; 1852: 334; 1855: pl. 20, fig. 6.
Brachynotus oregonensis. — Holmes 1900: 82.
Hemigrapsus oregonensis. — Rathbun 1904: 189; 1917: 270, pl. 70. — Weymouth 1910: 63, pl. 14, fig. 43. — Schmitt 1921: 274, text fig. 162, pl. 48. — Johnson & Snook 1927: 396, fig. 352. — Garth & Abbott 1980: 621, fig. 25.45. — Hart 1982: 220, fig. 91.—Ricketts *et al*. 1985: 358, fig. 275. — Campos & de Campos 1989: 174. — Bonfil et al. 1992: 39, fig. 1B. — Jensen 1995: 17, fig. 2. — Kuris *et al*. 2007: 641.

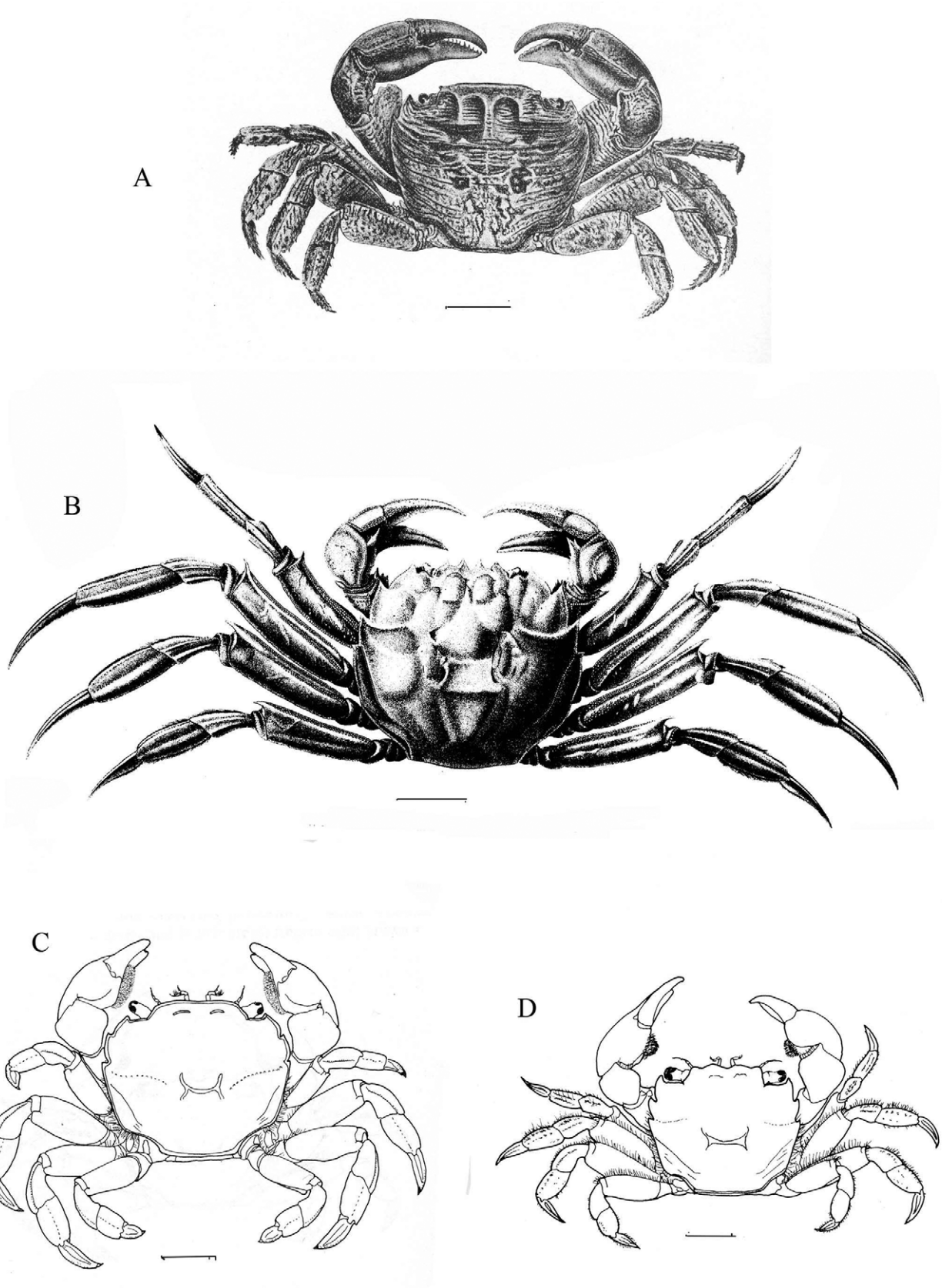

FIGURE 61. Families Grapsidae, Varunidae. A, *Pachygrapsus crassipes* Randall, 1839. B, *Eriocheir sinensis* H. Milne-Edwards, 1853. C, *Hemigrapsus nudus* (Dana, 1851). D, *Hemigrapsus oregonensis* (Dana, 1851). Scales = 10 mm. A from Schmitt 1921, B from H. Milne-Edwards 1853, C, D from Hart 1982.

Diagnosis. Carapace more or less square, smooth, with 2 lateral teeth posterior to postorbital tooth. Front with deep median sinus. Chelipeds smooth, adult male with rounded lobe on antero-internal angle of merus, patch of setae on inner surface of propodus; fingers of cheliped curved, with teeth, spooned. Pereopods 2–5 with coarse, sparse setae, dactyls narrow. Male carapace length to 29 mm, female smaller.

Color in life. Greenish to muddy gray, sometimes with minute black dots; fingers of chela white, without red-purple spots (Hart, 1982).

Habitat and depth. Salt marshes, mud flats; quiet, protected tide pools, gravel flats, intertidal zone.

Range. Resurrection Bay, Alaska to Tortugas Bay, Baja California, Mexico. Type locality Puget Sound.

Remarks. In bays and harbors, *H. oregonensis* can occur by the hundreds.

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Alphabetical Species Index

Species that have been reliably reported within the past 100 years from the area of coverage and seem to be regular visitors or resident species are indicated in bold; species erroneously reported, one-time or very local introductions, or species whose identification is in doubt are indicated by regular font.

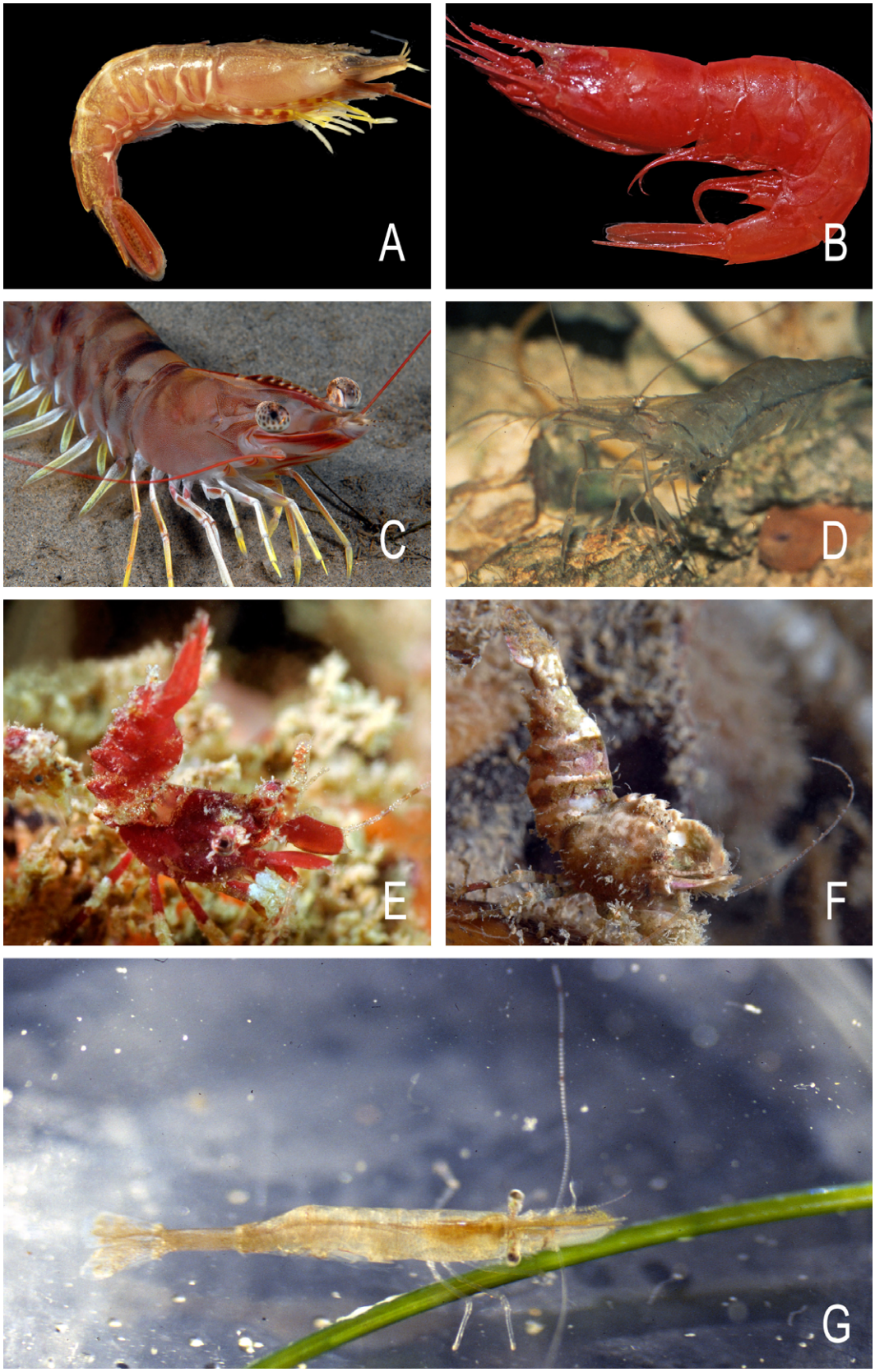

PLATE 1. A, *Sicyonia ingentis*, (Burkenroad, 1938); off Newport Bay; B, *Acanthephyra eximia* Smith, 1884; northern Gulf of Mexico; C, *Farfantepenaeus californiensis*, (Holmes, 1900); Redondo Submarine Canyon; D, *Palaemon macrodactylus* (Rathbun, 1902); aquarium, San Francisco Bay; E, *Lebbeus lagunae* (Schmitt, 1921); Palos Verdes Peninsula; F, *Spirontocaris prionota* (Stimpson, 1864); La Jolla Shores, San Diego County; G, *Hippolyte clarki* Chace, 1951; Santa Catalina I. Photo credits: C, E, F, by Kevin Lee.

PLATE 2. *Lysmata californica* (Stimpson, 1866); with California moray, *Gymnothorax mordax*, Laguna Beach. Photo credit: Kevin Lee.

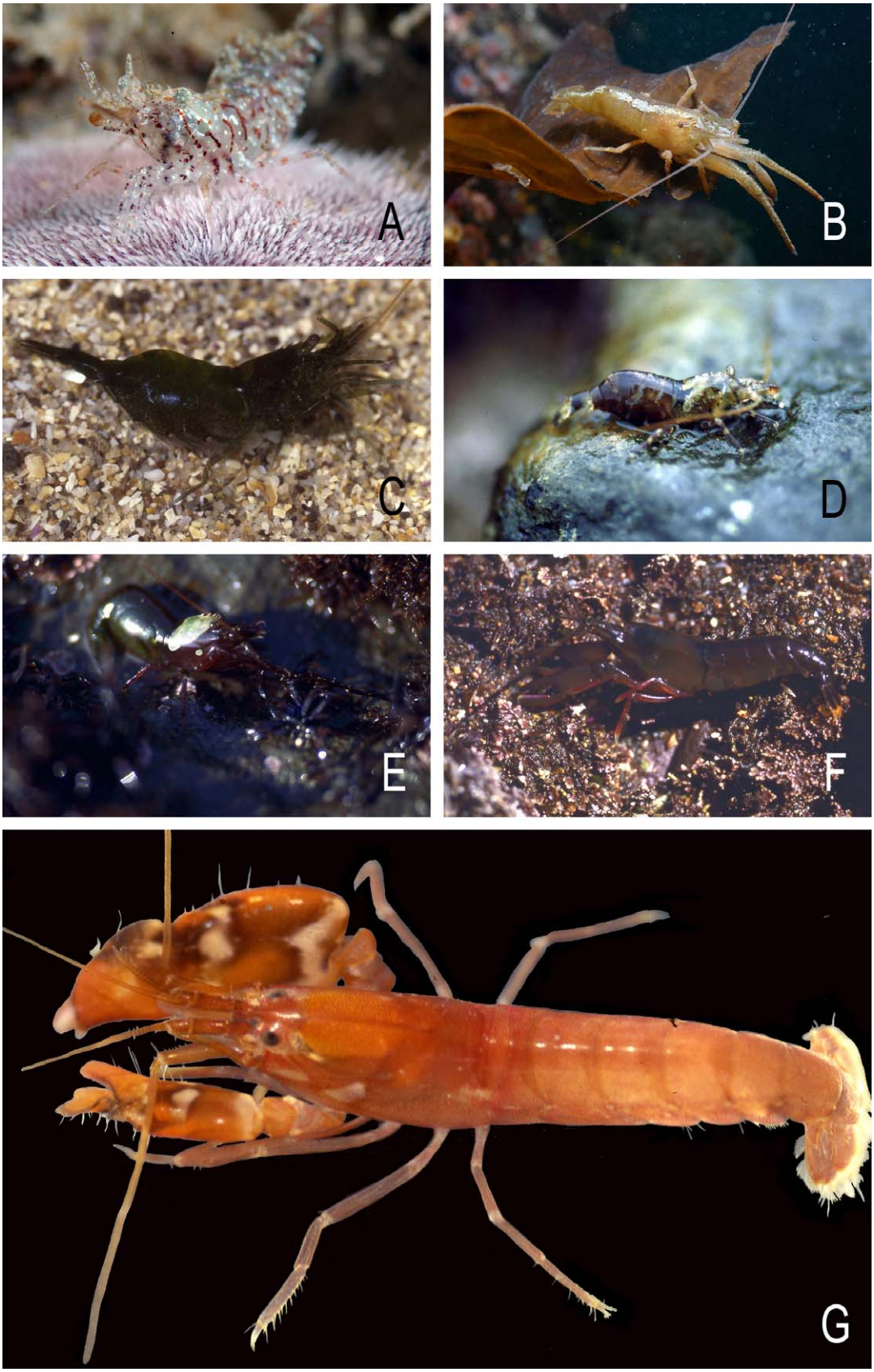

PLATE 3. A, *Spirontocaris snyderi* Rathbun, 1902; La Jolla Shores, San Diego County; B, *Heptacarpus palpator* (Owen, 1839): Monterey Bay: C, *Heptacarpus sitchensis* (Brandt, 1851); Pillar Point, San Mateo County; D, *Heptacarpus brevirostris* (Dana. 1852); Pillar Point; E, *Heptacarpus taylori* (Stimpson, 1857); Pillar Point; F, *Betaeus longidactylus* Lockington, 1877; Point Fermin, Los Angeles County; G, *Alpheus bellimanus* Lockington, 1877; off Newport Bay. Photo credits: A, Kevin Lee; B, Steve Lonhart.

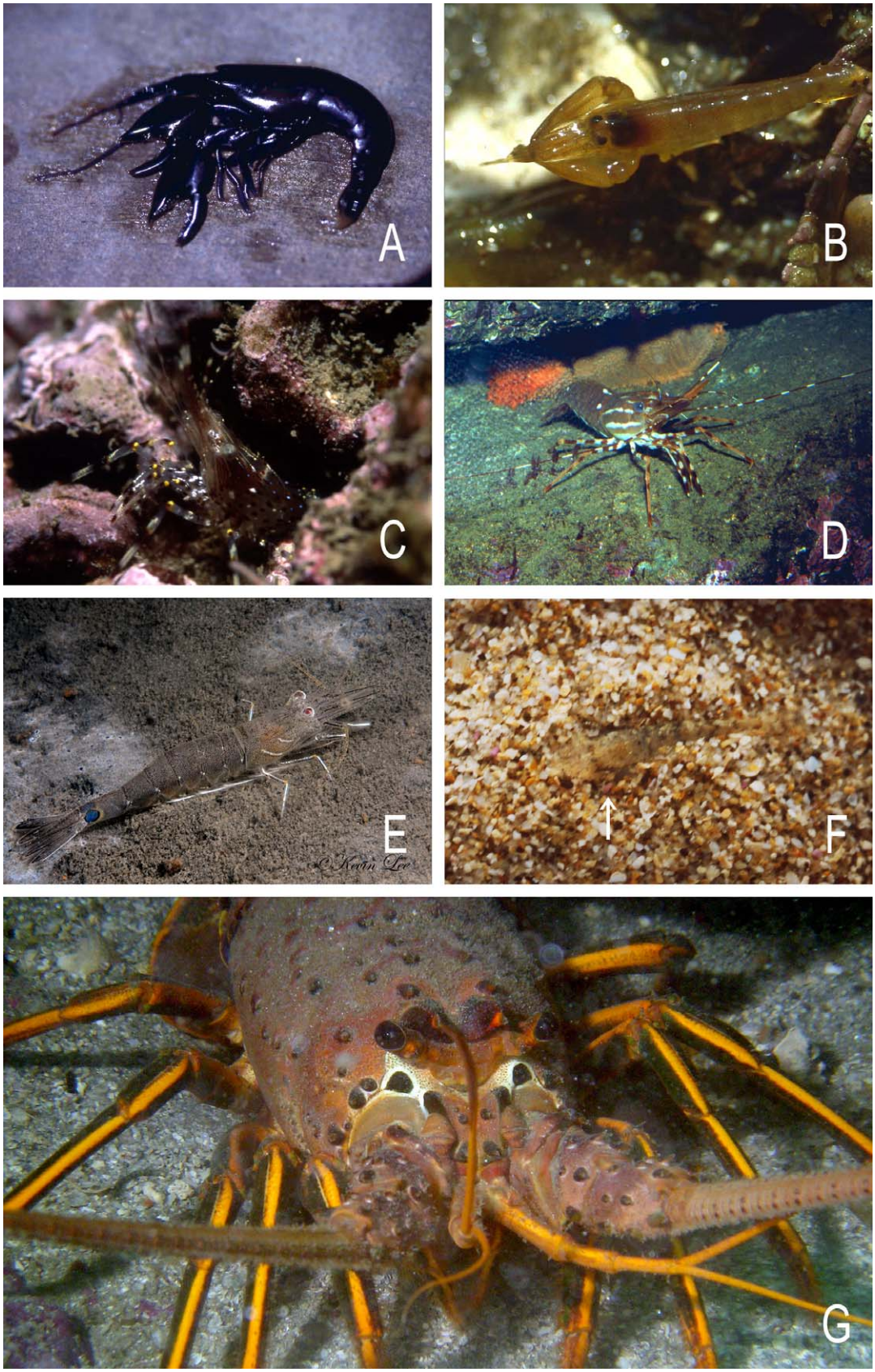

PLATE 4. A, *Betaeus harfordi* (Kingsley, 1878); Santa Catalina I.; B, *Betaeus setosus* Hart, 1964; Pillar Point, San Mateo County; C, *Pandalus danae* Stimspon, 1857; Palos Verdes Peninsula; D, *Pandalus platyceros* Brandt, 1851; aquarium, Monterey Bay; E, *Crangon nigromaculata* Lockington, 1877; Redondo Submarine Canyon; F, *Crangon nigricauda* buried in sand, Coyote Point, San Francisco Bay; G, *Panulirus interruptus* Randall, 1839, Santa Catalina I. Photo credits: C, Dick Turner; E, Kevin Lee; G, Stuart Berryhill.

PLATE 5. A, *Crangon nigricauda*, dorsal view, Coyote Point, San Francisco Bay; B, *Procambarus clarkii* (Girard, 1852); Bryan, Texas; C, *Neotrypaea biffari* (Holthuis, 1991); Point Fermin, Los Angeles County; D, *Emerita analoga* (Stimpson, 1857); Princeton, San Mateo County; E, *Neotrypaea californiensis* (Dana, 1854); Coyote Point; F, *Glyphocrangon spinulosa* Faxon, 1893; off Costa Rica.

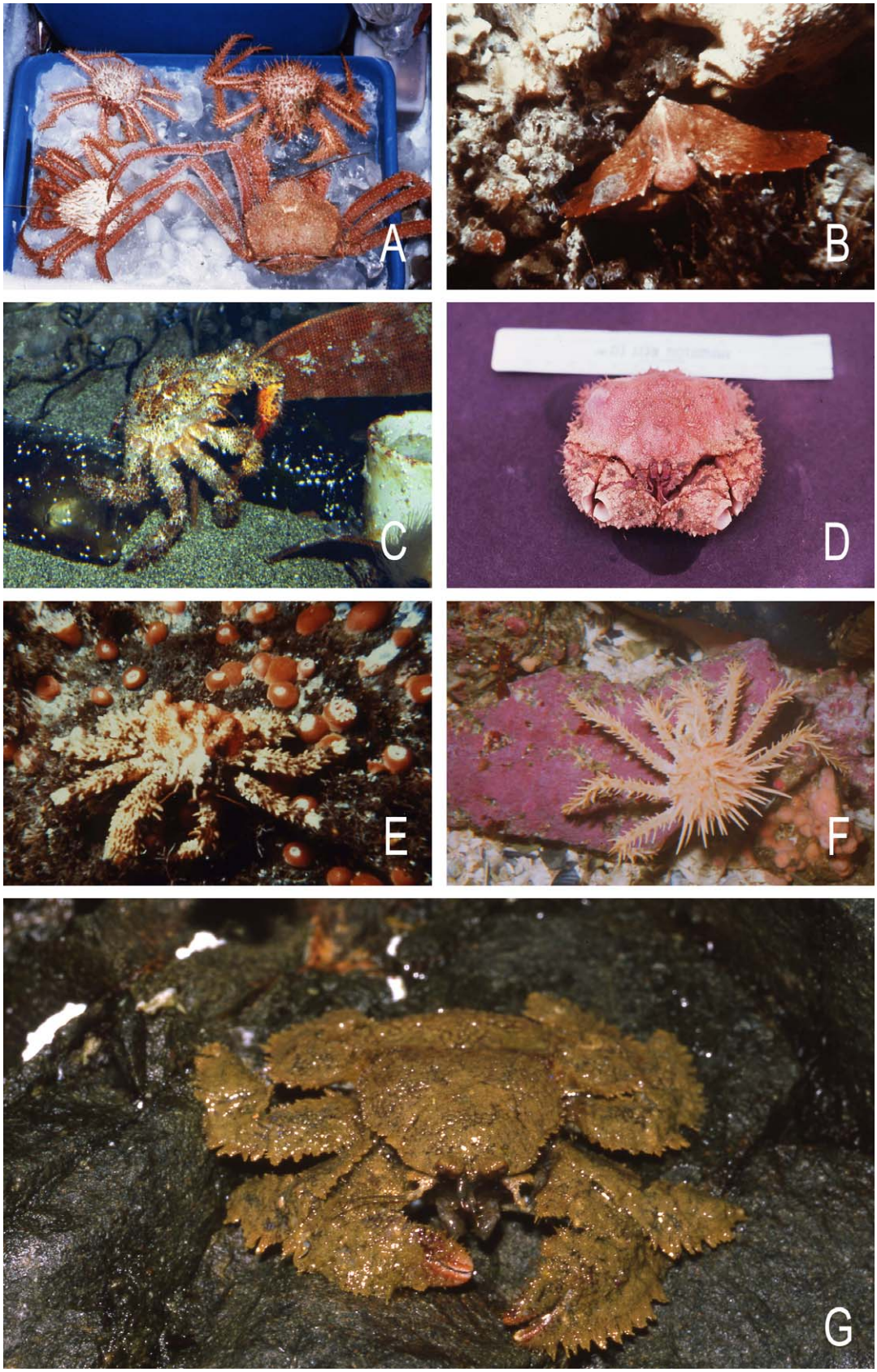

PLATE 6. A, *Paralomis multispina* (Benedict, 1895) and *Lithodes couesi* Benedict, 1895 (large crab on lower right); commercial catch from off Farallon Is.; B, *Cryptolithodes sitchensis* Brandt, 1853; Carmel Bay; C, *Acantholithodes hispidus* (Stimpson, 1860); aquarium, Monterey Bay; D, *Lopholithodes foraminatus* (Stimpson, 1859); off Santa Cruz I.; E, *Phyllolithodes papillosus* Brandt,1849; Carmel Bay; F, *Paralithodes rathbuni* (Benedict, 1895); juvenile, aquarium, Monterey Bay; G, *Hapalogaster cavicauda* Stimpson, 1859; Mendocino, Mendocino County. Photo credit: A, California Academy of Sciences.

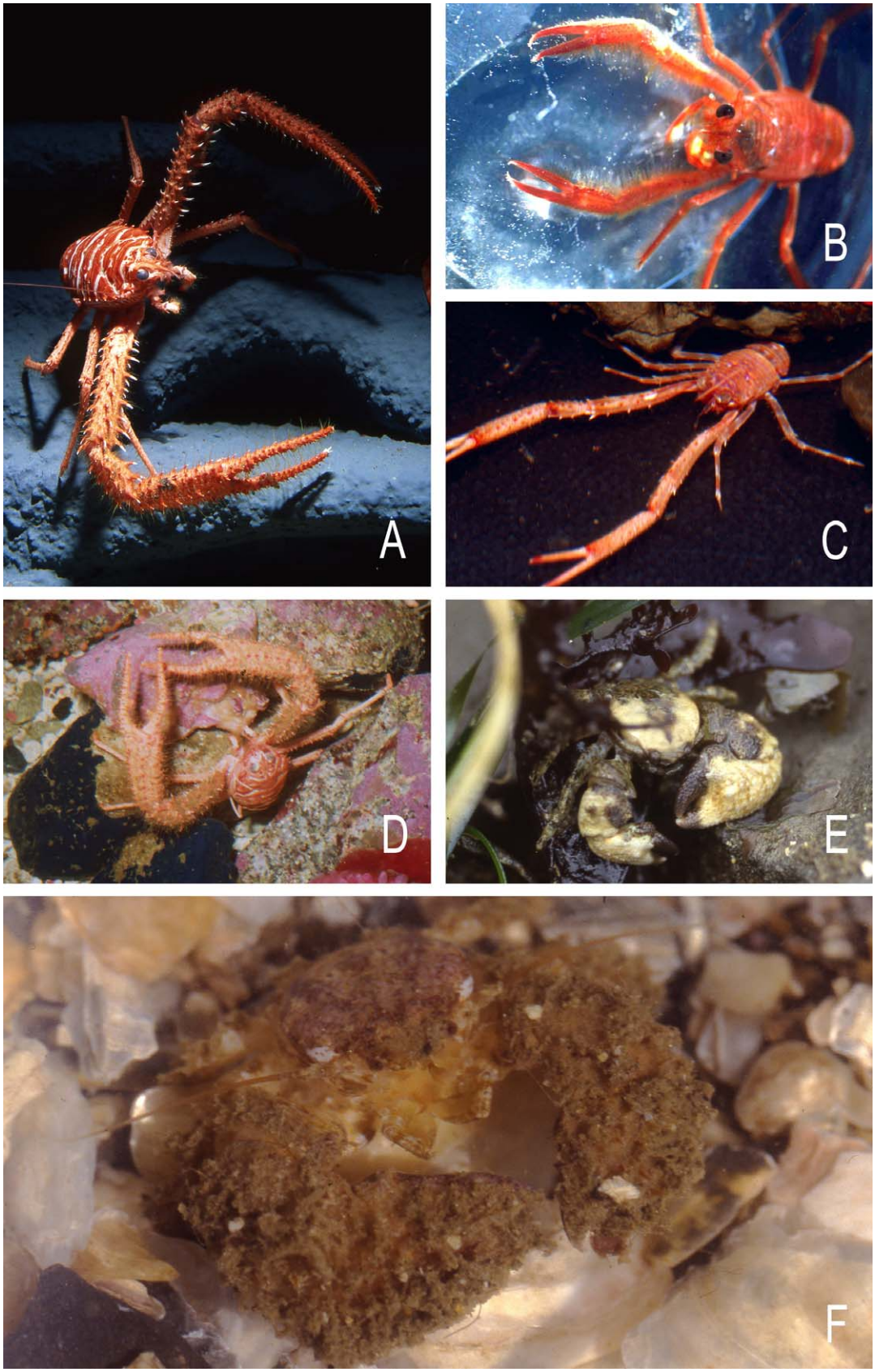

PLATE 7. A, *Janetogalathea californiensis* (Benedict, 1902); aquarium, Monterey Bay; B, *Pleuroncodes planipes* Stimpson, 1860; aquarium, Santa Catalina I.; C, *Munida quadrispina* Bendict, 1902; aquarium, Monterey Bay; D, *Munida hispida* Benedict, 1902; aquarium, Monterey Bay; E, *Pachycheles rudis* Stimpson, 1859; Pillar Point, San Mateo County; F, *Pachycheles pubescens* Holmes, 1900; Pillar Point. Photo credit: A, Karen Light.

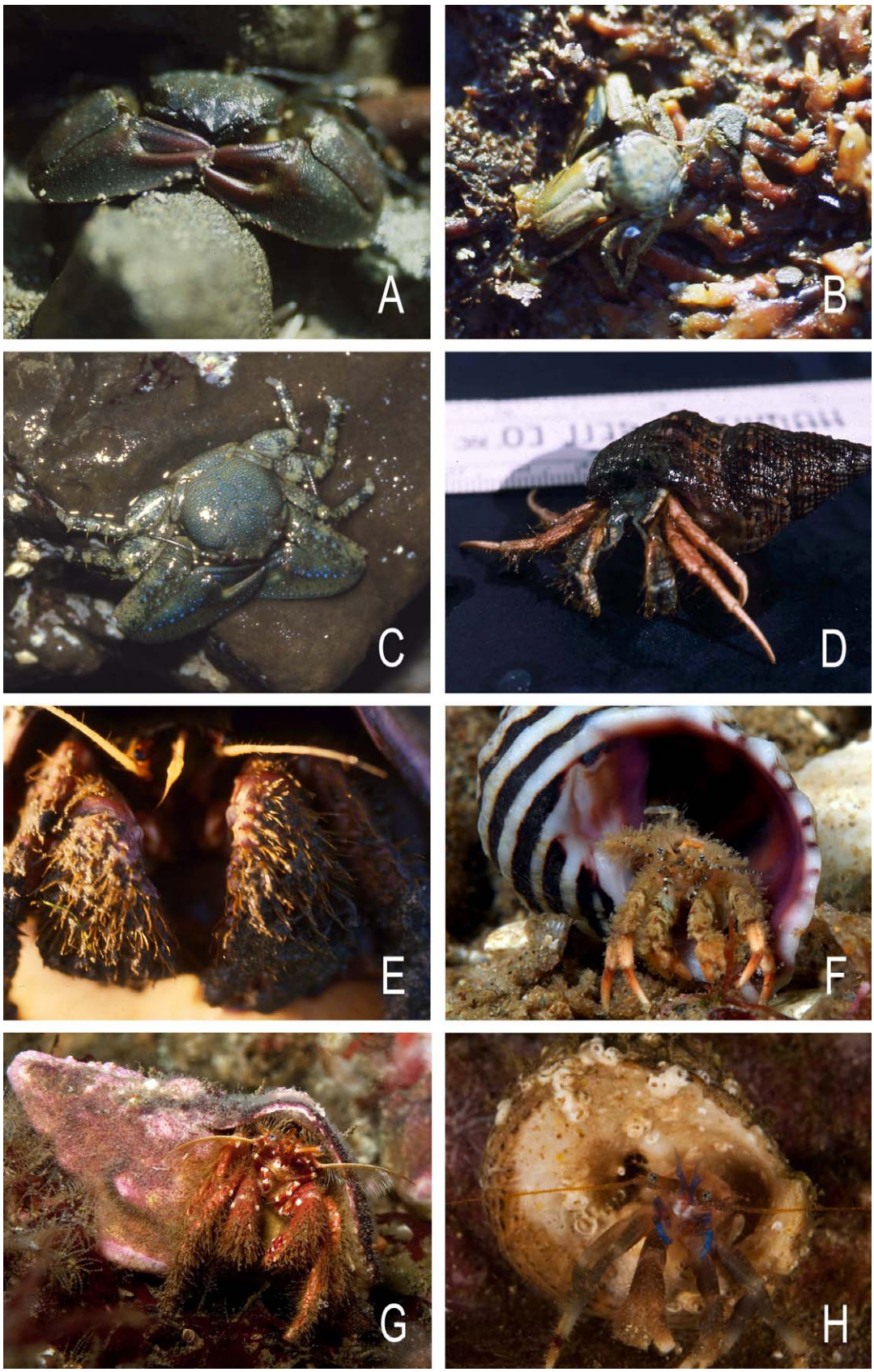

PLATE 8. A, *Petrolisthes cinctipes* (Randall, 1839); Princeton, San Mateo County; B, *Petrolisthes cabrilloi* Glassell, 1945; Point Fermin, Los Angeles County; C, *Petrolisthes eriomerus* Stimpson, 1871; Pillar Point, San Mateo County; D, *Isocheles pilosus* (Holmes, 1900); Cabrillo Beach, Los Angeles County; E, *Paguristes bakeri* Holmes, 1900; Doran Beach, Sonoma County; F, *Paguristes parvus* Holmes, 1900; Laguna Beach; G, *Paguristes ulreyi* Schmitt, 1921; off Redondo Beach; E, *Haigia diegenesis* (Scanland & Hopkins, 1969); Santa Catalina I. Photo credits: F, Kevin Lee; G. Phil Garner; H, Scott Webb.

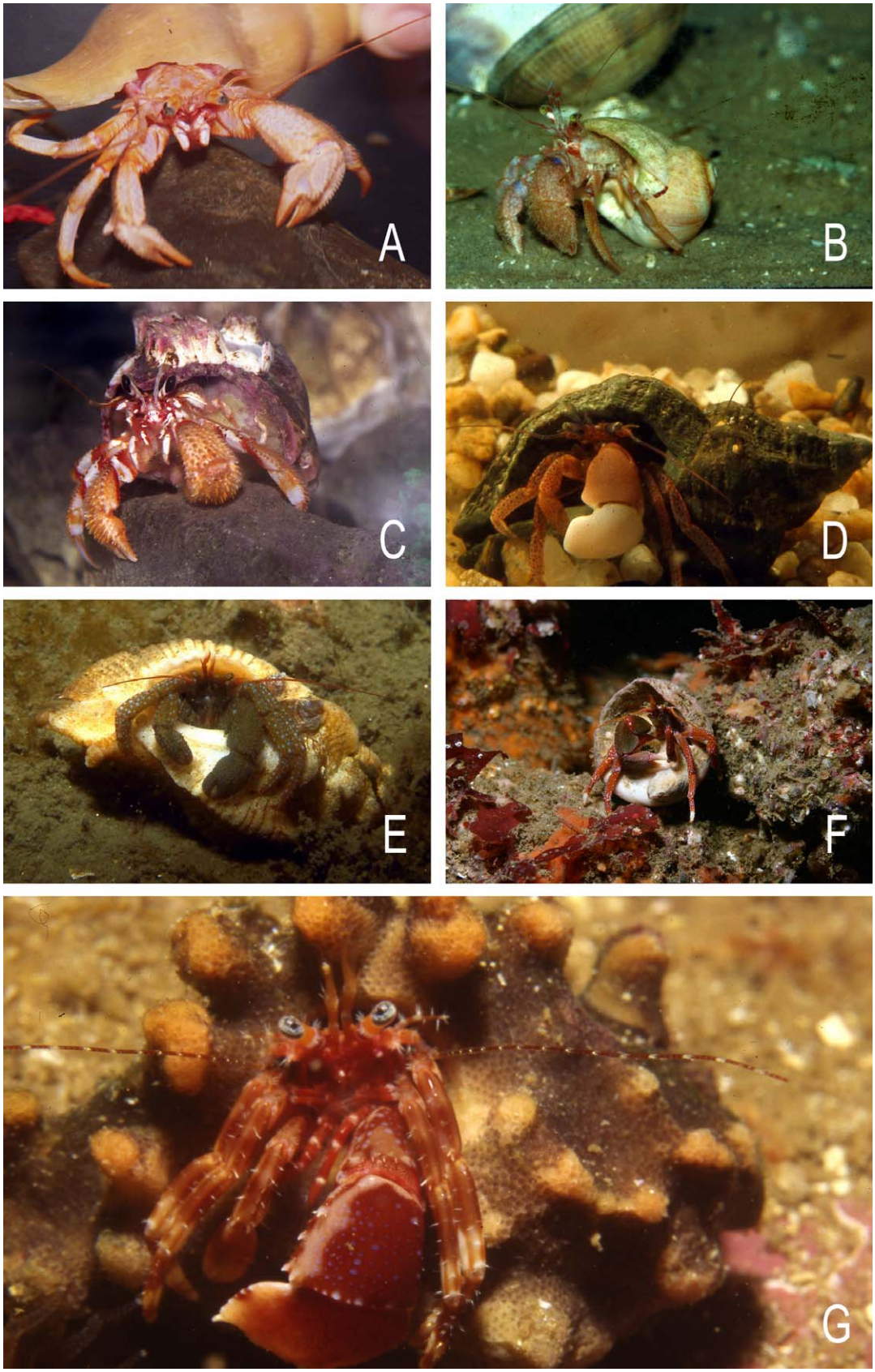

PLATE 9. A, *Pagurus cornutus* (Benedict, 1892); aquarium, Monterey Bay; B, *Pagurus spilocarpus* Haig, 1977; Newport Beach; C, *Pagurus armatus* (Dana, 1855); Monterey Bay; D, *Pagurus retrorsimanus* Wicksten & McLaughlin, 1998; aquarium, Palos Verdes Peninsula; E, *Pagurus granosimanus* (Stimpson, 1859); Los Angeles Harbor; F, *Pagurus hemphilli* (Benedict, 1892); Monterey Bay; G, *Phimochirus californiensis* (Benedict, 1892); Santa Catalina I. Photo credit: F, Steve Lonhart.

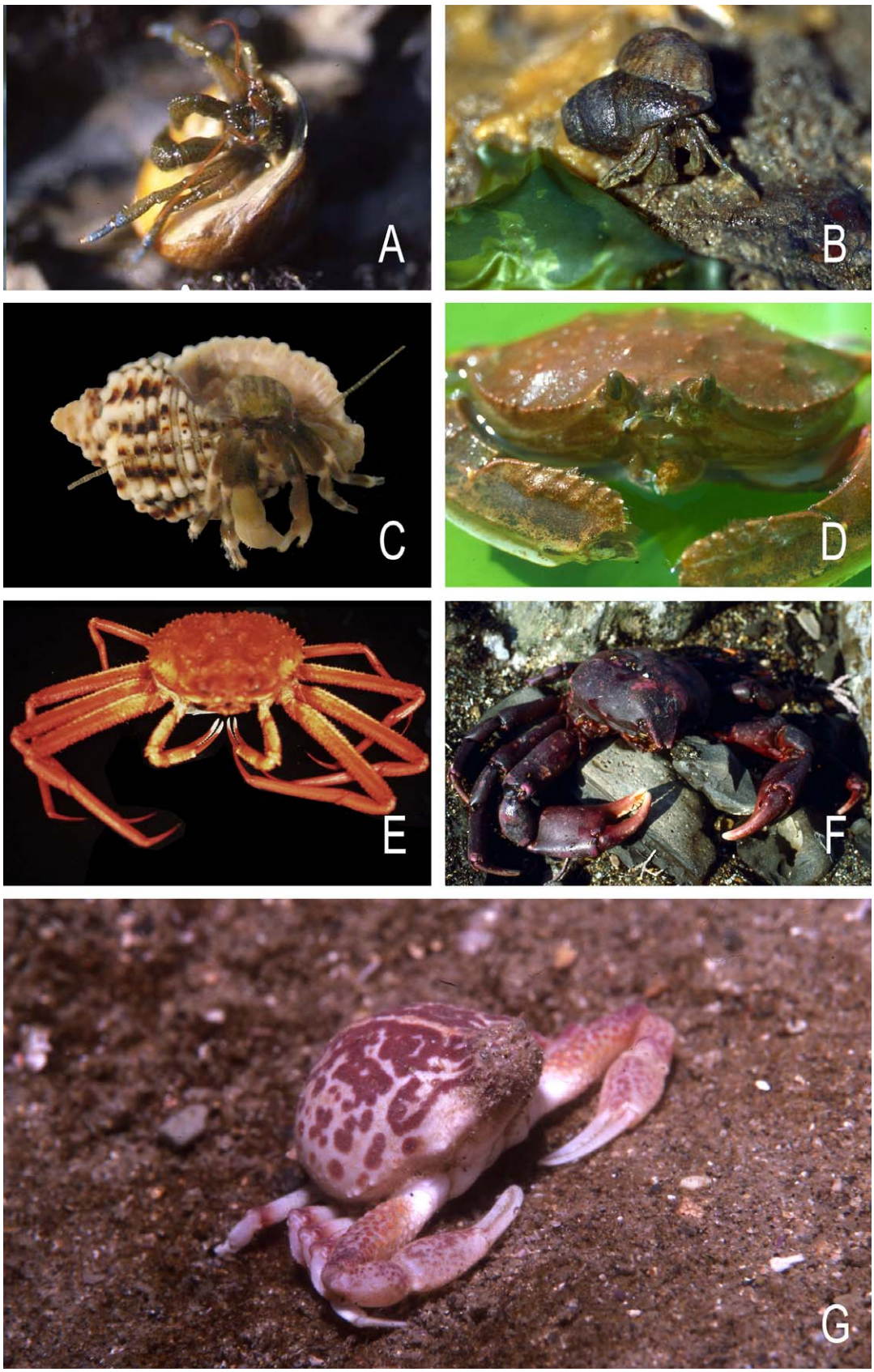

PLATE 10. A, *Pagurus samuelis* (Stimpson, 1857); Moss Beach, San Mateo County; B, *Pagurus hirsutiusculus* (Dana, 1851): Coyote Point, San Francisco Bay; C, *Pagurus venturensis* Coffin, 1957; Point Fermin, Los Angeles County; D, *Platymera gaudichaudii* H. Milne-Edwards, 1837; off Los Angeles Harbor; E, *Chionoecetes tanneri* Rathbun, 1893; off San Clemente I.; F, *Taliepus nuttallii* (Randall, 1839); Point Fermin; G, *Randallia ornata* (Randall, 1839); off Palos Verdes Peninsula. Photo credits: C, Jennifer Cross; G, Dick Turner.

PLATE 11. *Ericerodes hemphillii* (Lockington, 1877); La Jolla Shores, San Diego County. Photo credit: Allison Vitsky.

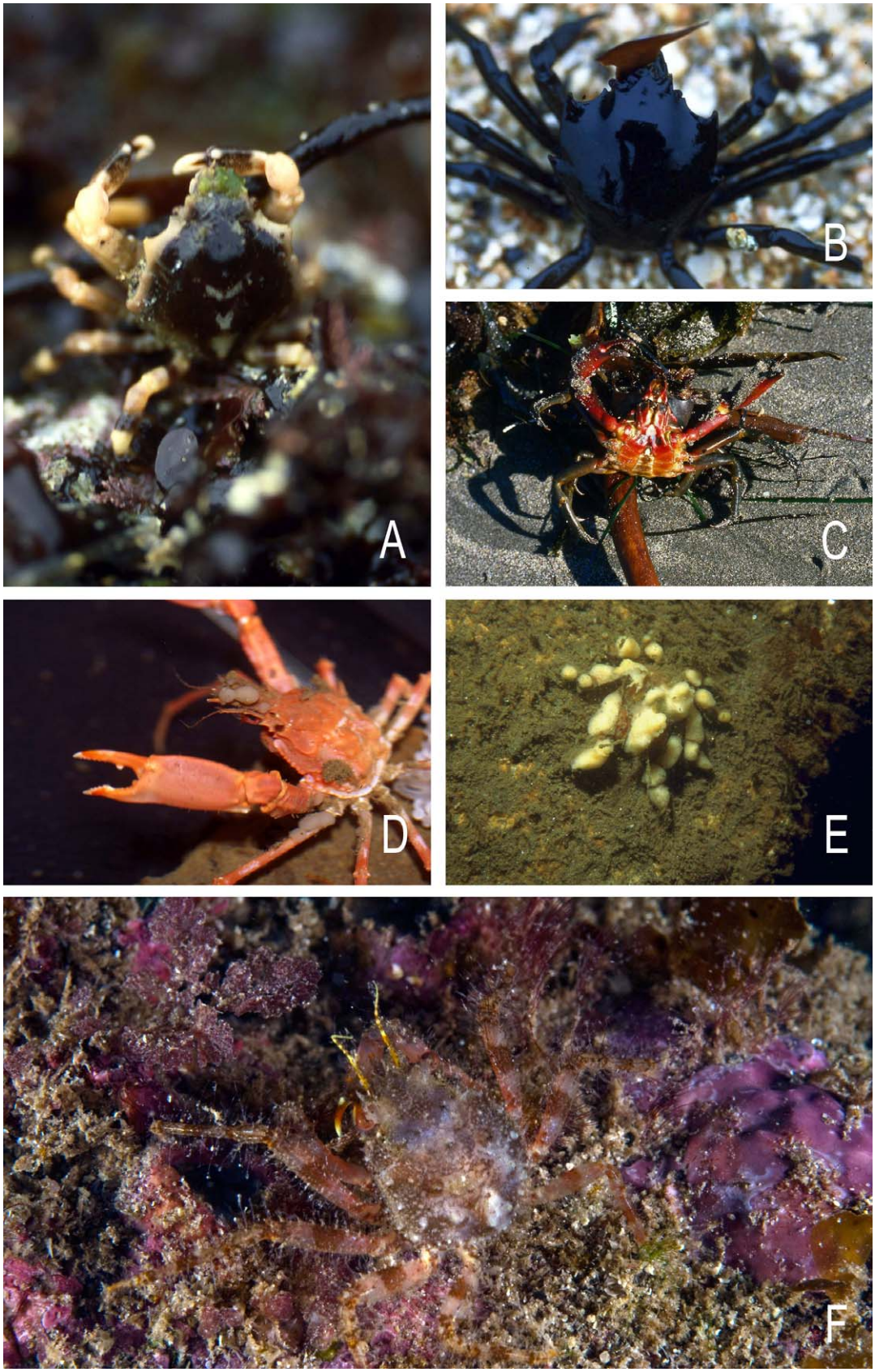

PLATE 12. A, *Mimulus foliatus* Stimpson, 1860; Monterey Bay; B, C, *Pugettia producta* (Randall, 1839); B, juvenile; C, adult male, Pillar Point,San Mateo County; D, *Chorilia longipes* Dana, 1851; aquarium, Monterey Bay; E, *Pelia tumida* (Lockington, 1877); Los Angeles Harbor Breakwater; F, *Herbstia parvifrons* Randall, 1839; Santa Catalina I. Photo credit: F, Scott Webb.

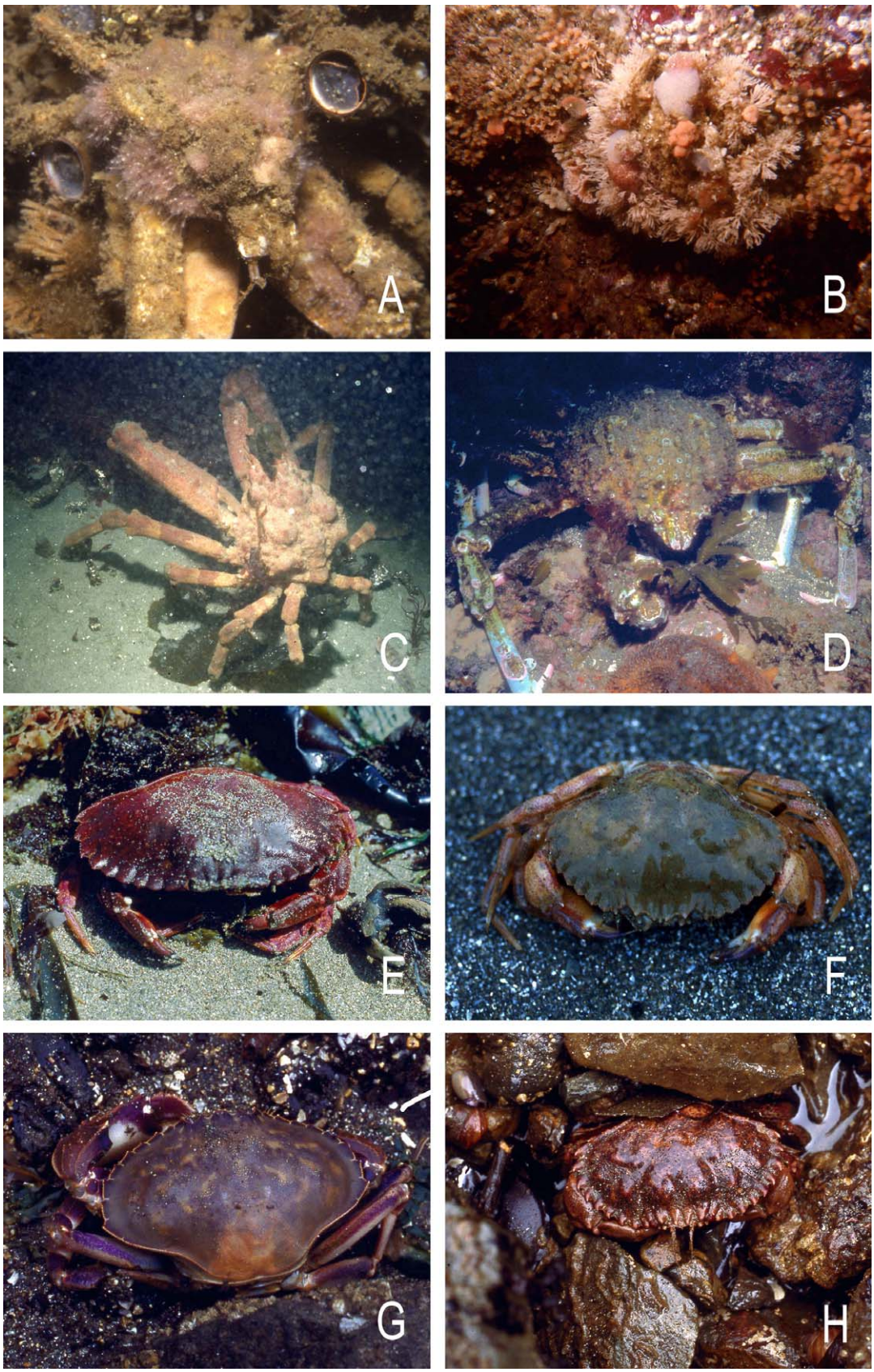

PLATE 13. A, *Scyra acutifrons* Dana, 1851; Los Angeles Harbor Breakwater; B, C, *Loxorhynchus crispatus* Stimpson, 1857; B, juvenile, C, adult male, Monterey Bay; D, *Loxorhynchus grandis* Stimpson, 1857; Anacapa I.; E, *Cancer productus* Randall, 1839; Pillar Point, San Mateo County; F, *Metacarcinus anthonyi* (Rathbun, 1897); Cabrillo Beach, Los Angeles County; G, *Metacarcinus gracilis* (Dana, 1852); Princeton, San Mateo County; H, *Rhomaleon antennarius* (Stimpson, 1856); Moss Beach, San Mateo County.

PLATE 14. A, *Metacarcinus magister* (Dana, 1852); Princeton, San Mateo County; B, *Rhithropaneopeus harrisii* (Gould, 1841); Port Aransas, Texas; C, *Lophopanopeus bellus* (Stimpson, 1860); Moss Beach, San Mateo County; D, *Cycloxanthops novemdentatus* (Lockington, 1877); Point Fermin, Los Angeles County; E, *Paraxanthias taylori* (Stimpson, 1860); Santa Catalina I.; F, *Pilumnus spinohirsutus* (Lockington, 1877); Point Fermin; G, *Portunus xantusii xantusii* (Stimpson, 1860); Cabrillo Beach, Los Angeles County. Photo credit: E, Scott Webb.

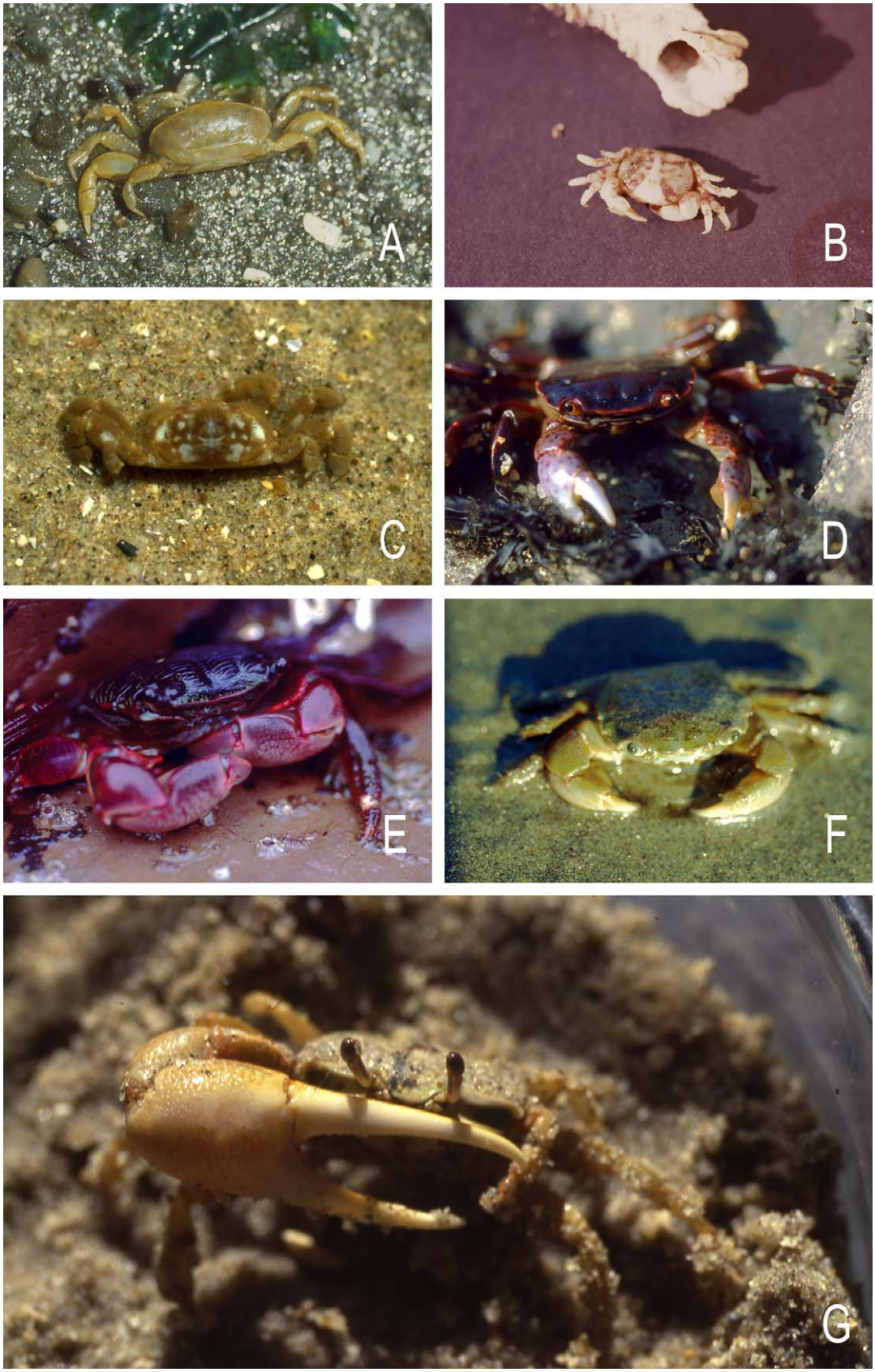

PLATE 15. A, *Scleroplax granulata* Rathbun, 1893; Princeton, San Mateo County; B, *Opisthopus transversus* Rathbun, 1893; Cabrillo Beach, Los Angeles County; C, *Pinnixa tubicola* Holmes, 1894; Newport Beach; D, *Hemigrapsus nudus* (Dana, 1851); Moss Beach, San Mateo County; E, *Pachygrapsus crassipes* Randall, 1839; Moss Beach; F, *Hemigrapsus oregonensis* (Dana, 1851); Coyote Point, San Francisco Bay; G, *Uca crenulata crenulata* (Lockington, 1876); male, Santa Catalina I.