Corallana,																			1 *a*		1
Alitropus,															2 *a*						2
Spheroma,	1 *e*, *g*	3 *e*	1 *c*	1 *b*, 3 *g*	9	6 *f*, 2 *g*	4 *d*	3 *e*, 1 *f*	3 *e*	13	2 *b*	2 *b*	1 *a*, 1 *f*			3, 2 *e*, 1 *f*		7 *e*		14 (1)
Cymodocea,						4 *f*, 1 *g*	4 *d*, 1 *f*			9						1				1
Cercelis,																1 *e*, 1				2
Cassidina,								1 *g*		1						1 *e*				1
Amphoroidea,		1 *e*			1											1 *e*				1
Nesæa,			2 *f*		2	1 *f*	1 *d*, 1 *f*			3			1 *c*							1
Campecopea,						2 *f*, 1 *g*				2										
Ancinus,																				

6. ANISOPODA.

	W. America.		E. America.		Total.	E. Atlantic.			Frigid.	Total.	E. Africa.		Indian Ocean and E. Indies.	W. Pacific.		Mid. Pacific.		Total.
	N.	S.	N.	S.		N.	Medit.	S.			N.	S.		N.	S.	N.	S.	
SEROLIDEA.																		
Serolis,		2 *e*		1 *f*, 3 *g*, 1 *h*	5													
Praniza,						3 *f*, 1 *g*	2 *d*		1 *h*	7								
Anceus,						2 *f*	2 *d*		1 *h*	4								
ARCTURIDEA.																		
Arcturus,							1 *d*			1								
Leachia,						1 *f*, 2 *g*				3			1 *a*					1
? Anthura,							1 *d*			1								
TANAIDEA.																		
Tanais,		2 *e*		1 *a*	3	1 *d*, 1 *f*	2 *d*		6 *h*	9	1 *b*							1 (1?)
Paratanais,				1 *b*?	1	1 *d*				1			1 *a*					1
Leptochelia,																		
Apseudes,						1 *f*				1							1 *a*	1
Rhœa,						1 *f*	1 *d*			1								
Liriope,									1 *h*	1								
Cryptothir,																		
Crossurus,									1 *h*	1							1 *a*	1
Bopyrus,						1 *f*	1 *d*, 1 *e*		2 *h*	4								
Phryxus,									2 *h*	2								
Cepon,													1 *b*′					1
Dajus,									1 *h*	1								
Ione,						1 *f*				1								
Argeia,	1 *g*				1													

7. AMPHIPODA.

	W. America.		E. America.		Total.	E. Atlantic.			Frigid.	Total.	E. Africa.		Indian Ocean and E. Indies.	W. Pacific.		Mid. Pacific.		Total.
	N.	S.	N.	S.		N.	Medit.	S.			N.	S.		N.	S.	N.	S.	
CAPRELLIDEA.																		
Proto,				1 *b*	1	1 *f*			2 *h*	2								
Protella,													1 *a*					1
Caprella,		3 *e*	1 *c*	6 *b*	10	4 *f*, 5 *g*	1 *d*		6 *h*	13		2 *b'*			1 *c*			3
Ægina,									2 *h*	2			2 *a*?					2
Cercops,									1 *h*	1								
Podalirius,									1 *h*	1								
Cyamus,		1 *c*	1 *g*		2	3 *f*	1 *d*	3		5 (1)								
GAMMARIDEA.																		
Dulichia,									1 *h*	1								
Chelura,						1 *f*				1								
Clydonia,						1 *a*				1								
Corophium,				1 *b*	1	1 *f*				1								
Siphonœcetes,									1 *h*	1								
Platophium,				1 *b*	1													
Cyrtophium,													1 *a*					1
Unciola,			1 *f*		1				1 *h*	1								
Podocerus,			2 *f*		2													
Cratophium,				1 *b*	1								1 *a*					1
Cerapus,			1 *f*		1	1 *f*, 1 *g*				2								
Erichthonius,						1 *f*				1								
Laphystius,									1 *h*	1								
Icilius,													1 *a*					1
Pterygocera.																		
Orchestia,	2 *g*	5 *e*	2 *f*	1 *b*, 1 *e*, 2 *g*	13	4 *f*	4 *d*, 1 *f*, 1 *e*	2 *e*	2 *h*	10	3 *b*	1 *b*			2 *e*	1 *b*	2 *a*, 6 *e*	14
Allorchestes,	1 *g*	1 *d*, 2 *e*		2 *b*	5	1 *c*, 1 *d*	1 *d*			2			1 *a*		2 *e*	1 *b*	1 *a*, 2 *e*	7
Stegocephalus,									1 *h*	1								
Lysianassa,				2 *b*	2		2 *d*			2								
Opis,						1 *g*				1								
Uristes,																	1 *h*	1
Anonyx,				1 *g*	1	1 *g*			2 *h*	3								
Urothoe,													2 *a*					2
Stenothoe,				1 *b*	1													
Leucothoe,						1 *f*			2 *h*	3								
Acanthonotus,						1 *f*	1 *f*		3 *h*	5								
Alibrotus,						1 *f*				1								
Leptochirus,						1 *f*				1								
Iphimedia,	1 *g*	1 *e*	1 *f*	2 *g*	5	1 *f*		1 *e*	14 *h*	16		1 *b*					1 *e*	2
Œdicerus,									1 *h*	1							1 *e*	1
Amphithoe,		2 *e*	1 *c*, 1 *f*	3 *b*, 1 *g*	8	4 *f*, 1 *g*	2 *d*, 1 *f*	1 *e*		9	2 *b*		3 *a*				1 *a*	6
Gammarus,	1 *g*	1 *d*, 2 *e*	2 *c*, 1 *f*	1 *b*, 1 *g*	8	1 *f*, 2 *g*	2		13 *h*	26			5 *a*		1 *e*		3 *a*	9
Photis,									1 *h*	1								
Melita,						1 *g*			2 *h*	3							1 *e*	1

Mæra,				2 *b*	2	4 *f*, 1 *g*	2 *d*			7			1 *a*					1
Dercothoe,				1 *b*	1								2 *a*					2
Pyctilus,				1	1								2 *a*					2
Pardalisca,									1 *h*	1								
Atylus,						1				1								
Ischyrocerus,									2 *h*	2								
Microcheles,									1 *h*	1								
Lepidactylis,									1 *h*	1								
Pontiporeia,									1 *h*	1								
Amphelisca,									1 *h*	1								
Protomedeia,									1 *h*	1								
Aora,		1 *e*			1													
Phoxus,									2 *h*	2								
Isæa,						1 *f*				1								
Anisopus,																		
HYPERIDEA.																		
Vibilia,							1 *d*			1			1 *a*					1
Lestrigonus,								2 *a*	1 *h*	3			1 *a*				1 *a*	2
Tyro,						1				1								
Hyperia,		2 *e*	1 *g*		3	1 *d*, 2 *f*		1 *e*	1 *h*	4								
Metœcus,									1 *h*	1								
Tauria,															1 *h*			1
Cyllopus,				1 *g*	1													
Dairilia,													2 *a*				2 *a*	4
Cystisoma,													1					1
Synopia,								1 *a*		1							1 *a*	1
Phronima,						1 *a*, 1 *g*	1 *d*			2								
Primno,		1 *e*			1													
Anchlomera,				1 *b*, 1 *e*	2							1 *b′*	1 *a*					2
Phrosina,								2 *d*		2								
Themisto,								1 *g*	2 *h*	3					1 *h*			1
Phorcus,								1 *a*		1			1					1
Dithyrus,						1 *c*				1								
Typhis,						2 *f*		1 *d*		3								
Thyropus,						2 *d*		1 *a*		3								
Pronoe,		1 *e*			1			1 *a*		1								
Lycæa,															1 *d*			1
Oxycephalus,		1 *e*			1								1 *a*					1
Rhabdosoma,																	1	1

RECAPITULATION.

The three subdivisions adopted in the preceding table, are designated A, B, and C, in the following summary of the results. The division A, includes the Atlantic and Pacific coasts and islands of America; B, the European and West African coasts and islands, from Cape Horn to Greenland inclusive; and C, the coasts and islands of the Indian and Pacific Oceans (America excluded).*

I. BRACHYURA.

	A.	B.	C.
MAIOIDEA.			
Maiinea,	69	24 (1 *a*)	73 (1 *b*)
Parthenopinea,	1	5	29
Oncininea,	0	0	2
Total Maioidea,	70	29 (1)	104 (1)
CANCROIDEA.			
Cancridæ,	10	3	0
Xanthidæ,	17	7 (1 *a*)	129 (1 *b*)
Eriphidæ,	7	5	52 (1 *b*)
Portunidæ, Platyonychidæ and Podophthalmidæ,	13	19 (1 *a*)	54 (1 *a*)
Telphusinea,	6	1	7
Cyclinea,	1	0	0
Total Cancroidea,	54	35 (2)	242 (3)
GRAPSOIDEA,	51	18 (5)	124 (5)
LEUCOSOIDEA,	9	12	48 (1)
CORYSTOIDEA,	6	5	8
Total BRACHYURA,	190	99 (8)	526 (10)

II. ANOMOURA.

	A.	B.	C.
Dromidea,	1	9	15 (1 *b*)
Bellidea,	2	0	0
Raninidea,	1	0	5

* The discrepancies between the enumeration here and the summaries of the preceding tables, arise from species omitted in one or both, on account of the uncertainty of their localities.

	A.	B.	C.
Hippidea,	7	2	7
Porcellanidea,	24	4	19
Lithodea,	5	1 (1 *a*)	3
Paguridea,	26	27 (1 *a*)	61 (1 *b*)
Ægleidea,	2	0	0
Galatheidea,	3	6 (1 *a*)	5
Total ANOMOURA,	71	49 (3)	115 (2)

III. MACROURA.

	A.	B.	C.
Thalassinidea,	7	8	9 (1 *b*)
Astacidea,	29	9	27
Caridea,	40	77 (3 *a*)	85 (3 *b*)
Penæidea,	4	8	22
Total MACROURA,	80	102 (3)	143 (4)

IV. ANOMOBRANCHIATA.

	A.	B.	C.
Squilloidea,	10	16	32 (3 *b*)
Mysidea,	3	18	15
Amphionidea,	0	9	11
Total ANOMOBRANCHIATA,	13	43	58 (3)

V. TETRADECAPODA.

	A.	B.	C.
ISOPODA.			
Idotæidea,	11	25	6 (1 *b*)
Oniscoidea,	30	72 (1 *a*)	11
Cymothoidea,	32	57 (1 *a*)	42 (2 *b*)
Total Isopoda,	73	154 (2)	59 (3)
ANISOPODA,	10	38	6
AMPHIPODA.			
Caprellidea,	13	24	6
Gammaridea,	55	114	51
Hyperidea,	9	27	17
Total Amphipoda,	77	165	74
Total TETRADECAPODA,	160	357 (2)	139 (3)

The preceding table affords the following lists of genera of the three grand divisions, according to the present state of the science.

1. GENERA EXCLUSIVELY AMERICAN OR OCCIDENTAL.

	Coast on which found.
1. *Maioidea.*	
Microrhynchus,	west.
Salacia,	"
Libidoclea,	west and east.
Libinia,	" "
Pelia,	west.
Rhodia,	"
Pisoides,	"
Thoe,	west and east.
Chorilia,	west.
Scyra,	"
Othonia,	"
Mithraculus,	west and east.
Tyche,	" "
Eurypodius,	" "
Oregonia,	west.
Inachoides,	"
Pugettia,	"
Epialtus,	west and east.
Leucippa,	" "
2. *Cancroidea.*	
Pilumnoides,	west.
Trichodactylus,	east.
Arenæus,	"
Potamia,	west and east.
Orthostoma,	east.
Acanthocyclus,	west.

	Coast on which found.
3. *Grapsoidea.*	
Cyrtograpsus,	east.
Uca,	west and east.
Gecarcoidea,	east.
Fabia,	west.
Pinnixa,	west and east.
Pinnotherelia,	west.
Halicarcinus,	west and east.
4. *Leucosoidea.*	
Platymera,	west.
Hepatus,	west and east.
Guaia,	" "
5. *Corystoidea.*	
Telmessus,	west.
Peltarion,	east.
Pseudocorystes,	west.
6. *Anomoura.*	
Corystoides,	west.
Bellia,	"
Ranilia,	"
Albunhippa,	west.
Echidnocerus,	"
7. *Macroura.*	
Cambarus,	west and east.
Paracrangon,	west.
Æglea,	"
Cryphiops,	"

2. GENERA EXCLUSIVELY OF THE AFRICO-EUROPEAN DIVISION.

1. *Maioidea.*
   - Lissa.
   - Stenorhynchus.
   - Amathia.
   - Eurynome.
2. *Cancroidea.*
   - Perimela.
   - Portumnus.
   - Polybius.
3. *Grapsoidea.*
   - Gonoplax.
   - Heterograpsus.
   - Brachynotus.
   - Hymenosoma.
4. *Leucosoidea.*
   - Ilia.
5. *Corystoidea.*
   - Thia.

Corystes.
6. *Anomoura.*
Homola.
7. *Macroura.*
Axius.
Calocaris.
Ephyra.
Gnathophyllum.

3. GENERA EXCLUSIVELY ORIENTAL, OR OF THE THIRD DIVISION.

1. *Maioidea.*
Macrocheira.
Paramithrax.
Micippa.
Lahaina.
Naxia.
Hyastenus.
Pyria.
Cyclax.
Camposcia.
Paramicippa.
Tiarinia.
Perinea.
Halimus.
Menæthius.
Stenocionops.
Huenia.
Xenocarcinus.
Parthenope.
Eumedonus.
Ceratocarcinus.
Gonatonotus.
Eurynolambrus.
2. *Cancroidea.*
Atergatis.
Liomera.
Liagora.
Medæus.
Halimede.
Etisus.
Carpilodes.
Zozymus.
Daïra.
Cymo.
Polydectus.
Œthra.
Galene.
Pseudozius.
Melia.
Acanthodes.
Actumnus.
Ruppellia.
Domæcius.
Trapezia.
Tetralia.
Quadrella.
Scylla.
Charybdis.
Lissocarcinus.
Podophthalmus.
3. *Grapsoidea.*
Curtonotus.
Cleistostoma.
Macrophthalmus.
Helœcius.
Scopimera.
Doto.
Eriocheir.
Platynotus.
Trichopus.
Sarmatium.
Helice.
Gecarcinicus.
Xenophthalmus.
Xanthasia.
Hymenicus.
Elamena.
Myctiris.
4. *Leucosoidea.*
Mursia.
Orythia.
Thealia.
Matuta.
Philyra.
Leucisca.
Nucia.

Nursia.
Myra.
Ixa.
Iphis.
Arcania.
Oreophorus.
Tlos.
Ethusa.
5. *Corystoidea.*
Kraussia.
Œidia.
Dicera.
6. *Anomoura.*
Caphyra.
Raninoides.
Ranina.
Notopus.
Lyreidus.
Cosmonotus.
Lomis.
Diogenes.
Aniculus.
Birgus.
7. *Macroura.*
Laomedia.
Glaucothoe.
Callianidea.
Callisea.
Thenus.
Ibacus.
Astacoides.
Paranephrops.
Cyclorhynchus.
Atyoida.
Alope.
Œdipus.
Harpilius.
Anchistia.
Palæmonella.
Hymenocera.
Oplophorus.
Regulus.
Stenopus.
Spongicola.
Acetes.
Eucopia.

4. GENERA COMMON TO THE AMERICAN AND AFRICO-EUROPEAN DIVISIONS, BUT NOT IN THE THIRD, OR ORIENTAL.

1. *Maioidea.*
Hyas.
Herbstia.
Leptopodia.
Stenorhynchus.
2. *Cancroidea.*
Atelecyclus.
3. *Anomoura.*
Munida.
Grimothea.
4. *Macroura.*
Homarus.

5. GENERA COMMON TO THE AFRICO-EUROPEAN AND ORIENTAL DIVISIONS, NOT YET FOUND IN THE OCCIDENTAL.

1. *Maioidea.*
Inachus.
Doclea.
Maia.
Achæus.
Lambrus.
2. *Cancroidea.*
Actæa.
Actæodes.
Thalamita.
Portunus.
Telphusa.
3. *Leucosoidea.*
Cycloes.
Ebalia.
Dorippe.
4. *Anomoura.*
Latreillia.
Cymopolia.
Remipes.
5. *Macroura.*
Nika.
Lysmata.
Caridina.

6. GENERA COMMON TO THE THREE DIVISIONS.

1. *Maioidea.*
   - Pisa.
   - Mithrax (mainly Occid.)
   - Acanthonyx.
2. *Cancroidea.*
   - Xantho.
   - Panopæus (mainly Occid.)
   - Pilumnus.
   - Eriphia.
   - Lupa.
   - Amphitrite.
   - Carcinus.
   - Platyonychus.
3. *Grapsoidea.*
   - Grapsus.
   - Goniograpsus.
   - Sesarma (sparingly European).
   - Acanthopus.
   - Plagusia.
   - Pinnothera.
   - Calappa.
4. *Anomoura.*
   - Dromia (sparingly Occid.)
   - Albunæa.
   - Porcellana.
   - Lithodes.
   - Paguristes.
   - Bernhardus.
   - Pagurus (mainly Orient.)
   - Clibanarius.
   - Galathea.
5. *Macroura.*
   - Gebia.
   - Scyllarus.
   - Panulirus.
   - Palinurus.
   - Astacus.
   - Crangon.
   - Alpheus.
   - Betæus.
   - Hippolyte.
   - Pandalus.
   - Palæmon.
   - Sicyonia.
   - Penæus.

The following are lists of *species* common to two or more of the three divisions. They may be much changed by further study, through the discovery that the specimens from distant localities are not conspecific. Should this happen, there is a relation indicated based on their close similarity, which is important.

1. SPECIES STATED TO BE COMMON TO DIVISIONS A. AND B., OR THE AMERICAN AND THE AFRICO-EUROPEAN WATERS.

Hyas coarctata; Massachusetts and Long Island, in United States; France; England; Shetlands.

Leptopodia sagittaria; Canaries; West Indies; Valparaiso.

Panopæus Herbstii; Mediterranean; Key West, South Carolina, and New York, in United States.

Carcinus mænas; Mediterranean at Nice; Crimea; England; Massachusetts, United States.

Grapsus pictus; Madeira; Peru and Chili; (also various Pacific islands.)

Planes minutus; Atlantic Ocean, and occasionally found on both the American and European coasts.

Goniograpsus varius; Canaries; Mediterranean at Algiers, Nice, Italy; Crimea; Brittany; and probably at Rio Janeiro, Brazil.

Sesarma reticulata; Key West and South Carolina, in United States; and in South Africa, according to M'Leay.

Acanthopus planissimus; West Indies; Canaries; Madeira; Cape Town and Port Natal, South Africa (also various tropical Pacific islands).

Plagusia squamosa; West Indies; Key West, South Carolina, in United States; Canaries; Madeira (also, Isle of France; Indian Ocean; Red Sea; Port Natal).

Plagusia tomentosa; Chili; Cape Town (also, New Zealand).

Albunæa symnista; Canaries; Mediterranean (also, Pondicherry); and if the *A. oxyophthalmus* is the same species, it occurs in the West Indies, and on the coast of South Carolina.

Lithodes maia; Great Britain; Shetlands; Norway; coast of Massachusetts (rare).

Bernhardus streblonyx; Great Britain; France; Mediterranean; Norway; Massachusetts, in United States; (also Kamtschatka).

Cenobita diogenes; West Indies; Mediterranean; (Hawaii?)

Crangon vulgaris; Great Britain; France; United States; San Francisco and Puget's Sound, Western America.

Crangon boreas; Norway; Iceland; Greenland; Massachusetts (in fish), (also, Kamtschatka).

Pandalus annulicornis; Scotland and Shetlands; Norway; Iceland; Massachusetts (rare).

Gonodactylus chiragrus; Mediterranean; Key West; (also, Red Sea; Port Natal, South Africa; Isle of France; East Indies; Swan River, Australia; Pacific Ocean, at Feejees, Tongatabu, &c.)

2. SPECIES COMMON TO B. AND C., THE AFRICO-EUROPEAN AND ORIENTAL SEAS.

Mithrax dichotomus; Mediterranean; East Indies.

Achæus Cranchii; Mediterranean; *Japan* (probably same species).

Actæa rufo-punctata; Canaries and Mediterranean; Isle of France, Indian Ocean.

Thalamita admete; Canaries; Port Natal, South Africa; Red Sea; Indian Ocean and East Indies; Pacific Ocean, at the Feejees, Samoa, Hawaiian Islands, Wake's Island, &c.

Pilumnus Forskalii; Canaries; Red Sea.

Grapsus pictus; *see above.*

Grapsus strigosus; Canaries; South Africa; Red Sea; East Indies.

Goniograpsus messor; Canaries; Port Natal, South Africa; Red Sea; East Indies.

Planes minutus; Atlantic; *Japan.*

Acanthopus planissimus; *see above.*

Plagusia tomentosa; Chili; South Africa; New Zealand.

Plagusia squamosa; *see above.*

Cycloes granulosa; Canaries; *Japan* (probably same species).
Remipes scutellata; Ascension Island; Swan River, Australia; St. Christopher's.
Lysmata seticaudata; Mediterranean; *Japan*.
Alpheus Edwardsii; Mediterranean; Cape Verdes; Port Natal, South Africa.
Pandalus pristis; Mediterranean; *Japan*.
Squilla mantis; Mediterranean; Canaries; *Tschusan*.
Pagurus striatus; Mediterranean; Japan.

3. COSMOPOLITES.

The above lists include the following species occurring in the Occidental, Africo-European, and Oriental seas.

Grapsus pictus.	Bernhardus streblonyx.
Acanthopus planissimus.	Crangon boreas.
Plagusia squamosa.	Crangon vulgaris.
Plagusia tomentosa.	Gonodactylus chiragrus.

These are cosmopolite species.* The *Grapsus*, *Acanthopus*, *Plagusia squamosa*, and *Gonodactylus* pre-eminently deserve this name, being found both north and south of the equator. They thrive in the hottest equatorial waters, and have their extreme limit in the temperate region. The temperature they admit of is hence at least from 56° to 88° F.

The other species are cold-water species. *Plagusia tomentosa* belongs to the southern subtemperate region, being reported from Cape Town, New Zealand, and Chili, and the rest are found in high northern latitudes, and probably pass from the Atlantic to the Pacific Ocean through the Arctic Seas.

Besides the above species, a few are found in the West Indies, which occur also in the Oriental Seas, but are not yet known from the European or West African coasts. These, which also may be styled cosmopolites, are as follows:—

Mithrax asper; East Indies; probably the same on the Peruvian coasts.
Atergatis lobatus; Red Sea and Indian Ocean; West Indies.
Carpilius maculatus; East Indies; South France; Japan; various Pacific Islands from the Paumotus to the Feejees and Hawaiian Islands; West Indies.
Eriphia gonagra; East Indies; Port Natal; Key West.

* The *Platyonychus bipustulatus* may possibly be another cosmopolite, for it is reported from Table Bay, the East Indies, Japan, and Valparaiso. But we believe the Valparaiso species to be different from that of the East Indies, and have so named it.

Menippe Rumphii; East Indies; Rio Janeiro and the West Indies.
Chlorodius exaratus; Pacific Islands; East Indies; West Indies.
Lysiosquilla scabricaudis; Indian Ocean; West Indies; Brazil; South Carolina.

From the survey already made, it is apparent, that the three grand divisions of the seas and coasts adopted in the preceding table, have very few species in common, and they correspond to a natural geographical arrangement. They constitute three kingdoms, to which two should be added, one for the Arctic Seas, and the other for the Antarctic. These kingdoms are:—

I. The *Occidental* Kingdom, embracing the Atlantic and Pacific coasts of America to the frigid region, or some point in the subfrigid region.

II. The *European* Kingdom, extending from Cape Horn (or Cape Agulhas) to the Shetlands inclusive, and embracing the adjoining islands.

III. The *Oriental* Kingdom, including the east coast of Africa, the south and east of Asia, and the islands of the Indian and Pacific Ocean, exclusive of the American continent.

IV. The *Arctic* Kingdom, including Norway, Iceland, Greenland, the Alascha Archipelago, and adjoining parts of the coasts of America and Kamtschatka, with other Arctic lands.

V. The *Antarctic* Kingdom, embracing Fuegia, the Falklands, Southern New Zealand, and the lands or islands of the Antarctic Seas.

Each of the first three kingdoms are naturally divided into three subkingdoms: a *north*, a *middle*, and a *south*, corresponding severally to the North Temperate, Torrid, and South Temperate zones of sea-temperature. The importance of these divisions will be a subject of further remark beyond.

The summary of the results in the preceding table, presents some striking facts.

We observe, first, that there is a ratio of 1 : 1·5 between the Maioids of the A and C divisions (that is between those of the *Occidental* and *Oriental* seas, as just explained), while the ratio is about 1 : 4½ for the Cancroids. So also, while the ratio of the A and B divisions together (Occidental and European) to C (Oriental) is for the Maioids, nearly 1 : 1, it is for the Cancroids, 1 : 3. Here is a wide difference between the Occidental and Oriental seas as regards these groups. This last ratio is for the Corystoids nearly that for the Maioids, or more exactly, 1 : 0·75; and for the Grapsoids it is 1 : 2;

for the Leucosoids, 1 : 2½. (The Arctic and Antarctic Seas are here merged in the other kingdoms, with which they are most nearly associated.)

If we compare these ratios with those which the same groups sustain as regards temperature, as exhibited on a former page, we discover that there is a very close parallelism; showing plainly that the prevalence of Maioids in the Occidental Seas must be owing to the comparative prevalence of cold waters; and the prevalence of the warm-water groups, the Cancroids and Leucosoids, in the Oriental Seas, is owing conversely to the great extent of warm waters.

Again, the ratio between the A and B divisions together of the Macroura, and the C division, is nearly as 1 : 0·8, which sustains the same conclusion.

The corresponding ratio for the Tetradecapoda is as 1 : 0·26. But as this group, owing to the smallness of the species, has not been thoroughly investigated, except in European regions, directly under the eyes of European observers, we cannot use satisfactorily the facts they present for deducing general conclusions, or for characterizing zoological districts or provinces. Still, it should be observed that the facts conform to the same principle.

It is hence of the highest importance before comparing the zoological character of different coasts, that the temperature-regions of those coasts should be ascertained.

Comparative tables of the East Indies and Mediterranean, or of the Peruvian coast and the East Indies, or of the southeast and southwest coast of Africa (and so on), would lead us far astray, if this element were left out of view; for a difference of temperature region, implies a difference of genera and species, independent of other considerations. On these grounds, whole continents, or sides of continents, may have a common character and differ widely from other continents in the same latitudes.

If we look at the American continent in this point of view, we at once perceive a striking peculiarity. All the coasts of North and South America, with the Gallapagos on the west, belong to the Temperate zone, excepting a few degrees along by Panama, and a connected range of coast from Key West to Rio Janeiro. Chili and Peru are excluded even from the warm temperate region, and so also, the coast of the United States, north of Cape Hatteras.

Now contrast America with the Oriental Seas. The whole east

coast of Africa, north of the parallel of 30° south, the coasts of India and the East India Islands, and the northern half of Australia, together with the numerous islands of the Pacific, belong alike to the Torrid zone. In the American Seas, the torrid coasts make a single range, and have many species in common throughout. In the Oriental Seas, they reach with an uninterrupted surface over one-half of the circumference of the globe, and there is room for many distinct provinces within the same temperature region. The space for Torrid zone species along the American coasts in the Atlantic or Pacific, or that of the whole Atlantic Ocean, is small compared with the vast extent of the East Indies, Indian Ocean, and Middle Pacific, and this fact is more striking, if we consider that the Atlantic east of the West Indies contains no islands in the Torrid zone, besides St. Helena, Ascension, and the Cape Verdes, all of which are of small size.

Again, in order to compare the coasts of America and Europe, we must observe that the warm temperate region is represented along the former by a small district from Northern Florida to Cape Hatteras, while this region does not reach at all the latter, and only the Canaries in the eastern Atlantic are within it. Moreover, the temperate and subtemperate regions are mere points on the North American coast at Cape Hatteras; while on the European side, the former embraces the larger part of the Mediterranean, and a portion of Northwestern Africa, and the latter includes the Atlantic coast of Portugal. But north of Cape Hatteras, the coast of America is rightly compared with that of Europe, north of Portugal.

To compare the coast of Asia and Europe, we first observe in the same manner the temperature regions. There is in fact a striking similarity with the coast of the United States. Yet, the torrid and subtorrid regions are confined to limits much nearer the equator; and the warm temperate, although embracing as many degrees of latitude as the warm temperate on the United States, does not on the China coast extend farther north than the subtorrid region of the Florida coast. The temperate region hardly has a place on the coast of China, while the subtemperate occupies the Yellow Sea. North of this Gulf, the coast corresponds mostly with the coast of the United States, north of Cape Cod.

It is unnecessary to adduce other explanations, as the chart furnishes all that is needed for a ready comparison between the different coasts.

The propriety of uniting in one kingdom both coasts of America, the eastern and western, and thus shutting off the latter from the great Pacific Ocean, may at first appear unnatural. Yet it is supported by all facts bearing on the subject. There are no species known to be common to Western America and the Middle Pacific, excepting two or three cosmopolites. Moreover, the genera are to a great extent distinct, and where so, they often occur on both sides of the continent. The genera of Podophthalmia peculiar to America are mentioned on page 1548, and also the particular coast on which they occur.

A review of some of the facts will exhibit in a strong light the zoological resemblances of the two sides of the continent.

Of *Cancer*, there are *four* species found on the west coast of South America, *three* on the west coast of North America, and *two* on the east coast of North America.

Of *Hepatus*, there is *one* species common to the West Indies and Brazil, a *second*, found at Rio Janeiro; a *third*, at Valparaiso, Chili; a *fourth*, on the Carolina coast.

Libinia, in the same manner, has its species on the Atlantic and Pacific coasts of the United States, and the coasts of Western and Eastern South America. *Mithrax* is as widely distributed.

Epialtus occurs in the West Indies, California, Brazil, Gallapagos, and Valparaiso. *Potamia* has two West Indian and one Chilian species.

Eurypodius of Southern South America has its representative at Puget's Sound, in the genus *Oregonia*.

Again, the *Libinia dubia* of the West Indies, is hardly distinguishable, according to Prof. L. R. Gibbes, from the *L. affinis*, Rand., of the California coast. *L. spinosa* of Brazil is also found in Chili. *Leptopodia sagittaria* occurs in the West Indies, and also, according to Bell, at Valparaiso; *Acanthonyx Petiverii* (?), in the West Indies, Brazil, and Gallapagos; *Epialtus marginatus*, on the coast of Brazil and at the Gallapagos (Bell); *Epialtus bituberculatus*, in Chili, and at Key West; *Uca una*, Guayaquil and West Indies; *Albunœa scutellata*, West Indies and San Lorenzo, Peru; *Hippa emerita* and *talpoides*, both on East and West America, North and South.

It is obvious, therefore, that the east and west sides of America are very closely related, and differ widely in a zoological sense, from either of the other kingdoms.

We observe further, that nearly all the genera peculiar to America are *cold-water* genera. They are mostly Maioids; the large group of

the Cancroids, which belong mainly to warm waters, does not include a single genus exclusively American, and of the family Leucosidæ, of the Leucosoids, there are only three known species.

We also perceive why the western coast of America has no zoological affinity with the Pacific Islands. The temperature of their waters is widely different; and, moreover, the oceanic currents of the tropics run *from* the American coast to the westward, and are a barrier to migration eastward.

The relations of the American or Occidental to the Africo-European kingdom are of much interest. The two kingdoms are widely different in most respects.

In the first place, the genera *Lupa, Gelasimus, Ocypoda, Libinia, Epialtus, Hepatus,* well represented on the American coasts, are not known on the European, besides others (Table 1, page 1548) of less prominence.

Again, there are several genera common in Europe, not known in America, as *Inachus, Maia, Achœus, Portunus, Ebalia, Latreillia, Athanas,* in addition to those included in Table 2, on page 1548.

Still, the American and Africo-European kingdoms have a common character separating them from the Oriental. For example: the great genus *Cancer* occurs in both of these kingdoms, and is not known in Oriental seas, except in New Zealand and Tasmania. So also the important genus *Homarus;* besides *Hyas, Herbstia, Leptopodia, Atelecyclus, Munida,* and *Grimothea.* The genus *Homarus* has one species on the coast of the United States, one on the coast of Europe, and one at Table Bay, South Africa, thus ranging over the whole Atlantic.

We may now treat separately of the several Kingdoms, and their subdivision into *Provinces,* pointing out the naturalness of their limits, and the characteristics of these Provinces. Each temperature region along a coast makes a distinct Province, which facts, where ascertained, show to be well characterized. In some cases, a farther subdivision may be desirable, and when so, the subordinate divisions may be called *Districts.* The Provinces of each zone together may constitute a *Subkingdom,* as the *Torrid* Subkingdom, *Temperate* Subkingdom, &c.

I. OCCIDENTAL KINGDOM.

In the Occidental kingdom, there are in the first place, two SECTIONS, the *Eastern* and the *Western;* and both these sections are subdivided into—

1. The *Torrid* Subkingdom; 2. The *South Temperate* Subkingdom; 3. The *North Temperate* Subkingdom. The last two subkingdoms include the whole of the Temperate zone, excepting perhaps the extreme portions, which on zoological grounds may be separated, and united to the Frigid zone, forming the Arctic or Antarctic kingdoms.

In the following mention of the provinces, we give their lengths along the coast; and it will be seen, that although they may appear to be numerous, they still have a wide extent, the length being seldom under five hundred miles, and sometimes full four thousand miles.

A. WESTERN SECTION.

I. TORRID SUBKINGDOM.

1. The PANAMA Province (torrid), extending from the equator or a degree south to a degree beyond Acapulco. Length, sixteen hundred miles.

2. The MEXICAN Province (north subtorrid), reaching from the termination of the Panama province to the Peninsula of California. Length to the California Peninsula, exclusive of the Gulf, six hundred miles.

3. The GUAYAQUIL Province (south subtorrid) occupying from Cape Blanco, the west cape of South America, nearly to the equator, and including the Bay of Guayaquil. Length, nearly two hundred miles.

II. SOUTH TEMPERATE SUBKINGDOM.

1. The GALLAPAGOS Province (warm temperate) includes the Gallapagos Islands, but does not reach the continent. The genera peculiar to it are *Microrhynchus, Pelia, Rhodia, Thoe,* and *Othonia.* There are also two species of *Mithraculus,* one of *Mithrax,* one of *Pisoides* (also

Chilian), one of *Herbstia*, one of *Pisa*, one of *Epialtus*. The variety of Maioid forms is remarkably large. The Cancroids have not been described. *Epialtus marginatus* is also reported from Brazil.

2. The PERUVIAN Province (temperate), from just north of Payta nearly to Copiapo. Length, fifteen hundred miles. The most characteristic species appear to be the *Panopæus crenatus*, *Xantho crenatus*, and *Albunhippa spinosa* (another species of which genus occurs in California). There also exists here, the cosmopolite *Grapsus pictus*, of very large size, which is rare farther south; also *Libinia rostrata*, *Mithrax asper*, *Acanthonyx emarginatus*, *Porcellana mitra*, *Paguristes Weddelii;* besides several Chilian species of Porcellana, and *Xantho Orbignii*, *X. Gaudichaudii*, *Bernhardus Edwardsii*, and *Pseudosquilla monoceros*, which are common to Chili and Peru. The *Pilumnoides perlatus* is reported from Peru by D'Orbigny; but we observed it only at Valparaiso, where it was originally found by Pœppig.*

3. The CHILIAN Province (subtemperate). Length, seven hundred miles. This province is distinguished from the Peruvian by the rare occurrence of *Grapsus pictus*, and the unusual number and size of the species of *Cancer* and *Porcellana*, *three* of the former and *ten* of the latter existing at Valparaiso. Both of these genera have been shown to reach their highest developments in the middle Temperate zone. Other characteristic genera are the following:—*Inachoides*, *Acanthocyclus*, *Platymera*, *Pseudocorystes*, *Bellia*, *Æglea*, *Cryphiops*, *Pinnotherelia*, and *Rhyncocinetes*. *Epialtus dentatus*, *Ocypoda Gaudichaudii*, *Grapsus planifrons*, *Hepatus chilensis*, and *Platyonychus purpureus* are large and common species. The genera *Ocypoda* and *Grapsus* are not found south of the subtemperate region. *Pilumnoides* we suspect to be peculiar to Chili. The following are other genera represented in the Chilian seas:—*Libinia*, *Libidoclea*, *Pisoides*, *Leptopodia*, *Leucippa*, *Xantho* (four large species), *Panopæus*, *Ozius* (also an Australian genus), *Pilumnus*, *Gelasimus*, *Cyclograpsus*, *Uca*, *Pinnixa*, *Leucosia*, *Atelecyclus*, *Paguristes*, *Bernhardus*, *Galathea*, *Callianassa*, *Thalassina*, *Alpheus*, *Betæus*, *Palæmon*, *Pseudosquilla*, *Gonodactylus*.

The Chilian province is allied to the Gallapagos through *Pisoides tuberculosus* and perhaps, *Acanthonyx Petiverii;* with Brazil, through *Libinia spinosa;* with the West Indies and Canaries, through *Leptopodia sagittaria*. The *Hepati* of Chili and Rio Janeiro are closely related; and we suspect that the *H. chilensis* is found also at

* Gay, in his Historia de Chile, mentions its occurrence only on the Chilian coast.

Callao, Peru. The Eurypodii of the Patagonian seas sometimes reach as far north as Valparaiso.

Among the Tetradecapoda, *Amphoroidea typica* is a peculiar species, yet it closely resembles a species from Australia. Other genera of Tetradecapoda represented in Chili, are the following:—*Epelys, Porcellio, Lygia, Spheroma, Desmarestia* (Nicolet), *Orchestia, Allorchestes, Iphimedia, Amphithoe, Aora, Hyperia, Primno, Pronoe, Oxycephalus.*

4. The ARAUCANIAN Province (cold temperate), extending from Valdivia nearly to the parallel of 50°. Length, nine hundred miles. The genera *Eurypodius* and *Lithodes* occur on this coast, and probably also *Platyonychus* and *Pseudocorystes;* but the Araucanian species have not yet been studied.

South of the Araucanian province lies the *South Patagonian* and *Fuegian*, the latter of which properly falls into the Antarctic kingdom.

III. NORTH TEMPERATE SUBKINGDOM.

1. The SONORA Province (warm temperate) along the California Peninsula. Length, five hundred and fifty miles.

2. The DIEGO Province (temperate), extending from just below the entrance of the Peninsula, in latitude 28½° to latitude 34½°, and including the port of San Diego. Length, four hundred and fifty miles. A species of the genus *Pugettia* and an *Albunhippa* (a Peruvian genus) occur on this coast.

3. The CALIFORNIAN Province (subtemperate) extending beyond the Bay of San Francisco to Cape Mendocino. Length, four hundred and eighty miles. This region has a close resemblance to the Chilian, in some of its genera, which is also subtemperate. Thus there are three species of *Cancer*, two of *Epialtus*, and one of *Libinia*. The Libinia is closely like the *L. dubia* of the United States, if not identical with it.

4. The OREGON Province (cold temperate), extending probably to Puget's Sound. Length, about four hundred and eighty miles. The *Crangon vulgaris*, common in Northern Europe, occurs on this coast, and the *Echidnocerus* of White (near Lithodes) is reported from the mouth of the Columbia.

5. The PUGETTIAN Province (subfrigid). Length, about twelve hundred miles. This province has some distinctive genera, as *Oregonia* (related to Eurypodius), *Chorilia, Scyra,* and *Telmessus;* also,

species of *Pugettia, Hyas, Pseudograpsus, Pinnothera, Fabia, Trichocera,* with others of *Bernhardus, Gebia, Callianassa, Nephrops, Crangon, Paracrangon, Pandalus;* and among the Tetradecapoda, there are the genera *Oniscus, Spheroma, Argeia, Orchestia, Allorchestes, Iphimedia,* and *Gammarus.*

The northern part of the North American coast, including the Alaschka Archipelago, belongs to the Arctic kingdom.

B. EASTERN SECTION.

I. TORRID SUBKINGDOM.

1. The CARIBBEAN Province (torrid), including the West India Islands, and the northern and northeastern coast of South America, from the north of Yucatan to beyond Bahia. Length, along the South American coast alone, about four thousand miles. There are as yet no known Caribbean genera of Podophthalmia, that do not occur in other Provinces in this or the other kingdoms. *Mithrax* and *Uca* are the more characteristic genera, and the latter is reported elsewhere only from Guayaquil, Brazil. The following are prominent forms:—*Chorinus heros, Pericera cornuta,* and *P. 3-spinosa, Amphitrite forceps* and *A. 3-spinosa, Ocypoda rhombea, Calappa marmorata, Atya occidentalis, Palinurus longimanus, Palæmon Jamaicensis.* The Torrid zone genus *Carpilius* contains two West Indian species, one of which (C. maculatus) is a cosmopolite, and allies the West Indies to the Oriental seas. *Dromia,* although a warm-water genus, has but a single representative, *D. latior;* and of *Chlorodius,* so common in the Orient, in like manner, only one species has been observed, and that occurs also in the Pacific. There is but a single species of Leucosidæ known; but the Caribbean species of Crustacea, it must be acknowledged, are not very thoroughly known. Through *Leptopodia sagittaria* the province is related to the Canaries.

2. The FLORIDAN Province (subtorrid), Key West and a part of Florida are here embraced, together with the Bermudas. Length on the United States coast, two hundred miles. The species are mostly those of the Caribbean Sea. A *Libinia, Hyas, Epialtus,* and *Menippe,* have been reported from Key West and Florida, that are not mentioned as occurring about the West India Islands; also, several *Sesarmas,* a *Ranilia,* and a *Callianassa;* these genera are none of them

eminently Torrid zone genera. The northern species, *Bernhardus pollicaris, Platyonychus ocellatus, Lupa dicantha, Panopœus limosus* and *Herbstii*, reach as far south as Key West.

3. The BRAZILIAN Province (subtorrid), including the harbour of Rio Janeiro, and extending north nearly to Bahia. Length, six hundred miles. The species of Crustacea are numerous, and have close relations to those of Key West. Among the species peculiar to the province are the following:—*Leucippa levis, Pilumnus Quoyi, Lupa spinimana, Eucrate crassimanus, Chasmagnathus granulatus, Hemigrapsus granulatus, Hepatus fasciatus, H. angustatus, Sicyonia carinata*, etc. The number of species of Caprellids and Cymothoids is large. The following species are common to Rio Janeiro and Key West, or the West Indies:—*Acanthonyx Petiverii, Gelasimus maracoani*, and *G. vocans, Uca levis?, Xantho parvulus, Lupa dicantha, Arenœus cribraria, Ocypoda arenaria, O. rhombea, Goniograpsus ruricola, Cardisoma guanhumi, Scyllarus equinoctialis, Penœus brasiliensis, Pagurus granulatus*, etc. *Epialtus marginatus* occurs also at the Gallapagos, and *Menippe Rumphii*, reported as Brazilian, belongs to the East Indies.

II. NORTH TEMPERATE SUBKINGDOM.

1. The CAROLINIAN Province (warm temperate), extending along by Northern Florida, Georgia, and the Carolinas to Cape Hatteras. Length, six hundred miles. Several Key West species occur also in this province; for example, *Libinia dubia, Mithrax hispidus, Menippe mercenarius, Arenœus cribraria, Ocypoda arenaria, Sesarma reticulata*, and *S. cinerea, Plagusia squamosa*. Still, the general character of the species is different. Among the peculiar species mentioned by L. R. Gibbes, are *Leptopodia calcarata, Pisa mutica, Cryptopodia granulata, Pilumnus aculeatus, Hepatus decorus, Guaia punctata, Porcellana macrocheles, Albunœa scutellata, Callianassa major, Gebia affinis, Alpheus heterochelis, A. formosus*, and *Pontonia domestica*. The following northern species have Charleston as their southern limit:—*Libinia canaliculata, Cancer Sayi, Bernhardus longicarpus; Squilla empusa* also reaches from Florida to New York. The warm-water genera of Cancroids are all absent; the species of Hepatus indicates a relation to the Chilian and Brazilian provinces.

2. The VIRGINIAN Province (cold temperate). It extends from Cape Hatteras to Cape Cod, including the shores of Virginia, New Jersey,

Delaware Bay, New York, Connecticut, Rhode Island. Length, six hundred and fifty miles. It corresponds essentially to the Pennsylvanian Province of Milne Edwards; a name not here adopted, since the state of Pennsylvania has no part in the coasts, it being entirely inland. The giant *Homarus, Lupa dicantha, Pilumnus Harrisii, Cancer Sayi,* and *C. irroratus, Libinia canaliculata, Panopœus Herbstii,* and *P. limosus, Platyonychus ocellatus, Gelasimus vocans, Bernhardus pollicaris,* and *B. longicarpus, Palœmon vulgaris,* with *Sesarma reticulata* (a southern species), occur in this province.

The province strongly contrasts with the same province across the Atlantic in the fewness of its species. Only *two* Maioids (exclusive of the subfrigid *Hyas coarctata,* and one of the two *Mithrax hispidus,* is properly a southern species) have been reported from these shores, with seven Cancroids, two Grapsoids (one a Pinnothera), three Anomoura (a Hippa and two Bernhardi), and three or four Macroura (besides Astaci). There is still one point of resemblance between the two regions, in that *Carcinus mœnas* is common to both; also, the genus *Homarus* has a species in each, and so also the genus *Cancer.* But America has no *Xantho* north of Florida, while this genus on the other side of the Atlantic reaches to the shores of Britain. Again, we have species of *Panopœi,* extending even to the subfrigid region, none of which group occur in the British Seas.

3. The NOVA-SCOTIA Province (subfrigid) extends from Cape Cod to the eastern cape of Newfoundland. Length, nine hundred miles. *Cancer irroratus, Pilumnus Harrisii, Carcinus mœnas,* and occasionally *Pandalus annulicornis, Hippolyte aculeatus, Crangon vulgaris,* and *C. boreas, Lithodes maia, Hyas coarctata, Bernhardus streblonyx,* occur on this coast, besides other species mentioned above as belonging to the Virginian province. We begin to find a resemblance to the Northern European and British shores.

III. SOUTH TEMPERATE SUBKINGDOM.

We know little of the Crustacea of this coast of South America. According to the temperate regions, there are four provinces. Two are north of the La Plata, and may be called the Provinces of ST. PAUL (four hundred and eighty miles long), and URAGUAY (three hundred and sixty miles). The mouth of the La Plata from Maldonado, around by Montevideo, Buenos Ayres, to the south Cape, C. Antonio, consti-

tutes a third province, the PLATENSIAN; a fourth, from C. Antonio to the south cape of the bay of Rio Negro, the NORTHERN PATAGONIAN, five hundred miles long. A peculiar Grapsoid form of Rio Negro is the *Cyrtograpsus angulatus*. The *Hemigrapsus affinis* is another species, and this locality is the extreme outer limit of the genus *Hemigrapsus*, as far as now known. Two peculiar Idotæid forms occur in this vicinity, having been taken by us from a fish: they are *Cleantis linearis*, and *Chætilia ovata*. The genus *Serolis* occurs farther south, and does not appear to extend to Rio Negro.

The subfrigid region, in its southern part at least, along Fuegia, belongs properly to the Antarctic kingdom; but the rest of the coast may belong to another province, called the *Southern Patagonian*, which may include also the coast of Western Patagonia south of the Araucanian Province.

II. AFRICO-EUROPEAN KINGDOM.

The prominent differences in temperature between this kingdom and the Occidental have been briefly pointed out. The most influential is the existence of a large temperate region, covering a considerable part of the Mediterranean coasts, as well as a portion of the western coast of Africa, with the Azores and Madeira; and also a subtemperate on the coast of Portugal; both of which regions are unrepresented on the coast of the United States. There are many species peculiar to the Mediterranean; and by their extension north, they give a greater variety to the British seas than they probably would otherwise have.

On the African coast, we make Cape Agulhas the southern limit. Table Bay, however, as is natural from its situation near the borders between two great kingdoms, partakes of a middle character, yet belongs more properly to the Atlantic Ocean. It affords the Oriental species *Platyonychus trimaculatus* and *Dromia hirsutissima;* but produces also a species of the Atlantic genus *Homarus*, and according to M'Leay, the *Sesarma reticulata* of Say, besides four other species of this genus.

The genera peculiar to the Africo-European kingdom, and those common to it and the other kingdoms, are already mentioned on pages 1548, 1550.

The following are the provinces belonging to the three subkingdoms, the torrid, the north temperate, and south temperate:—

I. TORRID SUBKINGDOM.

1. The GUINEAN Province (torrid), including the coast of Guinea to 9° north or Sierra Leone. Length, twelve hundred miles.

2. The VERDENSIAN Province (north subtorrid), including the coast from 9° north nearly to Cape Verde, and also the Cape Verde Islands. Length on the African coast, three hundred and fifty miles. A species of *Actæodes* (A. faba) occurs here, the only one of this warm-water genus yet known in the Atlantic.

3. The BIAFRIAN Province (south subtorrid), including part of the African coast near the equator, about the Bight of Biafra, and reaching to 7° or 8° south; and also the islands Ascension and St. Helena. Length on the African coast, nine hundred miles.

II. NORTH TEMPERATE SUBKINGDOM.

1. The CANARIAN Province (warm temperate), including the west coast of Africa to the latitude of the Canaries, and embracing these islands. Length on the African coast, one thousand miles. In this province there are several species from more tropical regions, which here reach their northern limit, such as *Pilumnus Forskalii*, also from the Red Sea; *Thalamita admete*, East Indies, Natal, &c.; *Grapsus strigosus*, East Indies, &c.; *Goniograpsus messor*, East Indies, Red Sea, &c. *Oplophorus spinosa* (= Palæmon spinosa, *Brullé*), *Leptopodia lanceolata*, *Cycloes cristata*, *Squilla oculata*, are reported only from the Canaries; though the Cycloes resembles closely a Japan species, if it be not identical with it. Many of the species of the British Channel here reach their southern limit; for example, *Inachus dorhynchus*, *Maia squinado*, *Pisa tetraodon*, *Xantho rivulosus*, *Portunus corrugatus*, *Gonoplax angulata*, *Goniograpsus varius*, *Atelecyclus cruentatus*, *Dromia vulgaris*, *Porcellana platycheles*, *Galathea strigosa;* these are found also in the Mediterranean. There are besides many other Canarian species that are found in the Mediterranean, which do not extend to the north, e. g., *Herbstia condyliata*, *Actæa rufo-punctata*, *Eriphia spinifrons*, *Lupa hastata*, *Amphitrite hastata*, *Portunus holsatus*,

Calappa granulata, Dorippe lanata, Homola spinifrons, Albunæa symnista, Scyllarus latus, Arctus ursus, Gnathophyllum elegans, Palæmon Treillianus, Pagurus callidus. The cosmopolites, *Plagusia squamosa* and *Acanthopus planissimus* are also found at the Canaries. The *Leptopodia sagittaria* occurs here, at the West Indies, and at Valparaiso.

2. The MEDITERRANEAN Province. The Azores and Madeira belong to this province. The characteristic species, distinguishing it from the more northern provinces are, *Lissa chiragra, Doclea ovis, Acanthonyx lunulatus, Panopæus Herbstii* (also, N. American), *Platyonychus nasutus, Goniograpsus maurus, Heterograpsus* 6-*dentatus, Brachynotus* 6-*dentatus, Ilia nuclea* and *I. rugulosa, Latreillia elegans;* and at Madeira, *Acanthopus planissimus* and *Grapsus pictus* are very common species. Above we have mentioned some of the species that are found at the Canaries also; and beyond we give a list of those found in the seas of Britain.

The relations of the Mediterranean region to Japan are mentioned by De Haan. The genera strikingly Mediterranean which occur in Japan, are *Latreillia, Nika, Caridina, Ephyra, Sicyonia, Achæus, Pandalus, Lysmata;* and the species of the last three, together with *Squilla mantis,* are probably identical, viz., *Pandalus pristis, Lysmata seticaudata,* and the *Achæus Cranchii,* which last is at least hardly distinguishable, according to De Haan, from the *A. japonicus. Portunus corrugatus* is also closely like a Japan species, according to De Haan. The *Cycloes* of the Canaries is another of the Atlantic species, allying the Atlantic region to Japan, as above mentioned. Doclea is also an Oriental genus, represented in the Occidental kingdom by Libinia. It has but one described species out of the Oriental kingdom.

3. The LUSITANIAN Province (temperate), along the western coast of Portugal. Length, three hundred miles.

4. The CELTIC Province (cold temperate) so named by Milne Edwards, including the Atlantic coast of Spain and France, the British Channel, and Southern Britain and Ireland. The more characteristic genera are *Inachus, Hyas, Pisa, Eurynome, Perimela, Cancer* (*C. pagurus*), *Portumnus, Portunus, Polybius, Ebalia, Atelecyclus, Bernhardus, Galathea, Munida, Axius, Calocaris, Homarus, Crangon, Nika, Hyppolyte, Pandalus.* Several of the species of the Celtic province, which reach to the Canaries, and occur also in the Mediterranean, are mentioned above. The following is a list of the Decapods common to the Celtic province and the Mediterranean :—

DECAPODA COMMON TO THE CELTIC PROVINCE AND THE MEDITERRANEAN.*

1. *Brachyura.*

Maia squinado, A.
Pisa tetraodon, A.
" lanata (Gibsii), A.
Achæus Cranchii, A.
Stenorhynchus phalangium, A.
Eurynome aspera.
Pèrimela denticulata, A.
Xantho floridus, A.
" rivulosus, A.
Pilumnus hirtellus.
Portunus pusillus.
" Rondeletii, A.
" depurator (plicatus), A.
" marmoreus.
" corrugatus, A.
" holsatus.
Carcinus mænas, A.
Portumnus latipes, A.
Gonoplax angulata, A.
Goniograpsus varius, A.
Pinnothera pisum.
Thia polita.
Corystes dentatus.

2. *Anomoura.*

Dromia vulgaris, A.
Porcellana platycheles, A.
" longicornis, A.
Bernhardus Prideauxii, A.
" Forbesii.
" streblonyx.
Clibanarius oculatus.
Galathea strigosa, A.
" squamifera.

3. *Macroura.*

Callianassa subterranea.
Arctus ursus, A.
Palinurus vulgaris, A.
Homarus vulgaris, A.
Nephrops norvegicus.
Crangon fasciatus, A.
" vulgaris.
" cataphractus, A.
Nika edulis, A.
Alpheus ruber, A.
Athanas nitescens, A.
Hippolyte varians, A.
" viridis, A.
Palæmon serratus, A.
Pasiphæa sivado.
Penæus sulcatus (caramote), A.

The genus Xantho, in *X. rivulosus* and *X. floridus* here reaches its extreme cold limit. *Nephrops norvegicus*, although more properly pertaining to the next province north, occurs also within the limits of this; and it has even been taken in the Mediterranean. *Stenorhynchus phalangium* and *Portunus pusillus*, reach south into the Mediterranean and north to the Frigid zone; *Portunus holsatus*, *Galathea strigosa*, and *Porcellana platycheles*, south to the Canaries and north into the subfrigid.

5. The CALEDONIAN Province (subfrigid), including Northern Scotland, the Shetlands, Orkneys, and the Ferroe Islands. *Hyas coarctatus*, *Portunus arcuatus*, *Galathea nexa*, *Munida Rondeletii*, *Calocaris Macandreæ*, *Nephrops norvegicus*, *Hippolyte spinus*, *Pandalus annuli-*

* Those species that are reported by Lucas from Algiers, are followed by the letter A.

cornis, and *Pasiphœa Savignii*, appear to belong especially to this province, besides some species of *Bernhardus* and *Crangon*. *Lithodes maia* also occurs here.

III. SOUTH TEMPERATE SUBKINGDOM.

The provinces of the South Temperate zone, along the west coast of Africa, are, the ANGOLA (warm temperate, three hundred and sixty miles long), BENGUELA (temperate, nine hundred miles long), and CAPENSIAN (subtemperate, four hundred and fifty miles long). Nothing is known of the Crustacea of the coasts, excepting in the last mentioned province, upon which we have already remarked. *Hymenosoma orbiculare* is one of the Table Bay species; and it belongs to a group that is represented only about the southern extremity of South America and in New Zealand. *Palinurus Lalandii*, another species, is one of the largest of known Macrourans.

South of the subtemperate region, in the *cold temperate*, stands in the Atlantic, the island of Tristan D'Acunha, which may be another province, the TRISTENSIAN. As mentioned by Krauss, the *Spheroma tristense*, Edw., is common to this island and Table Bay.

III. ORIENTAL KINGDOM.

Turning Cape Agulhas, we soon come into a different Zoological world. The coast immediately east to longitude 30°, belongs still to the Temperate zone, and must constitute a distinct province, which we call the ALGOA province (from Algoa Bay), the length of which, measured from Cape Agulhas, is full five hundred and fifty miles.

Passing beyond this, we reach the Natal province, and here we recognise at once the seas of India and the Pacific Ocean. Krauss mentions eighty-one Natal species of Podophthalmia, not thirty of which are peculiar to this region. *Twenty* are found in the Indian Ocean, *eighteen* in the Red Sea, *thirteen* in Japan, *eight* in Australia, *five* in the Isle of France, besides *three* European species, and *three* American. We observe further that, twenty-two of the species of Podophthalmia occur in the Pacific Islands, among which are four species supposed by Krauss to be peculiar to Natal, viz., *Pagurus* (*Clibanarius*, D.) *virescens*, Kr., *Pagurus* (*Calcinus*, D.) *elegans*, *Galene*

natalensis, Kr., *Platyonychus* (*Kraussia*, D.) *rugulosus*, Kr., all of which occur at the Hawaiian Islands.*

Of the *European* species, one is the cosmopolite *Gonodactylus chiragrus*, Latr. The others are *Alpheus Edwardsii*, and *Gammarus pulex*, Fabr. *Megalopa mutica* and *Hippolyte ensiferus*, also reported from South Africa, do not occur at Port Natal. The *American* are the cosmopolites *Goniograpsus pictus*, and *Gonodactylus chiragrus*, together with *Eriphia gonagra*, Edw. The *Sesarma reticulata*, Say, and *Plagusia tomentosa*, Lk., also South African, are not from Port Natal.

It is obvious, therefore, that the great ocean, from the east coast of Africa to the Hawaiian and Paumotu Islands, covering two-thirds of the surface of the globe, makes one great kingdom, closely related in its species, although including several zoological provinces and subordinate districts. This fact respecting the oceans is strikingly in contrast with those relating to the continents adjoining. A list of the genera of Decapods peculiar to this kingdom, and others of the genera and species common to this and the other two kingdoms, are given on pages 1549, 1550.

This kingdom may be viewed as consisting of three SECTIONS.

First, the *African*, including the African coast to the head of the Red Sea and Persian Gulf, with the adjoining islands, Madagascar, Mauritius, etc.

Second, the *Asiatic*, from Van Diemens Land and New Holland, by the East Indies to North Japan.

Third, the *Pacific*, including the Pacific Islands west of New Guinea, from New Zealand to the Hawaiian Islands.†

The principal provinces of these three sections are as follows:—

A. AFRICAN SECTION.

1. The NATAL Province (south subtorrid), including also South Madagascar, and the Isle of France and Bourbon. This region is

* The *Galene hawaiensis*, D., is so closely like the *G. natalensis*, that we believe there is not sufficient reason for considering them distinct.

† The species of these three sections are separately presented in Table VI. The two columns *N.* and *S.*, under *East Africa*, include the AFRICAN species; the column *E. Indies and Indian Ocean*, and the two columns *N.* and *S.*, under *West Pacific*, the ASIATIC species; the two columns *N.* and *S.*, under *Middle Pacific*, the PACIFIC species.

called the "Madecasse" by Edwards, a name here not accepted, as the larger part of Madagascar is in the torrid and not subtorrid region.

2. The ABYSSINIAN Province (torrid), including the east coast of Africa and the Red Sea, excepting its northern third, and also the larger part of Madagascar and the islands of that part of the Indian Ocean.

3. The ERYTHREAN Province (subtorrid), including the northern subtorrid part of the Red Sea, and probably also the Persian Gulf.

B. ASIATIC SECTION.

I. ASIATIC TORRID SUBKINGDOM.

1. The INDIAN Province (torrid), including the East Indian Islands, Northern Australia, from its most western to its most eastern cape, and the coast of Asia to latitude 12½° on the coast of Cochin China.

2. The LIUKIU Province (subtorrid), including the islands of Liukiu and Formosa, the Meicoshimah Islands, and the southeastern coast of Niphon, along by Jeddo, with the eastern side of Kiusiu; the province has but little space on the coast of Asia, along a part of Cochin China.

A third province exists on the west coast of Australia.

II. ASIATIC NORTH TEMPERATE SUBKINGDOM.

1. The TONQUIN Province (warm temperate), including the Gulf of Tonquin and coast of China, south of 25°.

2. The CHUSAN Province (subtemperate), including the coast of China north of 25° and the Yellow Sea, together with the western part of Kiusiu, along by Nagasaki.

The *temperate* region is nearly or quite absent from the China coast.

3. The SAGHALIAN Province (subfrigid), including the Asiatic coast within the Japan Sea, and part of the western and the northern shores of Niphon, with the islands Saghalian, Yeso, and others.

The cold temperate region does not appear to be represented on the Asiatic coast, but is found on the east coast of Niphon, where it forms along with the subtemperate region, what may be called the NIPHON Province.

III. ASIATIC SOUTH TEMPERATE SUBKINGDOM.

1. The SWAN RIVER Province (warm temperate), on the *west* coast of Australia.

2. The FLINDERS Province (temperate), along the southern coast of Australia.

3. The MORETON Province (warm temperate and temperate), on the *east* coast of Australia.

4. The BASS Province (subtemperate), from north of Port Jackson to Van Diemens Land.

5. The TASMANIAN Province (cold temperate), including Van Diemens Land.

C. PACIFIC SECTION.

I. PACIFIC TORRID SUBKINGDOM.

1. The POLYNESIAN Province (torrid). To this province belong the Pacific Islands east of the East Indies, within the torrid region, including all the groups between 20° south, and the Hawaiian Islands on the north, embracing also the New Hebrides and nearly all of New Caledonia. There are probably several subordinate districts, but as they are imperfectly indicated by the Crustacea, we do not attempt to lay them down. Tongatabu and Tahiti lie on the borders of the subtorrid region, in somewhat cooler waters than the Feejee or Samoan Islands.

2. The HAWAIIAN Province (north subtorrid), Hawaiian Islands and others in the same range, to the north of west.

3. The RARATONGAN Province (south subtorrid), including nearly all the Hervey Islands south of west from Tahiti, with Pitcairn's and the Gambier Islands, Ducie's, and some other islands in that vicinity.

II. PACIFIC SOUTH TEMPERATE SUBKINGDOM.

1. The KERMADEC Province (warm temperate and temperate). A few islands north of New Zealand lie in this province, and probably also Norfolk Island, a little farther to the west.

2. The WANGAROA Province (subtemperate). Includes the north part of New Zealand, of which the Bay of Islands is the prominent port.

3. The CHATHAM Province (cold temperate), embracing the Chatham Islands and Middle New Zealand, nearly to its southern extremity.

In the above, the Torrid zone of the Oriental kingdom embraces in each of its regions three provinces, as follows:—

	African Section I.	Indian Section II.	Pacific Section III.
I. TORRID REGION.	1. Abyssinian.	2. Indian.	3. Polynesian.
II. NORTH SUBTORRID REGION.	1. Erythrean.	2. Liukiuan.	3. Hawaiian.
III. SOUTH SUBTORRID REGION.	1. Natalensian.	2. West Australian.	3. Raratongan.

1. SPECIES COMMON TO THE THREE SECTIONS, THE AFRICAN, THE INDIAN, AND THE PACIFIC.

1. *Brachyura.*

Parthenope horrida.—I. Fr., Red Sea; E. I.; Haw.
Atergatis limbatus.—R. Sea; E. I.; Feej.
Atergatis floridus.—Natal; E. I.; Tonga, Paumotus; Tahiti.
Carpilius maculatus.—I. Fr.; E. I.; Jap.; Samoa, &c., to Paumotus.
Carpilius convexus.—R. Sea; E. I., Jap.; Feej., Haw.
Actæa hirsutissima.—R. Sea; Samoa.
Chlorodius niger.—R. Sea (N.); E. I.; Feej., Tonga, Samoa.
Trapezia ferruginea.—R. Sea; E. I.; Pacific.
Cymo Andreossyi.—R. Sea; E. I.?; Samoa, Tahiti.
Scylla serrata.—Natal; R. Sea; E. I., Jap.; Samoa.
Lupa sanguinolenta.—Nat.; I. Fr., R. Sea; E. I.; Haw.
Thalamita admete.—Nat.; R. Sea; E. I.; Samoa, Wake's, Haw.
Thalamita crenata.—Nat.; R. Sea (S.); E. I., Jap., Feej.
Cleistostoma Boscii.—Nat.; R. Sea; [E. I.?]; Feej.
Podophthalmus vigil.—I. Fr.; E. I., Jap.; Haw.
Ocypoda brevicornis.—I. Fr.; E. I.; Tonga.
Acanthopus planissimus.—Nat.; E. I.?; Samoa, Tahiti, Paumotu, Haw. [also Madeira].
Calappa tuberculata.—Nat.; I. Fr., R. Sea; E. I.; Feej., Tonga, Haw.
Calappa fornicata.—I. Fr.; E. I.; Feej.

2. *Anomoura.*

Pagurus difformis.—I. Fr.; E. I.; Feej.
Pagurus punctulatus.—E. I.?; E. I.; Haw.
Calcinus tibicen.—Nat.; E. I.; Samoa, Wake's, Tahiti, Paumotus, Haw.
Calcinus elegans.—Nat.; E. I.?; Wake's, Paumotus, Haw.
Aniculus typicus.—I. Fr.; Jap.; Wake's, Paumotus.
Clibanarius virescens.—Nat.; E. I.; Feej.
Cenobita rugosa.—Nat.; E. I., Jap.; Feej.; Samoa, Tonga, Paumotus.
Birgus latro.—I. Fr.; E. I., Jap.; Samoa, Swain's, Paumotus.

3. *Macroura.*

Parribacus antarcticus.—I. Fr.; E. I.; Samoa, Paumotus.

Panulirus penecillatus.—R. Sea; E. I.; Pacific.
Hippolyte marmoratus.— ?; E. I.; Pacific; Haw.
Stenopus hispidus.—I. Fr.; E. I.; Paumotus.

4. *Anomobranchiata.*

Pseudosquilla stylifera.—I. Fr.; ?; Feej., Haw.
Gonodactylus chiragrus.—Nat.; I. Fr., R. Sea; E. I.; Feej., Tonga.

Of the above species, a few occur in both the torrid and subtorrid regions of these three sections of the Oriental kingdom, that is, in the Erythrean, Natalensian, Indian, Liukiuan, Polynesian, and Hawaiian Provinces. These are:—*Lupa sanguinolenta, Podophthalmus vigil, Calappa tuberculata, Acanthopus planissimus, Calcinus tibicen, C. elegans,* and *Gonodactylus chiragrus. Grapsus pictus* is not included; it has not yet been reported from the eastern coast of Africa. The above list must be much increased as the species of the different regions are better understood. Some of the species have a range of over twelve thousand miles. Many species common to Natal and Japan or the Hawaiian Islands, are given in the above list. We add below a list of—

2. SPECIES COMMON TO THE NATAL AND THE LIUKIUAN (SOUTH JAPAN) OR HAWAIIAN PROVINCES OF THE SUBTORRID REGIONS, AND NOT YET OBSERVED IN THE TORRID REGION INTERMEDIATE.

Micippa thalia.—Nat. and Jap.
Xantho affinis, De H.—Nat. and Jap.
Xantho obtusus, De H.—Nat. and Jap.
Carpilius petræus, De H.—Nat. (I. Fr.) and Jap.
Charybdis granulatus.—Nat. and Jap.
Thalamita prymna.—Nat. and Jap.
Gelasimus arcuatus.—Nat. and Jap.
Gelasimus lacteus, De H.—Nat. and Jap.
Ocypoda cordimana.—Nat. and Jap.
Sesarma picta.—Nat. and Jap.
Sesarma affinis.—Nat. and Jap.
Kraussia rugulosa.—Nat. and Haw.
Galene natalensis.—Nat. and Haw.
Dromia hirsutissima.—S. Afr. and Haw.
Calappa spinosissima.—I. Fr. and Haw.
Doto sulcatus, Nat., Jap., and R. Sea.

The Natal province, includes properly two districts, the *Natal* and the *Mauritius*, the latter distinguished by its more torrid character and its larger number of East Indian species, among which are the following:—*Doclea ovis, Camposcia retusa, Carpilius maculatus, Œthra scruposa, Melia tessellata, Eriphia levimana, Calappa fornicata, Aniculus typicus, Birgus latro, Parribacus antarcticus,* etc. Among the species common to the two, not also East Indian, are the following:—*Elamena Mathœi* (a species found also in the *northern* or subtorrid part of the Red Sea), *Ocypoda cordimana* and *Orchestia Bottæ.*

The following are some of the species peculiar to Port Natal :—*Pisa fascicularis, Antilibinia Smithii, Acanthonyx Mac Leaii, A. scutellatus, A. 4-dentatus, Eriphia Smithii, Menippe Martensii, Pilumnus xanthoides* and *P. granulatus, Actæodes Ruppelii.* Among those of the Isle of France or Mauritius are, *Stenocionops cervicornis, Dynomene hispida, Hemigrapsus Latreilli* (the genus Hemigrapsus is not yet known to occur in the Torrid region), *Atergatis sinuatifrons*, A. and W., *Carpilius signatus*, A. and W., *Dromia fallax* and *D. hispida*, etc.; also *Caprella scaura*, and *C. nodosa.*

The *Erythrean* province, or the subtorrid portion of the Red Sea, includes several species not reported from more southern parts of the sea, as *Elamena Matthœi, Menœthius monoceros* (a Natal species), *Paramicippa platipes, Myra fugax*, Rüpp., *Oreophorus horridus*, Rüpp., *Nursia granulata*, Rüpp., *Macrophthalmus depressus*, Rüpp.

The *Abyssinian* province in its Red Sea portion contains seven species of *Atergatis*, of which *A. sculptus, A. exsculptus*, and *A. Savignii* are not elsewhere reported. *Lambrus pelagicus, Actæa asper, Ruppellia tenax?, Thalamita chaptalis*, are other species, besides many that are common in the East Indies. *Dromia unidentata* is found in both the northern and southern parts.

The *Indian* province is characterized more particularly by the following genera :—*Egeria, Doclea, Micippa, Tiarinia, Menœthius, Lambrus, Parthenope, Ceratocarcinus, Cryptopodia, Tlos, Atergatis, Carpilius, Actæa, Xantho, Zozymus, Panopœus, Actœodes, Etisus, Chlorodius, Pilumnus, Eriphia, Lupa, Amphitrite, Thalamita, Charybdis, Lissocarcinus, Podophthalmus, Ocypoda, Sesarma, Xenophthalmus, Xanthasia, Calappa, Matuta, Leucosia, Ixa, Iphis, Arcania, Platyonychus, Pagurisles, Pagurus, Calcinus, Clibanarius, Cenobita, Birgus, Remipes, Thalassina, Thenus, Panulirus, Atya, Alpheus, Palæmon, Penœus, Acetes, Squilla, Gonodactylus*, etc., and by the comparatively few species, if any, of the following Torrid zone genera, viz.—*Pericera, Acanthonyx, Mithrax, Ruppellia*, and *Hymenocera*, besides others that have been mentioned as peculiarly Occidental or Africo-European.

The relation of the Japan Seas to the Mediterranean, and also to the Natalensian have been remarked upon. The warm-water genera of *Xanthidæ* and *Lupinæ* are abundantly represented in the Liukiuan province, so also the *Calappinæ, Scyllaridæ, Sesarminæ, Palinuridæ*, and *Squillidæ. Eriocheir penecillatus, Curtonotus longimanus, Trichia*

dromiiformis, and *Oncinopus arenaria* are peculiar species. The *Ranina dentata* occurs here of a larger size than in the East Indies.

The *Tonquin* province is characterized by species of *Dorippe*, and by *Liagora rubro-maculata*, with some Leucosidæ. The *Acanthodes armatus* of De Haan from the east coast of Niphon appears to belong to the Niphon province; and the giant *Macrocheira Kæmpferi* of De Haan to the Saghalian.

The Japan Seas are allied to the Hawaiian through certain species, as mentioned beyond. Through species of *Sicyonia* they are related to Rio Janeiro as well as the Mediterranean. The species occurring both in the Japan Seas and at Port Natal, are given on page 1574.

The *Swan River* province on Western Australia, although of the warm temperate region, contains the following species identical with species of the Natal province, viz., *Penæus canaliculatus* and *Gonodactylus* 3-*spinosus;* also the cosmopolite, *Gonodactylus chiragrus*, and the East India species, *Thenus orientalis*. The following species found in this province, have not been mentioned from other localities, viz., *Gelasimus forceps* and *Philyra porcellana*.

The Crustacea of the eastern coast of Australia have been little studied, excepting those of Port Jackson and the vicinity. This province is characterized by the presence of *Halimus tumidus*, D., *Myctiris longicarpus*, *Ozius truncatus*, Edw., *Helœcius cordiformis*, *H. inornatus*, D., *Chasmagnathus levis*, D., and *C. subquadratus* (possibly N. Zealand), *Helice crassa*, *Plagusia glabra*, D., *Paguristes frontalis* (?), *Callianassa* (*Trypœa*) *australiensis*, D., *Hippolyte spinicaudis*.

The absence of the Xanthidæ is one of the prominent characters here observed, a group of species that occur but sparingly in any subtemperate region. Among the Tetradecapods there is the Chilian genus *Amphoroidea*, affording a species closely like that of Valparaiso. The other genera of Tetradecapoda observed, are *Idotœa*, *Spheroma*, *Orchestia*, *Allorchestes*, *Hyperia*.

In the great Pacific section of the Oriental kingdom, the *Polynesian* kingdom is of great extent, covering twenty degrees either side of the equator through the ocean to 130° west. Nearly the same genera are represented as in the East Indies, mentioned on page 1575. Among the exceptions, according to present knowledge, are *Egeria*, *Doclea*, *Tiarinia*, *Parthenope*, *Cryptopodia*, *Tlos*, *Panopœus*, *Lupa*, *Podophthalmus*, *Leucosia*, *Ixa*, *Arcania*, *Platyonychus*, *Thalassina*, *Acetes*, *Thenus*, etc., while there are present, species of *Pericera*, *Rup-*

pellia, Cymo, Domœcius, Galathea, Œdipus, Harpilius, Hymenocera, Regulus. Dromia and *Ranina* have not been observed in the Pacific except in the Hawaiian province. No species of *Penœus* has yet been reported from the Torrid region in this ocean. The *Maioidea* are few and small, the *Xanthidæ* and *Eriphidæ* numerous, and often large. Some of the species common to the Pacific and East Indies have already been mentioned.*

The Hawaiian province contains the following species, not elsewhere observed:—*Lahaina ovata*, D., *Perinea tumida*, D., *Huenia simplex* and *H. brevirostris, Xantho intonsus*, D., *Medœus ornatus, Chlorodius nodosus, Pseudozius inornatus*, some *Trapeziæ, Thalamita pulchra, Lupa pubescens, Macrophthalmus telescopicus, Gelasimus minor, Ocypoda levis*, D., *O. Urvillii, Hemigrapsus crassimanus, Sesarma trapezium*, and *S. obtusifrons, Cyclograpsus granulatus, C. cinereus, Nucia speciosa*, D., *Albunœa speciosa, Porcellana cinctipes, Galathea spinirostris, Scyllarus latus*, Randall, *Nika hawaiensis, Atyoida bisulcata*, Rand., *Alpheus levis, A. pacificus, A. pugnax, A. diadema, Palœmon debilis*, D., *P. acutifrons*, D., *P. grandimanus*, Rand., *P. gracillimanus*, Rand., *Penœus velutinus.*

It is most closely related to the southern part of the Japan Seas, containing the following Japan species:—*Penœus canaliculatus, Podophthalmus vigil, Ranina dentata, Pagurus carinatus*, Rand. (=P. asper, *De H.*); and the following genera that are represented in Japan and not in the Torrid region, viz.:—*Galene, Kraussia* (D.), *Nika, Scyllarus, Hemigrapsus.* Several Polynesian species occur here, as *Amphitrite vigilans* (Feejees), *Thalamita integra, Goniograpsus thukujar* (Feejees), *Grapsus rudis* (Ladrones), *Porcellana coccinea* (Paumotus), *Hippolyte marmoratus* (Paumotus), *Calcinus tibicen, C. elegans, C. latens, Pagurus punctulatus, Chlorodius cytherea*, besides *Grapsus pictus, Acanthopus planissimus*, and *Calappa tuberculata*, which have a wide range. *Lupa sanguinolenta* occurs here and also in the East Indies and at the Isle

* The following oceanic Entomostraca occur in the Pacific, or East Indies, and Atlantic:—*Pontella* (*Pontellina*) *turgida*, Atlantic, 0° to 8½° N., and 4½° S., 17°–31° W.; Pacific, near Hall's and Pitts' Islands, 1°–3° N., 173° E.—*Pontella* (*Pontellina*) *crispata*, Atlantic, 8½° N., 23° 45′ W.; 5°–7° N., 174½°–177° E.—*Undina vulgaris*, Straits of Banca; Atlantic, 9° S., 17½° W., and 4½° S., 25° W. *Oithona plumifera*, Atlantic, 4½°–7° N., 20°–22° W.; also 1° S., 30½° W.; Pacific, near Kingsmill Islands.—*Corycœus varius*, Atlantic, 1°–7° N., 18°–22° W., and 1°–7° S., 20°–30° W.; Pacific, 15½° S., 138½° W.; 33° S., 153½° E.; Ladrones.—*Candace pachydactyla*, Atlantic, 11° S., 14° W.; 4½° S., 25° W.; 8½° S., 150° W.; 1° S., 30° W.; China Sea, 300 miles northeast of Singapore.

of France. The relations to the Natal province are similar to those with Japan, as before observed (p. 1574). *Goniograpsus plicatus*, a Hawaiian species, according to Krauss, is also South African.

Little is known respecting the species of the *Raratongan*, or *Kermadec* provinces.

The *Wangaroa* province (Northern New Zealand) is distinguished by an absence of Cancroid forms, as in Southeastern Australia, and rather a prevalence of Grapsoid species. No *Squillidæ* have yet been observed. Among the species peculiar to the province are the following:—*Paramithrax Gaimardii*, *Eurynolambrus australis*, Edw., *Portunus integrifrons*, *P. cantharus*, *Goniograpsus strigilatus*, *Hemigrapsus crenulatus*, *H. Gaimardii*, *Halicarcinus varius*, *H. pubescens*, *Lomis hirta* (possibly from Middle or Southern New Zealand), several *Porcellanæ*, *Paguristes pilosus*, *Bernhardus cristatus*, *B. novi-zealandiæ*, *Clibanarius cruentatus*, *Gebia hirtifrons*, *Paranephrops planifrons*, *P. tenuicornis*, *B. æquimanus*, *Alope palpalis*, *Hippolyte spinifrons*, *Palæmon affinis*, with species of the Tetradecapodan genera, *Idotæa*, *Armadillo*, *Spherillo*, *Oniscus*, *Scyphax*, D., *Lygia*, *Cymothoa*, *Nerocila*, *Æga*, *Spheroma* (several species), *Orchestia*, *Allorchestes*, *Iphimedia*, *Melita*, *Œdicerus*, *Hyperia*.

The genus *Hymenicus*, which is near *Hymenosoma*, and the *Plagusia tomentosa* found also at Table Bay, show a relation to the Capensian province (South Africa). *Palæmon Quoyanus* is also stated by Krauss to be a South African species, found at Port Natal.

The genera *Ozius*, *Hemigrapsus*, and *Chasmagnathus*, and some of their species, are common to the Bass province (Australia) and North New Zealand, showing a relation between the two. Yet the difference in species is still so great, that they are properly distinct provinces. New Zealand is over twelve hundred miles from New Holland, and its Crustacea are hardly as much like those of New Holland as those of Valparaiso. The following genera characterize both Chili and North New Zealand:—*Cancer*, *Ozius*, *Cyclograpsus*, *Paguristes*, and *Betæus;* and the *Cancer Edwardsii* and *Plagusia tomentosa* appear to be common to the two provinces, while the genus Cancer is not elsewhere known out of America and Northern Europe. *Palæmon affinis* of the Bay of Islands, as Edwards observes, is hardly distinguishable from *P. squilla* of the coasts of France and Britain. The species of *Portunus* in these southern seas are representatives of the most characteristic of European genera, and they belong rather to the

cold temperate than subtemperate regions of the Australian and New Zealand Seas. *Portunus integrifrons* is reported from Tasmania (Van Diemens Land). Ozius represents Xantho of the British Channel.

ARCTIC AND ANTARCTIC KINGDOMS.

With our existing knowledge of species, the Arctic and Antarctic kingdoms widely differ; but much of this difference may be owing to the greater extent of land in the northern kingdom, and not a little to our limited knowledge of the latter. In the Arctic Frigid zone, there are the following genera of Podophthalmia:—*Hyas* 1 species, *Stenorhynchus* 1, *Cancer* 1, *Portunus* 1, *Carcinus* 1, *Lithodes* 2, *Bernhardus* 3, *Galathœa* 2, *Crangon* 2, *Sabinea* 1, *Argis* 1, *Hippolyte* 18, *Pandalus* 3, *Palœmon* 1, *Thysanopoda* 3, *Mysis* 3, *Myto* 1. Out of these, only *Lithodes* and *Galathea* are at present known to occur in the Antarctic kingdom, and as yet we are not certain that either reaches beyond Fuegia, near the limits of the subfrigid and frigid regions: further researches are required. The Thysanopoda of the north are represented in the south by a species of Euphausia.

Among the Tetradecapoda, the following exist in the Arctic kingdom:—IDOTÆIDEA, *Idotœa*, 9 species, *Glyptonotus* 1; ONISCOIDEA, *Lygia*, 1, *Jœra* 2, *Jœridina* 1, *Asellus* 1, *Janira* 1, *Henopomus* 1, *Munna* 1; of CYMOTHOIDEA, *Ægа* 3; SEROLIDEA, *Praniza* 1, *Anceus* 1; TANAIDEA, *Tanais* 6, *Crossurus* 1, *Bopyrus* 1, *Phryxus* 2, *Dajus* 1; of CAPRELLIDEA, *Proto* 2, *Caprella* 6, *Ægina* 2, *Cercops* 1, *Podalirius* 1; GAMMARIDEA, *Dulichia* 1, *Siphonœcetes* 1, *Unciola* 1, *Laphystius* 1, *Orchestia* 2, *Stegocephalus* 1, *Anonyx* 2, *Leucothoe* 2, *Acanthonotus* 3, *Iphimedia* 14, *Œdicerus* 1, *Gammarus* 13, *Photis* 1, *Melita* 2, *Pardalisca* 1, *Ischyrocerus* 2, *Microcheles* 1, *Lepidactylis* 1, *Pontiporeia* 1, *Ampelisca* 1, *Protomedeia* 1, *Phoxus* 1; HYPERIDEA, *Lestrigonus* 1, *Hyperia* 1, *Metœcus* 1, *Themisto* 2.

From the Antarctic kingdom, there are at present known, *Glyptonotus* 1, *Idotœa* 1, *Cirolana* 1, *Serolis* 1, *Uristes* (related to Anonyx) 1; of HYPERIDEA, *Cyllopus* 1, *Tauria* 1, *Themisto* 1; and if we add Southern Fuegia, *Eurypodii* 2 or 3, *Halicarcinus* 1, *Munida* 1, *Grimothea* 1, *Lithodes* 3, *Tylus* 1, *Oniscus* 1, *Styloniscus* 1, *Jœra* 1, *Pterelas* 1, *Spheroma* 3, *Serolis* 3, *Anonyx* 1, *Amphithoe* 1, *Gammarus* 1, etc. The contrast is again very striking. *Serolis* and some allied forms, with *Glyptonotus* are the most characteristic of southern Isopoda, and the

first of these genera is not known in the north. *Halicarcinus* characterizes the south but not the north. *Hippolyte* and *Crangon* are common in the north, and have not yet been detected in the south. *Lithodes* is common to both. *Eurypodius* is wholly southern, but has its analogue in *Oregonia* of Northwest America. If then we were to characterize the kingdoms by any of the species, we should call the Arctic, the *Hippolyte kingdom*, about half of the known species of the genus Hippolyte being Arctic; and the southern, the *Serolis kingdom*. The names imply a higher zoological rank for the Arctic than the Antarctic Seas.

The *Arctic* kingdom is naturally divided into three provinces. One occupying the North Atlantic Ocean; one corresponding, north of the Pacific; and the third, a Polar province. The limits of the Polar province we cannot exactly lay down. But the more Frigid seas which afford only Tetradecapods (and perhaps a species or so of Decapods) should be considered as constituting a distinct province from that in which species of Hippolyte and Crangon are common. These provinces are the *Norwegian*, the *Camtschatican*, and the *North Polar*.

The *Norwegian* includes the coast of Norway and Iceland, with a part probably of Greenland; characterized by *Lithodes maia*, *Hyas araneus*, *Bernhardus pubescens*, *Galathea rugosa*, *Crangon lar*, *C. 7-carinatus*, and many species of Hippolyte, etc. The *Camtschatican* comprises Kamtschatka, the Aleutian Islands, and the neighbouring part of the North American coast, and extending it may be some distance beyond Behring's Straits, and is characterized by the *Lithodes camschatica*, *Telmessus chirogonus*, *Bernhardus splendescens*, *Crangon salebrosus*, *Hippolyte armata*, *H. cornuta*.

In these Polar seas, the species have often a wide range, and probably pass from one ocean to the other through the Polar oceans. Thus *Crangon boreas*, *Carcinas mœnas*, *Pagurus streblonyx*, *Hippolyte aculeatus*, are not only found on opposite sides of the Atlantic, but also in the North Pacific.

The *Antarctic* kingdom may also consist of three provinces:—

1. The FUEGIAN Province, including Fuegia, the Falklands, South Georgia; and characterized by *Lithodes antarctica*, *L. verrucosa*, *L. granulata*, species of *Eurypodius*,* *Halicarcinus*, *Galathea*, *Spheroma*, and *Serolis*.

* The species of Eurypodius probably belong more especially to the South Patagonian or the Araucanian province, although occurring also in the Fuegian.

2. The AUCKLANDIAN Province, embracing the Aucklands and perhaps the south extremity of New Zealand.

3. The SOUTH POLAR province, including the South Shetlands (whence comes the huge *Glyptonotus* of Eights), and also the Antarctic lands of Wilkes and Ross.

The group Hymenicinæ, including the genera Hymenosoma, Halicarcinus, and Hymenicus, is peculiarly a southern type, and through these genera the extremities of the continents have a common character. The first characterizes the Cape of Good Hope, the second Patagonia and Fuegia, and the third New Zealand. The Patagonian genus reaches north to Valparaiso, into the same temperature region (the subtemperate) that affords the Hymenosoma of South Africa and Hymenicus of New Zealand, and this subtemperate region is the highest northern limit of the group. Halicarcinus is developed in its greatest perfection in Fuegia.

ORIGIN OF THE GEOGRAPHICAL DISTRIBUTION OF CRUSTACEA.

The origin of the existing distribution of species in this department of zoology deserves attentive consideration. Two great causes are admitted by all, and the important question is, how far the influence of each has extended. The first, is *original local creations;* the second, *migration.*

Under the first head, we may refer much that we have already said on the influence of temperature, and the restriction of species to particular temperature regions. It is not doubted that the species have been created in regions for which they are especially fitted; that their fitness for these regions involves an adaptation of structure thereto, and upon this adaptation, their characteristics as species depend. These characteristics are of no climatal origin. They are the impress of the Creator's hand, when the species had their first existence in those regions calculated to respond to their necessities.

The following questions come up under this general head:—

1. Have there been local centres of creation, from which groups of species have gone forth by migration?

2. Have genera only and not species, or have species, been repeated by creation in distinct and distant regions?

3. How closely may we recognise in climatal and other physical

conditions, the predisposing cause of the existence of specific genera or species?

With regard to the *second* head, migration, we should remember, that Crustacea are almost wholly maritime or marine; that marine waters are continuous the globe around; and that no seashore species in zoology are better fitted than crabs for migration. They may cling to any floating log and range the seas wherever the currents drift the rude craft, while the fish of the sea-shores will only wander over their accustomed haunts. Hence it is, that among the Pacific Islands the fishes are often to a considerable extent peculiar to particular groups of islands, while the Crustacea are much more generally diffused.

A direction and also a limit to this migration exist, (1) in the currents of the ocean, and (2) in the temperature of its different regions. Through the Torrid zone, the currents flow mainly *from the east* towards the west; yet they are reversed in some parts during a certain portion of the year. But this reversed current in the Pacific never reaches the American continent, and hence it could never promote migration to its shores. Again, beyond 30° or 35° of north or south latitude, the general course of the waters is *from the west*, and the currents are nearly uniform and constant. Here is a means of eastward migration in the middle and higher temperate regions. But the temperature regions in these latitudes are more numerous than in the tropics, and species might readily be wafted to uncongenial climates, which would be their destruction; in fact they could hardly escape this. Moreover, such seas are more boisterous than those nearer the equator. Again, these waters are almost entirely bare for very long distances, and not dotted closely with islands like the equatorial Pacific.

In the northern hemisphere, on the eastern coasts especially, there are warm currents from the south and cold currents from the north. The former overlie the latter to a great extent in the summer and may aid southern species in northward migrations. Cape Hatteras is nearly the termination of the summer line of 70° (see Maury's Chart), a temperature which belongs to the subtorrid region in winter. On the China coast, at Macao there is a temperature of 83° in July, and in the Yellow Sea, of 78° to 80°. But such northward migrations as are thus favoured, are only for the season; the cold currents of the winter months destroy all such adventurers, except the individuals of

some hardier species that belong to the seas or have a wide range in distribution. Sea-shore Crustacea are not in themselves migratory, and are thus unlike many species of fish. Even the swimming Portunidæ are not known voluntarily to change their latitudes with the season.

The following is a brief recapitulation of the more prominent facts bearing on these points.

1. The distribution of individuals of many species through twelve thousand miles in the Torrid zone of the Oriental seas.

2. The very sparing distribution of Oriental species in Occidental seas.

3. The almost total absence of Oriental species from the west coast of America.

4. The world-wide distribution within certain latitudes of the species we have called cosmopolites.

5. The occurrence of closely allied genera at the Hawaiian Islands and in the Japan seas.

6. The occurrence of the same subtorrid species at the Hawaiian Islands and at Port Natal, South Africa, and not in the Torrid zone intermediate, as Kraussia rugulosa and Galene natalensis.

7. The occurrence of identical species in the Japan seas and at Port Natal.

8. The occurrence of the same species (Plagusia tomentosa) in South Africa, New Zealand, and Valparaiso; and the occurrence of a second species (Cancer Edwardsii (?)) at New Zealand and Valparaiso.

9. The occurrence of closely allied species (as species of Amphoroidea and Ozius) in New South Wales and Chili.

10. The occurrence of the same species in the Japan seas and the Mediterranean, and of several identical genera.

11. The occurrence of a large number of identical species in the British seas and the Mediterranean; and also in these seas and about the Canary Islands.

12. The occurrence of closely allied, if not identical, species (as of Palæmon) in New Zealand and the British seas; and also of certain genera that are elsewhere peculiarly British, or common only to Britain and America.

13. An identity in certain species of Eastern and Western America.

The following are the conclusions to which we are led by the facts:

I. The migration of species from island to island through the tropical Pacific and East Indies may be a possibility; and the same species may thus reach even to Port Natal in South Africa. The currents of the oceans favour it, the temperature of the waters is congenial through all this range, and the habits of many Crustacea, although they are not voluntarily migratory, seem to admit of it. The species which actually have so wide a range are not Maioids (which are to a considerable extent deep-water species), but those of the shores; and some, as Thalamita admete, are swimming species.

II. The fact, that very few of the Oriental species occur in the Occidental seas, may be explained on the same ground, by the barrier which the cold waters of Cape Horn and the South Atlantic present to the passage of tropical species around the Cape westward, or to their migration along the coasts.

Moreover, the diffusion of Pacific tropical species to the Western American coast is prevented, as already observed, by the westward direction of the tropical currents, and the cold waters that bathe the greater part of this coast.

III. When we compare the seas of Southern Japan and Port Natal and find species common to the two that are not now existing in the Indian Ocean or East Indies, we hesitate as to migration being a sufficient cause of the distribution. It may, however, be said that driftings of such species westward through the Indian Ocean may have occasionally taken place; but that only those individuals that were carried during the season quite through to the *subtorrid* region of the South Indian Ocean (Port Natal, etc.), survived and reproduced, the others, if continuing to live, soon running out under the excessive heat of the intermediate equatorial regions. That they would thus run out in many instances is beyond question; but whether this view will actually account for the resemblance in species pointed out is open to doubt.

IV. When further, we find an identity of species between the Hawaiian Islands and Port Natal—half the circumference of the globe, or twelve thousand miles, apart—and the species, as *Galene natalensis*, not a species found in any part of the torrid region, and represented by another species only in Japan, we may well question whether we can meet the difficulty by appealing to migration. It may however be said, that we are not as yet thoroughly acquainted

with the species of the tropics, and that facts may hereafter be discovered that will favour this view. The identical species are of so peculiar a character that we deem this improbable.

V. The existence of the Plagusia tomentosa at the southern extremity of Africa, in New Zealand, and on the Chilian coasts, may perhaps be due to migration, and especially as it is a southern species, and each of these localities is within the subtemperate region. We are not ready however to assert, that such journeys as this range of migration implies are possible. The oceanic currents of this region are in the right direction to carry the species eastward, except that there is no passage into this western current from Cape Horn, through the Lagulhas current, which flows the other way. It appears to be rather a violent assumption that an individual or more of this species could reach the western current from the coast on which it might have lived; or could have survived the boisterous passage, and finally have had a safe landing on the foreign shore. The distance from New Zealand to South America is five thousand miles, and there is at present not an island between.

VI. Part of the difficulty in the way of a transfer of species between distant meridians might be overcome, if we could assume that the intermediate seas had been occupied by land or islands during any part of the recent epoch. In the case just alluded to, it is possible that such a chain of interrupted communication once had place; and this bare possibility weakens the force of the argument used above against migration. Yet as it is wholly an assumption, we cannot rely upon it for evidence that migration has actually taken place.

VII. The existence of the same species on the east and west coasts of America, affords another problem, which migration cannot meet, without sinking the isthmus of Darien or Central America, to afford a passage across. As yet we know of no evidence that this portion of the continent has been beneath the ocean during the recent epoch. An argument against such a supposition might be drawn from the very small number of species that are identical on the two sides, and the character of these species. *Libinia spinosa* occurs at Brazil and Chili, and has not been found in the West Indies. *Leptopodia sagittaria*, another Maioid, occurs at Valparaiso, the West Indies, and the Canaries.

VIII. The large number of similar species common to the Mediterranean and British seas may be due to migration, as there is a con-

tinuous line of coast and no intermediate temperature rendering such a transfer impossible; and the passage farther south to the Canaries of several of the species is not beyond what this cause might accomplish. Still, it cannot be asserted that in all instances the distribution here is owing to migration; nor will it be admitted unless other facts throw the weight of probability on that side.

IX. But when we find the same Temperate zone species occurring in distant provinces, these provinces having between them no water communication except through the Torrid or Frigid zone, and offering no ground for the supposition that such a communication has existed during the recent epoch, we are led to deny the agency of voluntary or involuntary migration in producing this dissemination. An example of this, beyond all dispute, is that of the Mediterranean Sea and Japan. No water communication for the passage of species can be imagined. An opening into the Red Sea is the only possible point of intercommunication between the two kingdoms; but this opens into the Torrid zone, in no part of which are the species found. The two regions have their peculiarities and their striking resemblances; and we are forced to attribute them to original creation and not intercommunication.

X. The resemblances found are not merely in the existence of a few identical species. There are genera common to the two seas that occur nowhere else in the Oriental kingdom, as *Latreillia*, *Ephyra*, *Sicyonia*, &c.; and species where not identical have an exceedingly close resemblance.

Now this resemblance in genera and species (without exact identity in the latter) is not explained by supposing a possible intercommunication. But we may reasonably account for it on the ground of a similarity in the temperature and other physical conditions of the seas; and the well-known principle of "like causes, like effects" forces itself upon the mind as fully meeting the case. Mere intercommunication could not produce the resemblance; for just this similarity of physical condition would still be necessary. And where such a similarity exists, creative power may multiply analogous species; we should almost say, *must*, for, as species are made for the circumstances in which they are to live, identical circumstances will necessarily imply identity of genera in a given class, and even of specific structure or of subgenera.

If, then, the similarity in the characters of these regions is the

occasion of the identity of genera, and of the very close likeness in certain species (so close that an identity is sometimes strongly suspected where not admitted), we must conclude that there is a possibility of actual identity of species, through original creation. This, in fact, becomes the only admissible view, and the actually identical species between Japan and the Mediterranean are examples.

XI. When we find a like resemblance of genera and species between Temperate zone provinces in opposite hemispheres that are almost exact antipodes, as in the case of Great Britain aud New Zealand, we have no choice of hypotheses left. We must appeal directly to creative agency for the peopling of the New Zealand seas as well as the British, and see in both, like wisdom, and a like adaptedness of life to physical nature. The Palæmon affinis of the New Zealand seas is hardly distinguishable from the common P. squilla of Europe, and is one example of this resemblance. It may not be an identity; and on this account it is a still better proof of our principle, because there is no occasion to suspect migration or any other kind of transfer. It is a creation of species in these distant provinces, which are almost identical, owing to the physical resemblances of the seas; and it shows at least, that a very close approximation to identity may be consistent with Divine Wisdom.

The resemblance of the New Zealand and British seas has been remarked upon as extending also to the occurrence in both of the genera Portunus and Cancer. It is certainly a wonderful fact that New Zealand should have a closer resemblance in its Crustacea to Great Britain, its antipode, than to any other part of the world—a resemblance running parallel, as we cannot fail to observe, with its geographical form, its insular position, and its situation among the temperate regions of the ocean. Under such circumstances, there must be many other more intimate resemblances, among which we may yet distinguish the special cause which led to the planting of peculiar British forms in this antipodal land.

The close resemblance in species and genera from Britain and New Zealand, and from Japan and the Mediterranean, and the actual identity in some species among the latter, proves therefore that, as regards the species of two distant regions, identity as well as resemblance may be attributable to independent creations, these resemblances being in direct accordance with the physical resemblances of the regions. As this conclusion cannot be avoided, we are compelled in all cases to try

the hypothesis of migration by considering something beside the mere possibility of its having taken place under certain assumed conditions. The possibility of independent creations is as important a consideration. After all the means of communication between distant provinces have been devised or suggested, the principle still comes up, that it is in accordance with Divine Wisdom, to create similar and identical species in different regions, where the physical circumstances are alike; and we must determine by special and thorough investigation, whether one or the other cause was the actual origin of the distribution in each particular case. Thus it must be with reference to the wide distribution of species in the Oriental tropics, as well as in the European temperate regions, and the Temperate zone of the South Pacific and Indian Oceans.

XII. With respect to the creation of identical species in distant regions, we would again point to its direct dependence on a near identity of physical condition. Although we cannot admit that circumstances or physical forces have ever created a species (as like can only beget like, and physical force must result simply in physical force), and while we see in all nature the free act of the Divine Being, we may still believe the connexion between the calling into existence of a species and the physical circumstances surrounding it to be as intimate nearly as cause and effect. The Creator has in infinite skill, adapted each species to its place, and the whole into a system of admirable harmony and perfection. In his wisdom, any difference of physical condition and kind of food at hand, is sufficient to require some modification of the intimate structure of species, and this difference is expressed in the form of the body or members, so as to produce an exactness of adaptation, which we are far from fully perceiving or comprehending with our present knowledge of the relations of species to their habitats.

When therefore we find the same species in regions of unlike physical character, as, for example, in the seas of the Canaries and Great Britain—regions physically so unlike—we have strong reason for attributing the diffusion of the species to migration. The difference between the Mediterranean and Great Britain may require the same conclusion for the species common to these seas. They are so far different, that we may doubt whether species *created* independently in the two could have been identical, or even have had that resemblance that exists between varieties; for this resemblance is usually of the

most trivial kind, and effects only the least essential of the parts of a species.

The continental species of Crustacea from the interior of different continents, are not in any case known to be identical; and it is well understood that the zoological provinces and districts of the land are of far more limited extent than those of the ocean. The physical differences of the former are far more striking than those of the latter. As we have observed elsewhere, the varieties of climate are greater; the elevation above the sea may vary widely; and numberless are the diversities of soil and its conditions, and the circumstances above and within it. Hence as the creation of each species has reference most intimately to each and all of these conditions, as well as to other prospective ends, an identity between distant regions is seldom to be found, and the characteristic groups of genera are very widely diverse. Comparatively few genera of Insects have as wide a range as those of Crustacea; and species with rare exceptions, have very narrow limits. Where the range of a species in this class is great, we should in general look to migration as the cause rather than original creation; but the considerations bearing on both should be attentively studied before either is admitted as the true explanation.

Throughout the warmer tropical oceans, a resemblance in the physical conditions of distant provinces is far more common and more exact than in the Temperate zone. And hence it would seem that we could not safely appeal to actual differences as an argument against the creation of a species in more than one place. The species spread over the Oriental Torrid zone may hence be supposed to owe their distribution to independent creations of the same species in different places, as well as to migration. Yet we may in this underrate the exactness of physical identity required for independent creations of the same species. We know that for some chemical compounds, the condition of physical forces for their formation is exceedingly delicate; and much more should we infer that when the creation of a living germ was concerned, a close exactness in the conditions would be required in order that the creation should be repeated in another place. Infinite power, it is true, may create in any place; but the creation will have reference to the forces of matter, the material employed in the creation. The few species common to the Oriental and Occidental torrid seas seem to be evidence on this point; the fact that the Oriental species have so rarely been repeated in the Occidental

seas, when the conditions seem to be the same, favours the view that migration has been the main source of the diffusion in the Oriental tropics.

As we descend in the order of Invertebrates, the species are less detailed in structure, with fewer specific parts and greater simplicity of functions, and they therefore admit of a wider range of physical condition; the same argument against multiplication by independent creations in regions for the most part different, does not, therefore, so strongly hold. As we pass, on the contrary, to the highest groups in Zoology, the argument receives far greater weight; and at the same time there are capabilities of migration increasing generally in direct ratio as we ascend, which are calculated to promote the diffusion of species, and remove the necessity of independent creations.

Migration cannot therefore be set aside. It is an actual fact in nature, interfering much with the simplicity which zoological life in its diffusion would otherwise present to us. Where it ends, and where independent creations have taken place, is the great problem for our study. This question has its bearings on all departments of Zoology; but in few has migration had the same extended influence as in that of Crustacea. Molluscs, if we except oceanic species, are no travellers, and keep mostly to narrow limits.

XIII. There is evidence in the exceedingly small number of Torrid zone species identical in the Atlantic and Indian Oceans, that there has been no water communication across from one to the other in the Torrid zone, during the period since existing species of Crustacea were first on the globe.

XIV. As to zoological centres of diffusion for groups of species, we can point out none. Each species of Crustacea may have had its place of origin and single centre of diffusion in many and perhaps the majority of cases. But we have no reason to say that certain regions were without life, and were peopled by migration from specific centres specially selected for this end. If such centres had an existence, there is at present no means by which they may be ascertained. The particular temperature region in which a species originated may be ascertained by observing which is most favourable to its development: we should thus conclude that the *Ranina dentata*, for example, was created in the subtorrid region and not the torrid, as it attains its largest size in the latter. By pursuing this course with reference to each species, we may find some that are especially fitted for almost

every different locality. Hence, we might show, as far as reason and observation can do it, that all regions have had their own special creations.

The world throughout all its epochs in past history, has been furnished with life in accordance with the times and seasons, each species being adapted to its age, its place, and its fellow species of life.

In the elaboration of the tables given in the preceding chapter, the following works and memoirs have been consulted:—

A. G. DESMAREST'S Considérations Générales sur les Crustacés, 8vo., Paris, 1825.

MILNE EDWARDS'S Histoire Naturelle des Crustacés, 3 vols., 8vo., Paris, 1834–1840.

MILNE EDWARDS, in Victor Jacquemont's Voy. dans L'Inde, 4to., 1844; and other papers in the Archives du Mus. d'Hist. Nat., and the Annales des Sci. Naturelles.

MILNE EDWARDS and H. LUCAS, on the Crustacea of D'Orbigny's Voy. dans L'Amérique Méridionale, 4to., Paris, 1843.

W. E. LEACH'S Malacostraca Podophthalmata Britanniæ, 4to., 1815–1817.

SAVIGNY, Crustacea of Napoleon's Egypt, folio.

DE HAAN'S Crustacea of the Fauna Japonica, fol., 1833–1850.

M'LEAY, in Smith's Illustrations of the Zoology of South Africa, 1838.

E. RÜPPELL'S Beschreibung und Abbildung von 24 Arten kurzschwänzigen Krabben als Beitrag zur Naturgeschichte des rothen Meeres, 4to., Frankfurt, 1830.

THOS. BELL'S papers on the genus Cancer and on some Crustacea of the coasts of South America, Zool. Trans., i. 335, and ii. 39.

THOS. BELL'S British Crustacea, Parts 1 to 6, 8vo., London, 1844–1847.

R. OWEN, on the Crustacea of the Voyage of the Blossom; and also, Appendix to Sir John Ross's Second Voyage in search of a Northwest Passage.

H. RATHKE, Fauna der Krym, Mem. Imp. Acad. Sci. St. Petersburg, iii. 1837, and Beit. zur Fauna Norwegens Kais. Leop. Car. Acad. der Nat. Bonn., vol. xx., 4to., 1840.

DR. F. KRAUSS'S Südafrikanischen Crustaceen, 4to., Stuttgart, 1843.

O. S. COSTA'S Fauna del Regno di Napoli, 4to., Crostacei in 1836.

WEBB and BERTHELOT, on the Canaries.

KRÖYER'S Conspectus Crustaceorum Greenlandiæ, Copenhagen, and also various papers in his Tidskrift, published at Copenhagen; and also the Crustacea of the Spitzbergen Expedition, in folio.

NICOLET, in Gay's Historia de Chile, Zoologia, Tome III. (including the Crustacea), 1849.

H. LUCAS, Crustacea of Expl. de l'Algiers, 4to., Paris.

List of the Specimens of Crustacea in the Collection of the British Museum, 16mo., London, 1847.

List of the Specimens of British Crustacea in the British Museum, 16mo., London, 1850.

A. ADAMS and A. WHITE, Crustacea of the Voyage of the Samarang, 4to., London, 1848.

A. A. GOULD'S Invertebrata of Massachusetts, 374 pp., 8vo., with plates. Boston, 1841.

LEWIS R. GIBBES, on the Carcinological collections of the Cabinets of Natural History in the United States, with an enumeration of the species contained therein, and Descriptions of New Species. From Proceedings of the Amer. Assoc., vol. iii., 1850.

W. BAIRD'S Natural History of British Entomostraca, 8vo., London, 1850.

EYDOUX and SOULEYET, Voyage of the Bonite.

HOMBRON and JACQUINOT, Voy. au Pole Sud. et dans l'Oceanie.

Besides various other Memoirs by Say, J. W. Randall, Pöppig, Erichson, Philippi, Müller, Wiegmann, Guèrin, S. Loven, H. D. S. Goodsir, A. White, W. Thompson, etc., in the Journal Acad. Nat. Sci. Philadelphia; Wiegmann's Archiv. f. Naturg., Berlin; Guérin's Magasin de Zool., Paris, and also Revue Zoologique, Paris; Annales des Sci. Nat., Paris; Vet. Acad. Förhandl., Stockholm; Annals and Mag. Nat. Hist., London; Reports of Brit. Assoc.; Proceedings of the Zool. Soc., London; Jameson's New Edinburgh Journal, etc., etc.

ADDENDA ET CORRIGENDA.

Page 19.—*Homologies of Crustacea.*—This subject, in its bearing on different groups of Crustacea, is treated of on pages 429, 503, 849, 1024, 1028, 1307, 1383.

" 92.—Under *Chorilia longipes*, add the locality, Oregon.

" 284.—Under *Thalamita crassimana*, add the locality, Feejee Islands.

" 292.—Under *Platyonychus purpureus*, add the locality, Valparaiso.

" 304.—The title, Family III. Corystidæ, should precede the genus Telmessus, on page 303.

" 320.—Under *Helœcius cordiformis*, add reference, *Gelasimus cordiformis*, Latr., Edwards, ii. 53.

" 347.—Under *Planes cyaneus*, longitude 105° is *west.*

" 379.—*Liriopea* of Nicolet (in Gay's Historia de Chile, iii.) is identical with Halicarcinus of A. White, and of more recent date. It is also an objection to the name that it is so near Liriope.

" 394.—Under *Calappa fornicata*, add the locality, Feejee Islands.

" 426.—The name *Porcellana armata* has been employed by L. R. Gibbes for a Florida species, and the author therefore would change the name of the Balabac species to *Porcellana spinuligera.*

" 444.—The name *Pagurus pubescens* is applied by Kröyer to a northern species; and as it is probably a Bernhardus, the author has changed the name of his species to *B. scabriculus* (see Proc. Acad. Nat. Sci. Philad., Jan. 1852, p. 6).

" 517.—*Ibacus antarcticus*, should be *Parribacus antarcticus.*

" 534.—*Periclimenes* of Costa (Fauna del Regno di Napoli, 1836) has the general form and habit of Anchistia, and the two may be identical; but the description contains no information as to whether the mandibles are palpigerous or not, and in other points it is defective.

" 534.—*Cryptophthalmus* of Rafinesque is retained by Costa (loc. cit.),

although hardly differing from Alpheus. The anterior hands are stout and very nearly equal.

Page 535.—*Typton*, Costa (loc. cit.) is also near Anchistia in habit. But the author states that there is no basal scale to the outer antennæ, and in this respect it is abnormal among the Caridea.

" 593.—Add under *Hymenocera picta*, references to Latreille, Règne Anim., iv. 95, and Edwards, ii. 348.

" 600.—*Cerataspis* of Gray (Cryptopus of *Latreille*) has not been inserted among the Mysidea, as Edwards has observed that there are regular branchiæ as in the Caridea, and remarks that the animal is probably the larve of some Penæidean; see Gray's Spicilegia Zoolog., p. 8, Pl. 6, f. 5, and Edwards, Crust., ii. 439, and Règne An. Illustr., Pl. 54 bis, f. 4, and note to this plate. If a distinct genus of the Penæidea, as is altogether probable, it should be arranged with the Sergestidæ.

" 600.—*Solenocera* is a name given by Lucas, in his work on Algiers, to a genus of Penæidæ.

" 615.—*Phyllamphion* of Reinhardt (Vid. Med. af den nat. Forening, 1849, ii.) is a genus between Phyllosoma and Amphion.

" 622.—Under *Pseudosquilla stylifera*, add reference, *Squilla stylifera*, Lamk., Hist. des An. sans Vert., v. 189; Edw., Crust., ii. 526, &c.

" 697.—*Glyptonotus*. This genus is instituted by Dr. Eights for a gigantic Idotæa from the South Shetlands, related to I. entomon, which it would also include. The species is called *G. antarctica*. Trans. Albany Institute, ii. 331, 1838–1852.

" 697.—The genus *Anthura* has been referred by us with hesitation to the Anisopoda. In the figure given by Edwards, on Plate 31, of his Crustacés, the *four* anterior pairs of legs are thrown forward and the three posterior backward. But in Costa's figure of a Naples species in his Crustacea of the *Fauna del Regno di Napoli*, which he calls the *A. gracilis*, the three anterior pairs are alike and are thrown forward, and differ in form as well as position from the four posterior pairs. Taking this species as the type of the genus, it is a true Isopod, and the family Anthuridæ should follow Idotæidæ in the system.

" 701.—The *Idotæa annulata* was taken in latitude 66° 16′ south, longitude 106° 15′ east.

" 716.—In the characteristic of Philoscia, 7-*articulatis* should read 7–8-*articulatis*. We intended to make the genus rest on the fact, that the antennæ are not at all concealed at base, and not on the number of joints. We doubt the value of either generic distinction.

" 716.—*Titanethes* is a name given by Schiödte (Danske Vid. Selsk. Skr. anden Række, ii.) to the *Pherusa alba* of Koch (Deutschlands Crus-

taceen, etc., Heft. xxxiv. 24), a species of Lyginæ, without eyes, and having a narrow head but slightly transverse, with the anterior angles projecting.

Page 717.—Insert the heading, *Pedes posteriores valde elongati*, after the characteristic of Genus 5, directly before that of Genus 6.

" 738.—Under *Lygia Ehrenbergii*, add reference to Brandt's Conspectus, and to Edwards's Crustacés, iii. 157.

" 741.—Under *Lygia Gaudichaudii*, add the reference, Edwards's Crustacés, iii. 157.

" 746.—The genus *Desmarestia* of Nicolet (loc. cit.) is near Cymothoe in its ancoral legs, but the abdomen is only two-jointed. The thorax is broad elliptical, the abdomen hardly half as wide as its greatest breadth; the four antennæ nearly equal. It is near Orozeuktes.

" 851.—The genus *Nicea* of Nicolet (loc. cit.) may possibly be the same with Allorchestes; but the essential characteristics are not given, excepting the non-palpigerous character of the mandible. Even if identical, the genus does not antedate the author's, as the description of Allorchestes was first published on July 1st of 1849. The maxillipeds are peculiar in having the surface tuberculate, and the inner lamella is dentate only at apex, and there sparingly.

" 855.—*Orchestoidea tuberculata* of Nicolet (loc. cit., Pl. 2, f. 4) is the author's Talitronus insculptus, and the genus Talitronus was instituted and published by the author, on July 1, 1849. The name has been since rejected by him for Orchestia insculpta; and as Gay's specific name is the older, it will become *Orchestia tuberculata*. We suspect that his *Talitrus chilensis* is what we have considered the *female* of the O. insculpta.

" 882.—The locality of the *Orchestia Pickeringi*, was Kauai or Oahu, Sandwich Islands.

" 908.—*Callisoma*, Costa (loc. cit.), appears to be identical with Lysianassa. The four anterior feet are not cheliform, and the second pair is longer than the first.

" 910.—*Niphargus* is the name of a new genus near Gammarus, proposed by Schiödte, in Danske Vid. Selsk. Skr. anden Række, ii. The author has not seen a description of it.

" 913.—The genus *Lalaria* (L. longitarsis) of Nicolet (loc. cit., Pl. 2, f. 8), is between the Gammaridæ and Corophidæ, and appears to be identical with Aora of Kröyer, which was also from Valparaiso.

" 917.—The specimen of *Uristes gigas* was taken from the stomach of a Penguin, in latitude 62° 28′ south, longitude 101° 35′ east.

" 989.—The *Tauria macrocephala* was found in latitude 67° 5′ south, 147° 42′ east. The colour when alive was deep orange.

" 991.—The name *Daira* of Edwards, is of more recent date than Daira of

De Haan; and we, therefore, propose to change it to *Dairilia*, and have so employed this name in the latter part of this volume.

Page 1046.—*Labidocera* of J. Lubbock (Ann. and Mag. Nat. Hist., Jan., 1853 [2], xi. 25), does not differ from Pontella. The figure represents the inferior eye, with the same form and position as in this genus (that is, projecting from the under side of the head); and in other respects it is identical with Pontella. The species *Labidocera Darwinii* is from the Atlantic, 38° south, in the open sea off the coast of Patagonia.

In the March number of the same Journal (1853), Mr. Lubbock proposes two subgenera under Labidocera, which do not appear to be based on important characters. The form of the posterior prehensile legs of the male, on which he rests for one characteristic, is exceedingly various, and if adopted as subgeneric, the subdivisions will become very numerous, and altogether at variance with correct natural affinities. Mr. Lubbock's three species of Labidocera are referred to three distinct subgenera.

" 1046.—*Iphionyx*, *Centropages*, *Agetus*, *Thaumaleus*, and *Thaumatoessa*, are names given by Kröyer to oceanic genera of Cyclopoidea, in a recent number of his Tidskrift, not seen by the author (vol. ii. 2d series, 582–595).

" 1203.—The genus *Edwardsia* of Costa (loc. cit.) is a true Sapphirina, and his figure represents well the general structure of the species.

" 1308.—The genus *Nesidea* of Costa (loc. cit.) is like Cythere in its structure and legs, except that it is said to have a sucker-mouth, and it is thus figured with some details by Costa. This Cyproid form of sucking Crustacea adds a new type to this section of the Entomostraça.

" 1393.—The statement that the Cirripedia of the Exploring Expedition are described by Dr. A. A. Gould in his Exp. Exp. Report on Mollusca, is incorrect.

INDEX.*

* In the following pages, the accepted names of species have the generic name in small capitals, and precede those which are only synonyms.

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