

or less irregular in form; the outer edge is either straightish, slightly convex, or undulating: *side arm-plates* in the form of narrow ridges: *arm-spines* very short, covered with skin at the base, naked and minutely prickly at the tips; four in number, except near the disk, where a few plates are armed with five; the three upper ones are subequal, and only a little more than a millimetre in length, the lowermost one very minute, and situated in a line with the tentacle-pores; and a few of them towards the end of the rays are armed with a minute hook or double hook at the extremity. No *tentacle-scale*. *Genital rimæ* furnished with a distinct irregular elongate-oval plate at the outer extremity, extending a little beyond the actual opening into the disk. The general colour of the disk above is purplish brown, somewhat paler on the keels of the radial shields, considerably paler beneath; arms light brown above and whitish below; the oral and aboral shields are of the same tint as the lower surface of the disk; the skin covering the arm-spines is purplish brown, giving the arms a bordered aspect.

Diameter of disk 25 millims., length of arm about 80, length of radial shields 10.

LIII.—*Remarks on some new Alpei, with a Synopsis of the North-American Species.* By W. N. LOCKINGTON.

THE North-American species of the old genus *Alpheus* are now known to be very numerous, as many as sixteen having been found upon the Pacific coast, from Panama northwards, making a total of eighteen species from both coasts.

Some kind of subdivision, in so numerous a group, is necessary for the sake of convenience; and the presence or absence of a rostrum and of ocular spines probably furnish characters as reliable as any.

Dana, in 1852, availed himself of the absence of a rostrum, and the inversion of the hands, to separate the genus *Betæus*, which has been generally acknowledged until Kingsley, in his synopsis of North-American species of the genus *Alpheus* (Bull. U.S. Geol. & Geogr. Surv. vol. iv. no. 1, p. 189), proposed, on what appear to me to be insufficient grounds, to reunite them.

In a large series of *A. minus*, Say, that author found many which wanted the rostrum; while in some other *Alpei* the dactylus works obliquely or horizontally, showing an approach to the characters of *Betæus*.

But is it not the case with almost every genus except such as stand alone, forming of themselves a family or subfamily, that some of the less typical species intergrade with an adjoining genus, or even with three or four adjoining genera? What is a genus? Is it not, like a species or family, a portion of the scale of Nature marked off arbitrarily for convenience in classification?

If there are rigid genera, not intergrading with others, it is because the connecting links have not yet been discovered—or because the causes which produced the generic characters were sudden and profound, destroying all races which did not change with sufficient swiftness.

The multiplicity of genera with one species has been caused in great part by the too great subdivision which has been indulged in by naturalists. Characters merely specific have been made generic, while every slight variation of form or colour has added a species. More advanced modern naturalists, reviewing these co-called species with ample material, have proved that they are merely geographical varieties of the same species; and the result has been that we have numerous single species with a full binomial to themselves, yet with little to warrant such distinction. This is especially the case among the birds of North America; and will occur in other classes as soon as our knowledge is sufficiently advanced to detect the intergradation of allied forms from different localities.

Were the test of geographical variation applied to our North-American *Alpei*, I have little doubt that many would sink into varieties. Yet the forms actually distinct are really numerous, and the genus so large that it needs subdivision. Many of the species included in it, were they classified on the same principles with birds, would become genera.

Previous to my notice of *A. bellimanus*, *A. æquidactylus*, and *B. longidactylus* (in the Proc. Cal. Acad. vol. vii. part 1, pp. 34, 35) no species had been described from this coast; immediately afterwards I added two other species; Kingsley (Bull. U.S. Geol. and Geogr. Surv. vol. iv. no. 1, p. 189) adds six new species, all occurring at Panama, and notes the occurrence of the Atlantic *A. heterochelis* at Panama and Realejo, on the Pacific coast; and in this paper I describe four additional species, noting also the occurrence of *A. heterochelis* on both shores of Lower California.

I am not aware that commensalism has previously been observed in this genus (Van Beneden, in his 'Animal Parasites and Messmates,' does not mention it), although *Pontonia*, an allied genus, is commensal; yet one at least of the Pacific species, *B. æquimanus*, is a commensal under the mantle

of the common "abalone" (*Haliotis rufescens*, Swains.). As this mollusk extends far towards the north, we may expect to hear of *B. æquimanus* from more northern localities. At present it is known only from Catalina Island and Santa Barbara, California.

As I have not in my possession any foreign species of the genus, and have not seen several of the species lately described by Kingsley, I shall in this place separate *Betæus* only, and treat of the rest of the group as one genus, divided into sections by the characters of the front and hands, for convenience in future identification.

The letter **P** indicates that the species belongs to; or has been found upon, the Pacific coast, while **A** indicates the Atlantic species.

The species I have had an opportunity to examine are marked thus, !.

*Synopsis of the North-American Alpei.*

A. Rostrum present.

a. Ocular spines present

A sulcus between eye-shields and rostrum :  
 larger hand complexly sulcated, with a superior and an external spine ; dactylus swollen at the tip, working horizontally : smaller hand with a superior spine. Meral joints of posterior pairs with a spine below ; propodi spinulose ..... *A. clamator* ! **P.**

No sulcus between eye-shields and rostrum :  
 larger hand as in *clamator* ; dactylus laminate, closing horizontally : smaller hand with superior and exterior spines. No spines on meral joints of posterior pairs ; propodi spinulose ..... *A. bellimanus* ! **P.**

No spine on basal joint of antennæ : larger hand with superior and external spines, sulcate ; dactylus vertical (?) : smaller hand with superior spine. Posterior pairs without meral spines ; propodi spinulose ..... *A. barbara* \* , **P.**

Antennal scale regularly elliptical ; larger hand a third longer than carapax, with a spine above and a smaller one near it. Propodi of posterior pairs spinulose .... *A. minor* ! **A.**

Basal spine of antennulæ reaching to end of second joint of antennular peduncle ; smaller hand (?) without spines. Penult. joint of abdomen with lateral spines. .... *A. æquidactylus* ! **P.**

Orbital spines arising from superior surface of carapax, margin continuous beneath them ; larger hand spineless ; smaller

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\* = *A. clamator*, Kingsley.

- ditto, slender. Propodal joints of posterior pairs spinulose ..... *A. panamensis*, P.
- Larger hand elongate, spineless, slightly sulcate; smaller slender, spineless. No spines or spinules on posterior pairs. Two pairs of spinules on telson ..... *A. tenuimanus* ! P.
- Basal spine of antennulæ reaching to middle of second joint of peduncle; basal joint of antennæ with a small upper and large lower spine; larger hand without spines or sulci; smaller ditto. Posterior pairs without meral spines; propodi spinulose. *A. læviusculus* ! P.
- b. No ocular spines.
- Eye-shields produced forwards, scarcely spiniform; larger hand spineless, sulcate, thumb distorted, smaller (?) ..... *A. sulcatus*, P.
- Rostrum separated from ocular shields by a deep depression: larger hand once and a half as long as carapax, spineless, constricted; dactylus slightly oblique, with large basal tooth: smaller hand spineless; fingers about equal to palm. Posterior pairs with spinulose propodi. . . . . *A. heterochelis* ! A, P.
- Rostrum separated from eye-shields by a sulcus: larger hand with a superior spine, sulcate; dactylus as in *heterochelis*, but obtuse: smaller hand as in *heterochelis*. . . . . *A. affinis*, P.
- Carina of rostrum running back to nearly middle of carapax; larger hand once and a half as long as carapax, spineless; smaller hand as long as larger, spineless, fingers longer than palm ..... *A. floridanus*, A.
- Carina of rostrum continued backwards, but no depression between eye-shields and rostrum: larger hand spineless, sulcate; dactylus vertical: smaller hand spineless. Meral joints of posterior pairs spineless; propodi spinulose. Telson with two pairs of spinules above and a third pair at tip ..... *A. spinicaudus* ! P.
- Hands small, nearly equal; larger spineless, constricted on margins; smaller slender, fingers equal to palm. No meral spines on posterior pairs. . . . . *A. parvimanus*, P.
- Hands very unequal; larger spineless, cylindrical, tapering; smaller smooth, slender, cylindrical, dactylus as long as palm. No meral spines on posterior pairs; propodi spinulose ..... *A. fasciatus* ! P.
- Rostrum very short, obtuse; no spine on basal joint of antennæ. Larger hand cylindrical, grooved externally; dactylus horizontal: smaller hand cylindrical; fingers equal to palm ..... *A. cylindricus*, P.
- B. Rostrum wanting; dactylus on lower side of hand. = *Betæus*, Dana.
- Front emarginate between eyes; hands nearly

equal, compressed-ovate, spineless. Dactyli of posterior pairs spinulose . . . . . *B. æquimanus!* P.  
 Front rounded; hands similar, fingers gaping widely . . . . . *B. longidactylus!* P.

*Alpheus clamator*, Lockington.

*Alpheus clamator*, Lockington, Proc. Cal. Acad. Sci. vii. 1876, p. 43.  
*Alpheus transverso-dactylus*, Kingsley, loc. cit. p. 197.

Carapax smooth, body not greatly compressed. Front tri-spinose; the rostrum longer and more slender than the ocular spines, which are separated from it by a deep sulcus, and widen out quickly into the eye-shield.

Basal spine of antennulæ shorter than the first joint of the peduncle; outer branch of flagella stout, margined with setæ, about equal in length to peduncle, inner branch about half the length of the body.

Antennæ with a spine on basal joint. Antennal scale narrow; its spine nearly, and its laminar portion quite, reaching the end of the antennary peduncle, which is slightly longer than that of antennulæ. Flagella more than three quarters the length of body.

External maxillipeds extending slightly beyond peduncle of antennæ. Meros of both hands of first pair smooth, compressed, with a slender spine at distal extremity above. Carpus of smaller hand slightly longer than that of larger. Hands unequal, dissimilar. Fingers of smaller pair straight, parallel, slender, closely fitting, working vertically, about equal in length to palm; manus with a spine above articulation of dactylus, whole inner surface beset with long hairs. Larger hand smooth proximally, setose and complexly sulcate distally. A large spine on the outer side continued backward as a carina, above the carina a deep sulcus; a second spine at articulation of dactylus. A deep and wide sulcus commencing above the articulation of the dactylus, flanked internally by a sharp ridge, externally by a smooth, broad ridge separating it from the exterior sulcus. This superior sulcus is continued obliquely backwards along the upper surface of the hand; and from about the centre of its length a transverse constriction is continued down the inner side of the hand. Below the exterior spine a constriction divides the pollex from the palm. Dactylus short, curved so as to close horizontally, swollen at the extremity, extending beyond the pollex. Ischium and meros of second pair equal; carpus five-jointed, first four joints together equal to meros, third and fourth joints each half the length of the second, which is equal to the first; fifth joint intermediate in length between

second and third; hand as long as fourth and fifth carpal joints.

Meral joint of posterior pairs with a spine at distal extremity beneath; propodal joints of all three posterior pairs spinulose beneath.

Telson broad, rounded at extremity.

Length 1.05 inch.

Colour, in alcohol, a light flesh tint, much deeper on the large hand. A darker spot on the upper surface of the carapax, also on the anterior edge of the first two abdominal segments.

This species lives in pools on rocky reefs at low-tide level, and is capable of producing, by clapping together the fingers of the larger hand, a snapping noise like that which can be made with the finger-nail.

*Loc.* Santa-Barbara Island (*S. A. L. Brannan*); San-Bartolomé Bay, W. coast Lower California (*W. J. Fisher*).

The above description is considerably amplified from the short and incomplete one published in the *Proc. Cal. Acad. Sci.*

Kingsley's description of his *A. transverso-dactylus* tallies exactly with my descriptions and with the specimen of *A. clamator* (a female) in my collection. His *A. clamator* differs from this in the want of a spine on the basal joint of the antennæ, in the proportions of the carpal joints of the second pair, in the want of a spine on the meral joints of the posterior pairs of limbs, and in the details of the hands.

*A. bellimanus* is near this species; but the rostrum is longer, there is no sulcus between eye-shields and rostrum; the dactylus of larger hand is not swollen at the tip, and works horizontally; the palmar portion of the smaller hand is not unlike that of the larger, and has two spines in the same positions as those on the larger; the dactylus is thin and laminate; and the meral joints of the posterior pairs have no spine below.

### *Alpheus bellimanus*, Lock.

*Alpheus bellimanus*, Lock. *loc. cit.* p. 34.

Carapax slightly compressed; front three-spined, rostrum longest; no sulcus between eye-shields and rostrum; basal spine of antennulæ short, not reaching second joint of peduncle, second joint twice as long as third; inferior branch of flagella twice as long as the superior.

A small spine on basal joint of antennæ; spine of basal scale about as long as peduncle; flagella twice the length of the carapax. External maxillipeds longer than peduncles.

Feet of first pair unequal. Larger hand constricted above the hind articulation of dactylus; a longitudinal groove continued backwards from this constriction on outer side of hand for about half its length, and a second shorter sulcus running backwards close inside the upper margin of hand; a second transverse constriction posterior to the upper one, on the lower margin; from this a longitudinal sinuous sulcus is continued forward to the extremity of the pollex. A sharp spine on the distal end of the ridge separating the anterior portion of the upper outer longitudinal sulcus from the posterior portion of the lower one. A spine at articulation of dactylus. Dactylus broad, thin, and articulated, so as to close horizontally above the point of the pollex, which is very short and irregular in outline; a few long hairs on dactylus and thumb. Smaller hand compressed, constricted above and below; a spine on outer surface at base of dactylus, and a second on upper margin at articulation of dactylus; dactylus laminate, working vertically with a straight lower margin; pollex slender; distal portion of hand and inner surface of dactylus hairy.

Carpus of second pair five-jointed; first joint nearly equal to the next three; second and fifth subequal, each nearly as long as the third and fourth together.

Meral joints of remaining pairs without a spine beneath; propodi spinulose beneath.

Telson tapering, convex at extremity.

Length of larger specimen, from tip of rostrum to end of abdomen, 1.20 inch; length of larger hand half an inch, of smaller 0.38 inch.

*Loc.* Two specimens from San Diego, found among kelp.

The dried specimens, when comparatively fresh, have the hands beautifully coloured with spots and markings of black and white on an orange ground; and the carapax presents traces of similar coloration.

### *Alpheus barbara*, Lock.

*Alpheus clamator*, Kingsley, Bull. U.S. Geol. & Geogr. Surv. vol. iv. no. 1, p. 197.

This species, supposed by Kingsley to be identical with my *A. clamator*, is proved by the absence of a spine on the basal joint of the antennæ, the different proportions of the carpal joints of the second pair, and the want of meral spines on the posterior pairs (characters belonging to parts not described in my notice of *A. clamator*) to be quite distinct from the latter; and I have therefore assigned it the name of *A. barbara*,

from the locality (Santa Barbara, California) where Kingsley's specimens were collected. The details of the hands also differ.

From *A. bellimanus* this species may be distinguished by the presence of a slender spine on the distal extremity of the meral joints of the first pair, by the want of the antennal basal spine, the less complex sulcation of the larger hand, the absence of an external spine on the smaller hand, and the equal length of the first two carpal joints of the second pair.

As Kingsley had only an imperfect specimen, and does not describe the rostrum and front, I cannot be sure that this species belongs to this section.

#### *Alpheus minor*, Say.

*Alpheus minus*, Say, Journ. Acad. Nat. Sci. 1818, i. p. 245; Edwards, Hist. Nat. des Crust. ii. p. 356; De Kay, New York Fauna, Crust. p. 26; Gibbes, Proc. Am. Assoc. Adv. Sci. 1851, p. 196; Kingsley, Bull. U.S. Geol. & Geogr. Surv. vol. iv. no. 1, p. 190.

*Alpheus formosus*?, Gibbes, *loc. cit.*

Kingsley believes *A. formosus* identical with *A. minor*: the range of variation, both in size and in rostral characters, appears to be great; and as it occurs along a great length of coast, it is not unlikely that distinct geographical varieties may be made out.

#### *Alpheus æquidactylus*, Lock.

*Alpheus equidactylus*, Lock. Proc. Cal. Acad. Sci. vol. vii. pt. 1, p. 35.

Front trirostrate, without sulcus between rostrum and ocular spines; the latter short, not greatly in advance of the eyes, the former extending slightly beyond first joint of antennular peduncle.

Basal spine of antennulæ stout, extending to end of second joint of antennular peduncle; joints of the latter subequal; flagella —?

Basal joint of antennæ with a small spine below; spine of antennal scale overpassing antennular spine by about one fourth of its length, but not extending to tip of antennular peduncle. Antennal peduncle intermediate in length between the antennular spine and that of antennal scale; flagella —?

External maxillipeds about equal to peduncle of antennæ.

Smaller (?) hand elongate-ovate, smooth, without spines, but with a transverse sulcus behind articulation of dactylus; a deep narrow longitudinal sulcus continuing backwards from the transverse sulcus for two thirds the length of the palmar portion: pollex with two teeth near base; tip recurved,



pointed. Dactylus articulated vertically, smooth, compressed, with a tooth near base fitting between those of the pollex; tip recurved, pointed, crossing that of pollex.

Carpal joints of posterior pairs produced into a blunt spine above distally; no spine on meral joints; propodi without spinules.

Penultimate joint of abdomen with a spine, apparently movable, at lower angle, and a triangular projection on each side of base of telson, which is smooth, somewhat tapering, convex at extremity.

Length of body 19 millims., of hand 7.5 millims.

This description is taken from a single dried, broken, and defective specimen from Monterey, California (*H. Hemphill*). The flagella of both pairs of antennæ are broken; one hand, probably the larger (?), is wanting, the other hand detached; and the second pair is wanting.

In my previous description (*loc. cit.*) I mention the larger hand; but it is probable that the member thus called is the same as that I now think, from its small size, to be the smaller hand.

#### *Alpheus panamensis*, Kingsley.

*Alpheus panamensis*, Kingsley, *loc. cit.* p. 192.

*Loc.* Acajutla, Central America, and Panama (*F. H. Bradley*).

#### *Alpheus tenuimanus*, nov. sp.

Carapax smooth, compressed, and arched in profile, much highest in centre. Front trispinose; rostrum much longer than ocular spines, reaching to middle of second joint of peduncle of antennulæ; ocular spines slender, projecting from the centre of the convex front of the eye-shields.

Basal spine of antennulæ reaching beyond the first joint of the antennular peduncle; upper branch of flagellum about as long as carapax; lower —?

A spine on basal joint of antennæ below; antennal scale equal to peduncle of antennæ; flagellum not shorter than abdomen.

External maxillipeds reaching beyond the antennal scale, with long hairs at tip.

Hands equal in length, not greatly differing in size, dissimilar.

Meros of first pair compressed, somewhat triangular, rounded above, with a small spine above at distal end. Larger hand elongated, entirely smooth, rounded above and below; proxi-

mal extremity slightly broader than distal; a shallow sulcus, with a shorter one above, extending obliquely upwards from the carpal articulation on the inner side of the hand; dactylus short, smooth, compressed, semicircular in outline when viewed from the side, slightly overpassing the pollex, working vertically, and closing in groove in pollex, bright red at tip (in alcohol). Smaller hand with meros similar to larger; manus exceedingly elongated, smooth, cylindrical; dactylus almost as long as palmar portion of hand, slightly curved, working vertically, slightly overpassing the long and slender pollex. Both dactyli are somewhat setose on their opposed outer margins.

Ischium and meros of second pair about equal; carpus with five joints, the first joint about equal to the next three united, second slightly longer than the third and fourth, which are equal; fifth, palmar portion of hand, and dactylus about equal, and each about equal to the second joint.

Posterior pairs without spines or spinules on any of the joints.

Telson elongate, slightly tapering, with four spinules, in two pairs, on its upper surface, and a spine on each side of its convex truncate extremity, which is margined by long setæ.

Length 34 millims.; length of larger hand 10, of carapax 13 to tip of rostrum.

A single specimen, with the antennæ and antennulæ damaged, from Port Escondido, Gulf of California (*W. J. Fisher*), is my only example of this species, which may easily be distinguished from its congeners by its long rostrum, smooth hands of equal length, and especially by the two pairs of spinules upon the telson.

*Alpheus læviusculus*, nov. sp.

Carapax stout, not compressed. Front trispinose, the ocular spines triangular, almost equal in length to the triangular rostrum, which is not divided from the eye-shields by a sulcus. Basal spine of antennulæ stout, reaching to the middle of the second joint of the peduncle; inferior branch of flagella two thirds longer than superior, which only slightly exceeds the peduncle in length.

Basal joint of antennæ with two spines, the upper one small, the lower almost half the length of the spine of the antennal scale, which does not reach to the end of the peduncle; flagellum short, reaching, when extended, slightly beyond the larger hand.

First pair very unequal in size. Meros of smaller hand compressed, with a spine at the upper distal end; hand about

equal in length to meros, smooth, ovate; dactylus in the same plane with the hand; pollex slightly hooked at tip.

Meros of larger hand less compressed than that of smaller; a small spine at upper distal end; manus broad, stout, entirely smooth, ovate, terminating abruptly in a sinuate distal margin, from the lowest point of which projects the short, broad, spoon-shaped pollex. Dactylus short, stout, curved, overpassing the pollex, with a large basal tooth fitting into a groove in the latter. Dactylus and pollex of both hands blue, becoming black at the tips. Meros of second pair longer than the ischium; carpus five-jointed, first joint nearly as long as the other four; second, third, and fourth joints equal, and two of them equal to the fourth; hand about equal to third and fourth joints.

Meral joints of posterior pairs without spines; propodi spinulose beneath; dactyli bifid at tip, the upper spine longer than the lower.

Telson with sinuate margins, arcuate posteriorly.

Length of largest specimen 30 millims., carapax 10, larger hand to tip of dactylus 11. ♀.

Several specimens from Port Escondido, Mulege Bay, and other points on the Californian shore of the Gulf of California.

#### *Alpheus sulcatus*, Kingsley.

*Alpheus sulcatus*, Kingsley, *loc. cit.* p. 193.

Bay of Panama. Zorritas, Peru (*F. H. Bradley*).

#### *Alpheus heterochelis*, Say.

*Alpheus heterochelis*, Say, *Journ. Acad. Nat. Sci.* 1818, p. 243; Edwards, *Hist. Nat. des Crust.* tome ii. p. 356; De Kay, *New-York Fauna*, Crust. p. 26; Gibbes, *Proc. Am. Assoc. Adv. Sci.* p. 196; Kingsley, *loc. cit.* p. 194; Smith, *Trans. Conn. Acad.* ii. pp. 23, 29.

*Alpheus armillatus*, Edwards, *op. cit.* ii. p. 354.

*Alpheus lutarius*, Saussure, *Crust. Nouv. des Antilles et du Mexique*, p. 45, pl. iii. f. 24, 25; Martens, *Wiegmann's Archiv für Naturgeschichte*, 1872, p. 139.

*Halopsyche lutaria*, Saussure, *Rev. Zool.* 1857, p. 100 (*teste* Saussure).

*Halopsyche bispinosus*?, Streets, *Proc. Ac. Nat. Sci. Phil.* 1871, p. 242.

This appears to be one of those forms, occasionally met with in every zoological class, that have changed so slightly in accommodating themselves to their environment as to be at once recognizable as the same species.

Specimens collected in various localities in Lower California present no appreciable difference from the typical *heterochelis*, of which I have a specimen from Florida. This specimen lacks the smaller hand.

Kingsley (*loc. cit.*) says of the smaller hand:—"cylindrical, constrictions but faintly indicated; fingers three fourths as long as palm."

In my specimens the dactylus is about equal in length to the palmar portion of hand behind it, and there is a projection, almost amounting to a blunt spine, on the inner side at origin of dactylus. There is no spine at the distal end of the meral joints of the posterior pairs, which have the propodi spinulose beneath.

The interior of the hands becomes more hirsute with age, many of the smaller specimens having only a few hairs on the fingers, while in some of the larger the distal portion of the hand is densely hairy.

The larger individuals, on examination after only a few weeks' exposure to alcohol, showed traces of a varied coloration; the tips of the fingers were black.

Length of a large specimen 37 millims. A specimen 30 millims. long has the larger hand 15 millims.

Kingsley gives the following localities:—

Fort Macon, N. C. (*Dr. H. C. Yarrow*); Smyrna and Key West, Fla. (*A. S. Packard, Jun.*); Lake Harney, Fla.; Bahama Islands (*G. B. Goode*); Bermuda Islands (*G. B. Goode*); Aspinwall (*J. A. M'Niel*); Abrolhos, Brazil (*C. F. Hartt*); Panama (*F. H. Bradley*); Realejo, W. C. Nicaragua (*J. A. M'Niel*).

I have specimens from La Paz; San-José Island, Amortiguado Bay; Mulege Bay and Port Escondido: all on the gulf coast of Lower California. Also from Magdalena Bay, west coast of Lower California.

#### *Alpheus affinis*, Kingsley.

*Alpheus affinis*, Kingsley, *loc. cit.* p. 195.

This appears to be very near indeed to *A. heterochelis*.

*Loc.* Panama (*F. H. Bradley*).

#### *Alpheus floridanus*, Kingsley.

*Alpheus floridanus*, Kingsley, *loc. cit.* p. 193.

*Loc.* Fort Jefferson, Florida (*Lieut. Jacques, U.S.N.*).

#### *Alpheus spinicaudus*, nov. sp.

Rostrum very short, continued backwards between the eye-shields as a low carina; no ocular spines.

Spine at base of antennulæ nearly as long as basal joint of peduncle; second joint of peduncle one half longer than third,

which is about equal to first; outer branch of flagellum, including its slender terminal portion, nearly equal to inner, which is about equal to carapax.

Spine of antennal scale longer than laminar portion or than peduncle of antennulæ, and equal to antennal peduncle; flagellum twice the length of the carapax.

External maxillipeds longer than peduncle of antennæ; terminal joint margined with setæ, those at tip very long.

Meros of first pair spineless, that of smaller hand concave on outer surface.

Hands of first pair unequal, dissimilar. Larger hand compressed, smooth, constricted above and below; at about the distal third of its length a sulcus, broad at commencement, but rapidly narrowing, running backwards longitudinally at right angles to the upper constriction on both outer and inner faces. Dactylus short, working obliquely, with a stout basal tooth, closing in a deep groove in the pollex; the blunt tip of the dactylus crossing the sharp extremity of the thumb. Smaller hand rounded, smooth; dactylus half the length of palm, working vertically, and equal to the pollex; tips of dactylus and pollex sharp, curved inwards, and crossing each other. Inside of both hands setose towards distal end, especially the smaller.

Ischium and meros of second pair equal; carpus five-jointed, second joint two thirds longer than the first, and longer than third and fourth together, third and fourth equal, fifth and first about equal.

Meral joints of posterior pairs without spines; propodal joints spinulose beneath.

Telson elongate; sides tapering; end slightly convex; two pairs of spinules on the upper surface, and a third pair projecting from the extremity, which is fringed with long setæ between the posterior spinules.

Prevailing colour of specimens, after six months' exposure to alcohol, red; antennæ blue.

Length of the largest female 22 millims.; length of larger hand 8 millims.

Several specimens from Port Escondido, Gulf of Cal. (*W. J. Fisher*), collected in July to August 1876; the females loaded with ova.

*Alpheus parvimanus*, Kingsley.

*Alpheus parvimanus*, Kingsley, *loc. cit.* p. 195.

*Loc.* Panama (*F. H. Bradley*).

*Alpheus fasciatus*, nov. sp.

Small; carapax smooth; no ocular spines; eye-shields scarcely produced forwards; rostrum about equal to diameter of eye; surface between rostrum and eyes slightly depressed, but with no distinct sulcus.

Basal spine of antennulæ longer than basal joint of peduncle; joints of peduncle nearly equal in length; inner branch of flagellum twice as long as outer, and rather longer than carapax.

A small spine on basal joint of antennæ below; spine of basal scale about equal to peduncle; flagella wanting or broken in all the specimens under examination.

External maxillipeds reaching to end of basal joint of antennæ.

Meros of first pair without spine; larger hand smooth, nearly cylindrical, tapering towards the dactylus, which is smooth, semicircular in profile, a fourth the length of the palm, and works vertically. Smaller hand very small, smooth, cylindrical, slender; dactylus equal to palm; pollex as long as dactylus; long hairs on inner side of fingers.

Carpus of second pair five-jointed; second joint two thirds the length of first, but equal to third and fourth together; fifth a little shorter than second. Posterior pairs with cylindrical joints; propodal joints spinulose beneath.

Telson elongate, tapering, rounded at end.

Colour after a short time in alcohol:—carapax and abdomen alternately banded with bright red and white; larger hand red, with marblings of white in some cases.

Length of a large female 18 millims.

Several specimens from Port Escondido, Gulf of Cal. (Fisher).

*Alpheus cylindricus*, Kingsley.

*Alpheus cylindricus*, Kingsley, *loc. cit.* p. 196.

From its short obtuse rostrum this form approaches *Betæus*.  
*Loc.* Pearl Island, Bay of Panama (F. H. Bradley).

*Betæus æqualis*.

*Betæus equimanus*, Lockington, Proc. Cal. Acad. Sci. vol. vii. p. 43.

*Alpheus æqualis*, Kingsley, N.-Amer. Species *Alpheus*, Bulletin U.S. Geol. and Geogr. Survey, vol. iv. no. i.

Carapax smooth, compressed; front curvately emarginate between the eyes.

Outer maxillipeds as long as base of inner antennæ; setæ of terminal joint long and closely set.

Basal scale of antennulæ a slender spine, reaching beyond the middle of the second joint of the peduncle. Second joint of the peduncle nearly twice as long as the last joint; peduncle slightly shorter than that of antennæ. Outer branch of flagellum about two thirds the length of the inner.

Antennal scale with long slender spine, the laminate portion reaching about to end of peduncle. Antennæ without spine on basal joint; flagellum more than half the length of body.

"Meros of first pair trigonal, with small spine at upper distal angle."

Hands nearly equal, entirely smooth, compressed, ovate; dactylus with a sharp recurved point and a straight edge, margined with setæ; this is opposed to a similar straight edge, margined with setæ, on the pollex, which also ends in a sharp incurved point. The dactylus of both hands has a basal tooth. The fingers gape slightly at the proximal end.

Feet of second pair slenderer than third and fourth, but not greatly longer; "ischium slightly shorter than meros; carpus five-jointed: first joint as long as the three succeeding ones; second, third, and fourth equal; fifth slightly longer. Chela about as long as the two preceding joints.

"Dactyli of posterior pairs spinulose at tip.

"Telson slender, tapering; extremity regularly rounded."

Length of larger specimen 1.05 inch.

Two specimens examined, both females with ova; Catalina Island, Cal. (*S. A. L. Brannan*).

This species lives under the mantle of *Haliotis rufescens*, Swains.

Colour, when fresh, dark purple; in alcohol, a light flesh tint.

I have here supplemented the short description given in the Proc. Cal. Acad. Sci., with others taken from Kingsley's description of *A. Harfordi*, and verified by reexamination under the microscope, the previous examination having been made with hand-lens only. I cannot find the "notch furnished with two or three small teeth near the articulation of the dactylus," mentioned by Kinglsey as existing upon the pollex of the larger hand; perhaps his specimens were males.

Kingsley gives the following dimensions:—

| Length.<br>millim. | Carapax.<br>millim. | Larger hand.<br>millim. | Larger dactylus.<br>millim. |
|--------------------|---------------------|-------------------------|-----------------------------|
| 24.0               | 8.0                 | 8.0                     | 4.7                         |
| 19.0               | 6.0                 | 6.0                     | 3.6                         |

My reexamination of the specimens has convinced me that

Kingsley's *Alpheus Harfordi* is identical with my *B. equimanus*.

*Betæus longidactylus*.

*Betæus longidactylus*, Lockington, Proc. Cal. Acad. Sci. vol. vii. p. 35.  
*Alpheus longidactylus*, Kingsley, *loc. cit.* p. 198.

Carapax smooth, much compressed, "front rounded; antennular spines slender, acute. First and second antennular joints subequal, third shorter; inner flagellum three fourths the length of carapax; outer——?"

"Antennal scales shorter than peduncles of either pair of antennæ.

"External maxillipeds extending nearly to extremity of antennal peduncle."

Hands of first pair similar, long and compressed; pollex forming half the length of the manus; dactylus more than half that length; the fingers when closed gape widely, both are pointed at the end, and the points cross each other like the mandibles of a *Loxia*. At the base of the dactylus are several teeth opposed to two large ones on the manus, which also bears a large tooth in the centre of the pollex.

"Carpus of second pair five-jointed; first joint as long as the three following; second, third, and fourth equal; fifth slightly longer.

"Extremity of telson rounded."

Colour of carapax of dried specimen green, with nuances of russet and olive. Fingers of the larger hand light red, the tips green. Length of carapax 1.12 inch, of larger hand 0.56, of smaller 0.36.

As in the description of the previous species, the portions within quotation marks are from Kingsley. The single specimen in the museum of the Academy came from a sandy mud flat, San Diego, California, between tide-marks.

San Francisco, April 4, 1878.

LIV.—*Descriptions of two Butterflies collected by Dr. Turner at Port Moresby, New Guinea.* By ARTHUR G. BUTLER, F.L.S. &c.

*Danaïs Turneri*, n. sp.

♂ ♀. Dark olive-brown, with semihyaline pale green markings, almost as in *D. purpurata*, but differing as follows:—primaries with three small spots, instead of two large ones and a dot, across the end of the cell; the four spots just