

CHITONS

The Polyplacophora from the Mexican Pacific

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Supplemental Publication of the San Diego Shell Club



THE FESTIVUS

A publication of the San Diego Shell Club

SUPPLEMENT

2016

SPECIAL ISSUE

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FRONT COVER: *Chiton albolineatus* Broderip & Sowerby, 1829 on rocks with coralline algae. (Cover artistic credit: Rex Stilwill)

BACK COVER: Collage with images of *Dendrochiton flectens* (Carpenter, 1864), *Lepidozona pectinulata* (Carpenter in Pilsbry, 1893), *Mopalia lionota* Pilsbry, 1918, *Mopalia lignosa* (Gould, 1846), *Mopalia plumosa* Carpenter in Pilsbry, 1893, *Mopalia ciliata* (Sowerby, 1840), *Callistoichiton expressus* (Carpenter, 1865), *Chiton articulatus* Sowerby in Broderip & Sowerby, 1832, *Stenoplax corrugata* (Carpenter, 1892), and *Callistoichiton elenensis* (Sowerby in Broderip & Sowerby, 1832). (Cover artistic credit: Rex Stilwill)

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Publication date: September ____, 2016
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THE POLYPLACOPHORA FROM THE MEXICAN PACIFIC

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ABSTRACT This study gives a summary of the current knowledge of Polyplacophora in the Mexican Pacific, totaling 102 species in 6 marine biogeographic provinces and belonging to 8 families and 20 genera. There is an important overlap of species, mostly of the typical fauna from the international biogeographic region between Punta Eugenia in México and Point Conception in California known as the Southern California Bight containing 36 species, with occasional records in the westernmost point of Baja California, México. The Gulf of California contains 21 species, the Southern Gulf of California and the Mexican Tropical Pacific both with 15 inhabiting species, and the rest of the species extending their distribution into several ecoregions. Intertidal species are better known than those from subtidal or deeper waters. Literature reviews and voucher specimens housed in museum mollusk collections were examined to update the chiton distribution checklist.

KEY WORDS Chitons, Mollusks, México, chiton distribution, chiton check-list.

INTRODUCTION

Reyes-Gómez & Salcedo-Vargas (2002) tallied 127 chiton species distributed in coastal and surrounding Mexican waters, based on Polyplacophora literature and the examination of chiton collections in Mexican museums (Colección Nacional de Moluscos, Instituto de Biología, UNAM and Laboratorio de Ecología, Departamento de Zoología, IPN). They reported species belonging to 3 suborders, 5 families and 21 genera, following Van Belle (1983) classification, in which they also divided the reports by depth into intertidal, sub-littoral, deep zones, and by regions including the Eastern Pacific, Gulf of California and Mexican Tropical Pacific, with 112 species.

After the publication of the first check-list, new species have been described and subsequent work has elucidated what is known about Polyplacophora diversity in México. Those studies include faunistic reviews and taxonomic accounts that have provided important and

punctual sets of distribution and bathymetric data of chiton species in specific geographic areas within the Pacific (Clark, 1991a, 1991b, 1994, 1999; Skoglund, 2001; Eernisse, 2004a, 2004b; García-Ríos & Álvarez-Ruiz, 2007; Eernisse *et al.*, 2007; Sirenko & Clark, 2008; Stebbins & Eernisse, 2009; Reyes-Gómez *et al.*, 2010 and Vendrasco *et al.*, 2012). In addition, chiton systematics is far from being settled and has changed substantially from Van Belle (1983). After Van Belle's classification, Sirenko (2006) proposed a system based on a shift to include more diverse characteristics (including Sirenko, 1993, 1997), assessing phylogenetic affinities based on the articulamentum shell layer, nephridiopore placement, arrangement of ctenidia, egg hull projections and sperm morphology. Subsequent works utilized molecular methods to understand specific taxa relationships based on DNA analysis (Okusu *et al.*, 2003; Kelly & Eernisse, 2008; Sigwart, 2008, 2013; Irisarri *et al.*, 2014), which have generally supported Sirenko's (2006) classifications, but have also proposed

additional changes in some cases; for example, *Callistochiton* that has been reassigned to Ischnochitoninae and the revival of *Cyanoplax* and *Dendrochiton* genera (Eernisse, 2004b; Eernisse *et al.*, 2007).

This compilation provides an updated account of chiton species distributed in the Mexican Pacific, and substantially refines its actual systematics and geographic and bathymetric distributions, based on specialized chiton literature, and takes into account recent information from chiton material held in the Colección Nacional de Moluscos, Instituto de Biología, UNAM. Finally, the removal of particular species from the earlier check-list are justified because they were based on erroneous reports that could not be validated.

MATERIALS AND METHODS

Some of the data presented in this check-list is based on the examination of recently collected and existing chiton material housed in the Colección Nacional de Moluscos, Instituto de

Biología, UNAM, México (CNMO). The new material was primarily based on 22 surveys between 2009 and 2013 from rocky coasts throughout Guerrero, material from the author's own collection and recent donations to the CNMO from Baja California Sur, Mazatlán and Oaxaca.

A summary of chiton species by family and genera are provided in Table 1 below. The chiton distribution is discussed in the succeeding paragraphs with acronyms and corresponding regions shown on the map in Figure 1, color coded as follows: Southern California Bight, between Punta Eugenia, México and Point Conception in California in blue (SCB); Magdalena Transition from Punta Eugenia to Cabo San Lucas, in gray (MT); Revillagigedos archipelago, in light brown (RG); Mexican Tropical Pacific from Cabo San Lucas to Cabo Corrientes, Jalisco extended down to the southern point of Oaxaca, in yellow (MTP) (Spalding *et al.*, 2007); the Gulf of California is from Río Colorado southward to Guaymas and

Family	Number of Genera	Number of Species by Family	Genus	Number of Species by Genus
Ferreiraellidae	1	1	<i>Ferreiraella</i>	1
Leptochitonidae	3	6	<i>Leptochiton</i>	4
			<i>Deshayesiella</i>	1
			<i>Oldroydia</i>	1
Chaetopleuridae	1	7	<i>Chaetopleura</i>	7
Ischnochitoninae	5	51	<i>Ischnochiton</i>	7
			<i>Callistochiton</i>	9
			<i>Callistoplax</i>	1
			<i>Lepidozona</i>	22
			<i>Stenoplax</i>	11
Chitonidae	2	4	<i>Chiton</i>	3
			<i>Tonicia</i>	1
Acanthochitonidae	1	7	<i>Acanthochitona</i>	7
Lepidochitonidae	3	10	<i>Lepidochitona</i>	4
			<i>Cyanoplax</i>	4
			<i>Nuttallina</i>	3
Mopaliidae	4	16	<i>Dendrochiton</i>	4
			<i>Mopalia</i>	7
			<i>Placiphorella</i>	4
			<i>Tonicella</i>	1

Table 1. Summary of chiton species by family and genera

to Punta Coyote, Baja California Sur in orange (GC); and the Southern Gulf of California from Guaymas to Cabo Corrientes, Jalisco and to Cabo San Lucas, in purple (SGC) (Brusca *et al.*, 2005). Unless otherwise specified all localities are in México.

The check-list also indicates the known species distribution records (author and year), and their bathymetric ranges (intertidal, subtidal and deep water species as DWP). The species held in the Colección Nacional de Moluscos, Instituto de Biología, UNAM are marked by its institution acronym CNMO, followed by its voucher number. The species ecoregion allocation follows the species common occurrence, that refers to its typical distribution only, and does not consider isolated records in other ecoregions which are occasional or rare. Chiton systematics follows Irisarri *et al.* (2014).

Collection Abbreviations:

CNMO, Colección Nacional de Moluscos, Instituto de Biología, UNAM; RNC, private collection Roger N. Clark; BA, private collection Bruno Anseeuw (Belgium); VB, private collection, Richard A. Van Belle (Belgium); ES, private collection, Enrico Schwabe (Germany); IRSN, Institut Royal des Sciences Naturelles de Belgique, Bruxelles; ANSP, Academy of Natural Sciences, Philadelphia; CASIZ, California Academy of Sciences, Department of Invertebrate Zoology, San Francisco; CBUPRH, Colección Biológica de la Universidad de Puerto Rico, Humacao; CAS, California Academy of Sciences, San Francisco .

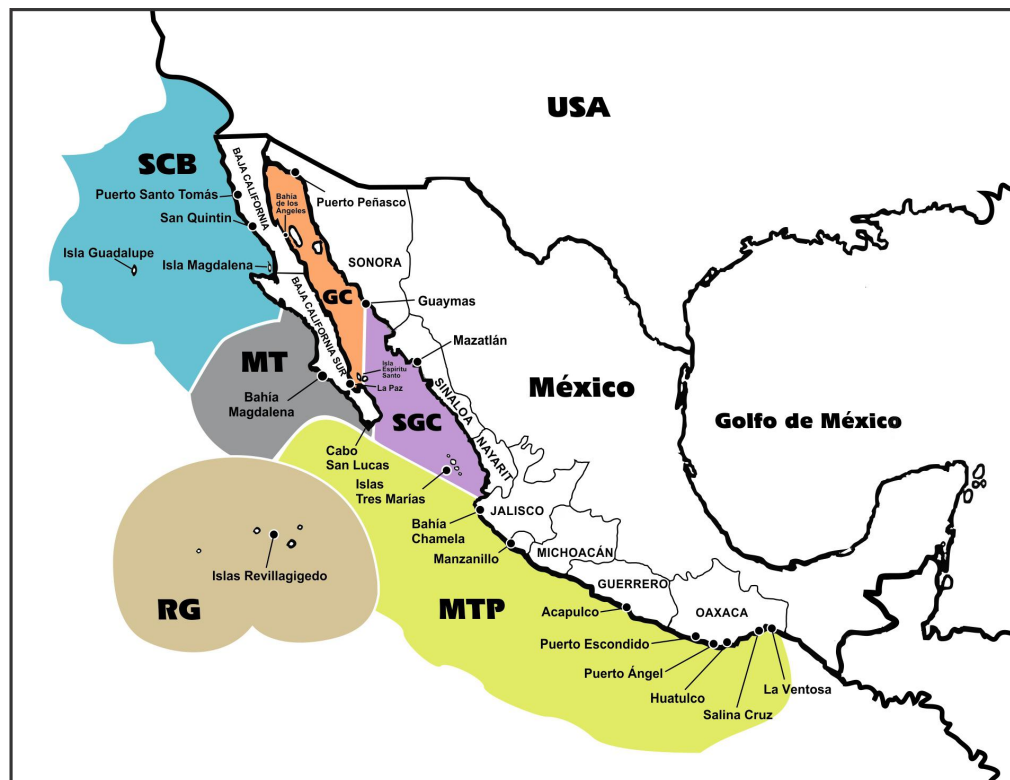


Figure 1. Chiton distribution is presented in marine ecoregions: Southern California Bight in blue (SCB); Magdalena Transition in gray (MT); Revillagigedos Archipelago in light brown (RG); Mexican Tropical Pacific in yellow (MTP); The Gulf of California in orange (GC); and the Southern Gulf of California in purple (SGC).

RESULTS

There are 99 recognized species and 3 undescribed species, belonging to 8 families and 20 genera reported. Lepidochitonidae showed 10 species and 3 genera; Chitonidae is represented by 4 species; Chaetopleuridae with 7 species; Leptochitonidae contain 3 genera and 6 species; Ischnochitonidae have the highest diversity, with 5 genera and 51 species, followed by Mopaliidae with 16 species in 4 genera. The best represented genera include *Lepidozona* (22 species); *Stenoplax* (11 species); *Callistochiton* (9 species); *Ischnochiton*; *Chaetopleura*, *Acanthochitona*, and *Mopalia* with 7 species each; *Leptochiton*, *Lepidochitona*, *Cyanoplax*, *Dendrochiton*, and *Placiphorella* with 4 species each; and *Chiton* and *Nutallina* with 3 species. The rest of the genera contain 1-2 species each (*Ferreiraella*, *Deshayesiella*, *Oldroydia*, *Callistoplax*, *Tonicia*, and *Tonicella*,) (see Table 1).

Class POLYPLACOPHORA Gray, 1821
Order LEPIDOPLEURIDA Thiele, 1910
Suborder LEPIDOPLEURINA Thiele, 1910

FERREIRAELLIDAE Dell'Angelo & Palazzi, 1991
Ferreiraella Sirenko, 1988

1. *Ferreiraella scrippsiana* (Ferreira, 1980)
 Off Baja California Sur and SW of Cabo San Lucas, México (as *Lepidopleurus scrippsianus* in Kaas & Van Belle, 1985a); Panamá Basin (Schwabe, 2008). Subtidal ranging from depths of 2507-4000 m. (DWP), **SCB**. (Figure 2).

LEPTOCHITONIDAE Dall, 1889
Leptochiton Gray, 1847

2. *Leptochiton nexus* Carpenter, 1864
 Cohen Island, Alaska to Punta Abreojos, Baja California and Bahía de Los Ángeles, Gulf of California, México (Kaas & Van Belle, 1985a). Rare species, especially in México; found on the side and top surfaces of rocks covered by sand (Eernisse *et al.*, 2007). Subtidal ranging to depths of 144 m. **SCB**, **GC**. (Figure 3).

3. *Leptochiton belknapi* Dall, 1878
 Widespread in the North Pacific (Kaas & Van Belle, 1985a); Aleutian Islands, Alaska, USA; British Columbia, Canada off Queen Charlotte Islands; Indonesia, south of Sulawesi Tenggara, Banda Sea; Gulf of Panamá; Galápagos Islands and the Peruvian

coast; Baja California Sur at southwest of Cabo San Lucas; off Nayarit, Islas Tres Marias; off Acapulco, México (Schwabe, 2008). In the Pacific Ocean from the Sea of Okhotsk and Bering Sea to North and South America's Pacific waters southwards to 42°40', 200-1840 m (Sirenko, 2015). Subtidal ranging from depths of 100-4400 m. (DWP), **SCB**, **SGC**, **MTP**. (Figure 4).

4. *Leptochiton rugatus* (Carpenter in Pilsbry, 1892)
 Sea of Japan, the Okhotsk Sea; the Bering Sea, Cohen Island, Alaska, USA to Bahía Magdalena, Baja California, México (Kaas & Van Belle, 1985a). In the Temperate Northern Pacific occasionally can be found under rocks submerged in sand or mud; rare in México (Eernisse *et al.*, 2007). Subtidal from 8-12 m, and intertidal ranging to depths of 458 m. **SCB**. (Figure 5).

5. *Leptochiton incongruous* (Dall, 1908)
 Salina Cruz, Oaxaca in the Gulf of Tehuantepec, México; Gulf of Panamá, Albatross station (Kaas & Van Belle, 1985a; Schwabe, 2008). Subtidal ranging from depths of 354-3612 m. (DWP), **MTP**. (Not figured*)

Deshayesiella Carpenter MS, Dall, 1879

6. *Deshayesiella spicata* (Berry, 1919)
 British Columbia, Howe Sound, North of Vancouver, Lions Bay, Canada to Canal Salsipuedes, Baja California, Gulf of California, México (Sirenko & Clark, 2008). Intertidal to subtidal from depths of 18-467 m. **GC**. (Figure 6).

Oldroydia Dall, 1894

7. *Oldroydia percrassa* (Dall, 1894)
 West coast of North America from Monterey Bay, California USA to Isla San Benito, Baja California and Canal Salsipuedes, Gulf of California, México (Kaas & Van Belle, 1985a; Eernisse *et al.*, 2007; Vendrasco *et al.*, 2012). Rare species in México; found occasionally on intertidal and soft substrate from 5-10 m; on granitic ridges under rocks, gravel and fine sediment from 22-24 m. Subtidal to 730 m, with a median depth of 40 m. **SCB**. (Figure 7).

Order CHITONIDA Thiele, 1910
Suborder CHITONINA Thiele, 1910
CHAETOPLEURIDAE Plate, 1899
Chaetopleura Shuttleworth, 1853

8. *Chaetopleura lurida* (Sowerby, 1832)
 Bahía de San Francisquito, Gulf of California to Gorgona Island, Colombia; Isla Cerralvo, Gulf of California; Isla Socorro and Clarión, Revillagigedo; Acapulco and Puerto Ángel, Oaxaca (Ferreira, 1983a, 1983b; Kaas & Van Belle, 1987); Tecolote and Sargento, La Paz, Baja California Sur (García-Ríos & Álvarez-Ruiz, 2007); Puerto Angelito, Puerto Escondido, Oaxaca (Reyes-Gómez *et al.*, 2010); Mazatlán, Jalisco (Reyes-Gómez, 2004); Tlacopanocha, Parque de la Reina, Majahua, Manzanillo, Pie de la Cuesta, Guerrero, México (Flores-Garza *et al.*, 2012; Galeana-Rebolledo *et al.*, 2014). Common species found on rocks and between algae, found in shallow intertidal zones to depths of 30 m. (CNMO5176). **RG**, **SGC**, **MTP**. (Figure 8).

9. *Chaetopleura gemma* Dall, 1879

Vancouver Island, British Columbia, Canada to Bahía San Juanico, Baja California, México (Kaas & Van Belle, 1987; Eernisse *et al.*, 2007; Stebbins & Eernisse, 2009). Occasional species in México; common throughout Monterrey Peninsula, California, USA, on rocks and in kelp forests to a depth of 10 m. Intertidal from 0-50 m. **SCB**. (Figure 9).

10. *Chaetopleura lanuginosa lanuginosa* (Dall, 1879)

Pacific coast of Baja California Peninsula: Bahía Todos Santos and Bahía Magdalena, San Felipe, Bahía de los Ángeles, Bahía Concepción, Baja California; Bahía Topolobampo and Guaymas, Sonora, México (Ferreira, 1983a; Kaas & Van Belle, 1987). Intertidal species, uncommon. **SCB**. (Figure 10).

11. *Chaetopleura lanuginosa mixta* (Dall, 1919)

In the upper Gulf of California down to Bahía Concepción on the western side to Bahía Topolobampo, Sinaloa, México (Kaas & Van Belle, 1987). Rare intertidally at depths up to 15 m. **GC**. (Figure 11).

12. *Chaetopleura unilineata* Leloup, 1954

La Paz, Baja California; San Felipe, Gulf of California in Mazatlán; Guaymas; Manzanillo, Colima, México; Gulf of Fonseca, Nicaragua; Bahía Jobo, Bahía Ballena and Bahía Cocos, Costa Rica; Taboga, Secas Islands and Cape Mala, Panamá; Vija Colombia; Bahía Santa Elena, Ecuador to Sechura Bay, Perú (Ferreira, 1983a; Kaas & Van Belle, 1987). Intertidal to subtidal at depths up to 90 m. **GC**, **SGC**. (Figure 12).

13. *Chaetopleura shyana* Ferreira, 1983

Bahía de los Ángeles; Isla Tiburón, Isla Turner, Isla Partida and Isla San Lorenzo within the Gulf of California, México (Ferreira, 1983a; Kaas & Van Belle, 1987). Intertidal to shallow-subtidal. **GC**. (Figure 13).

14. *Chaetopleura hanselmani* Ferreira, 1982

Mazatlán, Sinaloa, México to Isla Lobos de Afuera, Perú (Kaas & Van Belle, 1987); Casa Mixteca, Bahías de Huatulco, Oaxaca (Reyes-Gómez *et al.*, 2010); Tlacapanocha, Parque de la Reina, Majahua, Manzanillo, Pie de la Cuesta Guerrero, México (Flores-Garza *et al.*, 2012; Galeana-Rebolledo *et al.*, 2014). Recorded as common within the Gulf of California (Ferreira, 1983a). Intertidal from 0-17 m. (CNMO5247). **SGC**, **MTP**. (Figure 14).

ISCHNOCHITONIDAE Dall, 1889*Ischnochiton* Gray, 184715. *Ischnochiton muscarius* (Reeve, 1847)

Between Isla Venado and Mazatlán, Sinaloa to La Ventosa, Oaxaca, México. Isla Socorro, Revillagigedo Archipiélago (Ferreira, 1983b; Kaas & Van Belle, 1990); Puerto Ángel and Estacahuite, Oaxaca (Reyes-Gómez *et al.*, 2010); Costa Chica (southern), Acapulco and Costa Grande (northern), Guerrero, México (Flores-Garza *et al.*, 2012 and Galeana-Rebolledo *et al.*, 2014). Common species along the Mexican Tropical Pacific. Intertidal at depths up to 7 m, under rocks. (CNMO5300). **RG**, **SGC**, **MTP**. (Figure 15).

16. *Ischnochiton tridentatus* Pilsbry, 1893

Within the Gulf of California to Mazatlán (Kaas & Van Belle, 1990); Pichilingue, Balandra, Tecolote and Sargento, La Paz, Baja California Sur, México (García-Ríos & Álvarez-Ruiz, 2007). Somewhat common species. Shallow intertidal found under rocks. (CNMO5669). **GC**, **SGC**. (Figure 16).

17. *Ischnochiton guatemalensis* Thiele, 1909

Bahía Magdalena to the Northern area of the Gulf of California, México to Guatemala; El Salvador and Costa Rica (Kaas & Van Belle, 1990). Rare species in México, recorded in shallow-subtidal found on rocks or shells. **GC**. (Figure 17).

18. *Ischnochiton carolianus* Ferreira, 1984

Bahía de los Ángeles and Punta San Antonio, Gulf of California to San Carlos, Sonora, México (Ferreira, 1984; Kaas & Van Belle, 1990); Playa Balandra, La Paz, Baja California found at 1.5 m, and Mazatlán, México [CNMO5565]. Intertidal to subtidal species at depths up to 100 m. (CNMO5398). **GC**, **SGC**. (Figure 18).

18b. *Ischnochiton victoria* Ferreira, 1987

Isla Cocos, near Wafer bay, off Roca Sucia, Costa Rica (Ferreira, 1987; Kaas & Van Belle, 1994). Clipperton Island, France (Kaiser, 2007), SBMNH35870 (24 specimens 3.2 to 4.2 mm of length; Id. by R.N. Clark). This species is not distributed in Mexican territory, although its presence within the Tropical Eastern Pacific suggests its affinity to Mexican chiton species. Subtidal species to 24 m found in sand, and dead coral at 20 m.*

19. *Ischnochiton chaceorum* Kaas & Van Belle, 1990

Puerto Peñasco, upper Gulf of California, México (Kaas & Van Belle, 1990). Only known for the type locality, and probably intertidal. **GC**. (Figure 19).

20. *Ischnochiton rhodolithophilus* R.N. Clark, 2000

Bahía Concepción, Isla El Requesón to Canal de San Lorenzo, Gulf of California, México (Clark, 2000). Found in rhodolith beds. Shallow subtidal from depths of 4-12 m. **GC**.*

21. *Ischnochiton tomhalei* R.N. Clark, 2000

From Punta Chivado to Canal de San Lorenzo, and Isla Coronado, Gulf of California, México (Clark, 2000). Found in rhodolith beds. Shallow subtidal from depths of 7-12 m. **GC**.*

Callistochiton Dall, 1879

22. *Callistochiton elenensis* (Sowerby in Broderip & Sowerby, 1832) Gulf of California and Southward to Punta Ancón, Santa Elena Peninsula, Ecuador (Ferreira, 1979; Kaas & Van Belle, 1994); Pichilingue, Balandra and Tecolote, La Paz, Baja California Sur (García-Ríos & Álvarez-Ruiz, 2007); Tlacapanocha, Parque de la Reina, Manzanillo, Pie de la Cuesta, Guerrero (Flores-Garza *et al.*, 2012; Galeana-Rebolledo *et al.*, 2014); Carrizalillo, Oaxaca, México (Flores-Rodríguez *et al.*, 2014). Somewhat common in Jalisco and Guerrero. Found in shallow subtidal zones up to depths of 70 m. (CNMO5311). **SGC**, **MTP**. (Figure 20).

23. *Callistochiton expressus* (Carpenter, 1865)

Playa Cerritos and Mazatlán, Sinaloa, México to Punta Ancón, Santa Elena Península, Ecuador (Kaas & Van Belle, 1994; García-Ríos *et al.*, 2003). Low intertidal to subtidal species. **SGC**. (Figure 21).

24. *Callistochiton palmulatus* Carpenter MS, Dall, 1879

Buckhorn Creek, Mendocino Co., California, USA to Punta San Pablo, Baja California, México (Ferreira, 1979; Kaas & Van Belle, 1994; Eernisse *et al.*, 2007; Stebbins & Eernisse, 2009; Vendrasco *et al.*, 2012). Found on rock dredged off San Pedro, California, USA, rare in México. Intertidal zone to depths of 85 m. **SCB**. (Figure 22).

25. *Callistochiton crassicosatus* Pilsbry, 1893

Monterey and Trinidad, California, USA to Punta Banda and Isla Cedros, Baja California, México (Ferreira, 1979; Kaas & Van Belle, 1994; Eernisse *et al.*, 2007). Subtidal species under rocks, occasional in México. Type specimen recorded at a depth of 640-732 m near Santa Catalina Island, USA. (DWP), **SCB**. (Figure 23).

26. *Callistochiton decoratus* Carpenter MS, Pilsbry, 1893

Point Arguello, Santa Barbara, California, USA to Punta China near Isla Cedros, Baja California, México (Ferreira, 1979; Kaas & Van Belle, 1994). Uncommon species in México; in California it is found under rocks, mostly intertidal and subtidal at depths up to 72 m. **SCB**. (Figure 24).

27. *Callistochiton asthenes* (Berry, 1919)

From Palos Verdes Peninsula, California to Isla Coronado, Guadalupe and Cedros, Baja California, México (Ferreira, 1979; Kaas & Van Belle, 1994). Rare in México; found in California in intertidal zones with rather restricted distribution to Coronado Island. **SCB**. (Figure 25).

28. *Callistochiton colimensis* (A.G. Smith, 1961)

San José del Cabo, Baja California; Bahía Cuastocamate, Jalisco; Manzanillo, Colima, México; Port Parker and Bahía Elena, Costa Rica to Contadora and Pearl Islands, Panamá (Ferreira, 1979; Kaas & Van Belle, 1994). Rare species, intertidal to subtidal at depths up to 340 m. **SGC**. (Figure 26).

29. *Callistochiton leei* Ferreira, 1979

Guadalupe Island, Baja California, México (Ferreira, 1979; Kaas & Van Belle, 1994). Only known from the type locality. Shallow intertidal species found at a depth of 1 m. **SCB**. (Figure 27).

30. *Callistochiton* sp. (Reyes-Gómez, unpublished)

Tlacopanocha, Parque de la Reina; Majahua, Playa Manzanillo, Guerrero, México (as *Lepidozonia serrata* in Flores-Garza *et al.*, 2012 and Galeana-Rebolledo *et al.*, 2014). Intertidal zone to depths of 10 m. (CNMO5815). **MTP**. (Figure 28).

Callistoplax Carpenter MS, Dall, 1882

31. *Callistoplax retusa* (Sowerby in Broderip & Sowerby, 1832) Islas Tres Marias, México to Panamá (Kaas & Van Belle, 1994); Tlacopanocha, Parque de la Reina, Majahua, La Angosta, Guerrero (Flores-Garza *et al.*, 2012; Galeana-Rebolledo *et al.*, 2014); Isla Pájaros Michoacán; Chachacual-Jicaral, Bahías de Huatulco and Estacahuite Puerto Ángel, Oaxaca, México (Reyes-Gómez *et al.*, 2010). Common species in the Mexican Tropical Pacific. Intertidal to shallow subtidal, under rocks. (CNMO5230). **SGC**, **MTP**. (Figure 29).

Lepidozonia Pilsbry, 189232. *Lepidozonia scrobiculata* (Middendorff, 1847)

Along the West Coast from Sonoma County, California, USA to Thurloe Head on the outer coast of Baja California, México (Ferreira, 1978; Kaas & Van Belle, 1987; Clark, 2004; Eernisse *et al.*, 2007; Stebbins & Eernisse, 2009). Rare in México; reported common in the Southern California Bight, from 5 to 10 m. Intertidal zone to depths of 1460 m. (DWP), **SCB**. (Figure 30).

33. *Lepidozonia mertensii* (Middendorff, 1847)

Western coast of North America; Auke Bay, Alaska to Arrecife Sacramento, USA, to Baja California, México (Ferreira, 1978; Kaas & Van Belle, 1987; Eernisse *et al.*, 2007; Stebbins & Eernisse, 2009; Vendrasco *et al.*, 2012). Typical species in the Temperate Northern Pacific, found about 8 m on the bottom and sides of rocks; rare in México. Intertidal zone to depths of 100 m. (CNMO5389). **SCB**. (Figure 31).

34. *Lepidozonia clathrata* (Reeve, 1847)

Continuously distributed in the Gulf of California including Manzanillo, Colima and Islas Tres Marias (Ferreira, 1978; Kaas & Van Belle, 1987); Pichilingue, La Paz, Baja California Sur, México (García-Ríos & Álvarez-Ruiz, 2007). Under rocks in the low intertidal zone to depths of 10 m. (CNMO5395). **GC**, **SGC**. (Figure 32).

35. *Lepidozonia retiporosa* (Carpenter, 1864)

Western coast of North America, between Edna Bay, Kosciusko Island, Alaska, USA, and the very entrance of Baja California, México (Ferreira, 1978; Kaas & Van Belle, 1987; Eernisse *et al.*, 2007; Stebbins & Eernisse, 2009). Somewhat common species in the Southern California Bight, rare in México. Intertidal to subtidal in depths from 15 m to over 1463 m. **SCB**. (Figure 33).

36. *Lepidozonia serrata* (Carpenter, 1864)

San Diego and Monterey Bay, California, USA to Bahía Magdalena, Baja California; Gulf of California, Mazatlán, Sinaloa and Islas Tres Marias (Ferreira, 1978; Kaas & Van Belle, 1987); Pichilingue, Balandra, Tecolote and Sargento, La Paz, Baja California Sur, México (García-Ríos & Álvarez-Ruiz, 2007). Low intertidal zone to depths of 10 m. (CNMO5463). **SCB**, **SGC**. (Figure 34).

37. *Lepidozона cooperi* (Carpenter MS, Dall, 1879)
Western coast of North America from British Columbia, Canada, San Luis Obispo County, USA, Cayucos, Neah Bay, Strait of Juan de Fuca, Washington to Puerto Santo Tomás, Baja California, México (Ferreira, 1978; Kaas & Van Belle, 1987; Eernisse *et al.*, 2007). Occasional in México; most common in the Temperate Northern Pacific, in low intertidal zones around 8 m, under rocks and hidden on sediment deposits. Intertidal to depths of 20 m. (CNMO5391). **SCB**. (Figure 35).
38. *Lepidozона radians* (Carpenter in Pilsbry, 1892)
From Port Hardy, British Columbia, Canada and south to some cold-water upwelling intertidal sites south of Ensenada, Baja California, México (Eernisse *et al.*, 2007; Stebbins & Eernisse, 2009; Vendrasco *et al.*, 2012). Intertidal species. Rare in México, common within Southern California Bight, at depths of 5-13 m. Intertidal to shallow subtidal to depths of 150 m, found on rocks or buried in sand. **SCB**. (Figure 36).
39. *Lepidozона pectinulata* (Carpenter in Pilsbry, 1893)
Western coast of North America, Cayucos, San Luis de Obispo Co., California, USA to Bahía Magdalena, Baja California, México (Ferreira, 1978; Kaas & Van Belle, 1987; Eernisse *et al.*, 2007; Vendrasco *et al.*, 2012). Somewhat common north of southern California, USA, occasional in México. Found under rocks in low intertidal zones to depths of 20 m. **SCB**. (Figure 37).
40. *Lepidozона willetti* (Berry, 1917)
Western coast of North America; Forrester Island, Alaska, USA to Punta Abrejos, Baja California, México (Ferreira, 1978; Kaas & Van Belle, 1987; Eernisse *et al.*, 2007). Rare species, not found at depths less than 15 m, and found subtidally to 275 m. **SCB**. (Figure 38).
41. *Lepidozона golischi* (Berry, 1919)
Along the West Coast from the Gulf of Alaska, USA to Sebastian Vizcaino Bay, Baja California, México (as *Lepidozона scabricostata* in Ferreira, 1978, Kaas & Van Belle, 1987), (Sirenko & Clark, 2008; Stebbins & Eernisse, 2009). Rare in México. Found intertidally to depths of 1460 m. (DWP), **SCB**. (Figure 39).
42. *Lepidozона crockeri* (Willet in Hertlein & Strong, 1951)
Banco Gorda and Isla Monserrat, Gulf of California, México (Ferreira, 1978; Kaas & Van Belle, 1987). Rare species. Intertidally to depths of 15 m. **GC**. (Not figured*)
43. *Lepidozона subtilis* Berry, 1956
Puerto Peñasco to Bahía San Pedro and Guaymas, Sonora through San Felipe Puertecitos, Bahía Gonzaga, Bahía de los Ángeles to Bahía San Francisquito, México (Ferreira, 1978; Kaas & Van Belle, 1987). Shallow-subtidal zones to depths of 2-3 m. **GC**. (Figure 40).
44. *Lepidozона formosa* Ferreira, 1974
Isla San Francisco and Isla Blanca and near to Puerto Escondido, Baja California, Sur, México (Ferreira, 1978; Kaas & Van Belle, 1987). Only known from the type locality. Rare species. Low intertidal zone to depths of 15 m. **GC**. (Not figured*)
45. *Lepidozона allynsmithi* Ferreira, 1974
Caleta el Candelero, Isla Concepción, Isla Requesón, Cabo Pulmo, Baja California and Bahía Tenacatitla, Jalisco, México to Bahía de Huevos, Costa Rica (Ferreira, 1978; Kaas & Van Belle, 1987); and Chachacual-Jicaral, Bahías de Huatulco, Oaxaca, México (as *Lepidozона serrata* in Reyes-Gómez *et al.*, 2010). Low intertidal zone to depths of 20 m. (CNMO5651). **SGC**, **MTP**. (Figure 41).
46. *Lepidozона guadalupensis* Ferreira, 1978
Guadalupe Island, Baja California, México (Ferreira, 1978; Kaas & Van Belle, 1987). Only known from the type locality. Intertidal zone to depths of 70 m. **SCB**. (Figure 42).
47. *Lepidozона rothi* Ferreira, 1983
Isla Clarión, Islas Revillagigedo (Ferreira, 1983b); Isla San Pedro Nolasco, Gulf of California, México to Cocos Island, Costa Rica (Kaas & Van Belle, 1987; Vendrasco *et al.*, 2012). Subtidal from depths of 55-110 m. **RG**, **GC**. (Figure 43).
48. *Lepidozона clarionensis* Ferreira, 1983
Isla Clarión, Revillagigedo Islands, México (Ferreira, 1983b; Kaas & Van Belle, 1987). Only known from the type locality. Subtidal from depths of 8-25 m. **RG**. (Figure 44).
49. *Lepidozона laurae* Ferreira, 1985
Guaymas, Sonora (Ferreira, 1985; Kaas & Van Belle, 1987); Punta San Antonio, North of Guaymas, Sonora and Bahía de los Ángeles, Baja California, México. Only known from the type locality. Subtidal zone ranging from depths of 60-100 m. **GC***.
50. *Lepidozона stohleri* Ferreira, 1985
Islas Ángel de la Guarda and Danzante and Puerto Refugio, México (Ferreira, 1985; Kaas & Van Belle, 1987). Intertidal zone to depths of 12-60 m. **GC**. (Figure 45).
51. *Lepidozона skoglundi* (Ferreira, 1986)
Playa Novillero, Nayarit and Puerto Peñasco, Sonora, México (Kaas & Van Belle, 1990). Shallow subtidal from depths of 8-15 m. **GC**. (Figure 46).
52. *Lepidozона sirenkoi* Kaas & Van Belle, 1990.
Puerto Peñasco, Sonora, México (Kaas & Van Belle, 1990). Only known from the type locality. Habitat unknown, probably intertidal. **GC**. (Figure 47).
53. *Lepidozона tenuicostata* Kaas & Van Belle, 1990
Punta Peñasco, Sonora, México (Kaas & Van Belle, 1990). Only known from the type locality. Habitat unknown. Probably intertidal. **GC**. (Figure 48).

Stenoplax Dall, 1879.

54. *Stenoplax limaciformis* (Sowerby, 1832)

Isla Tiburón and Isla Carmen, Gulf of California, México to Inner Lobos Island, Perú, Western coast of Central America (Bullock, 1985, Kaas & Van Belle, 1987); Tecolote and Sargento, La Paz, Baja California Sur (García-Ríos & Álvarez-Ruiz, 2007); Jalisco; Michoacán; Puerto Angelito, Puerto Escondido and Estacahuite, Oaxaca, México (Reyes-Gómez *et al.*, 2010); (Flores-Garza *et al.*, 2012; Galeana-Rebolledo *et al.*, 2014). Common intertidal species found under rocks to depths of 20 m. (CNMO5179). **GC**, **SGC**, **MTP**. (Figure 49).

55. *Stenoplax magdalenensis* (Hinds, 1845)

Western coast of Baja California Península, México, from Bahía de San Quintín to Cabo San Lucas and between Bahía de la Concepción and Punta Peñasco, Gulf of California, México (Kaas & Van Belle, 1987). Found exposed in the shallow intertidal zone. (CNMO5384). **SCB**, **GC**. (Figure 50).

56. *Stenoplax boogii* (Haddon, 1886)

Caribbean and Eastern Pacific: Bermuda and St. Lucie Inlet, Florida, USA to Alagoas, Brazil; Cabo San Lucas, México to Isabel Island, Perú (Kaas & Van Belle, 1987); Tuxpan reef, Veracruz found in shallow intertidal zone and in dead coral (Rodríguez-Vázquez *et al.*, 2014). Rare species; intertidal zone to depths of 15 to 70 m on rocks and coral. (CNMO5423). **MTP** (Figure 51).

57. *Stenoplax fallax* (Carpenter, 1892)

Western coast of North America, Vancouver Island, Canada to Todos Santos Bay, Baja California, México (Kaas & Van Belle, 1987; Eernisse *et al.*, 2007; Vendrasco *et al.*, 2012). Rare in Baja California, occurs along the side of rocks and buried in sand. Subtidal to depths of 30 m. **SCB**. (Figure 52).

58. *Stenoplax corrugata* (Carpenter, 1892)

Coast of North Pacific, Santa Cruz, California USA and along the Eastern Pacific, Baja California, Guadalupe and San Martín Islands, Baja California; Bahía Magdalena; Clarion Island, Revillagigedo Archipiélago, México (Ferreira, 1983b; Kaas & Van Belle, 1987). Intertidal species. **RG**, **SCB**. (Figure 53).

59. *Stenoplax conspicua* (Pilsbry, 1892)

Western coast of North America, San Francisco, California, USA to Bahía de Sebastian Vizcaino, Baja California, México (Kaas & Van Belle, 1987; Eernisse *et al.*, 2007). Rare species north of southern California. Few reports in La Paz Baja California Sur, México. Shallow subtidal species. (CNMO1041). **SCB**. (Figure 54).

60. *Stenoplax mariposa* (Dall, 1919)

Pacific coast of Baja California, Gulf of California, southwards along the coast of México to Cape Corrientes, Revillagigedo Archipiélago (Kaas & Van Belle, 1990); Malecón, Pichilingue and Balandra, La Paz, Baja California Sur, México (García-Ríos & Álvarez-Ruiz, 2007). On rocks and stones, always associated with algae, low intertidal to shallow subtidal species. (CNMO5642). **GC**, **SGC**. (Figure 55).

61. *Stenoplax heathiana* Berry, 1946

Fort Bragg, Mendocino County, California, USA to Punta Santo Tomás, Baja California, México (Kaas & Van Belle, 1987; Eernisse *et al.*, 2007; Vendrasco *et al.*, 2012). Very common species in Central California; rare in the Southern California Bight and in Baja California, México. Intertidal to shallow subtidal to a depth of 7 m. **SCB**. (Figure 56).

62. *Stenoplax sonorana* Berry, 1956

Northern half of the Gulf of California, Bahía de San Carlos on western side to Guaymas, Sonora, México (Kaas & Van Belle, 1987). Found intertidally under rocks. (CNMO5464). **GC**. (Figure 57).

63. *Stenoplax circumsenta* Berry, 1956

Bahía San Gabriel, Isla Espíritu Santo and Pichilingue, Baja California Sur in the Gulf of California, México (Ferreira, 1972); Scammons Lagoon, Bahía Magdalena; La Paz to Isla Monserrat on the Western side and Sonora on the eastern side near to Guaymas, México (Kaas & Van Belle, 1987; Vendrasco *et al.*, 2012). Subtidal down to a depth of 72 m. **GC**. (Figure 58).

64. *Stenoplax* sp. (Reyes-Gómez, unpublished)

Estacahuite, Oaxaca (as *Stenoplax mariposa* in Reyes-Gómez *et al.*, 2010); Parque de la Reina, Tlacopanocha, Majahua, Parque de la Reina Muelle, Guerrero, México (as *Stenoplax rugulata* and *Stenoplax mariposa* in Flores-Garza *et al.*, 2012 and Galeana-Rebolledo *et al.*, 2014); Michoacán [CNMO5577]. Somewhat common in central Guerrero, México. Intertidal to shallow subtidal. (CNMO5730). **MTP**. (Figure 59).

CHITONIDAE Rafinesque, 1815

Subfamily CHITONINAE Rafinesque, 1815

Chiton Linnaeus, 1758

65. *Chiton albolineatus* Broderip & Sowerby, 1829

Occurs from Mazatlán at the entrance of the Gulf of California to southern México (Bullock, 1988); Las Salinas, Punta Maldonado, all along Acapulco and Costa Grande area (Flores-Garza *et al.*, 2012; Galeana-Rebolledo *et al.*, 2014); Cacaluta, Bahías de Huatulco, Oaxaca, México (Reyes-Gómez *et al.*, 2010). Common species, found in shallow subtidal depths. (CNMO5184). **SGC**, **MTP**. (Figure 60).

66. *Chiton articulatus* Sowerby in Broderip & Sowerby, 1832

Socorro Island, Revillagigedo; from Mazatlán south to Huatulco, Oaxaca, México (Ferreira, 1983b; Bullock, 1988); all along Guerrero coasts (Flores-Garza *et al.*, 2012; Galeana-Rebolledo *et al.*, 2014); Puerto Ángel, Estacahuite to Salina Cruz and La ventosa, Oaxaca, México (Reyes-Gómez, 2004; Reyes-Gómez *et al.*, 2010). Common species. Found intertidally on rocks. (CNMO5256). **RG**, **SGC**, **MTP**. (Figure 61).

67. *Chiton virgulatus* Sowerby, 1840

Bahía Magdalena and Gulf of California; Bahía Kino, Sonora (Bullock, 1988); Pichilgue, Tecolote, Sargento, La Balandra, La Paz, Baja California Sur, México (García-Ríos & Álvarez-Ruiz, 2007). Common species. Found exposed in intertidal zones. (CNMO5646). **GC**, **SGC**. (Figure 62).

Subfamily TONICINAE Pilsbry, 1893*Tonicia* Gray, 184768. *Tonicia forbesii* Carpenter, 1857

Mazatlán, México to Taboga, Island, Panamá (as *Tonicia (Tonicia) forbesii forbesii* in Kaas *et al.* 2006); Parque de Reina, Playa Tlacopanocha, Playa Majahua, Playa Pie de la Cuesta, Playa Manzanillo, Playa La Angosta, Parque de la Reina, Playa Piedra de Tlacoyunque, Playa Las Gatas (Flores-Garza *et al.*, 2012; Galeana-Rebolledo *et al.*, 2014); Chachacual-Jicaral, Bahías de Huatulco, Puerto Ángel, Oaxaca, México (Reyes-Gómez *et al.*, 2010). Intertidal to shallow subtidal. (CNMO5309). **SGC**, **MTP**. (Figure 63).

Suborder ACANTHOCHITONINA Bergenhayn, 1930**ACANTHOCHITONIDAE Pilsbry, 1893***Acanthochitona* Gray, 192169. *Acanthochitona hirudiniformis* (Sowerby, 1832)

From Bahía de las Animas, Gulf of California, México; Puerto San Juan del Sur, Nicaragua; Bahía Huevos, Costa Rica; Tonosi Bucaro, Panamá through western Central America to Perú and the Galápagos Islands (as *A. hirudiniformis hirudiniformis* in Watters, 1990). On rocks intertidally to subtidal depths of up to 10 m. **GC**, **MTP**. (Not figured*)

70. *Acanthochitona arragonites* (Carpenter, 1857)

From Sonora, México to Salinas, Ecuador (Watters, 1990). Isla San Francisco, Isla San José, Isla Coronado, Isla San Carlos, Bahía Las Animas, Bahía de los Ángeles, Isla Ángel de la Guarda; Pichilingue, La Paz, Baja California Sur, México (García-Ríos & Álvarez-Ruiz, 2007). Estacahuite, Puerto Ángel, Oaxaca, México (Reyes-Gómez *et al.*, 2010). Common in Acapulco, Playa Tlacopanocha, Playa Piedra de Tlacoyunque, Playa Puerto Vicente Guerrero, Ojo de Agua, Playa La Barrita, Barra de Potosí Expuesta and Protegida, Isla Grande, Playa Las Gatas, Playa Troncones Guerrero, México (Flores-Garza *et al.*, 2012; Galeana-Rebolledo *et al.*, 2014). Found on rocks intertidally to subtidal depths of 10 m. (CNMO5196). **GC**, **SGC**, **MTP**. (Figure 64).

71. *Acanthochitona avicula* (Carpenter, 1864)

From southern California Bight, La Jolla and Catalina Island, California, USA, to Isla Coronado, Bahía de los Ángeles, Ensenada, Bahía de las Animas, Bahía Pichilingue, Baja California Sur; Punta Cholla, Sonora, México (Watters, 1990; Stebbins & Eernisse, 2009); Malecón, Pichilingue and Sargento, La Paz, Baja California Sur, México (García-Ríos & Álvarez-Ruiz, 2007). Common species in Southern California Bight. Intertidal to shallow subtidal depths among or under rocks. **SCB**, **GC**. (Figure 65).

72. *Acanthochitona exquisita* (Pilsbry, 1893)

Las Animas Bay, Baja California; San Francisco, Partida, Ángel de la Guarda, Tiburón, Carmen, Coronado, San José Islands, Gulf of California, México (Watters, 1990); Pichilingue and Tecolote, La Paz, Baja California Sur, México (García-Ríos & Álvarez-Ruiz, 2007). Found in the lower intertidal zone under rocks. (CNMO5385). **GC**. (Figure 66).

73. *Acanthochitona angelica* Dall, 1919

Bahía de los Ángeles, Gulf of California; Islas Tres Marias, México to Panamá and the Galápagos Islands (Watters, 1990); Mazatlán, Sinaloa and Michoacán, México. Intertidal to a depth of 50 m. (CNMO5563). **GC**, **SGC**, **MTP**. (Figure 67).

74. *Acanthochitona imperatrix* Watters, 1981

From southern California, San Diego, USA, to La Paz and the western side of Baja California, México to Isla Santa Cruz, Galápagos Islands (Watters, 1981). Subtidal at depths to 10 m. **SGC**. (Not figured*)

75. *Acanthochitona burghardtae* R.N. Clark, 2000

Isla San José South to Canal San Lorenzo, Baja California Sur, México (Clark, 2000). Found in rhodolith beds, inner Gulf of California, Baja California, Norte, México. Subtidal from depths of 7-12 m. **GC**. (Figure 68).

LEPIDOCHITONIDAE Iredale, 1914*Lepidochitona* Gray, 182176. *Lepidochitona beanii* (Carpenter, 1857)

Gulf of Santa Catalina, California, USA; Isla Lobos de Afuera, Perú and Gulf of California, México (Kaas & Van Belle, 1985b); Pichilingue, La Paz, Baja California Sur, México (García-Ríos & Álvarez-Ruiz, 2007). On rocks intertidally, rarely subtidal up to depths of 230 m. **SCB**, **GC**. (Figure 69).

77. *Lepidochitona corteziana* R.N. Clark, 2000

Punta Chivato, Isla San José, Baja California Sur to Canal San Lorenzo, Gulf of California, México (Clark, 2000). Subtidal from depths of 10-12 m. **GC**. (Not figured*)

78. *Lepidochitona salvadorensis* García-Ríos, 2006

Los Cobanos, Sonsonate and Maculfs Playa, La Unión, El Salvador (García-Ríos *et al.*, 2003); Mazatlán (personal observation of specimens from Bahía Navachiste); Parque de la Reina, Tlacopanocha, Majahua, Manzanillo, Las Salinas, Playa Piedra de Tlacoyunque, La Barrita, Barra de Potosí, Isla Grande and Puerto Maldonado, Guerrero, México (Flores-Garza *et al.*, 2012; Galeana-Rebolledo *et al.*, 2014); Puerto Ángel, Oaxaca, México (Reyes-Gómez *et al.*, 2010). Intertidally found under rocks. Juveniles found on rocks buried in sand. (CNMO5252). **SGC**, **MTP**. (Figure 70).

79. *Lepidochitona* sp. (Reyes-Gómez, unpublished)

Estacahuite, Puerto Ángel, Oaxaca, México (as *Lepidochitona* sp. in Reyes-Gómez *et al.*, 2010); Acapulco, Tlacopanocha, Parque de la Reina, Las Salinas, Playa Punta Maldonado, Playa Majahua, Playa Piedra de Tlacoyunque, Playa La Barrita, Playa Troncones, Playa Casa de Piedra, Las Peñitas, Ojo de Agua, Barra de Potosí Protegida, Playa Las Gatas, Pie de la Cuesta, Playa Manzanillo, Guerrero, México (as *Lepidochitona hartwegii*, *Lepidochitona flectens* *Lepidochitona* sp. 1 and *Lepidochitona* sp. 2 in Flores-Garza *et al.*, 2012; Galeana-Rebolledo *et al.*, 2014). Found intertidally to depths of 7 m. (CNMO5236). **MTP**. (Figure 71).

Cyanoplax Pilsbry, 189280. *Cyanoplax dentiens* (Gould, 1846)

Boswell Bay, Hinchinbrook Island Near Prince William Island, Alaska, USA, and Puerto Santo Tomás, Baja California, México (as *Lepidochitona dentiens* in Eernisse, 1986 and Kaas & Van Belle, 1985b; Eernisse *et al.*, 2007). Occasional in México (this record needs reconfirmation). Common species between Alaska and California. Intertidal to subtidal at depths up to 60 m. (CNMO5387). **SCB**. (Figure 72).

81. *Cyanoplax keepiana* (Berry, 1948)

Distributed along Otter's Point, California, USA and Rancho Socorro; Isla Socorro Revillagigedo, México (as *Lepidochitona keepiana* in Ferreira, 1983b; Kaas & Van Belle, 1985b; Eernisse, 1986; Eernisse *et al.*, 2007). Rare in México, common species in the Southern California Bight. Intertidal, found in warm protected pools under small rocks. **RG, SCB**. (Figure 73).

82. *Cyanoplax hartwegii* (Carpenter, 1855)

Battle Rock, Port Orford, Oregon, USA, to the southern verified record at Punta Abreojos, Baja California, México (as *Lepidochitona hartwegii* in Eernisse, 1986; Kaas & Van Belle, 1985b); Between Sausalito, California, USA to Baja California, México (Eernisse *et al.*, 2007). Rare in México, common species in the Southern California Bight in tide pools under algae. Intertidal to shallow subtidal. **SCB**. (Figure 74).

83. *Cyanoplax berryana* (Eernisse, 1986)

Species distribution restricted at the Northeastern Pacific (as *Lepidochitona berryana* in Eernisse, 1986); Camalu, Punta Banda and Bahía San Quintín, Baja California, México (Clark, 1991a; Eernisse *et al.*, 2007). Rare in México, common species in the Southern California Bight in sand or protected areas, low intertidal and shallow subtidal zones at depths of 0-3 m. **SCB**. (Figure 75).

Nuttallina Dall, 187184. *Nuttallina californica* (Reeve, 1847)

Continuously distributed along the west coast and offshore Islands of North America; Doran Beach, Sonora County, California, USA and down to Puente Santo Tomás, Baja California, México (Kaas & Van Belle, 1985b; Eernisse *et al.*, 2007). Common in mid-intertidal; rare species north of Central California and Punta Concepción, Baja California. **SCB**. (Figure 76).

85. *Nuttallina crossota* (Berry, 1956)

Gulf of California on the Sonora side between Puerto Peñasco and Guaymas on the Baja California side between San Felipe and Puerto Balandra, México (Kaas & Van Belle, 1985b). Intertidal, sometimes found in tidal pools. **GC**. (Figure 77).

86. *Nuttallina fluxa* (Carpenter, 1864).

In lower Southern California, USA (rare in northern California), common in mid to lower intertidal habitats, often found in home depressions when substrate is sandstone (Eernisse *et al.*, 2007)

Bahía de San Quintín, Baja California, México, in intertidal (RNC791, January 25th, 1982). (Figure 94.)

MOPALIIDAE Dall, 1889*Dendrochiton* Berry, 191187. *Dendrochiton lirulatus* (Berry, 1863)

Confined to the Northern part of the Gulf of California, from San Felipe to Bahía de los Ángeles on the west side and Cholla Bay to Saladita Bay, Baja California, México (as *Lepidochitona (Dendrochiton) lirulata* in Kaas & Van Belle, 1985b; Eernisse *et al.*, 2007). Rare in México, found intertidally on stones. **GC**. (Figure 78).

88. *Dendrochiton flectens* (Carpenter, 1864)

Between Hot Springs Island British Columbia, Canada to Isla Santa Gerónimo, Baja California, México (as *Lepidochitona flectens* in Kaas & Van Belle, 1985b; Eernisse *et al.*, 2007). Rare in México, mostly subtidal at depths of 5-10 m and common in the Northern Pacific on sides of rocks, occasionally from the low intertidal zone to depths of 40 m. **SCB**. (Figure 79).

89. *Dendrochiton gothicus* (Carpenter, 1864)

Santa Cruz Island, Los Ángeles, California, USA and Isla Asunción, Baja California, México (as *Lepidochitona gothica* in Ferreira, 1982; Kaas & Van Belle, 1985b). (Stebbins & Eernisse, 2009). Rare in México, intertidal species, the deepest record is at 230 m. **SCB**. (Figure 80).

90. *Dendrochiton thamnopus* (Berry, 1911)

Bodega Bay, California, USA and Punta Abreojos, Baja California, México (Ferreira, 1982; as *Lepidochitona (Dendrochiton) thamnopus* in Kaas & Van Belle, 1985b), (Eernisse *et al.*, 2007; Stebbins & Eernisse, 2009). Common in Monterey Peninsula, USA on rocks from depths of 4-15 m, rare in Baja California. Low intertidal to subtidal zone at depths of 15-38 m. **SCB**. (Figure 81).

Mopalia Gray, 184791. *Mopalia ciliata* (Sowerby, 1840)

From Sonoma County, California, USA and Rancho Socorro, Puerto Santo Tomás, Baja California, México (Kaas & Van Belle, 1994; Eernisse *et al.*, 2007; Sirenko & Clark, 2008). Rare north of Monterey Bay, USA and in Baja California, México. Found in low intertidal on rocks and in crevices to depths of about 10 m. **SCB**. (Figure 82).

92. *Mopalia lignosa* (Gould, 1846)

Along the western coast of North America, Between Sitka, Alaska, USA (Eernisse *et al.*, 2007), and Bahía Magdalena, Baja California, México (Kaas & Van Belle, 1994), this last record need reconfirmation. According to Eernisse *et al.* (2007) is common around Monterey Peninsula under rocks. Intertidal species extends to subtidal depths of 10 m in the kelp forest. (CNMO5390). **SCB**. (Figure 83).

93. *Mopalia muscosa* (Gould, 1846)

Shumagin Islands, Alaska, USA and Rosario, Baja California; Isla Socorro, Revillagigedo, México (Kaas & Van Belle, 1994; Eernisse *et al.*, 2007). Occasional in México. Intertidal species. (CNMO5388). **RG**, **SCB**. (Figure 84).

94. *Mopalia porifera* Pilsbry, 1893

Along the western shores of North America between Topanga, North of Santa Monica, California, USA and Rancho Socorro, Baja California, México (Kaas & Van Belle, 1994; Eernisse *et al.*, 2007). Rare in México. Intertidal species. **SCB**. (Figure 85).

95. *Mopalia lionota* Pilsbry, 1918

From Santa Cruz, California, USA down to Punta Descanso, Baja California, México (Clark, 1991a; Kaas & Van Belle, 1994; Eernisse *et al.*, 2007). Rare in México; most common from the low intertidal zone to about 3 m, especially in the granite and sand habitat of Monterey, USA. Sometimes exposed, living mainly on the top of large rocks. **SCB**. (Figure 86).

96. *Mopalia imporcata* Carpenter, 1865

Along the North America from Kachemak, Bay, Kenai Peninsula, Cook Inlet, Alaska, USA down to Punta Santo Tomás, Baja California Norte, México (Clark, 1991a; Kaas & Van Belle, 1994; Eernisse *et al.*, 2007; Stebbins & Eernisse, 2009). Subtidal and common in California. Found from depths of 8-12 m, and intertidally to depths of 120 m. (CNMO5393). **SCB**. (Figure 87).

97. *Mopalia plumosa* Carpenter in Pilsbry, 1893

North America between Monterey, California, USA and Bahía del Rosario, Baja California, México (Eernisse *et al.*, 2007; Stebbins & Eernisse, 2009). Rare in México, common species in Monterey Bay, USA low intertidal zone to depths from 7-40 m. **SCB**. (Figure 88).

Placiphorella Dall, 187998. *Placiphorella velata* Carpenter MS, Dall, 1879

Hichinbrook and Prince William Island, Sound, Alaska, USA to Todos Santos, Baja California (Kaas & Van Belle, 1994); North Vancouver Island, Alaska, USA to Central Baja California, México in Punta Entrada at Sail Rock North entrance to Bahía Magdalena; Bahía Puerto Escondido, Baja California Sur and within the Gulf of California, México (Clark, 1991a; Clark, 1994; Eernisse *et al.*, 2007; Vendrasco *et al.*, 2012). Most common in the Temperate Northern Pacific. Intertidal to subtidal depths of 5-10 m. (CNMO5392). **SCB**. (Figure 89).

99. *Placiphorella pacifica* Berry, 1919

Aleutian Islands; Sea of Okhotsk, Russia to Guaymas, Sonora in the Gulf of California, México; Eastern Indian Ocean, South Tasmania Ridge (Clark, 1991a; Clark, 1994). Intertidal species ranging from depths of 210-274 m. **SCB**, **GC**. (Figure 90).

100. *Placiphorella mirabilis* R.N. Clark, 1994

Gaviota Santa Barbara County, California, USA and Isla Asunción, Baja California Sur, México (Clark, 1994; Vendrasco *et al.*, 2012); South of Santa Catalina Island, California USA to

Cedros Island Baja California, México (as *Placiphorella* sp. 1 in Kaas & Van Belle, 1994; Stebbins & Eernisse, 2009). Rare in México. Intertidal species, found on rock cliffs ranging from depths of 28-155 m. **SCB**. (Figure 91).

101. *Placiphorella hanselmani* R.N. Clark, 1994

Restricted to the upper Gulf of California, Puerto Lobos and Puerto de la Libertad, Baja California, México (Clark, 1994). Found in low intertidal zone to subtidal depths of 140 m. **GC**. (Figure 92).

Tonicella Carpenter, 1873102. *Tonicella venusta* R.N. Clark, 1999

Kodiak Island, Alaska, USA to Isla Cedros, Northern Baja, California Norte, México (Clark, 1999; Eernisse *et al.*, 2007; Stebbins & Eernisse, 2009; Vendrasco *et al.*, 2012). Common in Southern California Bight on top and sides of rocks at 13-18 m. Rare in México. Intertidal species to subtidal depths of 140 m. **SCB**. (Figure 93).

Modifications to the original chiton check-list

Seventeen species were removed from the original list (*see* Reyes-Gómez & Salcedo-Vargas, 2002), which occur outside the Mexican Pacific region or considered synonyms of other nominal species, each case is explained below.

-*Leptochiton alveolus* (M. Sars MS, Lovén, 1846)

Abyssopelagic species, considered now as two different entities (Schwabe, 2008). *Leptochiton alveolus* with a distribution range in the Atlantic and *L. belknapi* in the Indo-Pacific; *see* species No. 3.

-*Chaetopleura mixta* Dall, 1919

Synonym of *Chaetopleura hanselmani* in Kaas & Van Belle, 1987; *see* species No. 14.

-*Ischnochiton petaloides* (Gould, 1846)

Designated Synonym of *Stenoplax petaloides* (Gould, 1846), endemic to the Hawaiian Islands (Kaas & Van Belle, 1990).

-*Ischnochiton newcombi* Carpenter, 1892

Endemic species of Santa Catalina Island, California, USA. (Kaas & Van Belle, 1985b).

-*Stenoplax* sp. in Reyes-Gómez, 1999

Reported as provisional species (in Reyes-Gómez & Salcedo-Vargas, 2002). After the revision of specimens from Zihuatanejo, *Stenoplax* sp. was confirmed to be an albino juvenile of *Stenoplax limaciformis*; *see* species No. 54.

-*Lepidozona sinudentata* (Carpenter in Pilsbry, 1892)

Lepidozona scrobiculata, was demonstrated by Clark (2004) to be a senior synonym of *L. sinudentata* (Carpenter in Pilsbry, 1892); *see* species No. 32.

-*Lepidozonia allyni* Ferreira, 1977

Synonym of *Tripoplax allyni* (Ferreira, 1977), distributed in Amchitka, Aleutian Islands, Alaska, USA. (Kaas & Van Belle, 1987).

-*Lepidozonia scabricostata* (Carpenter, 1864)

Lepidozonia golischi formerly synonymized with *L. scabricostata* (Carpenter, 1864) as junior synonym (*see* Ferreira, 1978; Kaas & Van Belle, 1987), and considered by Clark (2008) as a distinct species. *See* species No. 41.

-*Lepidozonia macleaniana* Ferreira, 1985.

Synonym of *Lepidozonia rothi* in Kaas & Van Belle, 1987; *see* species No. 47.

-*Lepidozonia interstincta* (Gould, 1852)

Exclusively distributed on the western coast of North America, in San Juanico Islands, Washington, USA. *Lepidozonia radians* was designated for California specimens (Stebbins & Eernisse, 2009; Vendrasco *et al.*, 2012); *see* species No.38.

-*Lepidozonia californiensis* Berry, 1931

Synonym of *Lepidozonia pectinulata* (Carpenter in Pilsbry, 1893) in Kaas & Van Belle, 1987; *see* species No. 39.

-*Chiton stokesii* Broderip, 1832

This species was reported within the Gulf of Tehuantepec, México to Ecuador (Cruz & Sotela, 1983; FAO Guide, 1984; Poutiers J., 1995; Nishimatsu *et al.*, 2009; Siqueiros-Beltrones & Argumedo-Hernández, 2012; Alarcón-Chavira, 2014), at the time there is no supported evidence to confirm its occurrence in México. For now, until further revision, it is here deemed to be an inhabitant of Central America, from Guatemala to Ecuador (Kaas *et al.*, 2006).

-*Acanthochitona* sp. in Reyes-Gómez, 1999

Recorded as provisional species (in Reyes-Gómez & Salcedo-Vargas, 2002), examination of La Paz, La Balandra specimens, *Acanthochitona* sp. was corroborated as *A. exquisita* juvenile; *see* species No. 72.

-*Acanthochitona ferreirai* Lyons, 1988

Species distributed on the Pacific coasts of Costa Rica and Panamá (Lyons, 1988). Sonora, México records have not been confirmed (Watters, 1990).

-*Mopalia ferreirai* Clark, 1991

Species found continuously between latitudes 60°N in Prince William Sound, Alaska, USA and 36°N in Carmel Bay, Monterey County, California, USA only (Clark, 1991b).

-*Mopalia acuta* (Carpenter, 1855)

Formerly considered synonym of *Mopalia plumose*, which was recognized as distinct species (Eernisse *et al.*, 2007; Stebbins & Eernisse, 2009); *see* species No. 97.

-*Mopalia allantophora* Dall, 1919

Should be *Nutallina allantophora* Dall, 1919, designated synonym of *Liolophura japonica* (Lischke, 1873).

DISCUSSION**Polyplacophora Distribution**

This study brings the current total of Polyplacophora to 99 recognized and 3 undescribed species known to occur in the Mexican Pacific, and belonging to 8 families and 20 genera. Mexican Polyplacophora fauna consists essentially of tropical species, with an important southernmost overlap of chiton fauna from the cold and warm Temperate Northeast Pacific. Polyplacophora distribution was considered in terms of ecoregions, defined by Spalding *et al.* (2007) as the smallest-scale units in the marine biogeographic classification, which were intended to represent the generic patterns of biodiversity across habitats and taxa, from the intertidal zone to a depth contour of 200 m and extending out from the coast by 5 km. This system, represents “approximately” the observed Polyplacophora biogeography in the Mexican Pacific, except for the Gulf of California area, which here is treated differently from the Spalding classification as is explained in more detail below. This check-list attempts to capture chiton distribution by considering only its most typical occurrence in the Mexican Pacific. Therefore, the species ecoregion assignment, represents the common ranges to which the species belong; not diminishing the isolated records in different ecoregions, but not extending its scope of distribution into those areas, in which the species don't regularly occur.

In general, the Southern California Bight comprises the highest species diversity with 36 extant species, followed by the Gulf of California with 21; the SGC with 3 and the MTP with 5 exclusive species, and in both ecoregions (SGC and MTP) with 7 additional species. There is also a recurrent pattern of MT chitons, cohabiting with those from the SCB

and GC ecoregions, and the RG with the SCB and MTP ecoregions.

Based on the number of species, the family Ischnochitonidae was the most represented group with 50 species belonging to 5 genera, and Mopaliidae with 16 species belonging to 4 genera. The chiton diversity in México is ranked at the level of genera, adding to a total of 20; from which *Lepidozona* stood out from the rest of the genus with 22 species, followed by *Stenoplax* (11 species), *Callistochiton* (9 species), *Acanthochitona*, *Ischnochiton*, *Chaetopleura* and *Mopalia* with 7 species each (See Table 1). The composition and diversity of intertidal species are the best known (Holguín-Quiñones & González-Pedraza, 1994; García-Ríos & Álvarez-Ruiz, 2007; Flores-Campaña *et al.*, 2007; Reyes-Gómez *et al.*, 2010; Flores-Garza *et al.*, 2012; Galeana-Rebolledo *et al.*, 2014; Flores-Rodríguez *et al.*, 2014) because of the extensive collecting efforts conducted in accessible areas by researchers. While our knowledge of subtidal and deep water chitons is limited with only 6 species recorded so far in a bathymetric range of 354-4400 m. However, a recent deep-sea study suggested the presence of *Tripoplax balaenophila* (Schwabe & Sellanes, 2004), off western México at 530–625 m, initially recorded in off Concepción, Chile, at 240 m depth. Although, the species need further investigation, according to Suárez-Mozo & Hendrickx (2016), it suggests the possibility that chiton diversity in such deep water habitats, may be greater than what is known. In addition, Sirenko (2015), reviewed chronologically the synonymized species with *L. belknapi*; in which he found several morphologic inconsistencies. Possibly the most remarkable differences were with the subspecies of *Leptochiton halistreptus halistreptus* and *L. halistreptus abbreviatus*, (with extensive rows of gills, arranged from the anus to valve V) which haven't been studied in *L. belknapi* recorded in México. *Leptochiton*

species, as with many other chiton groups, are in state of flux.

A close review of *Lepidozona*, *Dendrochiton*, *Cyanoplax* and *Mopalia* records, highlights its trend to inhabit northern regions in the cold temperate Northeast Pacific and the Southern California Bight; which is consistent with what previous authors have noted (Ferreira, 1974, 1978, 1979; Stebbins & Eernisse, 2009; Vendrasco *et al.*, 2012). These species, find their most southern distribution limits at the entrance of the western side of Baja California, and in several locations of Baja California Sur, México. However, several of these species need re-confirmation, such is *Cyanoplax dentiens*, recorded in Puerto San Tomás, México by Kaas and Van Belle (1985b), but observed to reached to central California, USA, with no recent southern records. Additionally, *Mopalia lignosa*, is thought to be restricted to the Cold Temperate Northeast Pacific, with a furthestmost distribution to Point Concepción, making the Bahía Magdalena, México record (*see* Kaas and Van Belle, 1994) questionable (Roger N. Clark, personal communication).

Other species extend into the Gulf of California (5 species) and a few along to the SGC and the MTP (2 species); which occur occasionally or are considered rare species in México. On the contrary, there are groups like *Chiton* (*C. virgulatus*, *C. abolineatus* and *C. articulatus*) that are exclusive in the SGC and the MTP. *Stenoplax*, *Callistochiton* and *Chaetopleura* genera split their distribution, with some typical northern species in the SCB (*S. conspicua*, *S. fallax*, *S. corrugata*; *C. expressus*, *C. palmulatus*, *C. decoratus*, *C. asthenes*; *C. mixta* and *C. lanuginosa lanuginosa*); and also with southern members in the SGC and MTP, which seems to be the most common in México (*S. magdalensis*, *S. mariposa*, *S. sonorana*, *S. limaciformis* and *Stenoplax* sp.; *C. elenensis*, *C.*

colimensis, *Callistochiton* sp.; *C. lurida* and *C. hanselmani*). *Ischnochiton* genus is the most typical group in the GC and the SGC, with some species only known for its type locality or with isolated records in the GC (*I. guatemalensis*, *I. chaceorum*, *I. rhodolithophilus* and *I. tomhalei*). *Ischnochiton guatemalensis*, with type locality in Guatemala, and extended by A.G. Smith (1977) from Bahía Magdalena and the Gulf of California to Costa Rica, represents the rarest species recorded in México. Without the existence of material in Mexican collections, and so far, not recorded in recent surveys along the GC, SGC, MTP and in El Salvador (Holguín- Quiñones & González-Pedraza, 1994; García-Ríos *et al.*, 2007; García-Ríos & Álvarez-Ruiz, 2007; Ortíz-Arellano & Flores-Campaña, 2008; Reyes-Gómez *et al.*, 2010; Flores-Garza *et al.*, 2012; Galeana-Rebolledo *et al.*, 2014), suggesting the need of future re-confirmation. Whereas, *I. tridentatus* and *I. carolianus* are most common in the SGC, along with *N. crossota*, *L. beanii*, *S. mariposa*; *A. exquisita*, *A. avicula*, *C. virgulatus* and *L. serrata*; and others extended into the MTP, Central America and the Panamian realm (*A. arragonites*, *A. hirudiniformis*, *A. angelica*, *C. elenensis*, *S. limaciformis*, *C. retusa*, *C. expressus*, *C. colimensis*, *L. beanii*, *T. forbesii*, *L. allynsmithi*, *L. salvadorensis* and *C. lurida*). In the MTP, a mix of taxa generally occur, including some important endemic species (*L. clathrata*, *C. articulatus*, *C. albolineatus* and *I. muscarius*), having wide distribution ranges within this ecoregion.

In this study, unlike the other ecoregions, the Cortezian Region is modified from Spalding *et al.* (2007), and is proposed to be distributed into two large areas (which may be arbitrary), partially following Brusca *et al.* (2005) biogeographic classification. Here, the Gulf of California (GC) extends from Río Colorado southward Guaymas and to Punta Coyote, Baja

California Sur, which according to Brusca *et al.*, is directly influence by continental factors (Sonora Desert, drastic high tidal variations, temperature levels and evaporation). Little is known about how these physical conditions effect chiton distribution patterns, but the species occurrence in this area (which the author considers to be the real Gulf of California) is very distinctive, and remarkably different from those in the Southern Gulf. Kelly & Eernisse (2007) studied the latitudinal gradient in chitons gene flow, in species from the Northeastern Pacific and Baja California. Their results suggested a distinct positive correlation between these two factors, which may be influenced by larval development that occur faster in warmer waters. Such possibility seems to occur within the Gulf of California, where the temperature rises to 30°C or more in the summer (Brusca *et al.*, 2005). More information is needed, and further studies will likely establish the factors that influence chiton distribution in this region. This area also develops unique habitats near shore, in the big Islands (Del Carmen, Angel de la Guarda, Tiburón, San Lorenzo, San José, Smith and San Esteban) and in its numerous islets (around 800) (Brusca *et al.*, 2005). The GC held 18 species only known for its type locality (of the 21 present in the region), and mainly distributed in the upper Gulf, inhabiting regions up to Guaymas (Puerto Peñasco, Canal Salsipuedes, Canal San Lorenzo, Bahía de los Ángeles, Isla Tiburón, Isla San José). The reduced areas, in which these species occur is so limited that it suggests a particular sympatric speciation along this portion of the Gulf (*I. chaceorum*, *L. formosa*, *L. laurae*, *L. skoglundii*, *L. sirenkoi*, *L. tenuicostata*), however knowledge on this matter is scarce, and only future studies may clarify these species status.

The Southern Gulf of California (GC) extends from Guaymas to Cabo Corrientes, Jalisco and

Cabo San Lucas in Baja California Sur, México, and adjacent to the Mexican Tropical Pacific, which are a complex mix of waters and oceanic conditions. The SGC primary, represent the most northern geographic limits, of a large number of wide distributed species along the Panamian realm (*Chaetopleura lurida*, *Chaetopleura unilineata*, *Chaetopleura hanselmani*, *Callistochiton elenensis*, *Callistochiton expressus*, *Callistoplax retusa*, *Lepidozona allynsmithi*, *Stenoplax limaciformis*, *Tonicia forbesii*, *Acanthochitona arragonites*, *Acanthochitona angelica* and *Lepidochitona salvadorensis*).

Over the years the chitons in the USA (SCB and GC), have been the most studied, unlike southern areas (SGC and MTP), which have few species records. However, a recent Polyplacophora characterization in the Mexican Tropical Pacific, which has been the most extensive study conducted and especially throughout the coastline of Guerrero (20 surveys in 22 localities, and a total of 4,496 individual specimens), extended the knowledge of 11 typical intertidal species (*Ischnochiton muscarius*, *Stenoplax limaciformis*, *Callistochiton elenensis*, *Callistoplax retusa*, *Chaetopleura hanselmani*, *Chaetopleura lurida*, *Chiton articulatus*, *Chiton albolineatus*, *Tonicia forbesii*, *Lepidochitona salvadorensis* and *Acanthochitona arragonites*) in the MTP (Galeana-Rebolledo, 2011; Flores-Garza *et al.*, 2012). They also identified distribution extensions of four common species from the SCB (*Stenoplax mariposa*, *Lepidozona serrata*, *Cyanoplax hartwegii*, *Dendrochiton flectens*), and *S. rugulata* from Central America. The biogeographic and evolutionary implications of these new records, especially those from the SCB, made it imperative to seek taxonomic evidence for their findings and to refine the species identifications, by microstructure examination. Scanning Electron Microscopy

(SEM) was used to observe the valve morphology (sculpturing and articulamentum), radula (central, minor and major lateral teeth) and girdle elements, which resulted in new conclusions from their original results.

Chronologically, Reyes-Gómez *et al.* (2010: figure 2I therein) reported *L. serrata* for the first time in the MTP (Chachacual-Jicaral, Bahías Huatulco, Oaxaca), based on a single organism of 12 x 7 mm (4 m depth) (CNMO5651). Closer examination of the specimen's sculpturing (under SEM), revealed a microsculpturing of "diamond" shaped pits on the central areas (Figure 95a); the posterior edge of intermediate valves with 11-12 elongated pustules, 22 radiating ribs in the head valve (Figure 95b), 2 to 3 ribs in lateral areas (Figure 95c), tail valve with somewhat central mucro (Figure 95d), and scales having large spheres on their distal half (Figure 95e). In comparison with *L. serrata* from La Balandra, La Paz (7.8 x 5 mm; CNMO5397), showed 20-22 granulated radial ribs in the head valve (Figure 96a), the central areas having a squarish grating pattern, posterior edges hardly dentate, lateral areas having 2 wide ribs (Figure 96b), and mucro slightly postmedian (Figure 96c). Such morphology, suggested two different entities, especially on the general sculpturing and the number of ribs in the head and tail valves. The second record of *L. serrata*, was registered in the northern region of Guerrero (Parque de Reina, Playa Tlacopanocha, Playa La Angosta, Ojo de Agua, Isla Grande, Playa Las Gatas, Playa Troncones) (Flores-Garza *et al.*, 2012; Galeana-Rebolledo, *et al.*, 2014). Closer examination of the specimen (10.9 x 5.2 mm), from Playa Tlacopanocha, Guerrero (CNMO5464) (Figure 97), exhibited radial tuberculated ribs, 13 ribs on the head valve (Figure 97a), bicostate lateral areas (Figure 97b), 11 ribs on the postmucronal area of the tail valve (Figure 97c), central areas with

subgranulose latticed ribs (Figure 97d), wide and short scales and under magnification, indicated somewhat medium spheres on its distal end (Figure 97e). In summary, the distinctions observed in the Oaxaca species on its central areas, fits the general morphology of *L. allynsmithi*; Guerrero species belongs to *Callistochiton s.s.* (see Ferreira, 1979), in which the sculpturing and especially the rounded corpuscles on the distal half portion of the scales, do not resemble any of the species recorded in the area (*C. elenensis*, *C. expressus*, *C. colimensis*). This species is considered new to science and is in the process of being described (Reyes-Gómez, unpublished). In addition, this species was also recorded as *L. hartwegii*, *L. flectens*, *Lepidochitona* sp. 2 (Galeana-Rebolledo, 2011; Flores-Garza *et al.*, 2012; Galeana-Rebolledo, *et al.*, 2014) and *Lepidochitona* sp. 1, following Reyes-Gómez *et al.* (2010). The examination of specimen (CNMO5868) (7.2 x 4.6 mm), from Estacahuite, Puerto Angel, Oaxaca (Reyes-Gómez *et al.*, 2010), showed micro granular sculpturing (Figure 98a), lateral areas slightly elevated (Figure 98b), and an apparent spiculose girdle, with scattered pits, that seem to connect to larger spicules (Figure 98c). Closer observations of *Lepidochitona* sp.1 (CNMO5793) (8.9 x 3.1 mm) (Figure 99), from Punta Maldonado, and *Lepidochitona* sp. 2 (CNMO5779) (7.9 x 4.2 mm) (Figure 100), from Playa Tlacoyunque, Guerrero (Galeana-Rebolledo, 2011; Flores-Garza *et al.*, 2012; Galeana-Rebolledo, *et al.*, 2014), revealed great similarities to those from Oaxaca, on its valve sculpturing and morphology. Also, the girdle is characterized by barely curved, medium sized spicules, which are scattered and arranged in one (Figure 100a), or in groups of 2-3 (Figure 100b). This is in sharp contrast to the widely distributed *Lepidochitona beanii* from the Eastern Tropical Pacific, which bear bunches of hyaline spicules of 3-4 in the sutural areas (see Kaas and Van Belle, 1985a).

This also differs from *L. salvadorensis*, which bear long spicules in groups of 2-6 arranged around the girdle base (see García-Ríos, 2006). In summary, the provisional species from Oaxaca reported as *Lepidochitona* sp., and those from Guerrero designated as *Lepidochitona* sp. 1 and sp. 2, appear to be the same species, and can be distinguished from *L. beanii* and *L. salvadorensis*. *Lepidochitona* sp. is in the process of being described (Reyes-Gómez, unpublished). Finally, the records of *L. hartwegii* and *L. flectens*, corresponded to misunderstood juvenile specimens of *Lepidochitona* sp., with particular dark colored and the loose of the hyaline spicules. *Stenoplax mariposa*, another typical species from the SCB, was also recorded in the MTP; initially by Reyes-Gómez *et al.* (2010, figure 2M), and was based on two specimens (14 mm) from Estacahuite, Puerto Ángel, Oaxaca, México found at a depth of 4 m (Figure 101) and along the intertidal coasts of Guerrero (Figure 102) (Flores-Garza *et al.*, 2012), with maximum size of 7.6 mm; and as *Stenoplax rugulata* with a size of 12.9 mm (Figure 103) (Galeana-Rebolledo, 2011; Flores-Garza *et al.*, 2012). Observations of these specimens under light microscopy, revealed similar shell morphology in all specimens, although, its sculpturing detail were somewhat unclear (Figure 103a). Posterior SEM exposed, irregular sculpturing of narrow, somewhat broken ribs in central areas (Figure 103b) and poorly defined riblets or subsculpture in lateral areas (Figure 103c) which is different from *Stenoplax mariposa*, which bear longitudinal ribs in central areas and well defined riblets in lateral areas and a maximum size of 16 mm (see Kaas and Van Belle, 1990: figure 14). *Stenoplax rugulata* (type locality Perú), on the other hand, reaches 18.3 mm, with low concentric irregular not broken ribs in the head, tail and lateral areas, and longitudinal ribs that fade towards the jugum in central areas (see Kaas and Van Belle,

1990: figure 13). The above observations, suggest that Oaxaca and Guerrero species show no concordance and differed considerably from *S. mariposa* and *S. rugulata* sculpturing in lateral and central areas. *Stenoplax* sp. from Oaxaca and Guerrero are considered new to science and are in the process of being described (Reyes-Gómez, unpublished).

Chiton articulatus is the best known chiton in México, and has been extensively studied in different aspects of its ecology and reproductive physiology; due to its economic importance (Holguín-Quiñones & Michel-Morfin, 2002; Flores-Campaña *et al.*, 2007; Flores-Campaña *et al.*, 2012; Ávila-Poveda, 2013; Avila-Poveda & Abadia-Chanona, 2013; García-Ibáñez *et al.*, 2013). In general, these studies support the observed negative effects on these populations, due to over extraction for human consumption, and decreased maximum size of this species which attains an average of 60-74 mm in southern México. *Chiton articulatus* in Guerrero inhabits areas directly exposed to pollutants like oil, pesticides, detergents and synthetic hormones, which affected their normal reproductive processes, as suggested by Ramírez-Álvarez *et al.* (2013). In this study, several individuals were reported with a shift in normal development, by the simultaneous presence of female and male gonads (hermaphroditism). This effect can be caused by exposure to “endocrine disruptors”, which are known to modify the growth and change the hormonal function in invertebrate gonads (Thompson *et al.*, 2002). Therefore, it is imperative that México address regulations of waste disposal to protect the chitons’ habitat, as well as establishing fishing regulations in the MTP, where chiton consumption has increased substantially.

Chiton accounts and listings

Previous studies (Reyes-Gómez & Salcedo-Vargas, 2002; Castillo-Rodríguez, 2014; Alarcón-Chavira, 2014) have estimated different numbers of chiton species in the Mexican Pacific. However, these reports have included some erroneous data that cannot be confirmed. Chronologically, the first chiton lists followed species identifications and distribution ranges, on the well known Sea Shells of Tropical West America from Lower California to Colombia by Myra Keen. (1958, Thorpe in Keen, 1971). The influence of this guide in previous chiton works was so great that errors were repeated by their contemporaries and subsequent compilers for decades thereafter. A clear example is *Chiton stokesii* Broderip, 1832, which has been repeatedly recorded in the Mexican Pacific, but lacking of actual specimens. The first record of *C. stokesii* in México, was by Dall (1909), ranging from Guaymas, Sonora to Arica, Chile, possibly due its sculpturing similarity to the endemic *Chiton virgulatus* from the Gulf of California. Subsequently, this species ranged from the Gulf of Tehuantepec to Central America by Keen (Keen, 1958: figure 3 and Thorpe in Keen, 1971: figure 5). A subsequent review of Bullock (1988) placed *C. stokesii* occurring exclusively in south Guatemala to Ecuador, based on examination of specimens from Museum collections and fresh material from México and Central America. In addition, Bullock limited *C. virgulatus* distribution within the Gulf of California, and *C. articulatus* from Mazatlán to Huatulco, Oaxaca. However in later listings (Abbott, 1974; Cruz & Sotela, 1983; FAO Guide, 1984; Poutiers J, 1995; Nishimatsu *et al.*, 2009; Siqueiros-Beltrones & Argumedo-Hernández, 2012; Alarcón-Chavira, 2014) *C. stokesii* was again included as inhabitant of the Gulf of Tehuantepec, following Thorpe in Keen (1971) mollusk guide distribution ranges.

To corroborate those distribution accounts, the author conducted sporadic trips between 2006 and 2009, near and into Tehuantepec (Oaxaca) rocky shores, on intertidal and shallow subtidal zones (4 m). The Gulf of Tehuantepec is a large wide mouthed inlet located in southeastern México, and extends approximately from Puerto Ángel to Barra del Suchiate, Chiapas, that has been poorly studied and little information on chitons has been documented (Reyes-Gómez *et al.*, 2010). The observations started in the very southern point of Guerrero and the entrance to Oaxaca in Tierra Colorada, and several localities along Oaxaca, from its northern area (Pinotepa Nacional, Huatulco, Puerto Ángel) to its southern point (Salina Cruz, Juchitán de Zaragoza and La Ventosa). It is noteworthy to mention that the southern Oaxaca and the entrance of Chiapas shores are inaccessible for study, due to its high cliffs and strong wave activity, which makes it difficult the access to these areas. In all the surveys, there was no indication of the presence of *Chiton stokesii*, however a variety of *C. articulatus* and *I. muscarius* were identified, both sympatric species ranging from Mazatlán along the Mexican Tropical Pacific (Reyes-Gómez, 2004). The examination of *I. muscarius* sculpturing and color pattern, revealed differences from conspecific northern species from Guerrero, Michoacán, Jalisco and Mazatlán. *Ischnochiton muscarius*, from central and southern Oaxaca (Puerto Ángel and Salina Cruz) showed strong sculptured grooves (Figure 104a) and conspicuous light green to gray lines on central areas, and lacking the characteristic brown spots (Figure 104b). Such color display and sculpturing was previously misunderstood, and this species was categorized as undefined (as *Ischnochiton* sp. in Reyes-Gómez *et al.*, 2010), and confirmed as *I. muscarius* after observations of more material. Another common species in Oaxaca is *Chiton articulatus*, locally known as “dog’s tongue”, which unlike

northern specimens usually display dark green and sometimes dark brown tegmentum color, with dorsal longitudinal bands of dark brown and white on the jugal area (Reyes-Gómez *et al.*, 2010), and similar to *C. stokesii* described as “color dark gray to dull black-brown, the more intensely colored jugum generally with one or more longitudinal stripes of soiled white on each side” *sensu* Thorpe in Keen (1971: figure 5), whom also established its range from Southern México (Oaxaca) to Ecuador, and *C. articulatus* from southern Gulf of California to Acapulco, Guerrero. It is my belief that the darker specimens of *C. articulatus* (Figure 105) from central and southern Oaxaca were misunderstood and misidentified as *C. stokesii* (Figure 106), recorded in Keen, and followed in subsequent studies.

Other authors have attempted to characterize the chiton fauna from the Mexican Pacific through local catalogues (Hendrickx & Toledano, 1994; Ortíz-Arellano & Flores-Campaña, 2008) and species listings (Skoglund, 2001; Reyes-Gómez & Salcedo-Vargas, 2002). Others studies focused on the ecology of local rocky intertidal, and reported short chiton lists from several areas in the Gulf of California, Jalisco, Mazatlán and Oaxaca (González, 1993; Holguín- Quiñones & González-Pedraza, 1994; Brusca *et al.*, 2005; Hendrickx *et al.*, 2005; Hendrickx & Brusca, 2007; Zamorano *et al.*, 2008; Landa-Jaime *et al.*, 2013; Castillo-Rodríguez, 2014).

The latest chiton compilation was proposed by Alarcón-Chavira (2014), which was substantially based on the first check-list (Reyes-Gómez & Salcedo-Vargas, 2002), with 97 species recorded within the Mexican Pacific. The author also included data from specimens held in several international museums (California Academy of Sciences, The Academy of Natural Sciences of Drexel University,

Philadelphia, Museum of Comparative Zoology, Harvard University, Santa Barbara Museum of Natural History, Natural History Museum of Los Angeles County, Florida Museum of Natural History, National Museum of Natural History, Field Museum of Natural History and the Scripps Institution of Oceanography). Nevertheless, this study attempted to refine the knowledge of chiton species in México, the examination of type specimens and material from Mexican mollusk collections was somewhat limited. This author based her conclusions exclusively on those museum's electronic data bases, specimen counts and photographs, disregarding relevant taxonomic evidence and valuable type specimens re-examination and comparison with species in México. In addition, the apparent examination of chitons in the CNMO was not exhaustive. Particularly to the material from Guerrero, which were mistakenly listed as *Stenoplax mariposa*, *Stenoplax rugulata*, *Lepidozona serrata*, *Lepidochitona hartwegii*, *Lepidochitona flectens*, *Lepidochitona* sp. 1 and *Lepidochitona* sp. 2 (Galeana-Rebolledo, 2011; Flores-Garza *et al.*, 2012), omitting the present species identifications, that after verification (explained above), were renamed (since 2013) as *Stenoplax* sp. (before as *S. mariposa* and *S. rugulata*), *Callistochiton* sp. (before as *L. serrata*) and *Lepidochitona* sp. (before as *L. hartwegii*, *L. flectens*, *Lepidochitona* sp. 1 and *Lepidochitona* sp. 2).

Several studies have contributed to the knowledge of Mexican chiton species (Smith, 1977; Ferreira Antonio J., 1972, 1974, 1978, 1979, 1982, 1983a, 1983b, 1984, 1985; Clark, 1991a, 1991b, 1994, 1999; Watters, 1981, 1990; Bullock, 1985; 1988 Kaas & Van Belle, 1985a, 1985b, 1987, 1990, 1994; Skoglund, 2001; Eernisse, 2004b; Kaas *et al.*, 2006; García-Ríos & Álvarez-Ruiz, 2007; Eernisse *et al.*, 2007; Sirenko & Clark, 2008; Stebbins & Eernisse,

2009; Reyes-Gómez *et al.*, 2010 and Vendrasco *et al.*, 2012), however, some groups remain unsettled or are in the state of flux. For example, Ferreira (1978, 1983b, 1985) extended the understanding of *Lepidozona* s.s. diversity in México, and Stebbins & Eernisse (2009) and Vendrasco *et al.* (2012) clarified the taxonomic status of some of those species. However, this genus requires further investigation, because it has been suggested that some *Lepidozona* species may belong to a new taxonomic group (Eernisse D., personal communication). This is the case of *Lepidozona serrata*, a distinctive species from the SCB, whose morphology shows more differences than similarities with congeneric species within *Lepidozona* (also observed by Ferreira, 1978). Other morphologic analysis was developed by Bullock (1985) on the *Stenoplax limaciformis* complex, which related *S. limaciformis* from the eastern Pacific with *S. purpurascens* from the Caribbean, on its high aesthete density, unbroken ribs on the central areas and the denticle cap outline. Although, Bullock introduced the "sibling species" concept of *Stenoplax* s.s. genealogical relationships, the high sculpturing variability in this "complex" was not addressed. In México, *S. limaciformis* is one of the most abundant and variable species in color pattern, rib shape and arrangement on lateral areas, and little is known of its latitudinal variability along the SGC and MTP.

Finally, this study includes a large number of specimen lots from the National Mollusk Collection of México (CNMO), which also held historic chiton material from important explorations in the Gulf of California and in the Mexican Tropical Pacific (*see* Naranjo-García, 2003). The recent chiton material, comes from current research projects in México, and a variety of Mexican institutions (Universidad Autónoma de México, Universidad del Mar, Universidad Autónoma de Guerrero and

Universidad de Guadalajara), as well as from large individual donations. The CNMO, has become an important Polyplacophora collection in México, by making accessible the species referenced in this study for comparison purposes. The collection contains 35 species from the Mexican Pacific, 15 from the Gulf of México, and other 57 species from other countries (Greece, Italy, Spain, north western Pacific in the USA, Galapagos Islands and Chile).

CONCLUSIONS

It is difficult to tally chitons and describe their distribution ranges in México for many reasons; maybe the most significant is the existence of gaps of species knowledge in several geographic and bathymetric areas, especially those in national protected areas (reef and Islands), and subtidal and deep water species. The known chiton species recorded so far in México, has given a total of 102 species in the Pacific region; however, the apparent high number of species can be misleading. Considering that the Polyplacophora fauna from the Southern California Bight ecoregion (36 species), occur typically in the Warm and Cold Temperate Northern Pacific, and occasional in México, as explained above some records will need further reconfirmation. Another distinctive region is the Gulf of California, which is characterized by specimens only known for their type locality (18 species). Therefore, there are an additional 48 species commonly occurring in México, belonging mostly to the Southern Gulf of California and the Mexican Tropical Pacific. Chiton distribution in México resembles the marine ecoregions boundaries, with the exception of the Gulf of California, which here is proposed to be subdivided into two regions, primarily based on the chiton distribution patterns. The Southern Gulf represents a transition region between the species ranging

from the Cold Temperate Northeast Pacific, from the Southern California Bight and those species ranging south to Central and South America. Members of *Ischnochiton*, *Stenoplax*, *Acanthochitona*, *Lepidochitona* and *Chiton* are the best represented taxa in the Mexican Pacific region. In this study 17 species were disregarded from the first checklist, including species not distributed in México or now designated as synonyms of others.

The lack of exploration in certain areas of México and the ability to develop reliable inventories of Mexican species is hampered by the lack of comprehensive regional identification guides, limiting the ability to make accurate species inventories. Also chiton taxonomic revisions are limited by the general fact that many of the collected specimens reported in faunistic works or chiton check-lists, are not deposited in scientific mollusk collections, making these materials unavailable for study. Finally, the recurrent underestimation of chiton studies in ongoing investigation projects and the limited chiton taxonomic expertise has contributed to the scarce knowledge of Polyplacophora in México.

ACKNOWLEDGEMENTS

I would like to thank Dr. Edna Naranjo-García, curator of the Colección Nacional de Moluscos, CNMO, IBUNAM, for allowing access to the National Mollusk Collection (CNMO). I am especially grateful to Dr. Douglas J. Eernisse for critically reviewing this paper, for his valuable comments and numerous suggestions. I would also like to thank: Roger N. Clark for his helpful comments, especially on Northern Pacific species distribution, for kindly donating chiton specimens now included in the CNMO, and for providing most of the iconography presented in this study, from his personal collection and large number of type specimen

photos; Bruno Anseeuw for sharing chiton images from his own collection and from the Van Belle chiton collection; Enrico Schwabe for also sharing pictures of Mexican chitons; Cedar García-Ríos for handling pictures of *C. stokesii* and for donating *C. expressus* specimens from El Salvador; to the curator of the British Museum (Natural History), London, Henry Chaney for providing type specimen data; to David Berschauer and David Waller, editors of *The Festivus* for their active support in the editing and formatting of this manuscript, and for their genuine interest in publishing this paper; Rafael Flores-Garza, Pedro Flores-Rodríguez, Lizeth Galeana-Rebolledo and Carmina Torreblanca-Ramírez, for providing distribution data and access to their collection and for their donation to the CNMO of a large number of chitons from Guerrero. To Monica Vélez-Arellano, Quetzalli Y. Abadia-Chanona, Monica Ortiz-Arellano and Norma Barrientos-Luján for donating chiton material to the CNMO. Special thanks to Berenit Mendoza-Garfias from the Laboratorio de Microscopía y Fotografía de la Biodiversidad I, IBUNAM for promptly processing and preparing SEM images; Carmen Loyola and Susana Guzmán from Laboratorio de Microscopía y Fotografía de la Biodiversidad II, Instituto de Biología, UNAM for their technical assistance and for photographing the majority of the chiton species from the CNMO, and José Manuel Zepeda C. from “Imaginaria creations” for the map design in Figure 1.

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* The species not figured in this manuscript were not available to be photographed, either because their descriptions were based in disarticulated valves, or they are rare in scientific collections and the type material were on loan to institutions and no other specimens was readily available to be photographed.



Figure 2. *Ferreiraella scrippsiana* (Ferreira, 1980). Dorsal view of specimen 9.4 mm length, from SW of Cabo San Lucas, Baja California Sur, México, collected at 2500-2900 m. Paratype, CASIZ00717. Image by RNC. **Figure 3.** *Leptochiton nexus* Carpenter, 1864. Dorsal view of specimen 16.5 mm length, collected at Puerto Santo Tomás, Baja California, México, in subtidal 10 m depth. RNC1865. **Figure 4.** *Leptochiton belknapi* Dall, 1878. Dorsal view of specimen 8.1 mm length, collected at Bearing Sea in 310 m depth. RNC327. **Figure 5.** *Leptochiton rugatus* (Carpenter in Pilsbry, 1892). Dorsal view of specimen 9 mm length, collected at Punta Loma, San Diego California, USA. BA1172. **Figure 6.** *Deshayesiella spicata* (Berry, 1919). Dorsal view of specimen 14.5 mm length, collected at Howe Sound, British Columbia, Canada, in subtidal 25 m depth. RNC1835. **Figure 7.** *Oldroydia percrassa* (Dall, 1894). Dorsal view of specimen 24 mm length, collected at Catalina Island, California, USA. VB2818b.



Figure 8. *Chaetopleura lurida* (Sowerby, 1832). Dorsal view of specimen 26.1 mm length, collected at Playa Tlacopanocha, Guerrero, Mexico, in intertidal 1 m. CNMO5176. **Figure 9.** *Chaetopleura gemma* Dall, 1879. Dorsal view of specimen 16 mm length, collected at Mission Bay, San Diego County, California, USA. BA687. **Figure 10.** *Chaetopleura lanuginosa lanuginosa* (Dall, 1879). Dorsal view of specimen 30 mm length, collected at Bahía Todos Santos, Baja California, México, low subtidal 3 m. RNC1800. **Figure 11.** *Chaetopleura lanuginosa mixta* (Dall, 1919). Dorsal view of specimen 30 mm length, collected at San Felipe, Baja California, México. BA1166. **Figure 12.** *Chaetopleura unilineata* Leloup, 1954. Dorsal view of specimen 9.2 mm length, collected at Nayarit, Colima, México. ICMyl, Mazatlán Collection 093. Image by Douglas Eernisse. **Figure 13.** *Chaetopleura shyana* Ferreira, 1983. Dorsal view of specimen 18 mm length, collected at Bahía de los Ángeles, Baja California, México, in intertidal 1 m. RNC1841.



Figure 14. *Chaetopleura hanselmani* Ferreira, 1982. Dorsal view of specimen 6.7 mm length, collected at Teniente José Azueta, Playa Las Gatas, Guerrero, México, in low subtidal 2 m. CNMO5247. **Figure 15.** *Ischnochiton muscarius* (Reeve, 1847). Dorsal view of specimen 21.3 mm length, collected at Puerto Vicente, Guerrero, México, in intertidal. CNMO5300. **Figure 16.** *Ischnochiton tridentatus* Pilsbry, 1893. Dorsal view of specimen 18.7 mm length, collected at El Saladito, Baja California Sur, México, in intertidal 1 m. CNMO5669. **Figure 17.** *Ischnochiton guatemalensis* Thiele, 1909. Dorsal view of specimen 10 mm length, collected at Cholla Bay, Sonora, México, BA573. **Figure 18.** *Ischnochiton carolianus* Ferreira, 1984. Dorsal view of specimen 9.4 mm length, collected at Playa La Balandra, La Paz, Baja California Sur, México, in intertidal 1 m. CNMO5398. **Figure 19.** *Ischnochiton chaceorum* Kaas & Van Belle, 1990. Dorsal view of specimen 7 mm length, collected at Puerto Peñasco, upper Gulf of California, México, probably in intertidal. Paratype, RNC1059. Image by RNC.



Figure 20. *Callistochiton elenensis* (Sowerby in Broderip & Sowerby, 1832). Dorsal view of specimen 10.6 mm length, collected at Playa Tlacopanocha, Acapulco, Guerrero, México, in intertidal 1 m. CNMO5311. **Figure 21.** *Callistochiton expressus* (Carpenter, 1865). Dorsal view of specimen 9.8 mm length, collected at La Union, Playa Maculis, El Salvador (by Alvarez-Ruiz Migdalia, Roberto-Hasbun Carlos and García-Ríos Cedar), in intertidal 1 m. CBUPRH2083. **Figure 22.** *Callistochiton palmulatus* Carpenter MS, Dall, 1879. Dorsal view of specimen 18 mm length, collected at Morro Bay Breakwater, San Luis Obispo Co., California, USA, in intertidal 1 m. RNC836. **Figure 23.** *Callistochiton crassicostratus* Pilsbry, 1893. Dorsal view of specimen 24 mm length, collected at Quivira Basin, Mission Bay, San Diego Co., USA, in intertidal 1 m. RNC782. **Figure 24.** *Callistochiton decoratus* Carpenter MS, Pilsbry, 1893. Dorsal view of specimen 24.5 mm length, collected at Punta Santo Tomás, Baja California, México, in intertidal 1 m. RNC1752. **Figure 25.** *Callistochiton asthenes* (Berry, 1919). Dorsal view of specimen 9.2 mm length, collected at White Point, Los Angeles County, California, in intertidal 1 m. RNC1793.



Figure 26. *Callistochiton colimensis* (A.G. Smith, 1961). Dorsal view of specimen 24 mm length, type locality Manzanillo, Colima, México. Holotype, ANSP152139. **Figure 27.** *Callistochiton leei* Ferreira, 1979. Dorsal view of specimen 8.1 mm length, from Guadalupe Island, Baja California, México, in intertidal. Paratype, CASIZ00706. Image by RNC. **Figure 28.** *Callistochiton* sp. (Reyes-Gómez, unpublished). Dorsal view of specimen 9.7 mm length, collected at Tecpan de Galeana, Ojo de Agua, Guerrero, México, in intertidal 1 m. CNMO5815. **Figure 29.** *Callistoplax retusa* (Sowerby in Broderip & Sowerby, 1832). Dorsal view of specimen 22.9 mm length, collected at Playa Manzanillo, Acapulco, Guerrero, México, in intertidal 1 m. CNMO5230. **Figure 30.** *Lepidozона scrobiculata* (Middendorff, 1847). Dorsal view of specimen 21 mm length, collected at Carmel Bay, California, USA, in subtidal 24 m. RNC244. **Figure 31.** *Lepidozона mertensii* (Middendorff, 1847). Dorsal view of specimen 21.3 mm length collected at Washington, Pierce County, Tacoma Narrows USA, in intertidal 1 m. CNMO5389.



Figure 32. *Lepidozона clathrata* (Reeve, 1847). Dorsal view of specimen 35.8 mm length, collected at La Balandra, La Paz, Baja California Sur, México, in intertidal 1 m. CNMO5395. **Figure 33.** *Lepidozона retiporosa* (Carpenter, 1864). Dorsal view of specimen 14 mm length, collected at Tacoma Narrows, Pierce Co., Washington, USA, in intertidal 1 m. 2710. RNC2710. **Figure 34.** *Lepidozона serrata* (Carpenter, 1864). Dorsal view of specimen 7.1 mm length, collected at Isla Espiritu Santo, Baja California Sur, México, in shallow subtidal 2 m. CNMO5463. **Figure 35.** *Lepidozона cooperi* (Carpenter MS, Dall, 1879). Dorsal view of specimen, 34.2 mm length, collected at Oregon Coos County Cape Arago, South Cove, USA, in intertidal 1 m. CNMO5391. **Figure 36.** *Lepidozона radians* (Carpenter in Pilsbry, 1892). Dorsal view of specimen 23 mm length, collected at Lover's Point, Monterey Bay, Monterey County, California, USA, in intertidal 1 m. RNC1557. **Figure 37.** *Lepidozона pectinulata* (Carpenter in Pilsbry, 1893). Dorsal view of specimen 32 mm length, collected at Southwest of Punta Banda, Baja California, México, in intertidal 1 m. RNC1660.

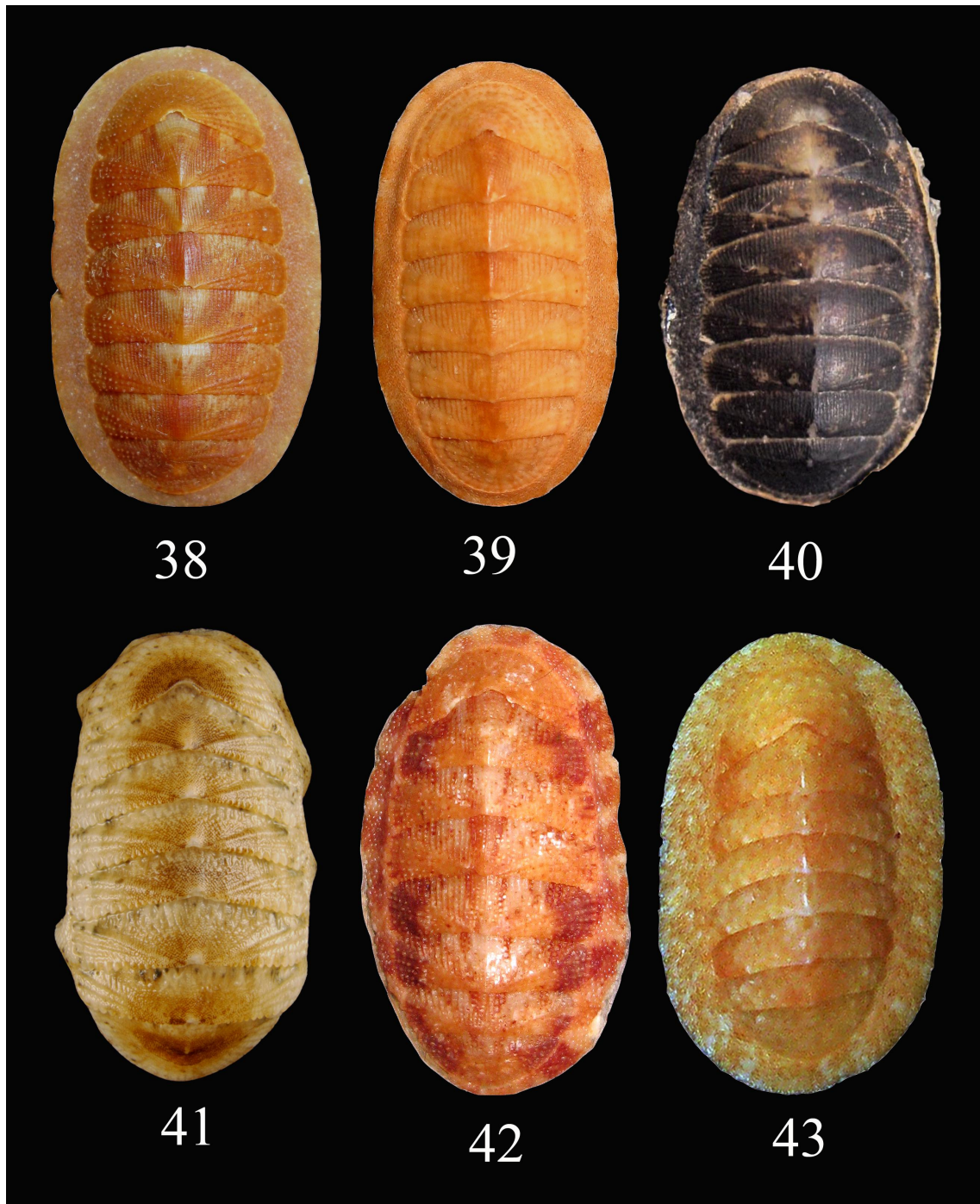


Figure 38. *Lepidozonia willetti* (Berry, 1917). Dorsal view of specimen 28 mm length, collected at Mountain Point, Ketchikan, Revillagigedo Id., Alaska, USA in subtidal 18 m. RNC872. **Figure 39.** *Lepidozonia golischi* (Berry, 1919). Dorsal view of specimen 17 mm length, collected at Mountain Point, Ketchikan, Revillagigedo Is., Alaska, USA, intertidal 1 m. RNC616. **Figure 40.** *Lepidozonia subtilis* Berry, 1956. Dorsal view of specimen 20 mm length, collected at Miramar, San Felipe, Baja California, México. BA64b. **Figure 41.** *Lepidozonia allynsmithi* Ferreira, 1974. Dorsal view of specimen, 12.1 mm length, collected at Chachacual-Jicaral, Bahias Huatulco, Oaxaca, México, in subtidal 4 m. CNMO5651. **Figure 42.** *Lepidozonia guadalupensis* Ferreira, 1978. Dorsal view of specimen, 15.1 mm length, collected at West side of Isla Guadalupe, Baja California, México, in intertidal 1 m. RNC2558. **Figure 43.** *Lepidozonia rothi* Ferreira, 1983. Dorsal view of specimen, 12 mm length, collected on Isla Clipperton, México, in subtidal. RNC 2077.



Figure 44. *Lepidozonia clarionensis* Ferreira, 1983. Dorsal view of specimen, 14.7 mm length, collected at Bahía de los Ángeles, Baja California, México, in subtidal 40 m depth. RNC465. **Figure 45.** *Lepidozonia stohleri* Ferreira, 1985. Dorsal view of specimen, 18.2 mm length, collected at Isla Danzante, Baja California, México, in subtidal 45 m depth. RNC434. **Figure 46.** *Lepidozonia skoglundii* (Ferreira, 1986). Dorsal view of specimen, 4 mm length, collected at Bahía de Los Angeles, México, in subtidal 120-183 m. Paratype, RNC 497. Image by RNC. **Figure 47.** *Lepidozonia sirenkoi* Kaas & Van Belle, 1990. Dorsal view of specimen, 6.2 mm length, collected at Punta Peñasco, Sonora, México, in intertidal 1 m. Paratype, RNC406. Image by RNC. **Figure 48.** *Lepidozonia tenuicostata* Kaas & Van Belle, 1990. Dorsal view of specimen, 14.6 mm length, collected at Punta Peñasco, Sonora, México, in intertidal 1 m. Paratype RNC407. **Figure 49.** *Stenoplax limaciformis* (Sowerby, 1832). Dorsal view of specimen 28.4 mm length, collected at Parque de la Reina, Acapulco, Guerrero, México, in intertidal 1 m. CNMO5179.

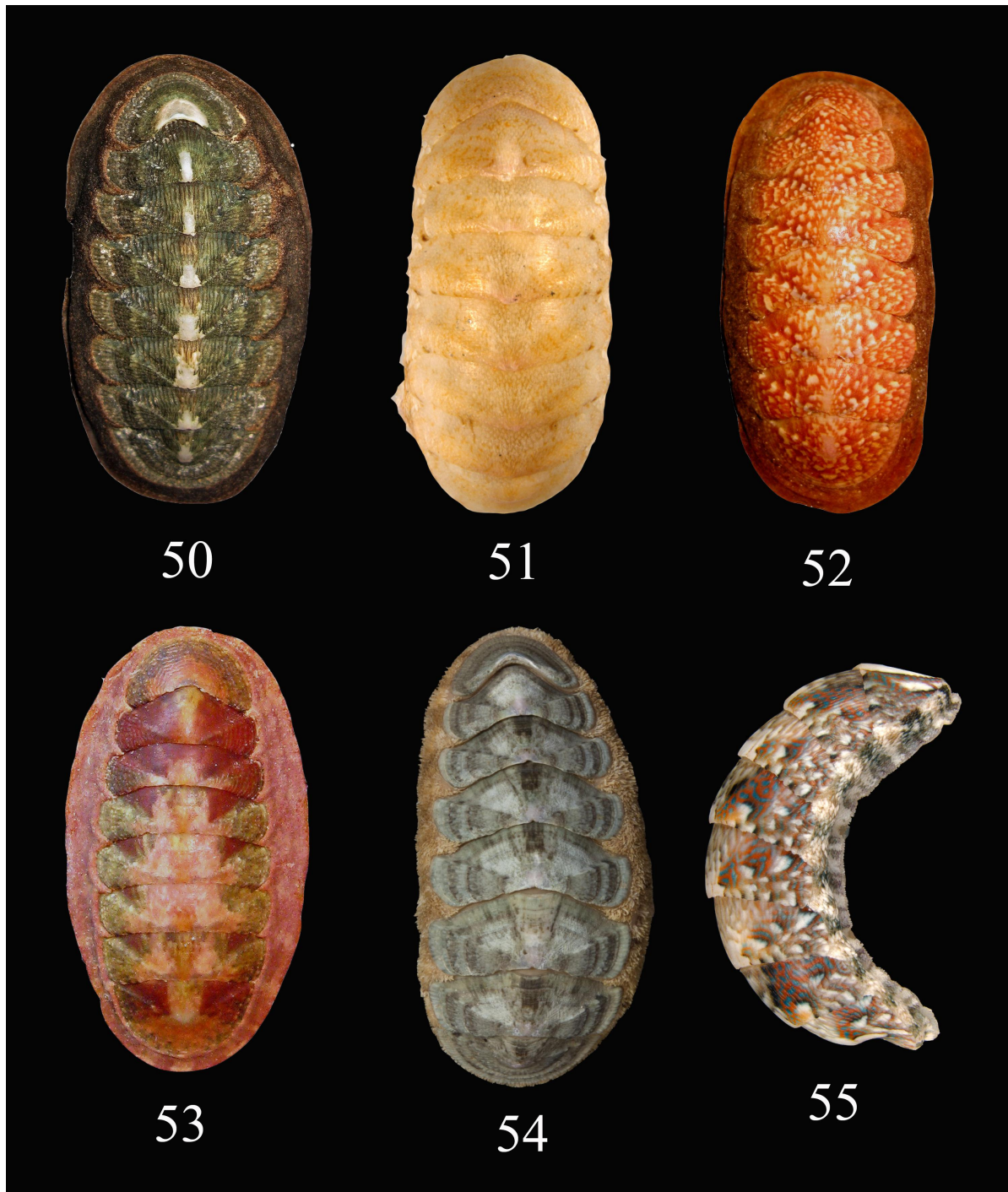


Figure 50. *Stenoplax magdalenensis* (Hinds, 1845). Dorsal view of specimen 48.5 mm length, collected at Punta Abreojos, Baja California, México, in subtidal 5 m depth. RNC1964. **Figure 51.** *Stenoplax boogii* (Haddon, 1886). Dorsal view of specimen 10.5mm length, collected at Michoacán, México, in shallow subtidal 4 m. CNMO5423. **Figure 52.** *Stenoplax fallax* (Carpenter, 1892). Dorsal view of specimen 62 mm length, collected at Pacific Grove, Monterey Co., California, USA, in intertidal 1 m. RNC1770. **Figure 53.** *Stenoplax corrugata* (Carpenter, 1892). Dorsal view of specimen 62 mm length, collected at Puerto Santo Tomás, Baja California, México, in subtidal 10 m. RNC1776. **Figure 54.** *Stenoplax conspicua* (Pilsbry, 1892). Dorsal view of specimen 40.4 mm length, collected at La Paz, Baja California Sur, México, in intertidal 1 m. CNMO1041. **Figure 55.** *Stenoplax mariposa* (Dall, 1919). Dorsal view of specimen 1.4 mm length, collected at El Saladito, Baja California Sur, México, in low subtidal 2 m. CNMO5642.

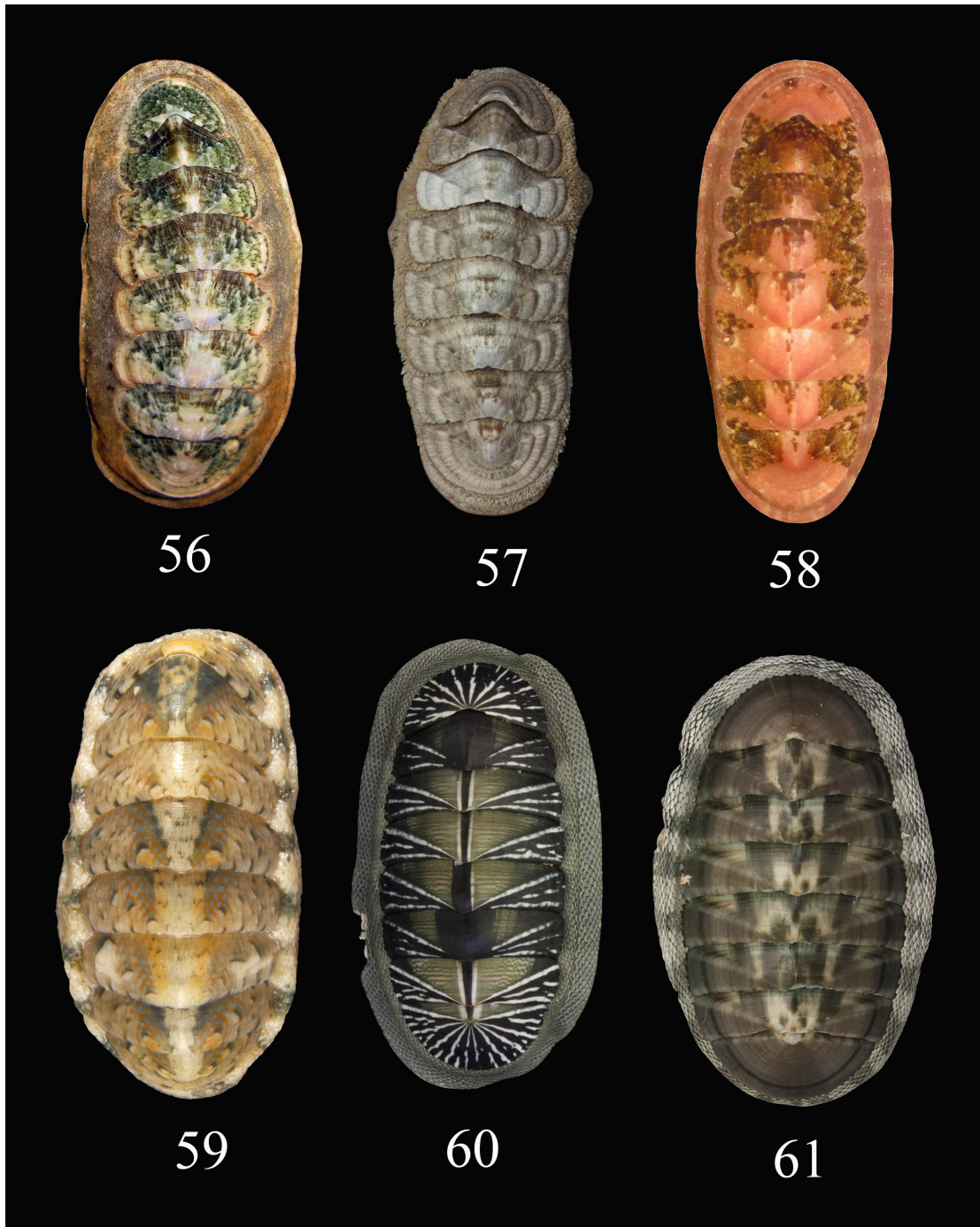


Figure 56. *Stenoplax heathiana* Berry, 1946. Dorsal view of specimen 66 mm length, collected at Point Joe, Monterey Co., California, USA, in intertidal zone at 1 m. RNC1836. **Figure 57.** *Stenoplax sonora* Berry, 1956. Dorsal view of specimen 40.4 mm length, collected at Guaymas, Sonora, México, in intertidal zone at 1 m. CNMO5464. **Figure 58.** *Stenoplax circumsenta* Berry, 1956. Dorsal view of specimen 30 mm length, collected at Puerto Santo Tomás, Baja California, México, in subtidal zone at 10 m. RNC2115. **Figure 59.** *Stenoplax* sp. (Reyes-Gómez, unpublished). Dorsal view of specimen 8.5 mm length, collected at Playa Troncones, Guerrero, México, in intertidal zone at 1 m. CNMO5730. **Figure 60.** *Chiton albolineatus* Broderip & Sowerby, 1829. Dorsal view of specimen 31.5 mm length, collected at Playa Angosta, Acapulco, Guerrero, México, in intertidal zone at 1 m. CNMO5184. **Figure 61.** *Chiton articulatus* Sowerby in Broderip & Sowerby, 1832. Dorsal view of specimen 42.7 mm length, collected at Playa Las Gatas, Guerrero, México, exposed on rocks. CNMO5256.



Figure 62. *Chiton virgulatus* Sowerby, 1840. Dorsal view of specimen 38 mm length, collected at Playa El Saladito, Baja California Sur, México, in intertidal zone at 1 m. CNMO5646. **Figure 63.** *Tonicia forbesii* Carpenter 1857. Dorsal view of specimen 32 mm length, collected at Playa Tlacopanocha, Acapulco, Guerrero, México, in intertidal zone at 1 m. CNMO5309. **Figure 64.** *Acanthochitona arragonites* (Carpenter, 1857). Dorsal view of specimen 9.1 mm length collected at Tecpan de Galeana, Playa Puerto Vicente, Guerrero, México, in intertidal zone at 1 m. CNMO5196. **Figure 65.** *Acanthochitona avicula* (Carpenter, 1864). Dorsal view of specimen 17.9 mm length collected at Doheny Beach, Orange Co., California, USA, in intertidal zone at 1 m. RNC1496. **Figure 66.** *Acanthochitona exquisita* (Pilsbry, 1893). Dorsal view of specimen 26.3 mm length, collected at La Balandra, La Paz, Baja California Sur, México, in low subtidal zone at 2 m. CNMO5385. **Figure 67.** *Acanthochitona angelica* Dall, 1919. Dorsal view of specimen 6.4 mm length, collected at Michoacán, México, in subtidal zone at 4 m. CNMO5563.

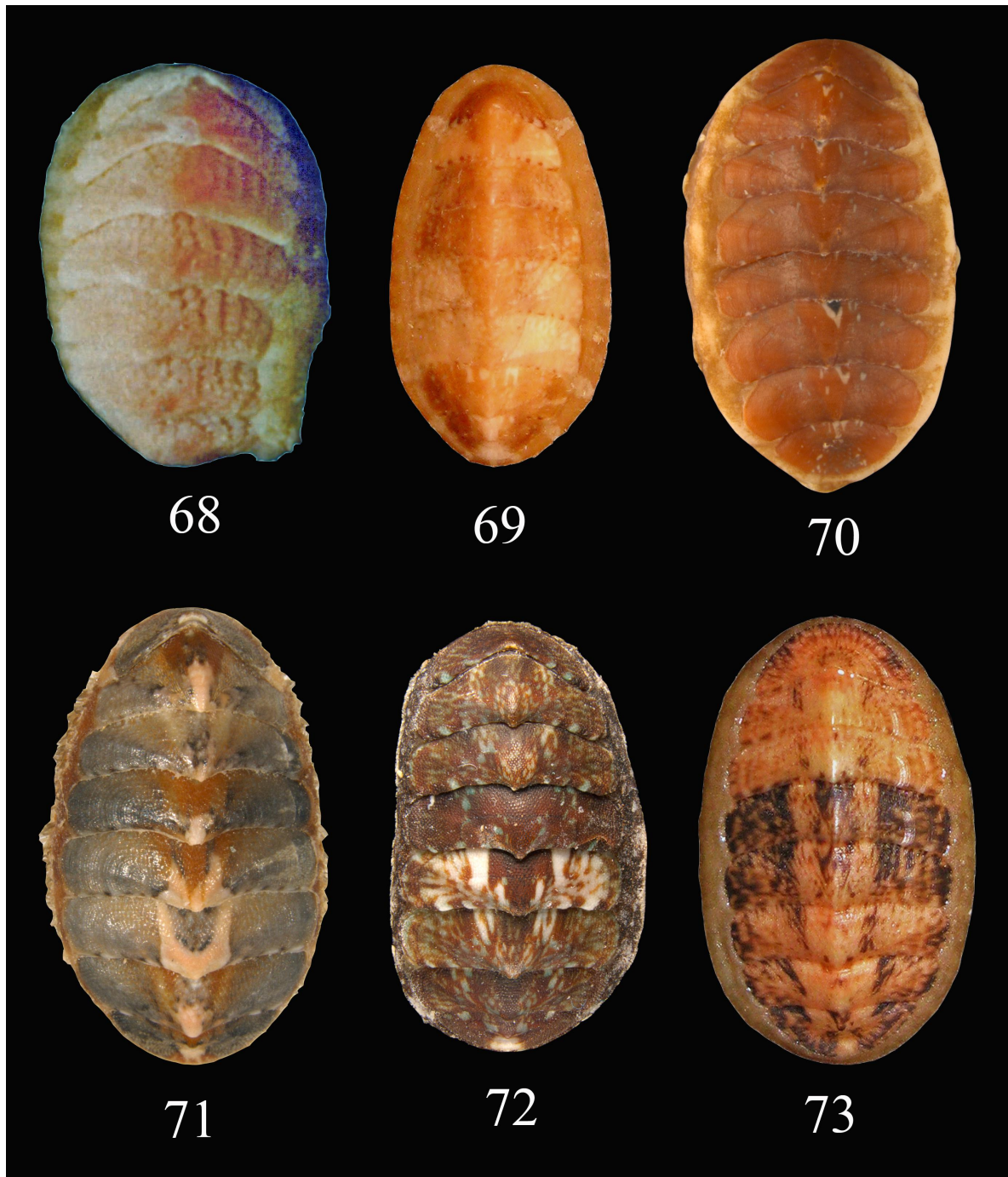


Figure 68. *Acanthochitona burghardtae* R.N. Clark, 2000. Dorsal view of specimen 8 mm length, collected at Isla San José South to Canal San Lorenzo, Baja California. Sur, México, in rhodolith bed, 7 m deep. RNC2137. **Figure 69.** *Lepidochitona beanii* (Carpenter, 1857). Dorsal view of specimen 13 mm length, collected at Doheney Beach, Orange Co., California, USA, in intertidal zone at 1 m. RNC1915. **Figure 70.** *Lepidochitona salvadorensis* García-Ríos, 2006. Dorsal view of specimen 11.9 mm length, collected at Playa Punta Maldonado, Guerrero, México, in intertidal zone at 1 m. CNMO5252. **Figure 71.** *Lepidochitona* sp. (Reyes-Gómez, unpublished). Dorsal view of specimen 6.1 mm length, collected at Playa Majahua, Guerrero, México, in intertidal zone at 1 m. CNMO5236. **Figure 72.** *Cyanoplax dentiensi* (Gould, 1846). Dorsal view of specimen 9.5 mm length, collected at Coos, County Cape Arago, South Cove, USA, in intertidal zone at 1 m. CNMO5387. **Figure 73.** *Cyanoplax keepiana* (Berry, 1948). Dorsal view of specimen 28 mm length, collected at Doheney Beach, Orange Co., California, USA, in intertidal zone at 1 m. RNC1673.



Figure 74. *Cyanoplax hartwegii* (Carpenter, 1855). Dorsal view of specimen 28 mm length, collected at Asilamar, Monterey Co., California, USA, in intertidal 1 m. RNC1683. **Figure 75.** *Cyanoplax berryana* (Eernisse, 1986). Dorsal view of specimen 10 mm length, collected at Punta Descanso, Baja California, México, in intertidal. RNC78. **Figure 76.** *Nutallina californica* (Reeve, 1847). Dorsal view of specimen 23 mm length, collected at Bird Rock, La Jolla, California, USA. BA841d. **Figure 77.** *Nutallina crossota* (Berry, 1956). Dorsal view of specimen 19 mm length, collected at Baja California, México, in intertidal 1 m. BA844e. **Figure 78.** *Dendrochiton lirulatus* (Berry, 1863). Dorsal view of specimen 10.3 mm length, collected at San Felipe, Baja California, México, in intertidal. RNC1989. **Figure 79.** *Dendrochiton flectens* (Carpenter, 1864). Dorsal view of specimen 16.2 mm length, collected Ketchikan, Alaska, USA in subtidal 18 m depth. RNC1940.

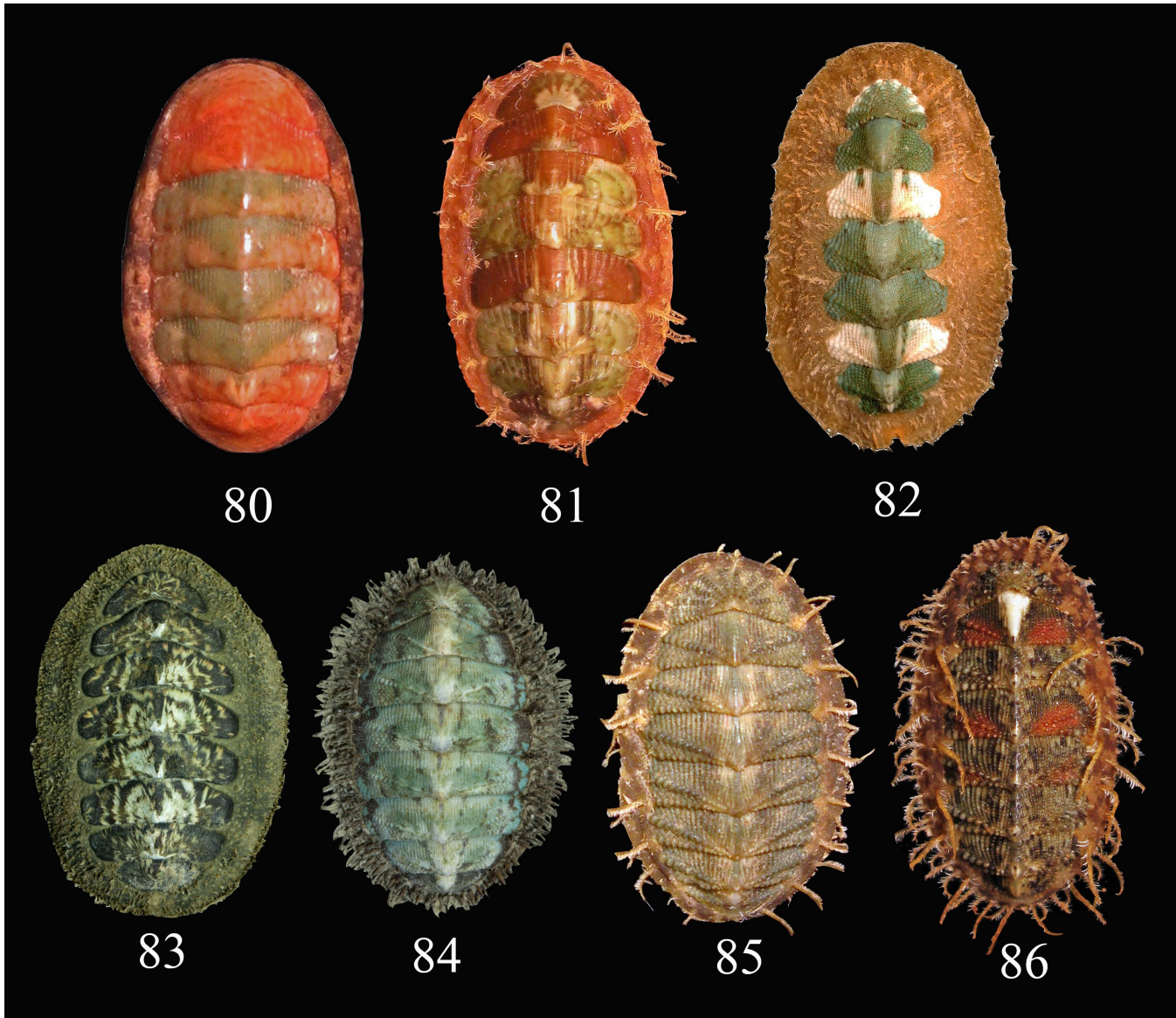
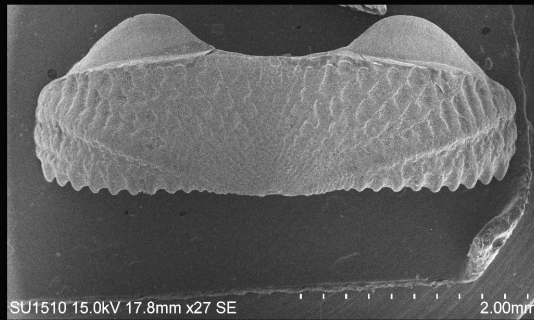


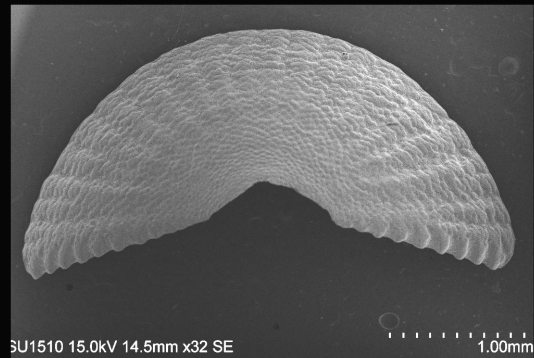
Figure 80. *Dendrochiton gothicus* (Carpenter, 1864). Dorsal view of specimen 16.2 mm length, collected at Puerto Santo Tomás, Baja California, México, in subtidal 10 m depth. RNC1931. **Figure 81.** *Dendrochiton thamnopus* (Berry, 1911). Dorsal view of specimen 10.5 mm length, collected Cayucos, San Luis Obispo Co., California, USA, in intertidal 1 m. RNC2105. **Figure 82.** *Mopalia ciliata* (Sowerby, 1840). Dorsal view of specimen 33 mm length, collected at Newport Bay, Orange Co., California, USA, found in intertidal. RNC1266. **Figure 83.** *Mopalia lignosa* (Gould, 1846). Dorsal view of specimen 67 mm length, collected Washington Pierce County, Tacoma Narrows, USA, in intertidal 1 m. CNMO5390. **Figure 84.** *Mopalia muscosa* (Gould, 1846). Dorsal view of specimen 32.9 mm length, collected at Tomales Bay, Marin County, California, USA, less than 1 m. CNMO5388. **Figure 85.** *Mopalia porifera* Pilsbry, 1893. Dorsal view of specimen 12 mm length, collected at Pescadero Point, San Mateo Co., California, USA, found in intertidal. RNC2000. **Figure 86.** *Mopalia lionota* Pilsbry, 1918. Dorsal view of specimen 16 mm length, collected at Puerto Punta Descanso, Baja California, México, found in intertidal. RNC1429.



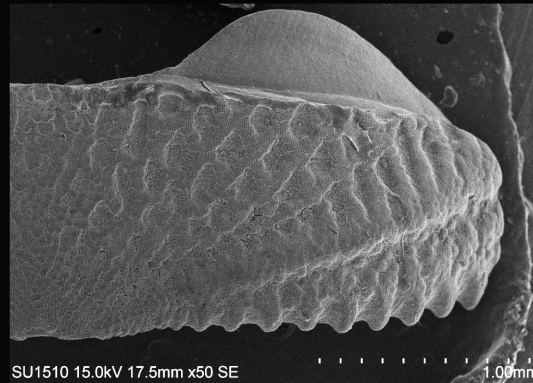
Figure 87. *Mopalia imporcata* Carpenter, 1864. Dorsal view of specimen 12.1 mm length, collected at Washington, Kitsap County, USA, in intertidal 1 m. CNMO5393. **Figure 88.** *Mopalia plumosa* Carpenter in Pilsbry, 1893. Dorsal view of specimen 29 mm length, collected at Sequit Point, Ventura Co., California, USA, in intertidal. RNC1472. **Figure 89.** *Placiphorella velata* Carpenter MS, Dall, 1879. Dorsal view of specimen 26.2 mm length, collected at Oregon Coos, County Cape Arago, South Cove, USA, in intertidal 1 m. CNMO5392. **Figure 90.** *Placiphorella pacifica* Berry, 1919. Dorsal view of specimen 24 mm length, collected at West of Kiska Id., Aleutian Is., Alaska, in subtidal at 91 m. RNC2016. **Figure 91.** *Placiphorella mirabilis* R.N. Clark, 1994. Dorsal view of specimen 13.5 mm length, collected at Goleta, Santa Barbara Co., California, USA, in subtidal at 27 m. RNC653. **Figure 92.** *Placiphorella hanselmani* R.N. Clark, 1994. Dorsal view of specimen 24 mm length, collected at Puerto Lobos, Sonora, México, in intertidal 1 m. RNC386. **Figure 93.** *Tonicella venusta* R.N. Clark, 1999. Dorsal view of specimen 13.5 mm length, collected at Victoria, Vancouver Id., British Columbia, Canada, in intertidal 1 m. RNC349. **Figure 94.** *Nutallina fluxa* (Carpenter, 1864). Dorsal view of specimen 33.5 mm length, collected at South side of Pita Point, Ventura Co., California, USA, in intertidal. RNC1798.



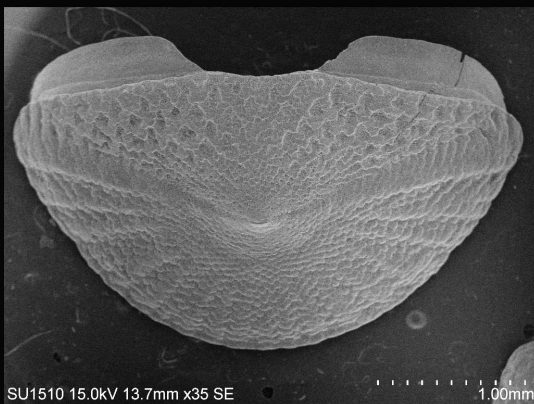
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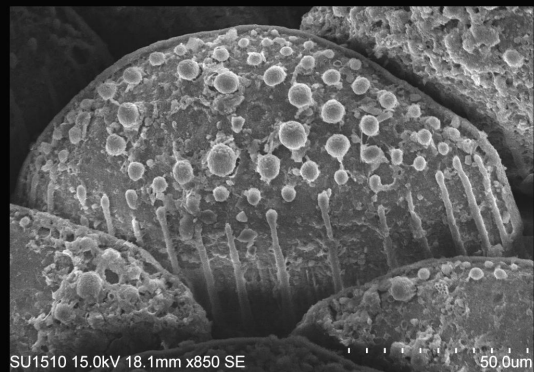
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Figure 95. *Lepidozona allynsmithi* Ferreira, 1974 (as *Lepidozona serrata* in Reyes-Gómez *et al.*, 2010). Specimen of 12.1 mm length, collected at Chachacual-Jicaral, Bahías Huatulco, Oaxaca, México at a depth of 4 m, CNMO5651. SEM microstructure of (a) valve IV intermediate area sculpturing detail; (b) head valve microstructure detail; (c) lateral areas of valve IV detail; (d) tail valve detail; and (e) SEM microstructure detail of girdle scales.

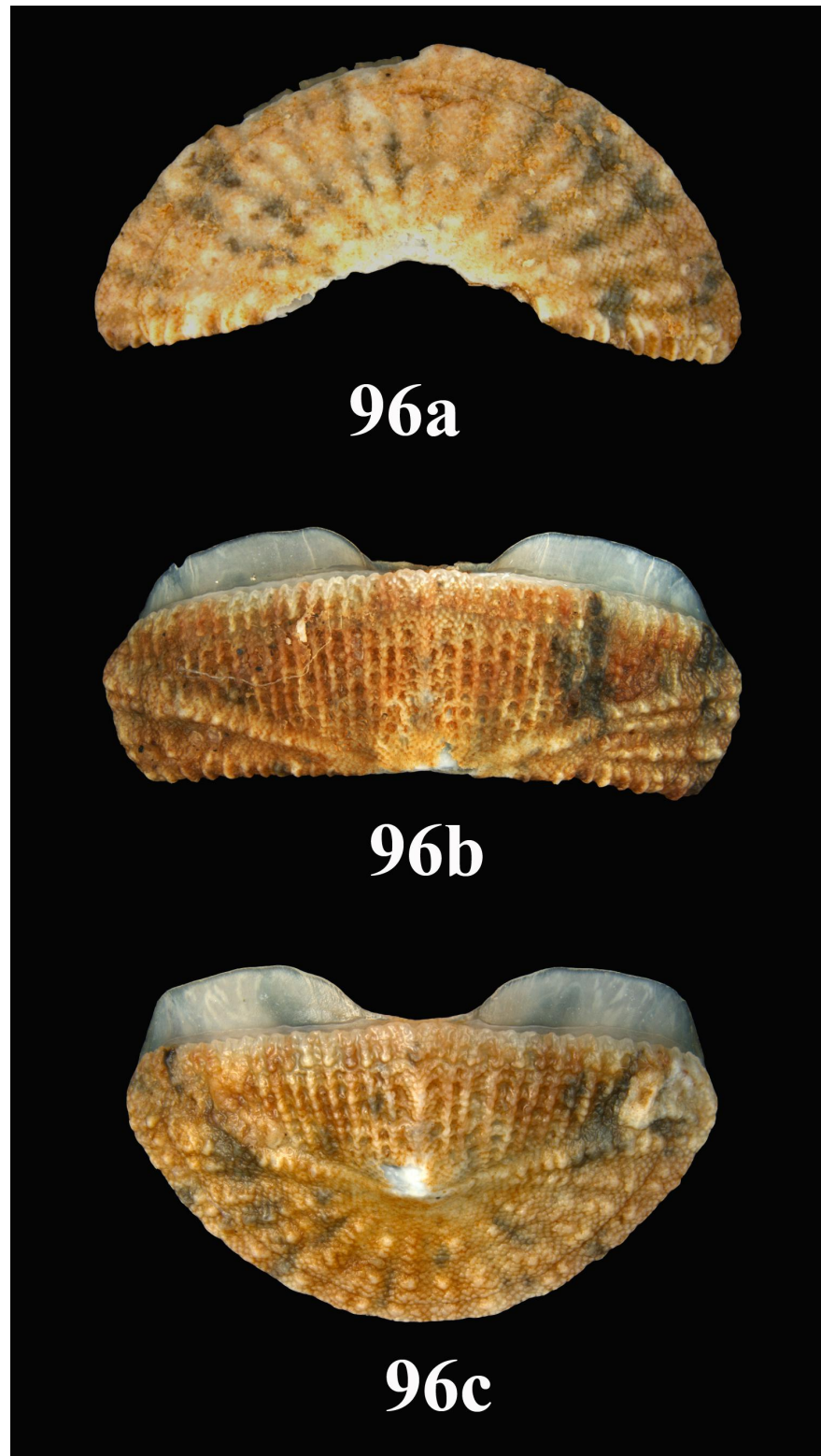


Figure 96. *Lepidozonia serrata* (Carpenter, 1864). Dorsal view of specimen 7.8 mm length, collected at Isla La Balandra, La Paz, Baja California Sur, México, in intertidal zone, CNMO5397. Enlarged view (a) of head valve microstructure; (b) central areas detail of intermediate valve IV; and (c) enlarged view of tail valve VIII.

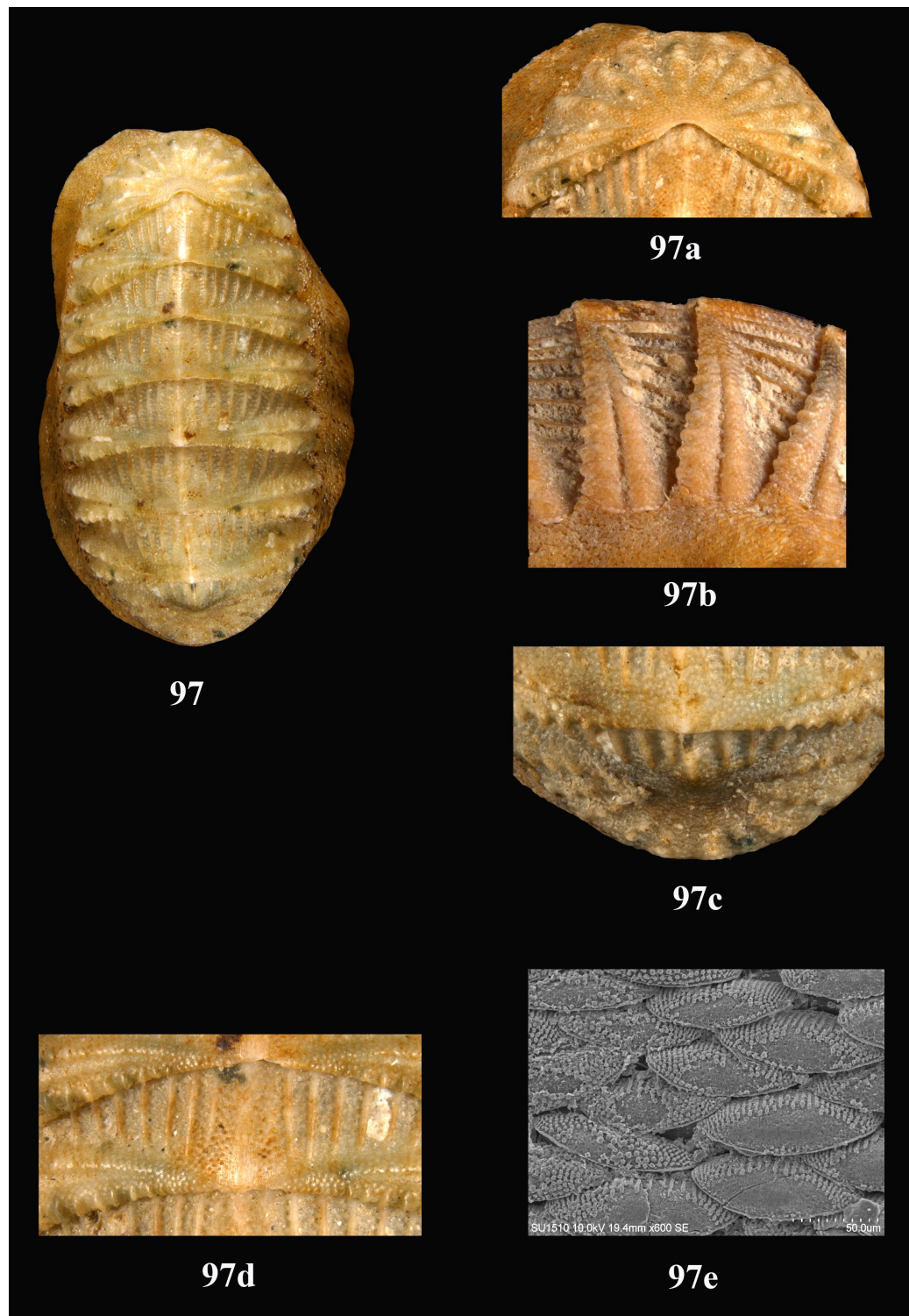


Figure 97. *Callistochiton* sp. (as *Lepidozona serrata* in Galeana-Rebolledo, 2011; Flores-Garza *et al.*, 2012; Galeana-Rebolledo, *et al.*, 2014). Dorsal view of specimen 10.9 mm length, collected at Playa Tlacopanocha, Acapulco, Guerrero, México, in intertidal zone at 1 m, CNMO5464. Enlarged view of same specimen (a) of head valve tuberculated ribs; (b) lateral areas detail of valve IV; (c) valve VIII detail; (d) central areas sculpturing of intermediate valve IV; and (e) SEM image of the girdle scales detail.

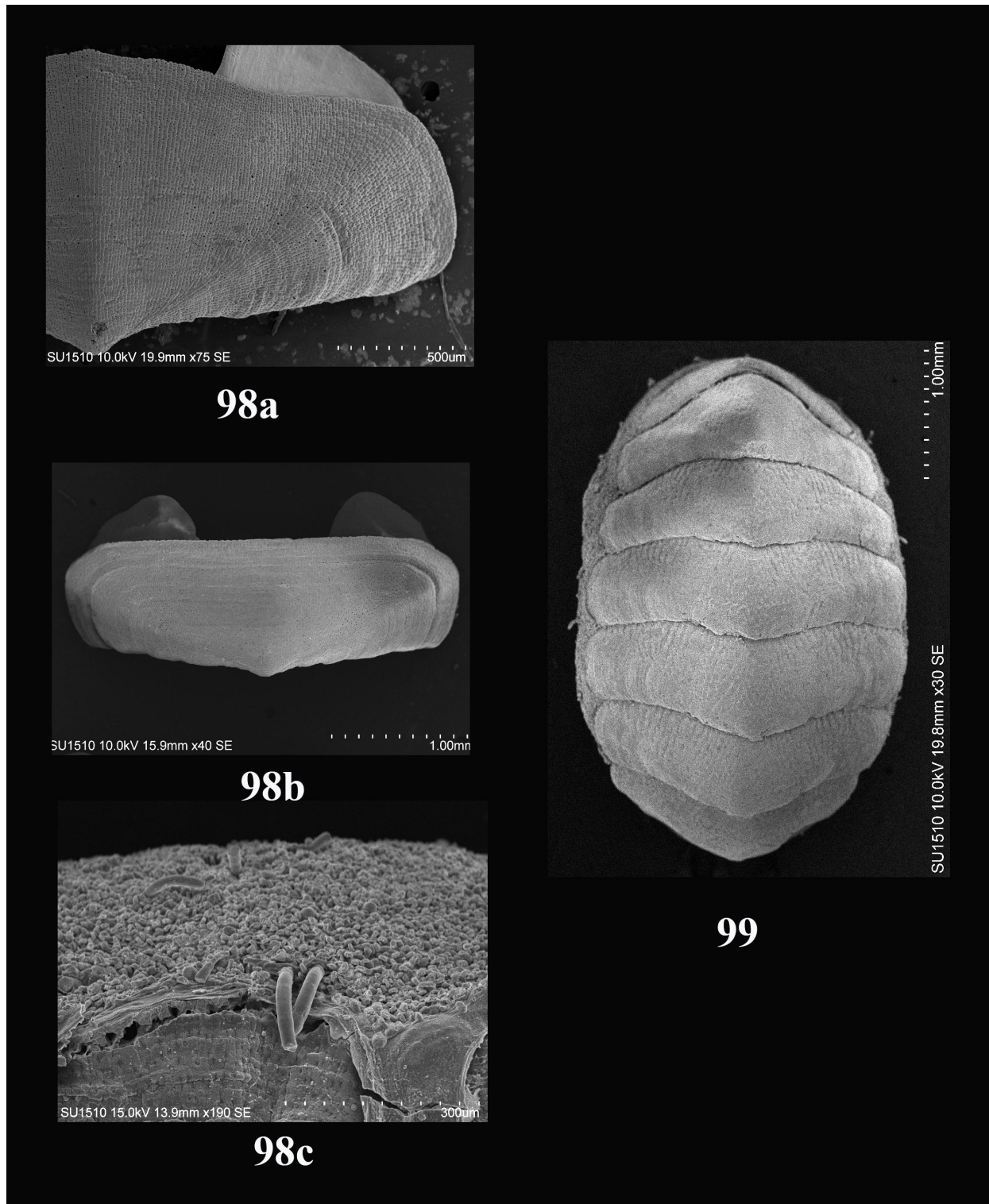


Figure 98. *Lepidochitona* sp. Specimen of 7.2 mm collected at Estacahuite, Puerto Ángel, Oaxaca, México, CNMO5868. SEM images of (a) sculpturing microstructure of valve II; (b) lateral areas of intermediate valve IV; and (c) girdle elements detail. **Figure 99.** *Lepidochitona* sp. (as *Lepidochitona* sp. 1 in Galeana-Rebolledo, 2011; Flores-Garza *et al.*, 2012; Galeana-Rebolledo, *et al.*, 2014). SEM image of dorsal view of a whole specimen of 8.9 collected at Punta Maldonado, Guerrero, México, CNMO5793.

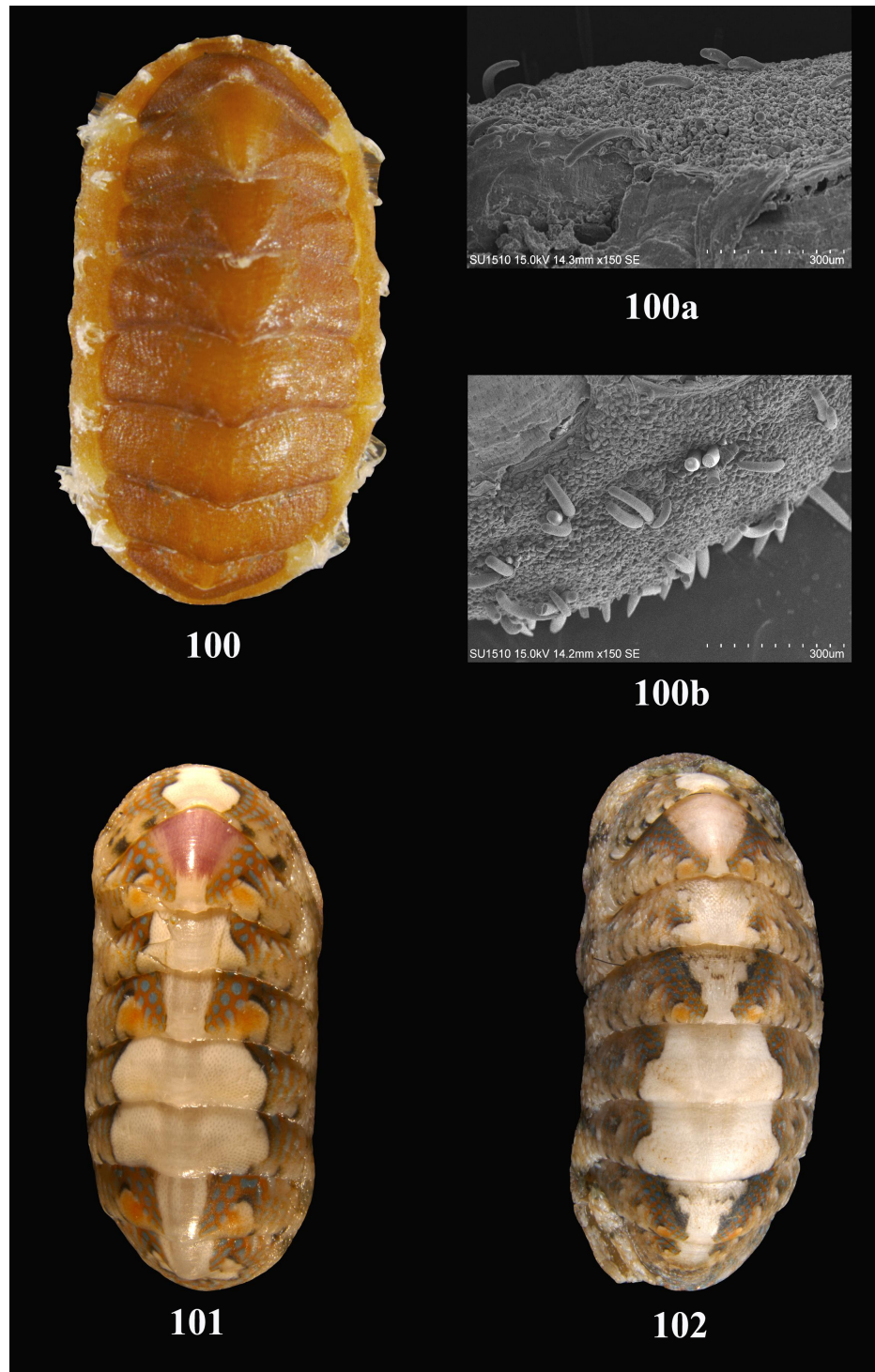


Figure 100. *Lepidochitona* sp. (as *Lepidochitona* sp. 2 in Galeana-Rebolledo, 2011; Flores-Garza *et al.*, 2012; Galeana-Rebolledo, *et al.*, 2014). Specimen of 7.9 mm collected at Playa Tlacoyunque, Guerrero, México, CNMO5779. SEM images of (a) single girdle hyaline spicules detail, and (b) groups of hyaline girdle spicules. **Figure 101.** *Stenoplax* sp. (as *Stenoplax mariposa* in Reyes-Gómez *et al.*, 2010). Dorsal view of specimen 14 mm length collected at Estacahuite, Puerto Ángel, Oaxaca, México, at 4 m depth. **Figure 102.** *Stenoplax* sp. (as *Stenoplax mariposa* in Flores-Garza *et al.*, 2012; Galeana-Rebolledo, *et al.*, 2014). Dorsal view of specimen 7.8 mm length, collected at Playa Ventura, Guerrero, México, in intertidal 1 m, CNMO5784.

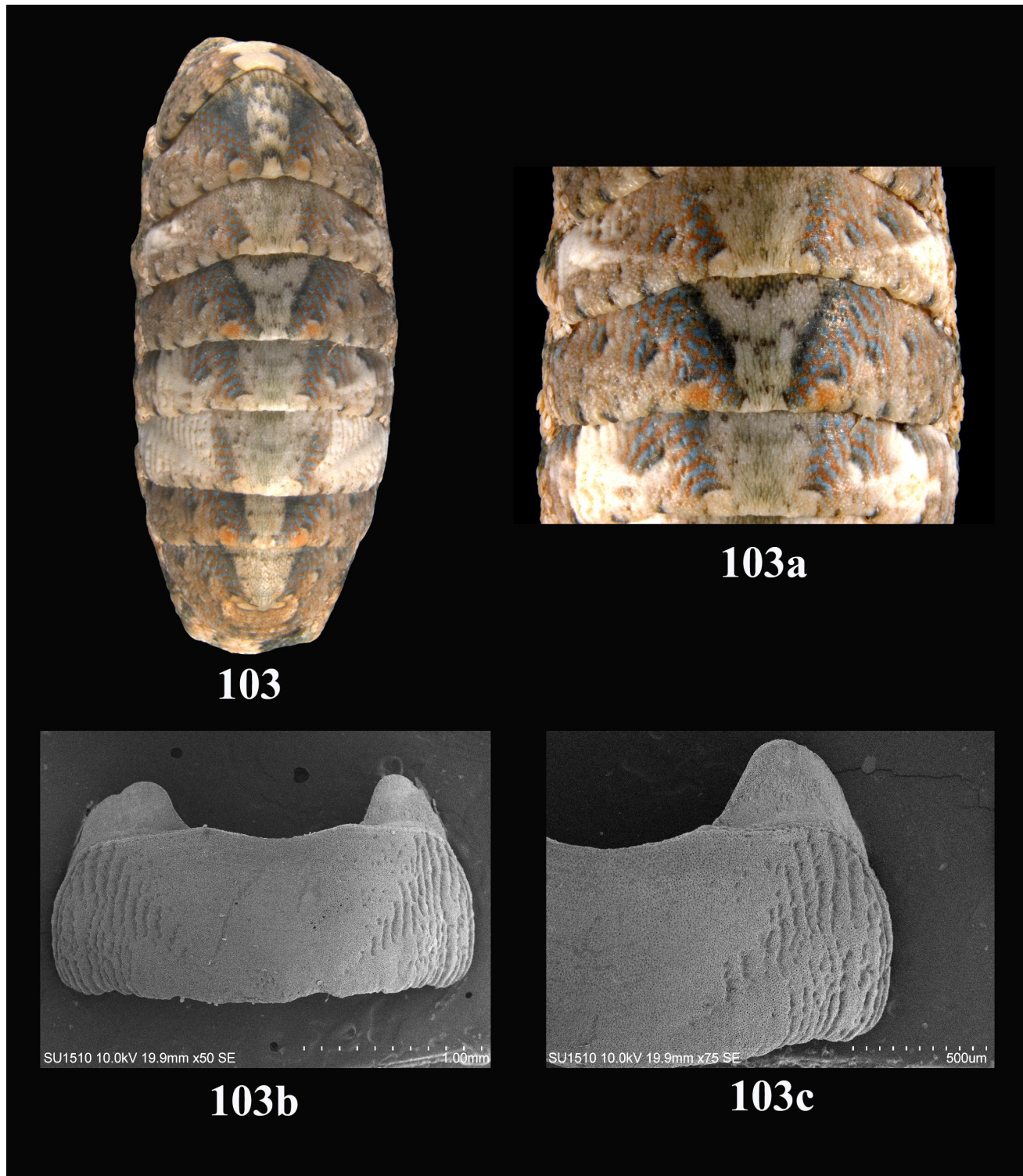


Figure 103. *Stenoplax* sp. (as *Stenoplax rugulata* in Galeana-Rebolledo, 2011; Flores-Garza *et al.*, 2012; Galeana-Rebolledo, *et al.*, 2014). Dorsal view of specimen 6.1 mm length, collected at Playa La Barrita, Teniente Azueta, Guerrero, México, in intertidal zone at 1 m, CNMO5314. Enlargement of (a) intermediate valves; SEM view of (b) intermediate valve VI; and (c) lateral areas of valve V sculpturing detail.

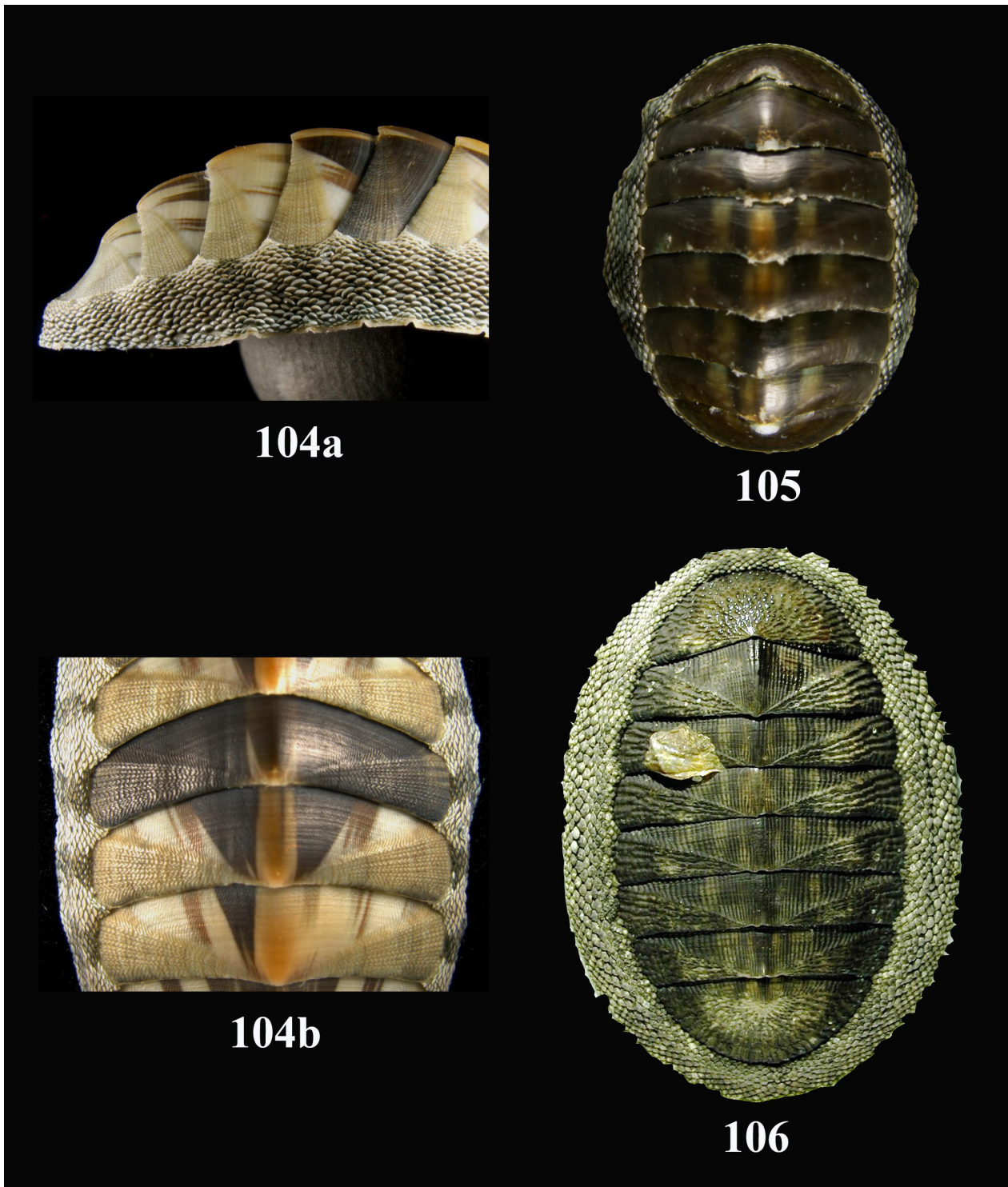
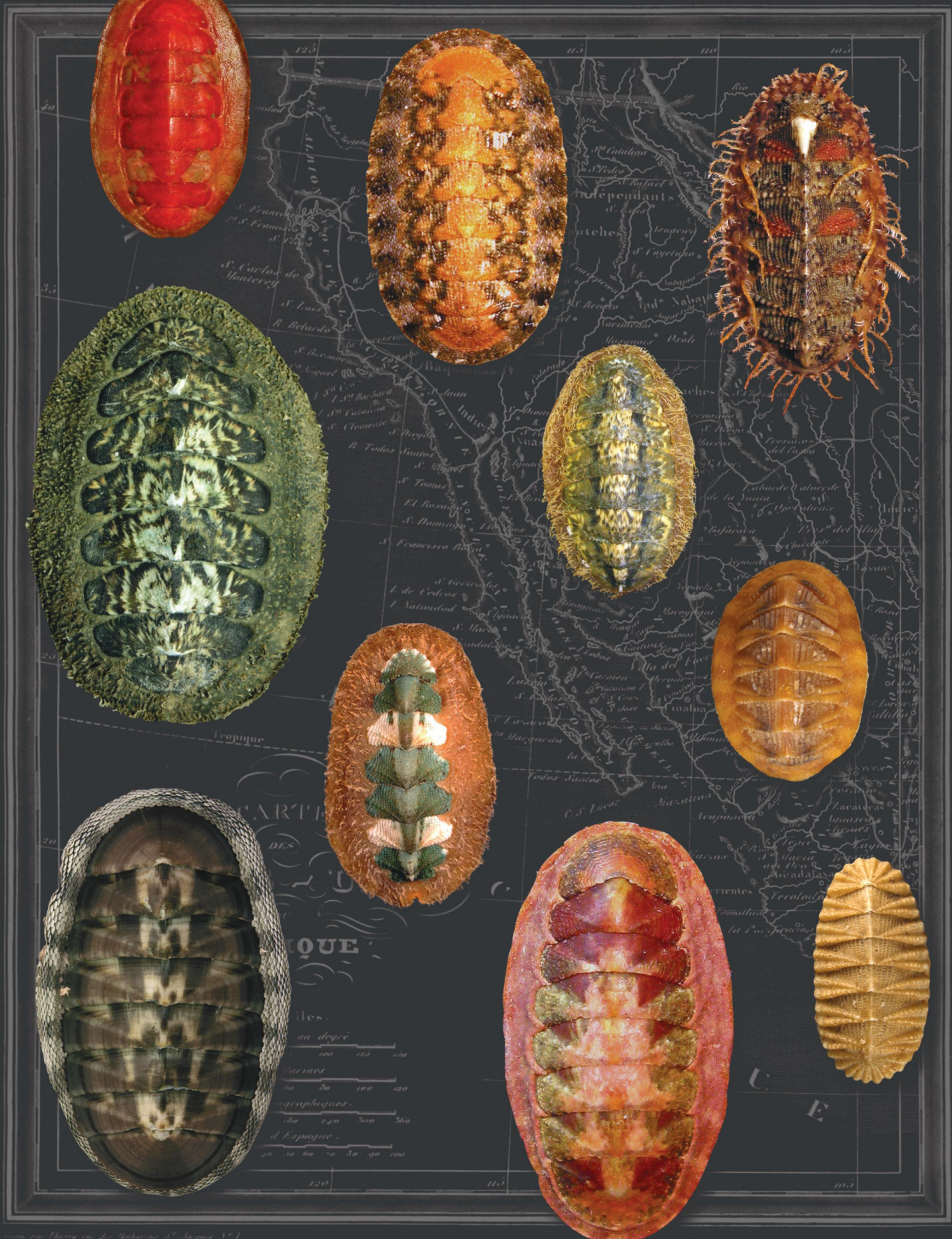


Figure 104. *Ischnochiton muscarius* (as *Ischnochiton* sp. in Reyes-Gómez *et al.*, 2010). Specimen of 28.7 mm collected at Estacahuite, Puerto Ángel, México, on rocky-coral bottom in intertidal zone, CNMO5663. Enlargement view of (a) detail of sculpturing in lateral view, and (b) detail of intermediate valves III-VI. **Figure 105.** *Chiton articulatus* Sowerby, 1832. Dorsal view of specimen 42.7 mm length, collected at Santa Elena, Oaxaca, México, on rocks, CNMO1066. **Figure 106.** *Chiton stokesii*. Specimen from, La Union, Playa Maculis, El Salvador. Courtesy of García-Ríos Cedar.



Icones per Thorey em de Molluscorum et Insectorum 1771