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A contribution to the morphology and the distribution of the Arctiidae of New England

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A CONTRIBUTION TO THE MORPHOLOGY AND THE DISTRIBUTION OF THE ARCHIDAE OF NEW ENGLAND

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by

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PART ONE

The External Morphology of *Apantesis virgo* L. and a Comparison of *virgo* with the Genotypes of *Halisidota*, *Phragmatobia*, and *Estigmene*

C O N T E N T S

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INTRODUCTION

The genus Apantesis is well-known for the general similarity of its species and also for the variation which each species exhibits. In certain groups of moths, e.g., nais Drury, vittata Fabricius, radians Walker, and phalerata Harris, the range of variation is so wide that it is impossible to give a description which will always distinguish one species with all of its variations from the other species.

Since wing pattern is the principal means of identifying the moths, and since a variant of one species may be almost exactly like the typical form of another, it is often difficult to distinguish between the various members of the genus.

The purpose of this thesis is to present a detailed account of the external morphology of a representative species of the genus Apantesis, with special reference to characters which may be of taxonomic importance. A. virgo L. has been selected because of its large size, its widespread distribution, and because it is one of the most common and best-known species of the genus.

A detailed morphological study of a species of one genus should prove of value not only in the study of other species of the same genus, but also in the comparison of other genera of the family.

Lastly, this thesis brings together in one work the morphology of a representative species of Lepidoptera. Burgess, in 1890, wrote on the morphology of a butterfly, Danais archippus, and since that time various writers have published papers covering portions of the external morphology of Lepidoptera, although no complete morphology of a higher Heteroceran has yet been presented.

It is hoped that this paper will be of value in the taxonomic study of the group Arctiidae, and as a reference work illustrating the morphology of a typical Heteroceran.

TAXONOMY

The first described species of the present genus Apantesis was virgo, which was named by Linnaeus in 1758 and placed in his genus Bombyx. Since that time the Linnaean genus Bombyx has been divided into a large number of restricted genera, and Bombyx has been retained only for the true silk moth. Species of Apantesis have since been described under several generic names which later were restricted to genera other than Apantesis. These include Phalaena A. & S., Arctia Schrank, Euplagia Hubner, Spilosoma Steph., Euprepia Ochs., Callimorpha Harris, and Cymbalophora Rambur.

The genus Apantesis was erected by Walker in 1855 with radians Wlk. (usually considered a variety of vittata L.) as type. Since that time three genera proposed by Packard in 1864, Wallengren in 1866, and Neumogen and Dyar in 1894, have been united in the single comprehensive genus Apantesis. The synonymy thus stands:

1855	Apantesis Walker	type vittata
1864	Callarctia Packard	ornata
1866	Orodemnias Wallengren	quenselii
1894	Mimarctia Neum. & Dyar	arge

Probably because virgo is definitely larger than any other species of the genus, and because it is confined to

the eastern part of the United States, the species has no synonyms. Although it is very similar in wing pattern to the slightly smaller species intermedia and parthenice, it is easily distinguished from them by the presence of a characteristic spot on the origin of Cu_2 in the hind wings, as well as by its larger size.

EXTERNAL MORPHOLOGY

General Description

Apantesis virgo is a large, stout-bodied moth with a wing-expanse of two to two and one-half inches. The female is usually noticeably larger than the male. Virgo is the largest species of the genus Apantesis. All the members of the genus are moths strikingly colored with black, cream, and red or yellow, and with very similar wing patterns.

The head, eyes, palpi, and antennae of virgo are black. A triangular cream-colored spot on the vertex narrows to a point on the frons between the eyes. The antennae of the male are very thinly clothed with ochre scales. The patagia forming the so-called collar are heavily covered with cream-colored scales. A longitudinal black stripe passes through the center of each patagium. The thorax is thickly clothed with long cream-colored scales, and is marked with three parallel longitudinal black stripes. The lateral stripes are on the hugely developed tegulae which are fringed with ochre. The abdomen is red, with a dorsal series of black spots, one on each segment. Occasionally the spots, especially those on the posterior segments, merge into a continuous uneven line. Head, thorax, legs, and abdomen are black on the ventral side. The male

frequently has ochre patches on the legs and abdominal segments.

The primaries or fore-wings are black with a narrow ochre fringe. The inner margin and all the veins except some of the branches of R at the apex of the wing are narrowly lined with cream, which, in fresh specimens, is often suffused with flesh-color or yellow. In addition to the stripes on the veins, a broad sub-median fascia rises from the base of the median vein and passes to the outer margin of the wing almost parallel to the inner edge, and then turns slightly caudad just before reaching the margin to join the first anal vein at the anal angle of the wing.

A post-median stripe extends from the costal margin across the end of the discal cell, and then turns inward very slightly and continues to the sub-median fascia. This stripe sometimes extends only to Cu_2, not quite reaching the sub-median fascia, and may not be complete between radius and costa. However, it is always present and nearly always complete. A median stripe from the costal margin across the cell about a third of the distance from the end of the cell is usually present and parallels the post-median stripe. It may sometimes extend beyond media to Cu_2 or the sub-median fascia, and is frequently incomplete between costa and radius. It is occasionally incomplete across the cell,and is rarely lacking. An ante-median stripe is rarely present. It

extends from costa to sub-median fold about half the distance from the base of the wing to the median stripe and parallel to it. It is present only when the median stripe is rather well-developed, and usually is merely a faint trace at the costa or across the cell. A sub-terminal W-shaped mark is usually complete. This passes from the costal margin a short distance from the apex of the wing diagonally across the apex to the outer margin between R_5 and M_1, where it turns in sharply toward the lower angle of the cell. Here it abruptly turns outward and joins Cu_2 at the outer margin, turning inward once more to join the sub-median fascia at the point where the latter turns caudad.

When fresh, the secondaries are a deep flame-color, with an orange-tinged fringe. There is a variable number of large black spots, each very narrowly edged with yellow. These spots are rarely confluent. The presence of a spot at the origin of Cu_2 readily distinguishes this species from the very similar A. intermedia. Other spots are (1) a marginal U-shaped spot at the apex; (2) a marginal triangular spot across the ends of M_3 and Cu_1; (3) a sub-marginal round or triangular spot across Cu_1 and Cu_2; (4) a very small, frequently absent, marginal triangular spot on the fold between Cu_2 and 2nd A; (5) a large marginal triangular spot on 2nd A; (6) a rectangular spot across the end of the cell; (7) a round spot, frequently lacking in the

male, on 2nd A above No. 5; (8) a narrow linear spot, very seldom present, from Cu_1 to Cu_2; (9) a small spot on R, often lacking.

The wing patterns of the male and female are similar. Ventrally the colors are less bright, and the ochre is more deeply suffused with yellow or flesh. The basal region of Sc + R_1 is usually black.

Head

Head Capsule. (Figs. 1, 2)

From the anterior aspect the head is approximately twice as wide as long, two-thirds of the area being taken up by the compound eyes (e), whose outer margins make up the entire lateral margin. Their inner margins are straight and slightly approximated ventrally, cutting off between them a broad flat fronto-clypeal sclerite (fc). This is delimited laterally by a narrow ridge, the ocular sclerite (oc) of Snodgrass and Comstock, surrounding the compound eyes. Ventrally the fronto-clypeus ends in a straight blunt edge which hangs down over the bases of the mouthparts. Dorsally a straight or slightly arched frontal suture (fr) lying between the antennal sockets demarks the fronto-clypeus from the vertex (vx). In many insects the frons is demarked from the clypeus by an epistomal suture, but all traces of this suture have been lost in virgo.

Short inconspicuous sutures, which may be called the sub-genal sutures (sgs), separate the subgenae (which are completely covered from this aspect by the mandibular lobes) from the fronto-clypeal region. Normally the sub-genal sutures are continuations of the epistomal sutures laterad and separate genae from sub-genae, but in this insect the growth of the compound eyes has completely obliterated the genae. The subgenae, as mentioned above, are completely covered in face view by small lobes representing the rudimentary mandibles (md).

At the base of the subgenal sutures lie the conspicuous frontal pits (fp), vertically elongated slits which are the openings of the invaginations forming the anterior arms of the tentorium. Since these pits always occur on the epistomal or sub-genal sutures, they may be regarded as features indicating the boundary of the true clypeus; and that part of the fronto-clypeal region below or anterior to the frontal pits may be called the clypeus.

The antennae (at) are located laterally, close to the mesal margins of the compound eyes. Each antennal socket is rimmed by a very narrow antennal sclerite (ăsc) cut off by an antennal suture (as). Laterally and slightly ventrally each antennal sclerite is prolonged into a blunt cone extending into the antennal socket. This bulb, called the antennifer (anf), serves as an articulatory point for the basal segment of the antenna.

The top of the head is termed the vertex (v). The longitudinal coronal suture which commonly divides the vertex into two parietals (pa) is not present in Apantesis. The vertex is arched abruptly. Laterally the vertex becomes narrow and bears near each margin, just above the antenna, a small ocellus (o). Posteriorly it is separated from the occiput (occ) (a sclerite lying just anterior to the occipital foramen) by the occipital suture (ocs). Laterally, the occiput and vertex are separated from the post-genae (pge) by post-genal sutures (pgs) which pass from the upper corners of the compound eyes to the lower or ventral edges of the occipital foramen.

Above and behind each eye lies a flat post-genal sclerite (pge) separated from the occiput, which forms the top of the head, by the post-genal suture. The occipital foramen (of) (through which the alimentary tract, ventral nerve cord, etc. pass to the body) takes up most of the posterior portion of the head capsule. A very narrow post-occipital sclerite (poc) demarked by a post-occipital suture (pos) forms a rim around the dorsal and lateral edges of the foramen. At the ventral margin of the foramen are found two lobe-like chitinous expansions, the occipital condyles (ocd) which serve as articulatory points for the cervical or neck sclerites.

The mesal edges of the subgenal plates are bordered by a heavy chitinous rim. On this ridge, just below the occipital condyles, are found the gular pits (gp), or invaginations of the posterior arms of the tentorium. Usually these lie in the post-occipital suture, but in this case the suture ends before it reaches the pits, although the internal ridge, of which the suture is an external indication, continues to the gular pits and gives rise to the posterior tentorial arms.

The membranous plate lying between the two post-genae may be interpreted as the labial region, since the labium, mentum, and gular region are not distinguishable as separate sclerites.

Antennae. (Figs. 5, 6)

The antennae (at) of the male are bipectinate, with long comb-like expansions on each segment. Those of the female are dentate with peg-like or cone-like protuberances. The number of segments varies from 52 to 65.

The basal segment, or scape (sc), is bulb-like, greatly enlarged, and articulates with the antennifer of the antennal sclerite. The second segment, or pedicel (p), is similar to the following one or two segments. None of these segments bear prolongations or protuberances.

In the male, the fourth or fifth segment bears short lateral protuberances, and on the next few segments these elongate until they reach a length three to four times the width of the segment. Toward the tip of the antenna they decrease in length, and the last segment is a simple linear cylinder. At the tip of each pectinate extension or pectination there is a stout seta. The rows of pectinations are not diametrically opposite, but are slightly approximated on the anterior or ventral edge, with the pectinations incurved.

In the female, each antennal segment beyond the third or fourth bears two blunt cone-like teeth, each with a seta. These teeth are in rows comparable to the rows of pectinations of the male antenna.

Mouthparts. (Figs. 1, 2)

The labrum (l) or upper lip is small wedge-shaped plate projecting downward very slightly from beneath the clypeus and is frequently entirely concealed by the latter. Its free margin is sinuate and is produced into three slightly developed lobes. The two lateral lobes represent the rudimentary pilifers (pfr) while the central lobe represents the epipharynx (ep), which covers the space at the base of the proboscis between the two galeae. Each

pilifer bears a small tuft of setae. Often the setae are all that can be seen of the labrum and its appendages.

The maxillae make up the greater part of the mouthparts. A small cardo (cd) is closely applied to the posterior part of the head capsule on the mesal margin of each post-gena. Articulating with the cardo is the stipes (stp), which bears a minute one-segmented maxillary palpus (mp) and an elongated galea (ga). The maxillary galeae make up the principal part of the sucking-tube or proboscis. Each galea is concave on its mesal surface and is fitted with ridges and grooves by means of which the two can be interlocked to form the sucking-tube, through which juices are drawn up into the mouth through the action of a muscular pump within the head capsule. The tip of the proboscis is covered with minute papillae which aid in the absorption of liquids and act as sensory cells.

When not in use the proboscis is coiled up between the two labial palps. Adults of this species do not feed, hence the proboscis is not fully developed, and although it is three to four times the length of the head, it is considered by systematists to be rudimentary since it does not extend beyond the thorax, and when rolled up, is entirely concealed by the palpi.

The labrum is largely represented by the labial palpi (lp). These are conspicuous three-segmented appendages rising from a membranous area on the posterior part of the head. The segments are approximately equal in length, the first one being curved anteriorly so that the palps stand in a porrect position, i.e., they extend straight out from the head capsule and are not upturned over the frontal region. The relative sizes of the segments and the position of the palpi are taxonomic characters of some importance in the family Arctiidae.

The labial and gular regions are more or less membranous and indefinite. A broad slightly sclerotized area on the posterior part of the head bears the labial palps on its posterior border and may be looked upon as a composite area formed by the gula and the labium, while separate sclerites are indistinguishable.

Thorax

Cervical Region. (Fig. 19)

The cervical or neck region is largely membranous in order to permit freedom of movement between the head capsule and the thorax. A single cervical sclerite or laterocervicale (lc) lies in the membrane on each side of the head and furnishes an articulatory point for the head capsule. The laterocervicale is a small, broadly V-shaped sclerite whose anterior arm or cephaliger articulates with the occipital

condyles (ocd) of the posterior region of the head. The apex of the V is enlarged to form a slight knob which is attached to the mesal margin of the prothoracic episternum (es), about half the distance between notum and sternum. The other arm of the V lies in the membrane mesad of the episternum. The tips of the cervical sclerites are approximated ventrally.

Prothorax. (Figs. 7, 8, 19)

The prothorax has been greatly reduced in comparison with the hugely developed mesothorax, the segment bearing the primary or fore-wings. The patagia (pt), two large flap-like expansions of the pronotum, are the most conspicuous elements of the prothorax. Together these form the collar which is peculiar to Lepidoptera and which lies over the anterior margin of the mesothorax.

The pronotum (pn) consists of a Y-shaped structure made up of four small plates. The stem of the Y articulates with the prescutum of the mesothorax, and is made up of a narrow plate and an anterior wider one. Two larger sclerites, which bear the patagia on their anterior margins, articulate with the anteriormost of these plates and form the short thick arms of the Y.

The episternum (es) of the prothoracic pleuron is an expanded, convex, and slightly curved sclerite attached to the antero-ventral margin of the pronotal lobe, which forms an arm of the Y. The laterocervicals are attached to the mesal margins of the episterna. The ventral margins of the episterna are connected with the basisternum by a very narrow precoxal bridge or precoxale (pr). The epimeron (em) consists of a slightly sclerotized membrane which extends between the posterior margin of the episternum and the large heavily sclerotized postcoxal bridge or postcoxale (pcx) which connects the epimeron with the furcasternum. A small trochantin (trn) is articulated with the ventral margin of the episternum and forms a pivotal point for the coxa of the prothoracic leg.

The sternum (s) is the narrow ventral region between the two coxal cavities. It is traversed by a mid-ventral suture which marks the presence of an internal plate formed by the infolding of the exoskeleton. There are no internal apophyses or furcae to distinguish the posterior furcasternum from the anterior basisternum, which are fused together into a single sternal plate. Extensions of the sternum into the pleural regions on each side of the coxal cavities form the so-called coxal bridges. The precoxal bridge or precoxale (pr) is a narrow bridge anterior to the coxae between the sternum and the prothoracic episterna, while the

postcoxale (pcx) is a more strongly developed bridge posterior to the coxae between the sternum and the epimeral regions of the prothoracic pleura. The spinasternum (ss), which bears a very small median internal projection or spina, is very closely fused with the posterior part of the sternal plate. The spinasternum extends inwardly as a slender strap-like process which continues outwardly and posteriorly and forks into two long slender arms. The arms of the spinasternite are fused with the mesothoracic basisternum (bs).

Mesothorax. (Figs. 7, 8, 19)

Notum.

The mesothorax is bordered anteriorly by a very narrow collar-like prescutum (psc) to which the pronotum is articulated. The prescutum is directed ventrad and from the dorsal aspect is wholly obscured by the overhanging scutum. Laterally the prescutum is continued into two projecting rod-like sclerites, the prealar sclerites (pra), which extend toward the pleuron.

The scutum (sc) is the largest and most conspiduous of the mesothoracic tergites. It is a strongly convex plate traversed by an inconspicuous median carina, and widest at the base or posterior end. Lateral extensions of the scutum

form articulatory points for the wing-bases. Caudad of the prealare is the suralare (sur) of Crampton, or the anterior notal wing process of Snodgrass. The suralare is a flat lateral lobe of the scutum, with a straight anterior margin and a strongly concave posterior margin. Between the suralare and the prealare lies the tegular incision (ti) which bears in its membrane two rod-like sub-tegular plates. The sub-tegulae serve as supports for the tegulae.

The tegulae (Fig. 13) are hugely developed. Each tegula (teg) is a flap-like plate extending from the tegular incision caudad to the posterior limits of the scutum, and covering the bases of the wings. Anteriorly the tegula has a broad shoulder with a projecting lobe by which it is attached to the sub-tegulae.

At its posterior corners the scutum is expanded into a broad lobe which bears two finger-like projections. The anterior projection is the adanale (ad) of Crampton, or the posterior notal wing process of Snodgrass. The posterior one is the post-adanale (pad).

Between the anterior and posterior wing processes, a forward-projecting curved lobe or adnotale (al) serves as a second anterior articulatory point for the wing. A deep incision between the adnotale and the suralare is called the notal incision (ni).

The scutellum (sl) is a smaller convex transversely oval plate caudad of the scutum or alinotum. Its postero-

lateral margins are produced into membranous axillary cords (ax) which are closely attached to the caudal margins of the post-adanales and pass to the anal regions of the wings.

The postscutellum (psl) or postnotum is an inconspicuous narrow region caudad of the scutellum. It is almost entirely concealed by the mesothoracic scutellum and the metathoracic scutum. The post-scutellum is important in that it bears the post-phragma (ph), a large plate-like internal projection to which muscles are attached.

Pleuron.

The mesothoracic pleuron is divided into an anterior episternum (es) and a posterior epimeron (em) by a vertical pleural suture (c) which extends from the dorsal to the ventral margins. The episternum is divided by a transverse anepisternal suture (a) into a dorsal anepisternum (aes) and a ventral katepisternum (kes). A small lobe or preepisternum (pes), which is fused with the sternum, is separated by the preepisternal suture (u) from the episternum (es) proper. A fold on the antero-dorsal margin of the epimeron overlies the anepisternum, and is called the preepimeron (pem) by Shepard. A deep dorsal incision in the epimeron gives the sclerite a U-shaped appearance. At the head of the pleural suture the anepisternum and preepimeron send off a rod-shaped arm which functions as the "pleural wing process" or alifer (pp). From its base there arises a second narrow bar

extending cephalad to the prealare of the prescutum. This is the larger of the two sub-tegulae.

The anepisternum bears on its dorsal margin a small lobe the basalare, episternal epipleurite, or preparapteron (bl), which bears wing muscles. In the membrane above the epimeron lies the subalare, epimeral epipleurite, or post-parapteron (sa), also bearing wing muscles. The subalare is completely detached from the epimeron, although the basalare is partially fused to the episternum. The subalare is connected with the notum by a prolongation of the adanale, and carries along its posterior margin the axillary cord. The posterior arm of the epimeron is called the post-alar bridge and links the pleuron with the postscutellum.

The basal segment of the leg is closely fused with the pleuron and forms an integral part of it. A continuation of the pleural suture ventrally as a basicostal or meral suture (bc) divides the coxal region into the anterior eucoxa (ecx) and the posterior meron (me). The meron represents the hugely-developed post-articulatory region of the basicoxite. At the base of the coxa, between the eucoxa and meron and the true sternum there is a small area separated from the eucoxa by the basicostal suture. Shepard calls this sclerite the epicoxal piece (x), and believes it to be merely the exposed portion of the basicoxite anterior to the pleural articulation.

The mesothoracic spiracle (sp) lies in the membrane between the prothoracic and the mesothoracic pleura just ventrad of the prealare.

Sternum.

The mesothoracic sternum is composed of three plates which are closely fused. The anteriormost of these plates is the basisternum (bs), a wide flat sclerite which extends almost vertically between the cephalic margins of the katepisterna of the pleura. A deep infolding of the basisternal region along the median line forms the mid-ventral suture (mv) and an internal projection or plate. The arms of the prothoracic spinasternite are fused with the anterior margin of the mesothoracic basisternite and enclose a narrow triangular membranous area. The preepisterna are not separated from the sternum by sutures and form narrow basisternal projections which border the anterior margins of the katepisterna. The basisternum becomes narrow between the approximated bases of the coxae and is continued posteriorly as the furcasternum, a narrow longitudinally-infolded sclerite which lies between and behind the coxae. The furcasternum forks posteriorly into two arms which are continuous with downward projecting regions of the epimeron and form the postcoxal bridges. At the base of the arms of the furcasternite lies the completely fused spinasternite which bears a small median internal spine.

Metathorax. (Figs. 7, 8)

Notum.

The metanotum has been reduced and displaced caudad by the hugely-developed mesonotum. The scutum (sc) consists of two lateral lobes which curve cephalad. On the anterior margin of each lobe is the anterior wing pivot or suralare (sur). The posterior wing process or adanale (ad) arises as a narrow projection from the posterior margin of the scutum. The scutellum (sl) forms a narrow transverse band across the bases of the lobes of the scutum. Laterally the scutellum is continued as the membranous axillary cords which pass to the anal angles of the wings. The postscutellum (psl) is a very narrow band just caudad of the scutellum. The membranous first abdominal segment is attached to it. The post-scutellum gives rise internally to phragmas for muscle attachment.

Pleuron.

A vertical pleural suture (c) divides the pleuron into an anterior episternum (es) and a posterior epimeron (em). At the top of the pleural suture the episternum and epimeron are produced into a narrow arm or wing process, or alifer (pp). Just anterior to the wing process is a second arm-like process which is the basalare or episternal epipleurite (bl). In the membrane above the epimeron lies the epimeral

epipleurite or the subalare (sa), traversed by the axillary cord. The epimeron is divided by a suture into a preepimeron (pem) and a postepimeron (pm). The postepimeron is continued dorsally as the post-alar bridge. As in the mesothorax, the coxa is closely attached to the pleuron, and consists of the eucoxa (ecx) and the meron (me). A small epicoxal piece (x) is also present between the meron and the eucoxa at the pleural margin.

The metathoracic spiracle (sp) lies in the membrane above the episternum and just cephalad of the basalare.

Sternum.

The basisternum is greatly reduced and very narrow. Lateral extensions of the basisternum form the preepisternum and border the mesal margins of the episternum. The episternum sends up a long arm anterior to the coxae which border the posterior margin of the basisternum and forms the pre-coxal bridge. The furcasternum extends caudad between and behind the coxae and gives off an internal forked furca. Lateral extensions of the furcasternum join prolongations of the epimera and form the post-coxal bridge. The meron is attached to the post-coxal bridge by a membrane.

Legs

Coxae. (Figs. 3, 4, 12)

The prothoracic coxa (cx) is not articulated directly with the propleuron but with a small triangular trochantin (trn) which lies along the ventral margin of the episternum. The fore coxa is a short stout segment, widest at the proximal end, narrowest distally.

The mesothoracic and metathoracic coxae, as previously mentioned, are closely united with the pleura and have no movement upon them. They are divided by the basicostal suture (bc) of Snodgrass or meral suture of Crampton into the anterior convex eucoxa (ecs) or veracoxa and the lateral and posterior meron (me). A membrane connects the meron with the postcoxal bridge in the posterior region of the segment. Both eucoxa and meron are produced distally into small knobs or trochantifers (Crampton) which serve as coxotrochanteral articulations.

Trochanters.

The trochanters of all the legs are similar, and consist of very short irregularly-globose segments freely movable on the trochantifers of the coxae. Distally the trochanter is provided with a slight indentation or pocket which holds a proximal process of the femur.

Femora.

The femora (fe) of the prothoracic and metathoracic legs are approximately equal in length and thickness, but the mesothoracic femur is slightly longer and more slender than the others. The femur is a stout segment, thickest at the middle. It is always smooth, without spines or spurs, but is densely clothed with long hairs.

Tibiae.

The tibia (ti) of the prothoracic leg is slightly shorter andmuch more slender than the femur. Its proximal end is produced into a flat plate-like hinge which is closely applied to the distal end of the femur. Mesally the tibia bears a narrow leaf-like membranous epiphysis (epi) which is attached near the proximal end and extends almost to the distal end, closely applied to the tibia.

The tibia of the mesothoracic leg is of approximately the same length as the femur. It becomes gradually wider distally, and at the distal end bears a pair of hinged tibial spurs (spu) on its mesal margin. The anteriormost of these spurs is slightly shorter than the posterior one. The spurs are about one-fourth the length of the tibia.

The tibia of the metathoracic leg is considerably longer than the femur, and although it is slender at the proximal

end, distally it is swollen and equal to the femur in thickness. Mesally the tibia bears two pairs of apical articulated spurs (spu), one of each pair shorter than the other, and equal in length to those on the mesothoracic leg.

Tarsi.

The tarsus is composed of five short segments or tarsomeres. The basal tarsal segment, which is from two to three times the length of the others, is called the basitarsus (bt). The second segment is slightly less than half as long as the basitarsus. The third, fourth, and fifth are subequal in size, the fourth being smallest. Each tarsal segment bears, on its mesal or ventral side, three rather irregular rows of small spines.

Pretarsus. (Fig. 11)

The distitarsus (dt), or distal tarsal segment of each leg, bears a claw-bearing region or pretarsus, which represents a vestigial segment homologous with the dactylopodite of other Arthropods. The structure of the pretarsus is similar in each leg.

Two prominent curved bifid claws or ungues (ung) are borne on a small dorsal plate or unguifer. Laterally two membranous pulvilli (pv) arise from the membrane at the base of the claws. The pulvilli are also bilobed, and are thickly

clothed with hairs. Between the claws there is found the median dorsally-articulated pad-like arolium (ar), which consists of two lobes. Supporting the pads of the arolium is a narrow curved U-shaped sclerite called the camera (cm). A membranous area separates the camera from the planta (pl), a sclerotized, slightly curved plate from which the arolium arises. In the membrane between the bases of the pulvilli lies the unguitractor (unp). Extending from the proximal border of the unguitractoral plate through the tarsal segments to the tibia and femur there is a strong unguitractor tendon (ten) which flexes the claws.

Wings

The family Arctiidae is characterized by the apparently four-branched condition of cubitus, caused by the union of veins M_2 and M_3 with cubitus at the base of the discal cell; and by the coalescence of subcosta with radius in the hind wing for a considerable distance, at least a fifth of the length of the cell, and usually a half, but never beyond the end of the cell.

The venation is based on the Comstock-Needham system and the interpretations of Forbes (1920).

Fore-wing. (Fig. 20)

The fore-wings or primaries of virgo are triangular in shape with rounded apical and anal angles.

Radius is five-branched. R_3, R_4, and R_5 are stalked, and with R_2 rise from the upper angle of the discal cell. R_1 rises free from the cell a short distance from the upper angle. Although the three branches of media are present, they rise directly from the discocellular vein across the end of the cell, since the basal portion of media is lost. The dotted lines within the cell represent the theoretical position of media. The first branch of media rises from just below the upper angle of the cell, cutting off a short radio-medial cross-vein or upper discocellular region on the discocellular vein. M_2 and M_3 are associated with Cu_1 at the lower angle of the cell. The branches of M are separated by a short medial cross-vein or lower discocellular vein. Cu_1 rises just below the lower angle and is separated from M_3 by a short medio-cubital cross-vein. The second branch of cubitus rises from the cell about half the distance from the base of the wing.

The second anal vein is the only anal retained in the fore-wing. The position of the first anal vein is marked by a submedian groove or fold in the anal region. There is only a very faint indication of the third anal vein in the basal region of the wing.

Hind Wing. (Fig. 20)

The hind wings or secondaries are very broad. The anal angle has been completely lost, so that the wings are nearly circular along the outer and inner margins.

Sc + R_1 are fused for about half the length of the cell. Rs and M_1 spring from the upper angle of the cell, and are separated only by a very short radio-medial cross-vein or upper discocellular vein. The medial cross-vein has been retained between M_2 and M_3 at the lower angle, but the medio-cubital vein has been obliterated since both M_3 and Cu_1 rise directly from the angle. Both 2nd and 3rd anals are well-developed, but the 1st anal has dropped out.

Frenulum. (Figs. 9, 10)

In order to coordinate the movements of the wings in flight, the fore-wing is attached to the hind wing by means of a frenulum (f) which is characteristic of most of the families of the higher Heterocera. The frenulum of the male consists of a single strong spine-like seta or bristle borne on the humeral angle of the hind wing. The tip of the frenulum is held by a frenulum hook (fh), a hook-like projection of the membrane which hangs down over the subcosta on the ventral side of the fore-wing.

In the female the frenulum consists of several more slender bristles on the humeral angle. Usually three setae

of equal length constitute the frenulum, but often there are four, and sometimes five, of varying lengths. Comstock believes that the single bristle of the frenulum of the male has resulted from the fusion of several such as are found in the female. The female is likewise more primitive in that the frenulum hook is not developed. The tips of the bristles are held in a retinaculum (ret) or cluster of strong hairs on the ventral side of the cubital vein.

Axillary Sclerites. (Fig. 7)

The fore-wings are attached to the thorax by a wing membrane which extends between the tegula and the axillary cord (ax). Within the membrane are several axillary sclerites which serve as articulatory points between the wing veins and the notum (Fig. 7).

The first axillary sclerite of Snodgrass, or the notale (n) or notopterale of Crampton, is an X-shaped sclerite. Its anterior cephalic arm articulates with the lateral margin of the suralare (sur) and with the subcostal head or prolongation of the subcostal vein. Its posterior arms both articulate with the adnotale (al) of the tergal margin. A lateral arm is hinged to the second axillary sclerite or mediale (m). The medialis consists of a series of plates lying at the base of the radius, cubitus, and media. They comprise not only the second axillary of Snodgrass, but his

median plates as well. The distal plate is closely hinged to the third axillary or basanale (ba), a V-shaped sclerite associated with the base of the anal veins. A small fourth axillary connects the basanale with the tip of the adanale or posterior wing process. It is generally considered to be merely a detached portion of the arm of the adanale. A conspicuous flexor muscle is attached to the basanale. At the base of the anal vein there is a prominent basal knob or basoplica (bp), which, when the wings are laid over the abdomen in repose, fits into a marsupium (r) or pocket between the basoplica and the medialeS. A parategula or basicosta, the humeral plate of Snodgrass, is closely associated with the subcostal head at the base of Costa.

The hind wing bears on its humeral angle the frenulum. From the base of the frenulum the alar membrane stretches caudad to the axillary cord. The first axillary or notale (n) articulates with the base of the subcostal vein or subcostal head. Its mesal margin lies close to the lateral lobe of the scutum, against the suralare. The second axillary or mediale (m) consists of four closely associated plates. The most proximal abuts against the first axillary. A second one is associated with the base of radius; and two others are less closely associated with the base of cubitus. The third axillary or basanale (ba) is articulated with one

of the distal plates of the mediale group by means of a cephalic arm. A caudal arm of the basanale reaches to the long-drawn-out adanale of the scutum. The third axillary is associated with the bases of the anal veins.

Abdomen

The abdomen (Fig. 14) consists of ten segments. The dorsal sclerotized area of each somite is called the tergite (t), and the ventral plate the sternite (s). A lateral or pleural membranous region lies between the dorsum and the sternum, and contains the abdominal spiracles. The segments are connected by conjunctival membranes. Normally each tergite or sternite slightly overlaps the following tergite or sternite. A narrow anterior border of each tergite is demarked by an antecostal suture (an) (Snodgrass 1935) which indicates the presence of an internal ridge or antecosta to which muscles are attached. This anterior flange is the acrotergite (ac) or precosta of Snodgrass, which he believes represents the portion of the preceding tergite which was stranded behind the articulatory or conjunctival membrane when secondary segmentation occurred. The antecosta then represents the primary intersegmental fold. According to this theory, the acrotergite of the first abdominal segment forms the metathoracic postscutellum. Acrosternites are present in the sternal plates but are not so evident.

The lateral margin of the first abdominal tergite is heavily sclerotized and bears a groove which Forbes (1916) believes represents the tergopleural suture (tp). The rest of the first tergite is entirely membranous or only very slightly sclerotized. A small pleural sclerite (pu) or pleurite (Forbes, 1916) lies just below the groove. The groove continues caudad through the second tergite and demarks a second abdominal pleurite. Only the first and second segments have distinct sclerotized areas in the pleural membrane.

On the line where the abdominal pleuron joins the metathoracic post-epimeron there is developed an elliptical expansion which extends outwardly and posteriorly. This is the hood or bulla (th) of the tympanum. Forbes (1916) believes it to be the resonator of an auditory organ corresponding to the one in certain Hemiptera. Packard (1883) calls attention to the fact that "several moths of this family have been known to produce a stridulating noise by rubbing their hind legs over a vesicular expansion of the thorax," and it is possible that these sounds are heard by means of the auditory organ mentioned above.

Seven abdominal spiracles (sp) are present, located slightly below the lateral margins of the first seven tergites. The first spiracle is situated far cephalad on the somite,

beneath the postero-ventral margin of the tympanal hood. The first two spiracles lie below the sclerotized pleural plates. Miss Newell (1918) calls attention to the fact that the eighth spiracle is present in the larva, but becomes rudimentary in the pupa.

The first abdominal sternite has been lost. The second sternite is elongate and rests against the posterior coxae. The second sternite may possibly represent the fusion product of the true first and second sternites, since it lies below both first and second tergites.

Male Genitalia. (Figs. 15, 17)

The ninth and tenth abdominal segments of the male are modified for mating. The eighth segment consists of an elongated tergite and a small sternal plate at the base of the genitalia. The whole segment constitutes a tube into which the genitalia are withdrawn when not in use. Normally the genital segments are completely retracted within the eighth segment except for the tips of the uncus and valves or harpes. The tip of the abdomen is heavily clothed with long hairs which conceal the terminal structures.

The ninth segment is modified to form a narrow ring. Distally the dorsal arch or tegumen (tg) of the ninth segment bears an elongated tubular spine-like protuberance or uncus (un) which apparently represents the modified tergite of the

tenth segment or an appendage of the tenth tergite. Since the remainder of the tenth somite is membranous, the uncus has become secondarily attached to the tegumen.

The ninth sternite consists of an arch which articulates with the lateral margins of the tegumen. The distal edge of the ventral arch or vinculum (v) is heavily sclerotized, while the proximal region is membranous. The harpes (h) or valves which function as clasping organs during copulation are articulated to the lateral margins of the vinculum. Zander has shown that the harpes arise as true appendages of the ninth sternum, and Snodgrass (1931) states that there is little doubt that they are derivatives of the styli of more primitive insects. Since they are one-segmented, Eyer believes that they represent the basistylus.

The harpes are irregularly elliptical, extended at the tips, and widest across the center. The distal or apical end (valvulla or cucullus of Pierce) projects from the eighth somite as a blunt point when the genitalia are retracted. The proximal end is drawn out into a narrow point which approximates the other harpe mid-ventrally. The ventral or free margin of the harpe is sinuate, and the dorsal margin is irregular where it is attached to the vinculum, and bears a small finger-like lobe or digitus, which projects mesally. On its concave inner surface each harpe bears a prominent transverse projection or ridge.

The aedeagus (ae) is a curved chitinous tube which projects through the ninth segment between the harpes. The term "aedeagus" is here applied only to the sclerotized outer sheath of the penis, while the membranous eversible tip of the penis is termed the vesica (ves). The vesica is normally completely retracted within its chitinous sheath.

The aedeagus is supported by a membranous ring-wall or anellus. The ventral part of the anellus is more heavily sclerotized, although the whole tube forms a funnel through which the aedeagus protrudes. The ventral sclerotized area or juxta (jx) is a bilobed plate just distad of the elongated proximal tips of the harpes. Eyer (1926) believes that the juxta is homologous with the basal plate of more primitive insects; e.g., Ephemerida, which is formed by the uniting coxites or basal segments of the gonapophyses. In higher Lepidoptera Eyer (1924) shows that the harpes or basistyli, originally appendages of the coxites, lose the intimate connection with the juxta which primitive Lepidoptera show.

The rectum (rec) of the male passes through the ninth segment and opens just ventrad of the uncus. It is a membranous tube closely applied to the tergum.

Female Genitalia. (Figs. 16, 18)

As is true of other Lepidoptera, the female possesses no true ovipositor of the Orthopteroid type; that is, a

special egg-laying organ formed from the appendages of the genital segments. The terminal segments form a retractile tube which is extended during oviposition.

The eighth and ninth segments make up the so-called genitalia. The eighth segment consists of a dorsal tergite similar to the preceding tergites and an irregular sternite. The sternum bears the ostium bursae or the opening of the vagina (vg). The vagina is surrounded by sclerotized lips or plates which are parts of a lobe of the eighth sternite extended anteriorly. A chitinous tendon (or apodeme of Snodgrass) extends cephalad into the seventh segment for muscle attachment. A similar but more elongate tendon extends cephalad from the ninth segment. Snodgrass (1931) believes that the terminal or apparent ninth segment is the fusion product of the ninth and tenth somites. The segment consists of two flattened hairy lateral lobes. Between them are the anus and the oviporus (op) or opening of the egg passage.

Although the male genitalia are highly specialized and show great variation even within a single genus, the female genitalia are generalized and show little variation from a common basic plan.

Other Genera

In order to determine the type of variation among the genera of Arctiidae, and to learn what characteristics can be used for separating them, three genotypes have been compared with Apantesis virgo L. Halisidota tessellaris A. & S., Phragmatobia fuliginosa L., and Estigmene acraea Dru. were chosen because they are the most common of the genotypes of the Arctiinae. Each species has been thoroughly compared morphologically with the basic study made of A. virgo, and a synopsis of the characteristics which vary from those of virgo is presented.

Although virgo is not the type species of Apantesis, A. vittata Fabr., the genotype, has been compared with virgo and with four other species of Apantesis, namely, arge Dru., virgincula Kirby, nais Dru., and phalerata Harris. This study has revealed that no important morphological difference exists within this group of species, with one outstanding exception: the male genitalia are distinctly different, and a species can be recognized from the genitalia alone.

HALISDOTA TESSELLARIS A. & S. (Figs. 21, 22, 24, 31)

Head: The labrum is exposed below the clypeus and bears well-developed pilifers and "epipharynx." The labial palpi are upturned over the frontal region, and the distal segment

is minute. The antennae of the male are bipectinate, but the pectinations are shorter than those of virgo. The antennae of the female are asymmetrically serrate, with two rows of teeth, the teeth of the inner row shorter. The number of antennal segments varies from 62 to 74. The proboscis is much more strongly developed than in virgo, with very elongate and more numerous papillae.

Thorax: The pronotal lobes (pn) are broader than in virgo, and their mesal margins are more concave. The episternum (es) has a sharp incision into which the articulatory tip of the trochantin (trn) fits. The arms of the prothoracic spinasternum (ss) are fused with the mesothoracic basisternum (bs) far from the sternal lobes, and enclose a nearly equilateral triangle. The preepisternum (pes) is greatly enlarged and obliterates most of the episternum proper. The preepisternal suture (u) has migrated laterad and is not continued to the anepisternal suture (a). The legs are similar to those of virgo.

Wing venation: The fore-wing is long and narrow with a sharply pointed apex. R_1 and R_2 rise from the discal cell. R_3, R_4, and R_5 are stalked, R_5 arising first. M_1 springs from the upper angle of the cell, M_3 from the lower angle, M_2 just above it, and Cu_1 some distance below. The hind wing has distinct apical and anal angles. $Sc + R_1$ is not produced

to the inner margin. Rs and M_1 rise from the upper angle of the cell, M_2 and M_3 from the lower angle.

Male genitalia: The tegumen (tg) is slightly lobed at the apex, and has two curved, finger-like, hair-bearing, lateral projections or penicula (pen). The uncus (un) is spine-like and hairy. The juxta (jx) is bifurcate. The harpe (h) is roughly quadrangular, with the ventral edge extended proximally into a sharp point. The apex is blunt, and a spine-like protuberance from the inner surface projects beyond it. Dyar distinguishes H. harrisii Walsh from tessellaris A. & S. by the fact that in harrisii the spine-like appendage does not project beyond the apex. The dorsal margin near the apex bears a small lobe-like projection. A transtilla (trs) (Pierce) or chitinous band connects the dorsal or inner margins of the harpes near the bases and passes behind the aedeagus just below the rectum.

PHRAGMATOBIA FULIGINOSA L. (Figs. 23, 27, 32)

Head: The labrum is retracted behind the clypeus as in virgo, with the pilifers and epipharynx inconspicuous. The labial palpi are porrect, with the third segment half as long as the second. The proboscis is minute, scarcely longer than the head. The antennae are filiform or slightly moniliform, not pectinate or serrate, and consist of about forty segments.

Thorax: The prothorax in general is similar to virgo, although a definite suture demarks the episternum from the precoxal bridge. The arms of the prothoracic spinasternite (ss) are fused with the mesothoracic basisternum (bs) about halfway to the sternal lobes. There is a broad preepisternum (pes) distinctly separated from the katepisternum by the preepisternal suture which is continued to the anepisternal suture, as in virgo. The legs are similar to virgo, but the spurs are very short.

Wings: The apex of the fore-wing is blunt and pointed. R_1 rises free from the apical cell. R_2, R_3, R_4, and R_5 are stalked, R_2 rising first, near the base of the stalk; R_3 usually rises next, although R_5 may. M_1 springs from just below the upper angle, M_3 from the lower angle, M_2 just above it, and Cu_1 just below. The hind wing is broad and rounded. $Rs + M_1$ rise from the upper angle. R_2 springs from far above the lower angle, and M_3 and Cu_1 from the lower angle.

Male genitalia: The uncus (un) is blunt, stout, and tongue-like. The harpes (h) are very narrow and elongate, with the distal end drawn out into a long narrow point. The ventral margin bears a small lobe near the apex. The dorsal or inner margin bears a longer curved finger-like projection opposite the first lobe, and near the base a narrow elongate point which is attached to the vinculum. The transtilla (trs)

does not form a complete transverse band, but projections from the basal prongs of the harpes extend inward and the central portion is membranous. The juxta (jx) has slightly concave margins and a membranous part of the anellus extends beyond the sclerotized ventral plate. The aedeagus (ae) is deeply bilobed with small spines at the apices of the lobes. It is not heavily sclerotized throughout its length, and laterally is covered with small scale-like spines. The lateral tips of the ventral ring or vinculum (v) are bifurcate. One arm extends dorsally, and the other mesally and articulates with the tegumen.

ESTIGMENE ACRAEA DRU. (Figs. 25, 28, 29, 30)

Head: The labrum is retracted beneath the clypeus and the pilifers are inconspicuous. The palpi are small and porrect; the first segment is longest and the third is slightly shorter than the second. The proscis is greatly reduced to less than twice the length of the head. Antennae of the male are asymmetrically bipectinate, with the anterior row of pectinations short. The female has serrate antennae with a single ventral row of teeth.

Thorax: The prothorax is, in general, like virgo, but has a much narrower precoxale. The spinasternal arms of the prothorax are joined to the basisternum of the mesothorax less than half the distance to the sternal lobes, enclosing a

small heart-shaped membranous area. The preepisternum is distinct from the katepisternum, as in virgo. The thoracic sclerites of acraea have been figured by Shepard (1930, fig. 41).

Legs: The fore tibia is very short, no longer than the basitarsus, but the mesothoracic and metathoracic tibiae are twice as long as the basitarsi of the middle and hind legs. The fore tibia, as in virgo, bears a stout epiphysis attached near the proximal end, but unlike virgo, there are two dorsal conical spines at the distal end. The anterior spine is shorter than the posterior. The middle tibia bears ventrally a pair of short apical spurs, of which the posterior is shorter, while it bears dorsally two short terminal spines, of which the posterior is much larger. These spines are less strongly developed than those of the fore legs. The hind tibia has two pairs of spurs, the proximal pair much smaller, often very minute, and hidden beneath the hairs of the legs. The tibial spines are much less developed, the anterior one with a mere indication.

Wings: The fore wing is narrower than in virgo. R_2, R_3, R_4, and R_5 are stalked, R_2 rises near the base of the stalk, and R_5 next. M springs from the upper angle of the cell. M_2 and M_3 rise from the lower angle, and Cu_1 arises just below the angle. The hind wing is broad, and more

angular than in virgo. Sc + R_1 rises from the middle of the cell. Rs springs from the angle and M_1 just below the angle. M_2, M_3, and Cu_1 rise from the lower angle.

Genitalia: The uncus (un) is stout and tongue-shaped with two small prongs, one extending ventrad and one dorsad. A scaphium or gnathos (sca), part of the tenth segment, is present as a protruding shelf just above the anal opening. The juxta (jx) is wide and articulated with the harpes. The vesica usually protrudes from the aedeagus as a membranous sac covered with small spines or cornuti. The harpes (h) are asymmetrical. The left harpe bears ventrally a prominent long arm which is absent on the right harpe. The apex may be bilobed or simple, and the lobes on the ventral margins may be several or none.

Summary of Generic Characteristics.

From the study of these species, representing four of the most important genera of the Arctiinae, it was found that the following characters may vary in the various genera:

1. Labial palpi: The palpi may be strongly developed or relatively inconspicuous; they may be porrect (extending straight out from the head capsule) or upturned over the frons; and the segments may or may not be of equal size.
2. Antennae: Although the number of segments varies within narrow limits even with the species, the approximate number of segments is fairly constant for the genus Apantesis, and differs from the approximate number in the other genera examined. The form of the antenna is an important character.
3. Proboscis: The proboscis may be weakly developed and inconspicuous, or more strongly developed with the papillae more or less conspicuous.
4. Labrum: The labrum may be almost completely retracted behind the clypeus or it may be more conspicuous; the pilifers and "epipharynx" may be scarcely distinguishable from the rest of the labrum or may be represented by strongly developed lobes.

5. Spinasternum: The arms of the prothoracic spinasternum are fused in these genera with the mesothoracic basisternum and enclose a variously-shaped membranous area.
6. Preepisternum: The preepisternum may be a narrow anterior border of the episternum or it may be developed into a more conspicuous sclerite which overlaps the episternum.
7. Legs: The legs bear spines, spurs, and epiphyses which may be lacking in some cases or well-developed in others.
8. Wings: Wing venation has long been an important taxonomic character.
9. Genitalia: The genitalia of the males are specifically distinct, and the genitalia of the species of the genus Apantesis are fundamentally alike. The genitalia of the females have not been compared.

Although some of the above characters may prove to be of specific importance only when compared with spedies other than the genotypes, and still other characteristics may be added after other genera are examined, they represent the essential morphological differences by which these four genera may be distinguished.

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ABBREVIATIONS

A - anal vein
a - anepisternal suture
ac - acrotergite
ad - adanale
ae - aedeagus
aes - anepisternum
al - adnotale
an - antecostal suture
anf - antennifer
ar - arolium
as - antennal suture
asc - antennal sclerite
at - antenna
ax - axillary cord

ba - basanale
bc - basicostal or meral suture
bl - basalare
bp - basoplica
bs - basisternum
bt - basitarsus

c - pleural suture
cd - cardo
cm - camera
Cu - cubitus
cx - coxa

dc - discal cell
dt - distitarsus

e - compound eye
ecx - eucoxa
em - epimeron
ep - epipharynx
epi - epiphysis
es - episternum

f - frenulum
fc - fronto-clypeus
fe - femur
fh - frenulum hook
fl - flagellum
fp - frontal pit
fr - frontal suture
fs - furcasternum

ga - galea
gp - gular pit

h - harpe
hu - humeral angle

jx - juxta

kes - katepisternum

l - labrum
la - labial region
lc - laterocervicale
lh - left harpe
lp - labial palpus

M - media
m - median ossicle
m-cu- medio-cubital crossvein
md - mandible
me - meron
mp - maxillary palpus
mv - mid-ventral suture

n - notale
ni - notal incision

o - ocellus
oc - ocular sclerite
occ - occiput
ocd - occipital condyle
ocs - occipital suture
of - occipital foramen
op - oviporus
os - ocular suture

p - pedicel
pa - parietal
pad - postadanale
pcx - postcoxale
pem - preepimeron
pen - peniculus
pes - preepisternum
pfr - pilifer
pge - postgena
pgs - postgenal suture
ph - phragma
pl - planta
pls - pleurosternite
pm - postepimeron
pn - pronotum
poc - postocciput
pos - postoccipital suture
pp - pleural wing process
pr - precoxale
pra - prealare
psc - prescutum
psl - postscutellum
pt - patagium
ptg - parategula
pu - pleurite
pv - pulvillus

R - radius
r - marsupium or basosinus
rec - rectum
ret - retinaculum
rh - right harpe
r-m - radio-medial crossvein
Rs - radial sector

s - sternite
sa - subalare
Sc - subcosta
sc - scutum
sca - scaphium
scp - scape
sgs - subgenal suture
sh - subcostal head
sl - scutellum
sp - spiracle

spu - spur
ss - spinasternite
st - subtegula
stp - stipes
sur - suralare

t - tergite
teg - tegula
ten - tendon
tg - tegumen
th - tympanal hood
ti - tibia
tin - tegular incision
tp - tergo-pleural groove
tr - trochanter
trn - trochantin
trs - transtilla
ts - tarsus

u - preepisternal suture
un - uncus
ung - ungues
unp - unguitractor plate

v - vinculum
ves - vesica
vg - vagina
vx - vertex

x - epicoxal piece

EXPLANATION OF PLATES

PLATE I

1. Frontal view of the head
2. Caudal view of the head (with right palpus removed)
3. Prothoracic leg
4. Mesothoracic leg
5. Antenna of male
6. Antenna of female

PLATE II

7. Dorsal view of thorax (with right tegula and patagium removed, showing axillary sclerites)
8. Lateral view of thorax (with tegula removed)
9. Frenulum of male
10. Frenulum of female
11. Pretarsus
12. Metathoracic leg
13. Ventral view of tegula

PLATE III

14. Lateral view of abdomen of male
15. Lateral view of male genitalia
16. Lateral view of female genitalia
17. Ventral view of male genitalia
18. Ventral view of female genitalia
19. Ventral view of pro- and meso-thorax
20. Fore and hind wings

PLATE IV

Halisidota

21. Ventral view of prothorax and portion of mesothorax
22. Ventral view of male genitalia
24. Cross-section of antenna of female
31. Fore and hind wings

Phragmatobia

23. Ventral view of mesothoracic basisternum
26. Right harpe
27. Ventral view of male genitalia
32. Fore and hind wings

Estigmene

25. Ventral view of mesothoracic basisternum
28. Fore and hind wings
29. Cross-sections of male and female antennae
30. Ventral view of male genitalia

Plate I

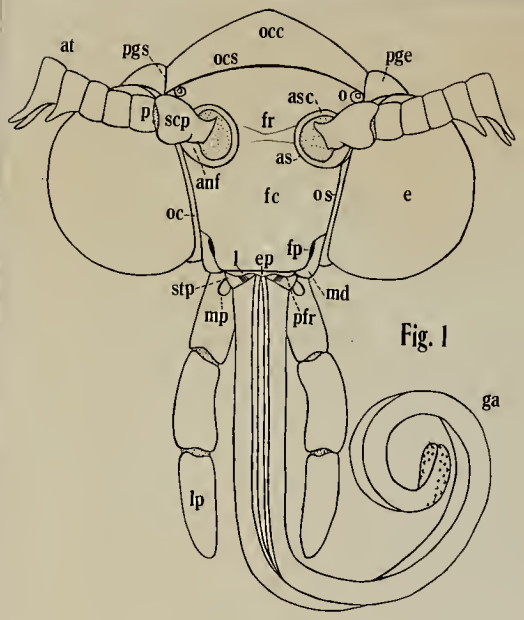


Fig. 1

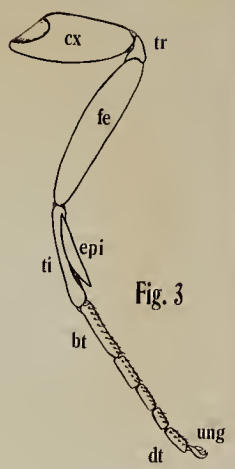
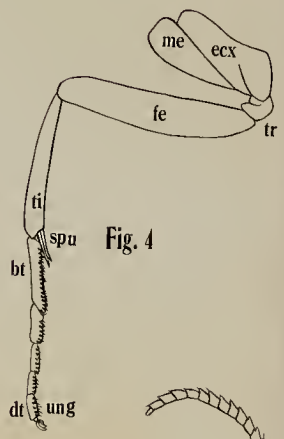


Fig. 3



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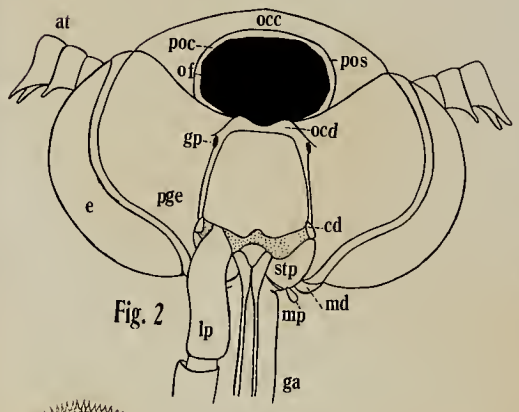

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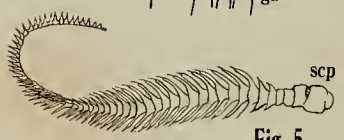

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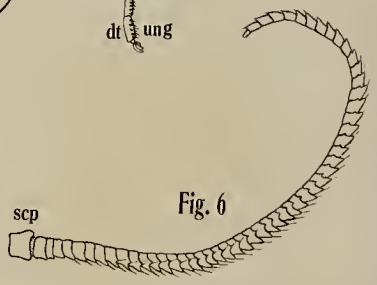
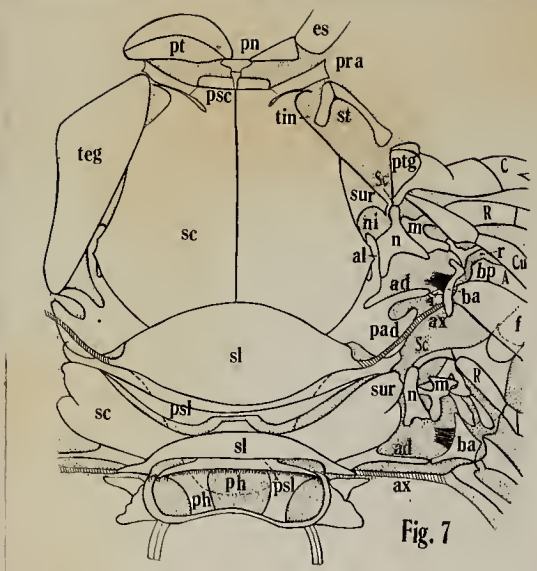


Fig. 6

Plate II



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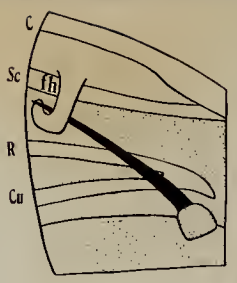


Fig. 9

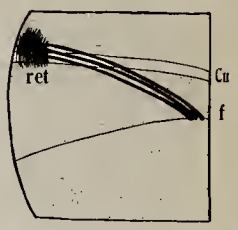
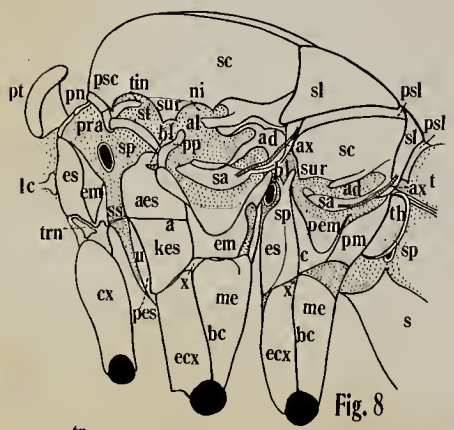


Fig. 10



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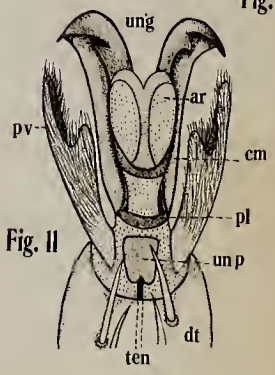
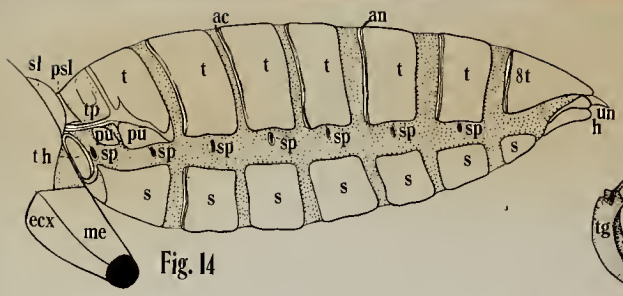


Fig. 11

Fig. 12


Fig. 13

Plate III



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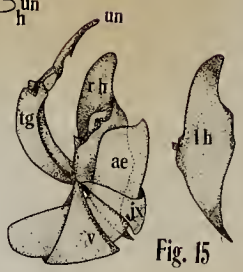
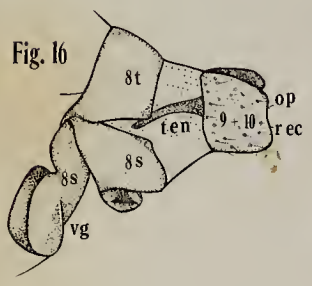


Fig. 15



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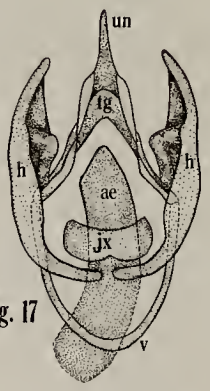

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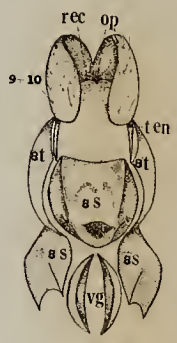

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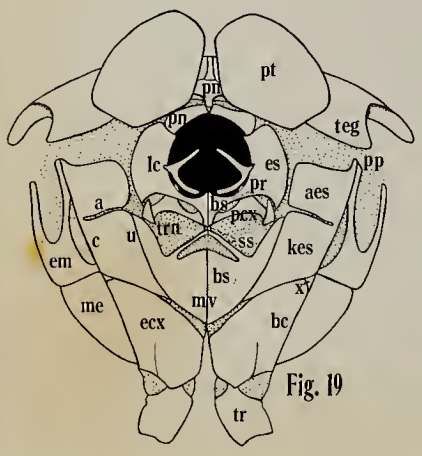

Fig. 19

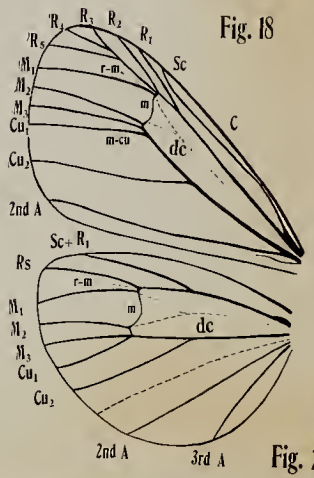

Fig. 20

Plate IV

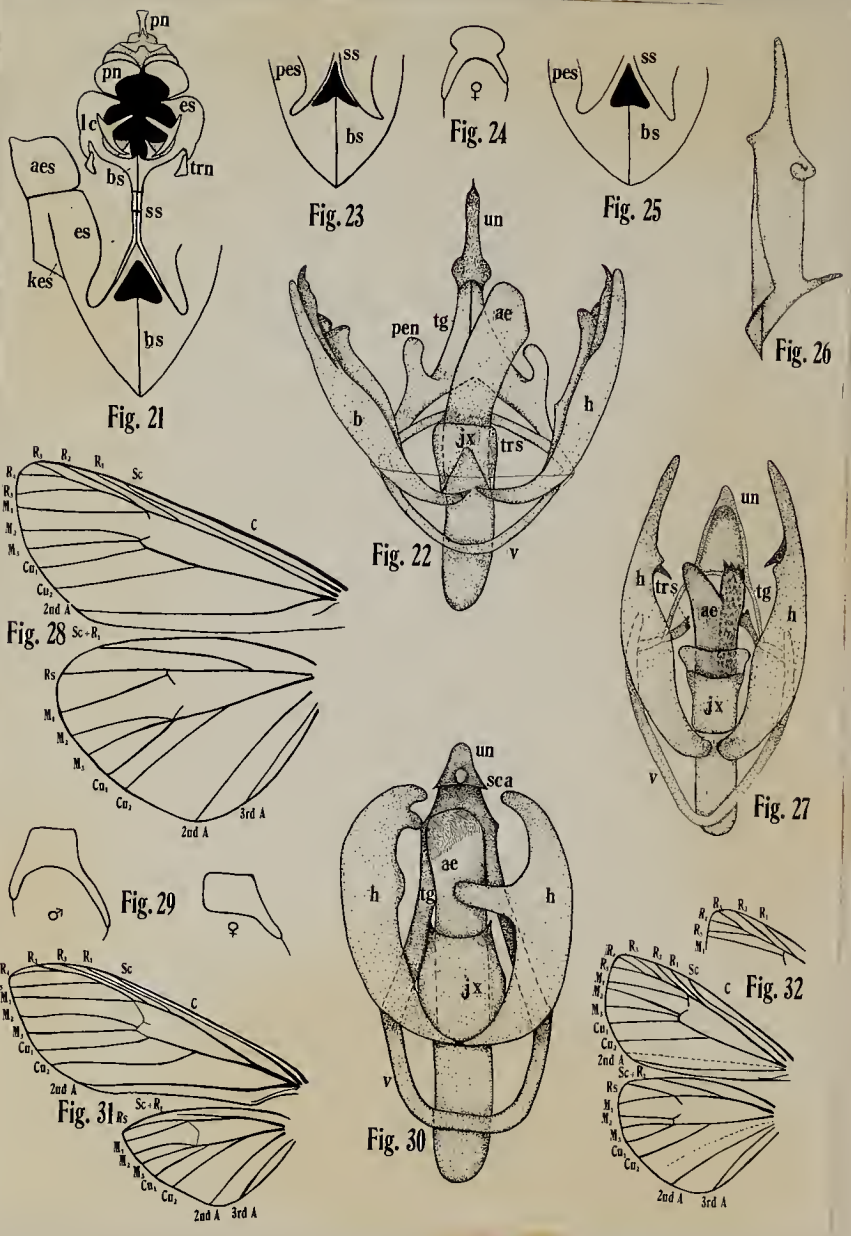
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Fig. 21
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Fig. 25
Fig. 26
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trs
v
Fig. 22
C
2nd A
Fig. 28
Sc+R1
Rs
M1
M2
M3
Cu1
Cu2
2nd A
3rd A
un
h
trs
ae
tg
h
jx
v
Fig. 27
♂
Fig. 29
♀
un
sca
ae
h
tg
h
jx
v
Fig. 30
C
2nd A
Fig. 31
Sc+R1
Rs
M1
M2
M3
Cu1
Cu2
2nd A
3rd A
C
Fig. 32
2nd A
Sc+R1
Rs
M1
M2
M3
Cu1
Cu2
2nd A
3rd A

PART TWO

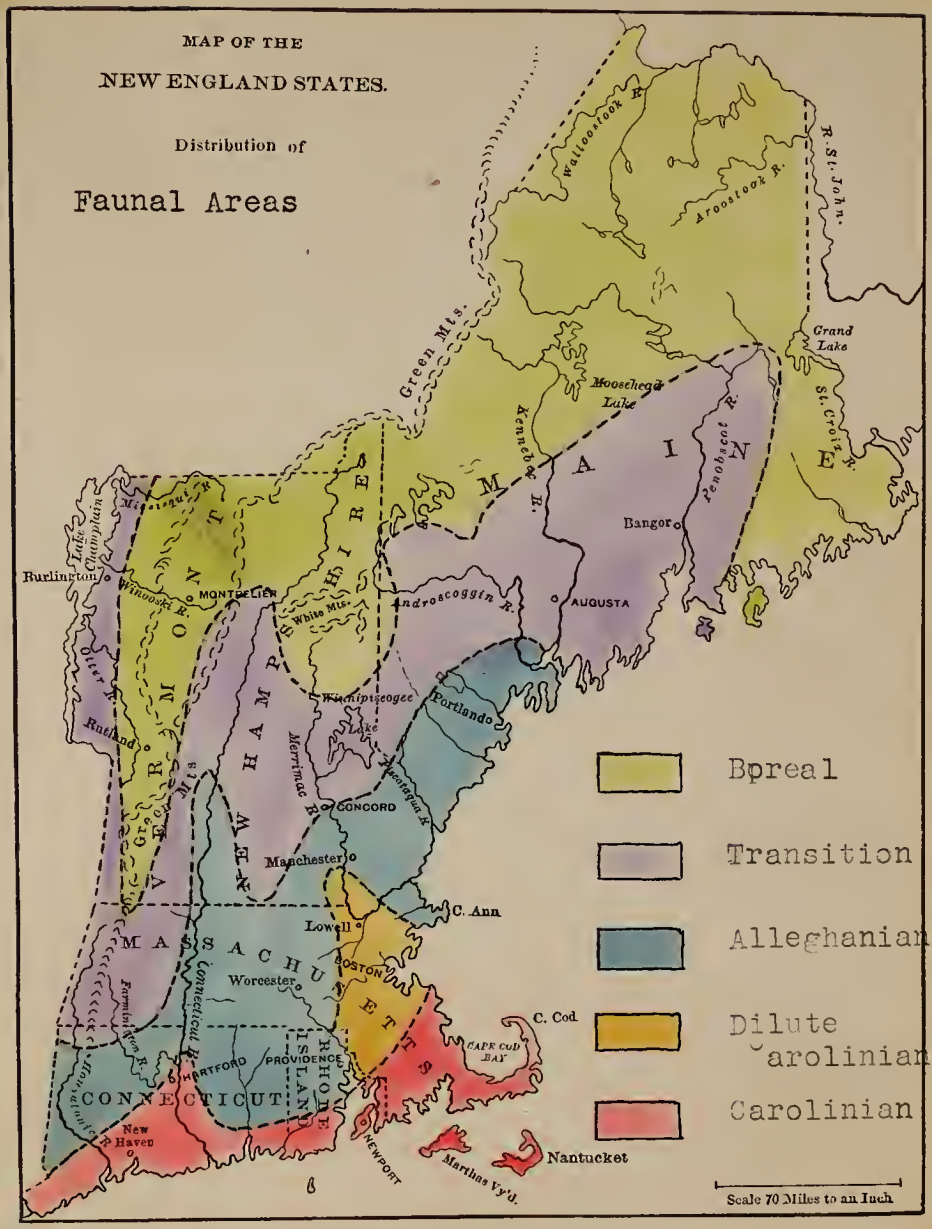
The Geographical Distribution of the Arctiidae of New England

This list of the locality records for the species of Arctiidae known to occur in New England has been compiled from three sources: first, from collections in museums, educational institutions, and experiment stations; second, from collections made by private individuals; and last, from references in the literature. The collections at the Museum of Comparative Zoology at Harvard University, the Boston Society of Natural History, the American Museum of Natural History in New York City, the Peabody Museum in Salem, Massachusetts, the Connecticut Experiment Station in New Haven, Connecticut, and the Massachusetts State College in Amherst, Massachusetts, have been examined personally, but other records have been gathered through correspondence.

The check-list of Barnes and McDunnough (1917) has been followed in the listing of genera and species, and synonyms and sources of original descriptions are included. After each locality there is given the source of the record, which may be the name of the collector, the location or owner of the collection, or the author who mentions the species.

To all who have contributed to this list the writer is deeply indebted and wishes to express sincere appreciation for the help which they have given, and without which such a check-list would not have been possible. Special thanks are due Dr. Richard Dow, Curator of insects at the Boston

Museum of Natural History; Prof. D. W. Farquhar of the College of the City of New York; Mr. C. V. Blackburn of Stoneham, Massachusetts; Mr. William Procter of Bar Harbor, Maine; Mr. L. P. Grey of Lincoln, Maine; and Dr. C. P. Alexander of Massachusetts State College.


MAP OF THE
NEW ENGLAND STATES.
Distribution of
Faunal Areas
Boreal
Transition
Alleghanian
Dilute Carolinian
Carolinian
Scale 70 Miles to an Inch
MAINE
VERMONT
NEW HAMPSHIRE
MASSACHUSETTS
CONNECTICUT
RHODE ISLAND
Green Mts.
Penobscot R.
Androscoggin R.
Merrimac R.
Connecticut R.
Grand Lake
St. Croix R.
R. St. John.
Aroostook R.
Wallostook R.
Moosehead Lake
Bangor
AUGUSTA
Portland
Winnipiseogee Lake
CONCORD
Manchester
Lowell
C. Ann
BOSTON
Worcester
C. Cod
CAPE COD BAY
HARTFORD
PROVIDENCE
New Haven
NEWPORT
Marthas V'y'd.
Nantucket
Burlington
Lake Champlain
MONTPELIER
Winooski R.
White Mts.
Otter R.
Rutland
Green Mts.
Pawtucket R.

Faunal Areas of New England

The faunal map on Page 3 shows the division of New England into the faunal zones worked out by Scudder in his "Butterflies of the Northeastern States."

The northern parts of Maine and New Hampshire and the Green Mountain range in western Vermont as far south as Mt. Greylock in Massachusetts, lie within the Boreal zone. Three distinct parts of the Boreal zone are recognized. The Arctic or Arctic-Alpine is found only above timber-line on the highest peaks of the White Mountains of New Hampshire, the Green Mountains of Vermont, and Mt. Katahdin in Maine. The Hudsonian zone is characterized by forests of spruce and fir, and is found on the higher levels (in general, above 3500 feet) of the mountains of Maine, New Hampshire, and Vermont. The Canadian zone occupies the entire Boreal region below 3500 feet.

A coastal strip along the southern part of Connecticut, Rhode Island, and Massachusetts, including all of Cape Cod, Martha's Vineyard, and Nantucket, lie within the Upper Austral or Carolinian zone. An arm of the Carolinian follows the Connecticut River northward almost to the Massachusetts line, and an area in eastern Massachusetts along the Atlantic Coast possesses a fauna which is not typically Carolinian but has been called a Dilute Carolinian.

The greater part of New England lies between the Boreal and Carolinian zones and is known as the Transitional zone, characterized by the overlapping of boreal and austral species. The area may be divided into two regions, - an arid Transitional, and a humid Transitional or Alleghanian. The arid region covers central Maine, New Hampshire, parts of Vermont, and western Massachusetts. Most of Massachusetts, Connecticut, and Rhode Island lies in the Alleghanian.

ABBREVIATIONS

ABK - A.B.Klots, Bull. Brook. Ent. Soc. 26:1931.

AEB - Dr. A. E. Brower, Bar Harbor, Me.

ATS - Mrs. A. T. Slosson

BSNH - Boston Society of Natural History

CFG - C. F. Goodhue, Ent. News 13: 1902.

CFP - Mrs. C. F. dos Passos, Mendham, N. J.

CSC - Connecticut State College, Storrs, Conn.

CVB - C. V. Blackburn, Stoneham, Mass.

DWF - Dr. D. W. Farquhar, College of the City of New York

EJS - E. J. Smith collection, Peabody Museum, Salem, Mass.

ETL - Dr. E. T. Learned, Fall River, Mass.

Fbs - Dr. W. T. M. Forbes, Cornell University

FHW - F. H. Walker, Salem, Mass.

FM - Fairbanks Museum, St. Johnsbury, Vt.

Grt - A. R. Grote, Proc. Ent. Soc. Phil. III: 1864.

Har - Museum of Comparative Zoology, Harvard University

Harris- "Injurious Insects," Harris

HGD - Harrison G. Dyar

HLB - H. L. Bailey, Montpelier, Vt.

HLJ - Harry L. Johnson, South Meriden, Conn.

JAM - J. A. Manter, Connecticut State College, Storrs, Conn.

JVS - J. V. Schaffner

LPG - L. P. Grey, Lincoln, Me.

MEF - Mrs. Maria E. Fernald

MES - Marion E. Smith, Massachusetts State College, Amherst, Mass.

MSC - Massachusetts State College, Amherst, Mass.

N.H. - Connecticut Experiment Station, New Haven, Conn.

NY - American Museum of Natural History, New York City.

Pack - A. S. Packard, "Guide to the Study of Insects"

VGD - Vincent G. Dethier, Harvard University

WJC - W. J. Clayton, Lincoln, Me.

WP - William Procter, Bar Harbor, Me.

Subfamily Nolinae

Celama Walker

841 pustulata Walker, Cat.Brit.Mus.XXXIII:795:1865.
(Plate I)
(nigrofasciata Zeller, obaurata Morrison)
Me. Orono (MEF); Kittery (DWF).
N.H. Webster (CFG); Squam Lake (BSNH).
Mass. Nantucket, Cohasset, Princeton (BSNH);
Framingham (DWF).

842 cilicoides Grote, Bull.Buff.Soc.I:175:1873. (Plate I)
Me. Kittery (DWF).
N.H. Webster (CFG).

844 triquetrana Fitch, First Rept.Ins.N.Y.244:1856. (Plate I)
(trinotata Walker, sexmaculata Grote)
N.H. Webster (CFG).
Mass. Bedford (JVS); Winchendon (BSNH).
Conn. New Haven, New Britain (NH).
R.I. Bradford (JVS).

846 ovilla Grote, Can.Ent.VII:221:1875. (Plate I)
Me. Rangeley (CFP).
N.H. Webster (CFG).
Mass. Framingham, Cohasset (BSNH); Newton (DWF);
Marblehead (FHW); Stoneham, Woburn (CVB).
Conn. New Haven (NH).

847 clethrae Dyar, Can.Ent.XXXI:62:1899. (Plate I)

Me. Kittery Point (DWF).

Mass. Cohasset, Framingham (BSNH); Woods Hole (Fbs); Newton (DWF); Fall River (AEB).

Conn. New Haven, East River (NH).

Nigetia Walker

850 formosalis Walker, Cat.Brit.Mus.XXXIV:1506:1865. (Plate II)

(melanopa Zeller)

Conn. (DWF).

Roeselia Hubner

851 minuscula Zeller, Verh.Zool.-Bot.Ges.Wien.XXII:455:1872. (Plate II)

Me. Orono (MEF).

N.H. Jaffrey (DWF).

Mass. Cohasset (BSNH); Stoneham (CVB).

R.I. Killingly Pond (ABK).

minuscula (a) phylla Drury, Jour.N.Y.Ent.Soc.VI:43:1898.

N.H. Jaffrey (BSNH).

Mass. Cohasset, Southbridge (BSNH).

Conn. New Haven (NH).

Subfamily Lithosiinae

Lexis Wallgr.

855 bicolor Grote, Proc.Ent.Soc.Phil.III:74:1864. (Plate IV)

(argillacea Packard)

Me. N.E.Harbor (WP); Capens (DWF); Orono (MEF); Bar Harbor (CVB); Lincoln (AEB).

N.H. Webster (CFG); Mt. Washington (EGS).

Crambidia Peck

856 pallida Packard, Proc.Ent.Soc.Phil.III:99:1864.
(Plate III)

Me. Orono (MEF); Bar Harbor (AEB).

N.H. Webster (CFG); Franconia (NY).

Mass. West Roxbury, Martha's Vineyard, Cohasset, Framingham (BSNH); Amherst (MES); Winchendon (NY); Woods Hole (Fbs); Sherborn (EJS).

Conn. East River (NH);

R.I. Killingly Pond (ABK).

860 casta Sanborn, Pack.Guide Study Ins.284:1869. (Plate III)
(candida Hy. Edw.)

Me. Bar Harbor (AEB); Enfield (LPG).

N.H. Webster (CFG); Berlin Falls (BSNH).

Illice Walker

885 subjecta Walker, Cat.Brit.Mus.II:534:1854. (Plate IV)
(packardii Grote)

Mass. Nantucket (BSNH).

Conn. East River (NH).

Clemensia Packard

892 albata Packard, Proc.Ent.Soc.Phil.III:100:1864.
(Plate IV)
(albida Walker, cana Walker, umbrata Packard, irrorata Hy. Edwards, patella Druce, philodina Druce)

Me. Bar Harbor (WP); Pemaquid Point (NH); Norway (Har); Orono (MEF).

N.H. Franconia (ATS); Webster (CFG).

Mass. Manchester (NY); Sherborn (EJS).

Conn. East River, Mt. Carmel (NH).

R.I. Providence (HGD); Killingly Pond (ABK).

Palpidia Dyar

894 pallidior Dyar, Jour.N.Y.Ent.Soc.VI:34:1898. (Plate IV)

Me. Capens, N.E.Harbor (BSNH).

N.H. Mt. Washington (BSNH).

Hypoprepia Hubner

900 fucosa Hubner, Zutr.exot.Schmett.f.471:1825. (Plate V)

(tricolor Fitch)

Me. Norway, York, Kittery (DWF); Orono (MEF).

N.H. Epping (JVS); Webster (CFG); Squam Lake, Wolfboro (BSNH).

Vt. Bristol (JVS).

Mass. Amherst (MES); Princeton (BSNH); Beverly, Weston (Har); Sherborn (EJS); Williamstown (Grt).

Conn. New Haven, East River (NH); Pleasant Valley (DWF).

R.I. Bristol (BSNH); Providence (HGD).

fucosa (a) plumbea Hy.Edwards, Ent.Amer.II:0:1886. (Plate V)

Me. Kittery (Har).

Mass. Amherst (MSC).

899 miniata Kirby, Faun.Bor.Amer.IV:305:1837. (Plate V)

(vittata Harris)

Me. Orono (MEF); Kittery, York (DWF); Lincoln (CFP).

N.H. Webster (CFG); Squam Lake (BSNH).

Vt. Grand Isle (Har).

Mass. Malden, Beverly, Sherborn, Newbury, Framingham, Princeton, Edgarton, North Adams (BSNH); Newton, Wollaston (DWF); Marblehead (FHW); Weston, Chatham (Har); Phillipston (CFP); Amherst, Worthington (MSC).

Conn. East River, New Canaan, New Haven (NH); Storrs (CSC).

R.I. Bristol (BSNH).

Subfamily Arctiinae

Ammalo Walker

905 tenera Hubner, Zutr.exot.Schmett.I:7:1818. (Plate VI)

(collaris Fitch, antica Walker)

Me. Lincoln (DWF); Enfield (LPG); Dixfield (CFP).

N.H. Hanover (DWF); Webster (CFG).

Mass. Groton (BSNH); Amherst (MES); Great Barrington, Cohasset (DWF); Worcester (Fbs); Woburn, Stoneham (CVB); Townsend (CFP); Sherborn (EJS).

Conn. East River, New Britain, New Haven (MH).

R.I. Bristol (DWF).

907 inopinatus Hy. Edwards, Papilio II:13:1882. (Plate VI)

(nivalis Stretch, eglenensis Clemens)

Conn. Groton, Thompson (JVS).

Halisidota Hubner

915 caryae Harris, Rept.Ins.Mass.258:1841. (Plate VII)

(annulifascia Walker, porphyria Herrich-Schaeffer)

Me. Enfield (LPG); Orono (MEF); Kittery (DWF); York (AEB).

N.H. Webster (CFG); Claremont Junction (JVS).

Vt. Rutland (JVS); Bradford (HLB).

Mass. Malden, Cohasset (BSNH); Amherst (MSC); Framingham, Wellesley, Newton, Nantucket (DWF); Sherborn (EJS); Swampscott (FHW); Woburn, Stoneham (CVB); Williamstown (Grt).

Conn. South Meriden (HLJ); New Haven, Westville(NH).

R.I. Bristol (DWF).

918 maculata Harris, Rep.Ins.Mass.259:1841. (Plate VII)

(fulvoflava Walker, guttifera Herrich-Schaeffer)

Me. Kittery (NH); Bar Harbor, Ironbound Isle (WP); Orono (MEF); Wales (DWF); Norway, Frenchville, St. Francis, Van Buren, Grand Isle, Bangor (JVS); Lincoln (AEB).

N.H. Franconia (ATS); Webster (CFG); Whitefield, Fitzwilliam (DWF); Richford (JVS); South Hero (Fbs).

Vt. Barre (DWF); Bradford (HLB).

Mass. Beverly, Hudson (DWF); Salem (FHW); Winchendon (EJS).

R.I. Bristol (BSNH).

921 tessellaris Smith and Abbott, Lep.Ins.Ga.II:149:1797. (Plate VII)

(antiphola Walsh)

Me. Pemaquid Point (NH); Salisbury Cove, S.W.Harbor (WP); Lincoln, Bar Harbor (AEB); Enfield (LPG); Orono (MEF); Rangeley (CVP).

N.H. Franconia (ATS); Webster (CFG); Peterboro (VGD); Sullivan County (JVS).

Vt. Windsor County (JVS); Bradford (HLB).

Mass. Brookline, Cohasset, Medford, Winchendon, Martha's Vineyard (BSNH); Williamstown (Grt); Woburn, Stoneham (CVB); Amherst (MES); Sherborn (EJS); Buzzard's Bay (VGD).

Conn. New Haven, Guilford, Stonington (NH); South Meriden (HLJ); Storrs (CSC).

R.I. Bristol (BSNH).

922 Harrisii Walsh, Proc.Ent.Soc.Phil.III:430:1864. (Plate VII)

(indistinguishable from H. tessellaris except in larval stages)

Mass. Nantucket (DWF).

Eubaphe Hubner

931 laeta Guerin, Icon.Ins.pl.88, f.6,1829. (Plate VIII)

(treatii Grote, rubropicta Packard)

Me. Bar Harbor (AEB).

N.H. Webster (CFG).

Mass. Princeton, Medford (BSNH); Amherst (MES); Sherborn (EJS); Buzzard's Bay (VGD).

934 aurantiaca Hubner, Zutr.exot.Schmett.,f.411:1825. (Plate VIII)

(The forms of this species are difficult to separate and are frequently confused)

Me. N.E.Harbor, Monmouth, Salisbury Cover (BSNH); Wales (DWF); Orono (MEF).

N.H. Squam Lake (BSNH); Webster (CFG).

Vt. Bradford (HLB).

Mass. Milton, Bridgewater, Princeton, Cohasset, Barnstable (BSNH); Amherst (MES); Marblehead (FHW); Hadley (Fbs); Framingham (DWF); Sherborn (EJS); Boston (MY); Southbridge (DWF).

Conn. Westville (BSNH).

R.I. Bristol (BSNH).

aurantiaca (a) rubicundaria Hubner, Zutr.exot.Schmett. f.511:1825. (Plate IX)

(rosa Franch, diminutiva Graef)

Me. N.E.Harbor, Salisbury Cove, Eagle Lake (Mt.Desert Island), Monmouth, Wales (BSNH); Orono (MEF).

N.H. Franconia (ATS); Webster (CFG).

Mass. Southbridge, Princeton, Framingham (BSNH).

aurantiaca (b) ferruginosa Walker, Cat.Brit.Mus.II:535: 1854. (Plate IX)

Me. Kittery (DWF).

N.H. Webster (CFG); Mt. Washington (ATS); Savoy (BSNH).

Mass. Amherst (MSC); Framingham, Cohasset (BSNH); Sherborn (EJS).

Conn. New Haven, Stonington, Meriden, Colebrook, East Hartford (BSNH).

R.I. Bristol (BSNH).

aurantiaca (c) brevicornis Walker, Can.Brit.Mus.II:536: 1855. (Plate IX)

(belfragei Stretch)

Me. Kittery (DWF); East Bluehill (VGD).

N.H. Franconia (ATS); Webster (CFG); Peterboro (VGD).

Vt. Bradford (HLB).

Mass. Boston (NY); Newtonville, Wollaston, Arlington, Belmont (DWF); Woburn, Stoneham (CVG); Sherborn (EJS); Buzzard's Bay (VGD).

Conn. Litchfield (NY).

R.I. Bristol (BSNH); Killingly Pond (ABK).

aurantiaca (d) quinaria Grote, Proc.Ent.Soc.Phil.II:30: 1863. (Plate IX)

(choriona Reikirt, Bimaculata Saunders)

Me. Mt. Desert, Monmouth (BSNH); Salisbury Cove (WP); Norway (DWF); Lincoln, Enfield (LPG); Orono (MEF).

N.H. Webster (CFG); Franconia (NY).

Mass. Beverly, North Ipswich, Horseneck Beach, Martha's Vineyard (BSNH); Newtonville, Pingabog Swamp (NY); Sherborn (EJS).

R.I. Bristol (BSNH).

937 opella Grote, Proc.Ent.Soc.Phil.I:345:1863. (Plate VIII)

(obscura Strecker, rubricosta Ehrman)

Me. Orono (MEF).

N.H. Webster (CFG); Franconia (NY).

Mass. Malden Falls, Brookline (BSNH); Saugus, Marblehead (FHW).

R.I. Washington (BSNH).

opella (a) nigricans Reakirt, Proc.Ent.Soc.Phil.II: 371:1864. (Plate VIII)

(nigrifera Walker)

Mass. Melrose, Cohasset (BSNH); Sherborn (EJS).

opella (b) belmaria Ehrman, Can.Ent.XXVII:345:1895. (Plate VIII)

Mass. Mattapoisett (JVS).

938 immaculata Reakirt, Proc.Ent.Soc.Phil.II:372:1864. (Plate X)

Me. Monmouth, Northeast Harbor, Salisbury Cove, Lincoln (DWF); Bar Harbor (AEB); Enfield (LPG); Oquossoc, Dixfield (CFP).

N.H. Squam Lake (BSNH); Webster (CFG); Franconia (NY);
Mass. Savoy, Cohasset, Princeton (BSNH); Boston, Reading, Manchester (NH); Barnstable (DWF); Sherborn (EJS); Lake Quinsegasson (Fbs).
R.I. Bristol (HLC); Killingly Pond (ABK).

immaculata (a) trimaculosa Reakirt, Proc.Ent.Soc.Phil. II:372:1864. (Plate X)

N.H. Webster (CFG).
Mass. Sherborn (EJS).
Conn. (DWT).

Hyphoraia Hubner

942 Parthenos Harris, Agassiz's Lake Sup.309:1850. (Plate XI)
(Borealis Moeschler)

Me. Southwest Harbor, Machias, Isle of Springs, Bar Harbor, Salisbury Cove (BSNH); Northeast Harbor (WP); Enfield, Lincoln (LPG); Orono (MEF); Caribou, Princeton (DWF); St. John (JVS).
N.H. Mt. Moosilauke (BSNH); Mt. Washington, Crawford Notch (NY).
Vt. Mt. Mansfield (DWF).
Mass. Williamstown, Monroe (JVS).

943 lapponica Thunberg, Diss.Ent.II:40:1791. (Plate XI)
(hyperborea Curtis, Alpina Quensel, thulea Dalman, avia Hubner)

N.H. Mt. Washington (ATS).

Phragmatobia Stephens

948 fuliginosa Linnaeus, Syst.Nat.I:509:1858. (Plate XII)
(rubricosa Harris)

Me. Bar Harbor, Lincoln (AEB); Orono (MEF); Enfield (LPG).

N.H. Webster (CFG).

Vt. (JVS).

Mass. Framingham, Brookline, Princeton, Beverly, North Adams (BSNH); Amherst (MES); Nantucket, Fairhaven, Philipston (MSC); Woburn, Stoneham (CVB); Acoaxet (CFP); Revere (JVS).

Conn. New Haven, East River (NH); South Meriden (HLJ); Storrs (CSC).

R.I. Bristol (BSNH); Killingly Pond (ABK).

949 assimilans Walker, Cat.Brit.Mus.III:630:1855. (Plate XII)

Me. Orono (DWF).

N.H. Franconia (ATS).

Mass. Winchendon, Hudson (BSNH); Worcester (Fbs).

R.I. Bristol (BSNH).

assimilans (a) franconia Slosson, Ent.News II:41:1891. (Plate XII)

N.H. Franconia (ATS); Concord, Webster (CFG).

Diacrisia Hubner

953 latipennis Stretch, Zyg.Bomb.N.A.133:1872. (Plate XIII)

Mass. Amherst (MSC); Sherborn (EJS); Dorchester, Martha's Vineyard (BSNH); Wellesley, Forest Hills (DWF); Salem, Marblehead (FHW); Worcester (Fbs).

Conn. New Haven, New Britain (NH); South Meriden (HLJ).

R.I. Bristol (BSNH).

954 virginica Fabricius, Syst.Ent.Suppl.437:1798. (Plate XIII)

Me. Southwest Harbor (BSNH); Bar Harbor, Northeast Harbor (WP); Lincoln (AEB); Orono (MEF); Enfield (LPG); Rangeley (CFP).

N.H. Jaffrey (BSNH); Franconia (ATS); Webster (CFG); Peterboro (VGD).

Vt. Bradford (HLB); St. Johnsbury (FM).

Mass. Amherst, Lynn, Greenfield (MES); Savoy (NH); Framingham, Riverside, Winchendon, Nantucket, Princeton, Brookline (BSNH); Sherborn (EJS); Buzzard's Bay (VGD); Williamstown (Grt).

Conn. New Haven (NH); South Meriden (HLJ); Storrs (CSC).

R.I. Bristol (BSNH).

Isia Walker

957 isabella Smith & Abbot, Pep.Ins.Ga.II:131:1797.

(Plate XIV)

(californica Packard)

Me. Bar Harbor, Lincoln (AEB); Southwest Harbor (BSNH); Salisbury Cove (WP); Orono (MEF); Enfield (LPG); Dixfield (CFP).

N.H. Webster (CFG); Franconia (ATS).

Vt. St. Johnsbury (FM); Bradford (HLB).

Mass. Amherst, Lynn, Greenfield (MES); Winchendon, Brookline, Cohasset, Boston, Auburndale (BSNH); Sherborn (EJS); Williamstown (Grt).

Conn. New Haven (NH); Storrs (CSC).

R.I. Bristol (BSNH).

Hyphantria Harris

958 textor Harris, Rep.Ins.Mass.255:1841. (Plate XV)

(candida Walker)

Me. Bar Harbor, Northeast Harbor (WP); Salisbury Cove (BSNH); Orono (MEF); Kittery (DWF); Lincoln (AEB); Enfield (LPG).

Mass. Brookline, Cohasset, Natick, Winchendon, Chatham, Martha's Vineyard, Nantucket, Auburndale, Malden, Dorchester (BSNH); Medford, Worcester (DWF); Westboro (Fbs); Sherborn (EJS).

Conn. Pequonock, East Granby (NH); New Haven (BSNH); South Meriden (HLJ).

R.I. Bristol (BSNH); Killingly Pond (DWF).

959 cunea Drury, Ill.exot.Ent. 36:1773. (Plate XV).

(punctatissima Smith & Abbot, budea Hubner, punctata Fitch, pallida Packard, suffusa Strecker, brunnea Strecker)

Me. Orono (MEF); York (DWF).

N.H. Webster (CFG); Hampton (DWF).

Vt. Bradford (HLB).

Mass. Malden, Martha's Vineyard (BSNH); Amherst (MSC); Marblehead (FHW); Stoneham (CVB); Sherborn (EJS).

Conn. New Haven, Westville, Wallingford (NH); Storrs (CSC).

R.I. Bristol, Newport (BSNH).

Estigmene Hubner

960 acraea Drury, Ill.Exot.Ent.I:pl.3,f.2:1770. (Plate XVI)

(caprotina Drury, menthrastrina Martyn, pseudermínea Packard, californica Packard, packardi Schaupp, klagesi Ehrman)

Me. Bar Harbor, Salisbury Cove (WP); Southwest Harbor (BSNH); Lincoln (AEB); Enfield (LPG); Orono (MEF); Rangeley (CFP).

N.H. Franconia (ATS); Webster (CFG).

Vt. Bradford (HLB).

Mass. Boston, Cambridge, Roxbury, Quincy, Chelsea, Saugus, Lynn (Harris); Brookline, Cohasset, Framingham (BSNH); Amherst (MES); Williamstown (Grt); Sherborn (EJS); Buzzard's Bay (VGD).

Conn. New Haven, Westville (NH); South Meriden (HLJ); Storrs (CSC).

R.I. Bristol (BSNH).

acraea (a) dubia Walker, Cat.Brit.Mus.III:682:1856. (Plate XVI)

(ricksecker Behr)

Me. Kittery (DWF).

Mass. Dorchester, Nantucket (BSNH); Worcester (Fbs); Woburn (CVB); Sherborn (EJS).

962 prima Slosson, Ent.Amer.V:40:1889. (Plate XVI)

Me. Orono, Norway (DWF); Bar Harbor, Passadumkeag (AEB); Lincoln (WJC).

N.H. Franconia (ATS); Webster (CFG).

Mass. Winchendon (BSNH); Forest Hills (DWF); Fall River (ETL); Sherborn (EJS); Woburn (CVB).

963 congrua Walker, Cat.Brit.Mus.III:669:1856. (Plate XVI)

(antigone Strecker)

Me. Lincoln, Enfield (LPG); York, Kittery (DWF); Bar Harbor (WP).

N.H. Squam Lake, Jaffrey (BSNH); Webster (CFG); Franconia (NY).

Mass. Martha's Vineyard, Framingham, Cohasset, Nantucket, Brookline (BSNH); Amherst (MES); Cambridge, Lynnfield (DWF); Sherborn (EJS); Salem (FHW); Stoneham, Woburn (CVB); Paxton (Fbs).

Conn. New Haven (DWF); South Meriden (HLJ).

R.I. Bristol (BSNH); Providence (HGD).

Ecpantheria Hubner

964 deflorata Fabricius, Syst.Ent.582:1775. (Plate XVII)
(scribonia Stoll, oculatissima Smith & Abbot, chryseis Olivier)

N.H. Squam Lake (BSNH); Webster (CFG).

Mass. Martha's Vineyard, Cohasset (BSNH); Nantucket (DWF); Buzzard's Bay (VGD).

Conn. New Haven, Westville, Stonington (NH).

R.I. Bristol (BSNH).

Apantesis Walker

971 virgo Linnaeus, Syst.Nat.501:1758. (Plate XVIII)
(ab. simplex Stretch, ab. citrinaria Neumogen & Dyar)

Me. Staceyville, Northeast Harbor, Machias (BSNH); Lincoln, Enfield (LPG); York (DWF); Orono (MEF); Bar Harbor (AEB); Kittery (Har); Rangeley (CFP).

N.H. Glen House, Squam Lake (BSNH); Webster (CFG); Wolfboro, Mt. Washington, Jefferson (ETL).

Vt. Lake Dunmore (BSNH); Ferrisburg (DWF); Bradford (HLB); St. Johnsbury (FM); Randolph (Har).

Mass. Princeton, Warwick, Cohasset (BSNH); Amherst (MES); Acoaxet (ETL); Taunton, Nantucket (DWF); Marblehead (FHW); Townsend Harbor (CVB); Weston, Chatham (Har); Sherborn (EJS); Buzzard's Bay (VGD); Williamstown (Grt).

Conn. Ivoryton, Mystic (ETL); New Haven (NH).

R.I. Bristol (BSNH); Warwick (DWF).

972 intermedia Stretch, Zyg.Bomb.N.A.216:1874. (Plate XVIII)

Me. Bar Harbor (AEB).

N.H. New London (JVS); Campton, Hampton (DWF).

Mass. Stoneham (CVB).

Conn. South Meriden (HLJ).

intermedia (form) stretchi Grote, Can.Ent.VII:197:1875. (Plate XVIII)

Mass. Amherst (MSC).

973 parthenice Kirby, Faun.Bor.Amer.IV:204:1837. (Plate XIX)

(saundersi Grote, circa Stretch)

Me. Orono, Kittery, Monmouth, Lincoln, Isleford (DWF); Northeast Harbor (WP); Vassalboro (AEB); Rumford Falls, Woodland (BSNH); Enfield (LPG).

N.H. Webster (CFG); Mt. Washington (ATS); Mt. Monddnock (ETL); Manchester, Squam Lake, Jaffrey (DWF); Randolph (BSNH).

Vt. Bradford (HLB).

Mass. Martha's Vineyard, Princeton (BSNH); Worcester, Newton, Middleton, Dennis (DWF); Sherborn (EJS); Woburn (CVB).

Conn. New Haven, Fairfield (NH); South Meriden (HLJ).

R.I. Bristol (DWF).

974 rectilinea French, Can.Ent.XI:45:1879. (Plate XX)

Mass. Newton, Newtonville (Har); Sherborn (EJS).

rectilinea (a) conspicua Stretch, Jr.N.Y.Ent.Soc.XIV:122: 1916. (Plate XX)

Mass. Milton, Sherborn, Woodland (BSNH); Dorchester (har).

975 oithona Strecker, Lep. Rhop. et Het.131:1877. (Plate XX)

Me. Woodland, Aroostook County (DWF).

Mass. Sherborn (BSNH); Newtonville (DWF); Salem, Marblehead (FHW); Amherst (MSC).

R.I. Bristol (BSNH).

976 michabo Grote, Can.Ent.VII.197:1875. (Plate XXI)

Me. Kittery Point (Har); Bar Harbor (WP).

N.H. Jefferson (ETL).

Mass. Marblehead (FHW).

michabo (a) minea Slosson, Ent.News III:257:1892. (Plate XXI)

N.H. Franconia (ATS).

977 arge Drury, Ill.Exot.Ent.1:35:1770. (Plate XXII)

(dione Fabricius, incarnatorubra Gooze, coelebs Martyn, nerea Boisduval, doris Boisduval)

Me. Kittery Point (DWF).

N.H. Webster (CFG).

Vt. Bradford (HLB).

Mass. Athol (JVS); Princeton, Natick, Malden (BSNH); Framingham, Manomet, Cohasset, Wollaston, Nahant, Newton, Seekonk, Cambridge, Forest Hills,(DWF); Sherborn (EJS); Stoneham, Woburn (CVB); Buzzard's Bay (VGD); Amherst (MES).

Conn. New Haven, Woodmont, Wallingford (NH); South Meriden (HLJ).

R.I. Bristol (DWF).

arge (a) nervosa Neumogen & Dyar, Ent.News IV:142:1893. (Plate XXII)

Mass. Sherborn (BSNH); Fall River (ETL).

Conn. New Haven (ETL).

979 anna Grote, Proc.Ent.Soc.Phil.II:433:1863. (Plate XXIII)

Me. Lincoln (LPG).

N.H. Alpine Summit, Mt. Washington (Pack).

Mass. Malden (BSNH); Salem, Marblehead (FHW).

anna (a) persephone Grote, Proc.Ent.Soc.Phil.II:433:1863. (Plate XXIII)

Me. Monmouth (BSNH); Lincoln (LPG); Kittery Point (DWF); Bar Harbor (AEB).

N.H. Webster (CFG).

Mass. Malden, Dorchester (BSNH); Newtonville (DWF); Weston (Har); Sherborn (EJS); Amherst (MSC).

Conn. South Meriden (HLJ).

R.I. Bristol (BSNH); Providence (HGD).

980 quenselii Paykull, Act.Hafn.II:99:1793. (Plate XXVI)
(strigosa Fabricius, gelida Moschler, liturata Menetries, complicata Walker, speciosa Moschler)

Me. Mt. Katahdin (AEB).

N.H. Mt. Adams (DWF); Mt. Washington, Alpine Gardens (NY, Har, BSNH).

982 virgincula Kirby, Faun.Bor.Amer.IV:304:1837. (Plate XXIV)
(speciosa Moeschler)

Me. Southwest Harbor (BSNH); Enfield, Lincoln (LPG); Albion, Kittery (DWF); Orono (MEF); Bar Harbor (AEB); Pemaquid Point (NH).

N.H. Jefferson (CFP); Franconia, Bretton Woods (BSNH); Webster (CFG); Squam Lake (DWF); Alpine Summit, Mt. Washington (ATS).

Mass. Princeton, Sherborn, Dorchester (BSNH); Newtonville, Taunton (DWF); Marblehead, Salem (FHW); Fall River (ETL); Stoneham, Woburn (CVB); Amherst (MES); Malden (Har).

Conn. New Haven (NH); Storrs (CSC).

R.I. Bristol (BSNH).

virgincula (a) otiosa Neumogen & Dyar, Ent.News IV:142: 1893. (Plate XXIV)

Mass. Sherborn (EJS); Amherst (MES).

R.I. Bristol (DWF).

989 phyllira Drury, Ill.Exot.Ent.1:15:1770. (Plate XXV)

(batra Goeze, plantaginis Martyn, dodgei Butler)

Me. Dixfield, Enfield (CFP).

N.H. Jaffrey (BSNH); Webster (CFC).

Mass. Nantucket (BSNH); Sherborn (EJS); Milton, Lexington, Cape Cod, Newton, Newtonville, Rowley (DWF); Amherst (Fbs); Stoneham, Woburn (CVB); Weston (Har).

Conn. New Haven, Wallingford (NH); South Meriden (HLJ).

R.I. Providence (HGD).

990 figurata Drury, Ill.Exot.Ent.II:22:1770. (Plate XXV)

(ceramica Hubner, f-pallida Strecker)

Me. Dixfield (DWF); Orono (MEF); Enfield (LPG).

N.H. Hampton (DWF).

Mass. Cohasset, Martha's Vineyard (BSNH); Newton (DWF); Sherborn (EJS); Worthington, Weston (Har).

Conn. New Haven (NH); South Meriden (HLJ).

R.I. Bristol (BSNH).

figurata (a) excelsa Neumogen, Papilio III:70:1883.
(Plate XXV)

Mass. Framingham, Brookline (BSNH); Stoneham (CVB);
Weston (Har).

figurata (b) franconia Edwards, Ent.Amer.3:184:1888.
(Plate XXV)

N.H. Franconia (BSNH).

991 celia, Proc.Ent.Soc.Phil.II:59:1863. (Plate XXVI)

Me. Orono (DWF).

N.H. Franconia (NY).

Mass. Stoneham, Woburn (CVB); Weston (Har); Sherborn
(EJS).

995 nais Drury, Ill.Exot.Ent.I:14:1770. (Plate XXVII)
(cuneata Goeze, defloriana Martyn, ochreata Butler)

N.H. Webster (CFG).

Mass. Winchendon (BSNH); Framingham, Cohasset, Dorchester
(DWF); Sherborn (EJS); Fall River, South Swansea
(ETL); Woburn, Stoneham (CVB); Amherst (MSC).

Conn. New Haven, Westville, East River (NH).

R.I. Bristol (DWF).

996 phalerata Harris, Cat.Ins.Mass.73:1837. (Plate XXVII)
(rhoda Butler)

Me. Kittery Point (DWF).

Mass. Beverly, Sherborn (BSNH); Cohasset, Brookline, Framingham (DWF); Natick (EJS); South Swansea, Acoaxet (ETL); Woburn, Stoneham (CVB); Weston, Stratton, Seekonk, Nahant (Har); Amherst (MES).

Conn. South Meriden (HLJ); New Haven (DWF).

R.I. Bristol (DWF); Killingly (ABK).

vittata Fabricius, Mant.Ins.II:127:1787. (Plate XXVIII)

(decorata Saunders)

Me. Kittery Point (DWF); Enfield (CFP).

Mass. Cohasset, Dorchester (BSNH); Marblehead (FHW); Sherborn (EJS); Waltham, Newton (DWF); Woburn, Stoneham (CVB); Weston, Natick (Har); Fall River, Medford (ETL); Nantucked, Amherst (MSC).

Conn. New Britain (NH); West Granby (DWF); Storrs (Biggs).

R.I. Bristol (DWF).

radians Walker, Cat.Brit.Mus.III:632:1855. (Plate XXVIII)

(colorata Walker, incompleta Butler)

Mass. Salem (FHW); Forest Hills (DWF); Westport (CFP).

Conn. South Meriden (HLJ).

Euchaetias Lyman

1015 egle Drury, Ill.exot.Ent.II:pl.20,f.3:1773. (Plate XXIX)

Me. Lincoln (LPG); Orono (MEF); York, Kittery (DWF).

N.H. Webster (CFG); Concord (DWF); Peterboro (VGD).

Vt. Bradford (HLB).

Mass. Sharon (NH); Beverly (BSNH); Melrose, Saugus, Newton, Medford, Cambridge (DWF); Sherborn (EJS); Stoneham, Woburn (CVB); Marblehead, Salem (FHW); Andover, Weston (Har); Buzzard's Bay (VGD); Amherst (MES).

Conn. New Haven, Westville, East River, New Britain, Woodbury (NH).

R.I. Bristol (DWF).

1018 oregonensis Stretch, Zyg.Bomb.N.A.187:1873. (Plate XXIX)

Me. Kittery Point (DWF); Orono (MEF).

N.H. Webster (CFG).

Mass. Lynnfield, Wakefield (JVS); Taunton, Newtonville (DWF); Stoneham, Montrose, Woburn (CVB); Salem (FHW); Sherborn (EJS).

Arctia Schrank

1025 caja (a) americanus Harris, Rep.Ins.Mass.246:1841. (Plate XXX)

Me. Lincoln, Aroostook County (DWF); Rangeley (CFP).

N.H. Webster (CFG); Dover, Concord, Madbury (DWF); Jefferson (CFP).

Vt. Bradford (HLB); Lake Dunmore (DWF).

Mass. Ware (DWF); Sandisfield (JVS); Middlefield (MSC).

Utetheisa Hubner

1029 bella Linnaeus, Syst.Nat.534:1858. (Plate XXXI)

Me. Ogunquit (BSNH); Bar Harbor (AEB); Lincoln (WJC); Witch Hole Pond, Ironbound Island (WP); York Beach (DWF); Orono (MEF).

N.H. Mt. Washington (CFP); Peterboro (VGD); Webster (CFG).

Mass. Springfield (BSNH); Framingham, Nantucket, Needham, Danvers (DWF); Amherst (MSC); Marblehead (FHW); Stowe (VGL).

Conn. Storrs (WJM); South Meriden (HLJ); New Haven, Rainbow, Wallingford, Stonington, Manchester, Stamford, Stratford (NH).

R.I. Newport, Bristol (DWF).

Haploa Hubner

1031 clymene Brown, Ill.Zool.96:1776. (Plate XXXIII)

(interruptomarginata de Beauvois, comma Walker)

N.H. Webster (CFG).

Mass. Beverly, Boxford, Williamstown (JVS); Amherst (MES); Medford, Andover, North Adams, Cohasset, Princeton, Pride's Crossing, Ware, Malden (BSNH); Wareham, Dedham, Milrose (DWF); Marblehead, Salem (FHW); Sherborn (EJS).

Conn. Stonington, Orange (NH).

R.I. Bristol (BSNH); Killingly Pond (ABK).

1033 lecontei Boisduval, Icon.Reg.An.Ins.517:1829.

(Plate XXXII)

(leucomelas Herrich-Schaeffer)

Me. Lincoln (AEB); Orono (MEF).

N.H. Webster (CFG).

Vt. St. Albans (BSNH).

Mass. Winchendon, Southbridge, Princeton (BSNH); Amherst (MES); Sherborn (EJS).

R.I. Providence (HGD).

lecontei form militaris Harris, Rep.Ins.Mass.243:1841.

(Plate XXXII)

(confinis Walker, harrisii Dyar)

Me. Augusta (AEB); Enfield (LPG); Dixfield (CFP).

Mass. Ware, Princeton, Malden, Southbridge, Cohasset, Norwood, Beverly, Framingham (BSNH); North Abington (JVS); Amherst (MSC); Lawrence, Belmont, Taunton, Cambridge (DWF); Sherborn (EJS); Salem (FHW); Stoneham (CVB); Williamstown (Grt).

Conn. South Meriden (HLJ); Storrs (JAM); New Haven, Thompson (NH).

R.I. Newport (BSNH).

1034 confusa Lyman, Can.Ent.XIX:185:1897. (Plate XXXII)

Me. Enfield (LPG); Lincoln (AEB); Rangeley (CFP).

N.H. Claremont, Squam Lake (BSNH); Chocorua (NH); Newport (DWF).

Mass. Salem (FHW); Woburn (CVB).

1035 contigua Walker, Cat.Brit.Mus.III:651:1855.

(Plate XXXIII)

Vt. Mt. Ascutney (BSNH).

Mass. Hamilton (BSNH).

Summary of geographical distribution

Of the 200 species of Arctiidae listed by Barnes and McDunnough for boreal North America, 62 species and many varieties of these have been recorded from New England. 48 of these species, or the great majority, belong to the subfamily Arctiinae, with comparatively few Nolinae and Lithosiinae.

53 of the 62 species have been recorded from Massachusetts, 50 from Maine, and 48 from New Hampshire. Rhode Island and Connecticut have a similar fauna, with 39 and 38 species respectively. Only 19 species have been recorded from Vermont, but Vermont has few collections and has not been adequately surveyed by entomological collectors. A thorough study of the Vermont fauna would probably reveal the presence of essentially the same species that occur in New Hampshire and Maine.

It is interesting to note how closely the fauna of New England parallels that of New York. The number of species of Arctiidae recorded from New England is approximately same as the number found in New York, but there are a few species which are not common to both regions.

Plate I

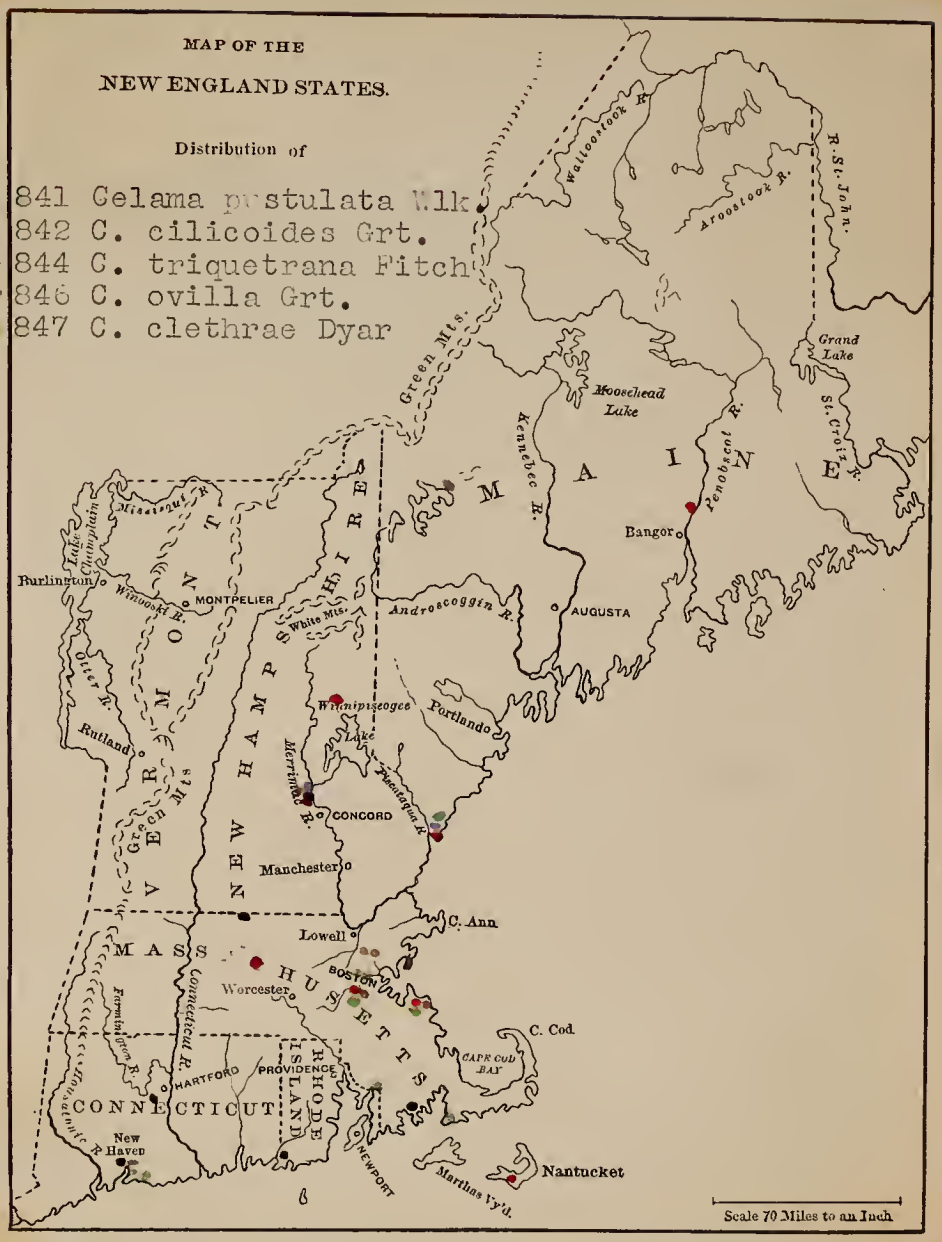

MAP OF THE
NEW ENGLAND STATES.
Distribution of
841 Celama pustulata Wlk.
842 C. cilicoides Grt.
844 C. triquetrana Fitch
846 C. ovilla Grt.
847 C. clethrae Dyar
Walloostook R.
Aroostook R.
R. St. John.
Grand Lake
Moosehead Lake
St. Croix R.
Kennebec R.
Penobscot R.
Green Mts.
MAINE
Bangor
Lake Champlain
Missisquoi R.
Burlington
Winooski R.
MONTPELIER
White Mts.
Androscoggin R.
AUGUSTA
VERMONT
NEW HAMPSHIRE
Otter R.
Rutland
Winnipiseogee Lake
Portland
Merrimack R.
Piscataqua R.
CONCORD
Green Mts.
Manchester
C. Ann
Lowell
MASSACHUSETTS
BOSTON
Worcester
Connecticut R.
Housatonic R.
HARTFORD
PROVIDENCE
RHODE ISLAND
C. Cod
CAPE COD BAY
CONNECTICUT
New Haven
NEWPORT
Marthas Vy'd.
Nantucket
Scale 70 Miles to an Inch
8

Plate II

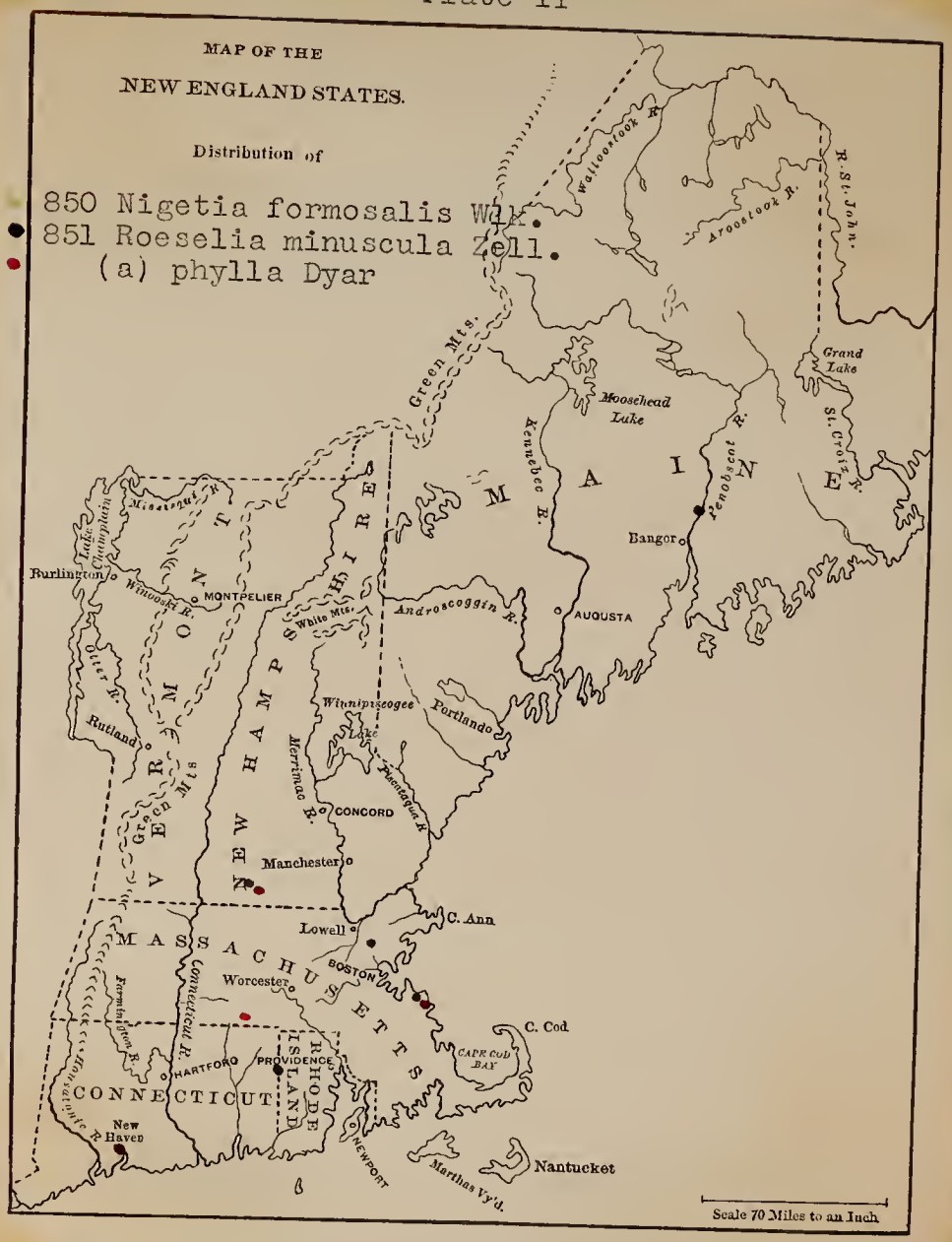

MAP OF THE
NEW ENGLAND STATES.
Distribution of
850 Nigetia formosalis Wlk.
851 Roeselia minuscula Zell.
(a) phylla Dyar
Waitoostook R.
Aroostook R.
R. St. John
Grand Lake
St. Croix R.
Green Mts.
Moosehead Lake
Kennebec R.
Penobscot R.
MAINE
Bangor
Missisquoi R.
Lake Champlain
Burlington
Winooski R.
MONTPELIER
White Mts.
Androscoggin R.
AUGUSTA
VERMONT
NEW HAMPSHIRE
Otter R.
Rutland
Green Mts.
Winnipiseogee Lake
Portland
Merrimac R.
Piscataqua R.
CONCORD
Manchester
C. Ann
Lowell
MASSACHUSETTS
Worcester
BOSTON
Connecticut R.
Farmington R.
C. Cod
CAPE COD BAY
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
New Haven
NEWPORT
Martha's Vy'd.
Nantucket
Scale 70 Miles to an Inch

Plate III

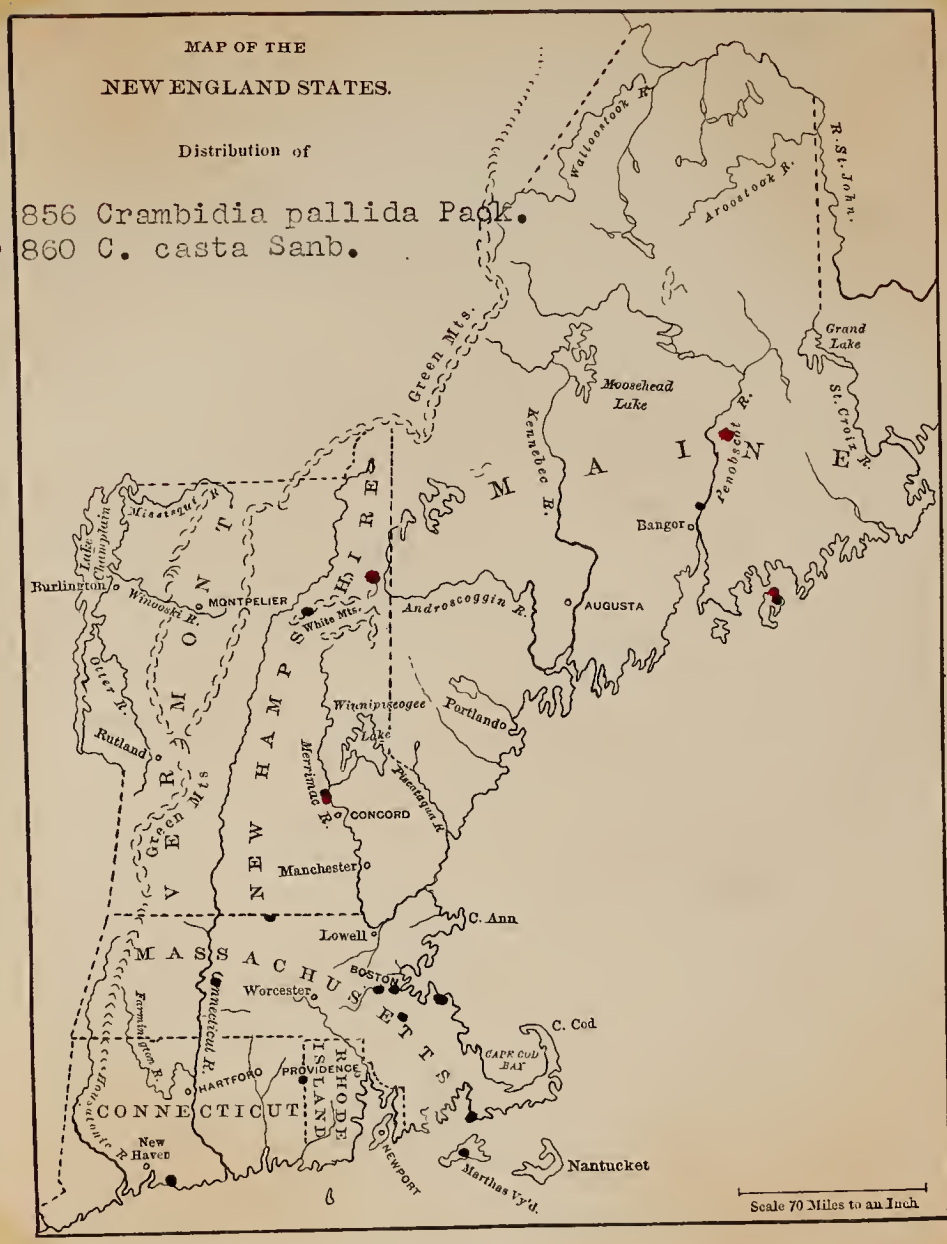

MAP OF THE
NEW ENGLAND STATES.
Distribution of
856 Crambidia pallida Pack.
860 C. casta Sanb.
Green Mts.
Wallostook R.
Aroostook R.
R. St. John.
Grand Lake
Moosehead Lake
Kennebec R.
Penobscot R.
St. Croix R.
MAINE
Bangor
AUGUSTA
Androscoggin R.
Missisquoi R.
Lake Champlain
Burlington
Winooski R.
MONTPELIER
White Mts.
NEW HAMPSHIRE
VERMONT
Otter R.
Rutland
Green Mts.
Winnipiseogee Lake
Portland
Merrimac R.
Pawtucket R.
CONCORD
Manchester
C. Ann
Lowell
MASSACHUSETTS
BOSTON
Worcester
Housatonic R.
Connecticut R.
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
New Haven
NEWPORT
CAPE COD BAY
C. Cod
Marthas Vy'd.
Nantucket
Scale 70 Miles to an Inch.

Plate IV

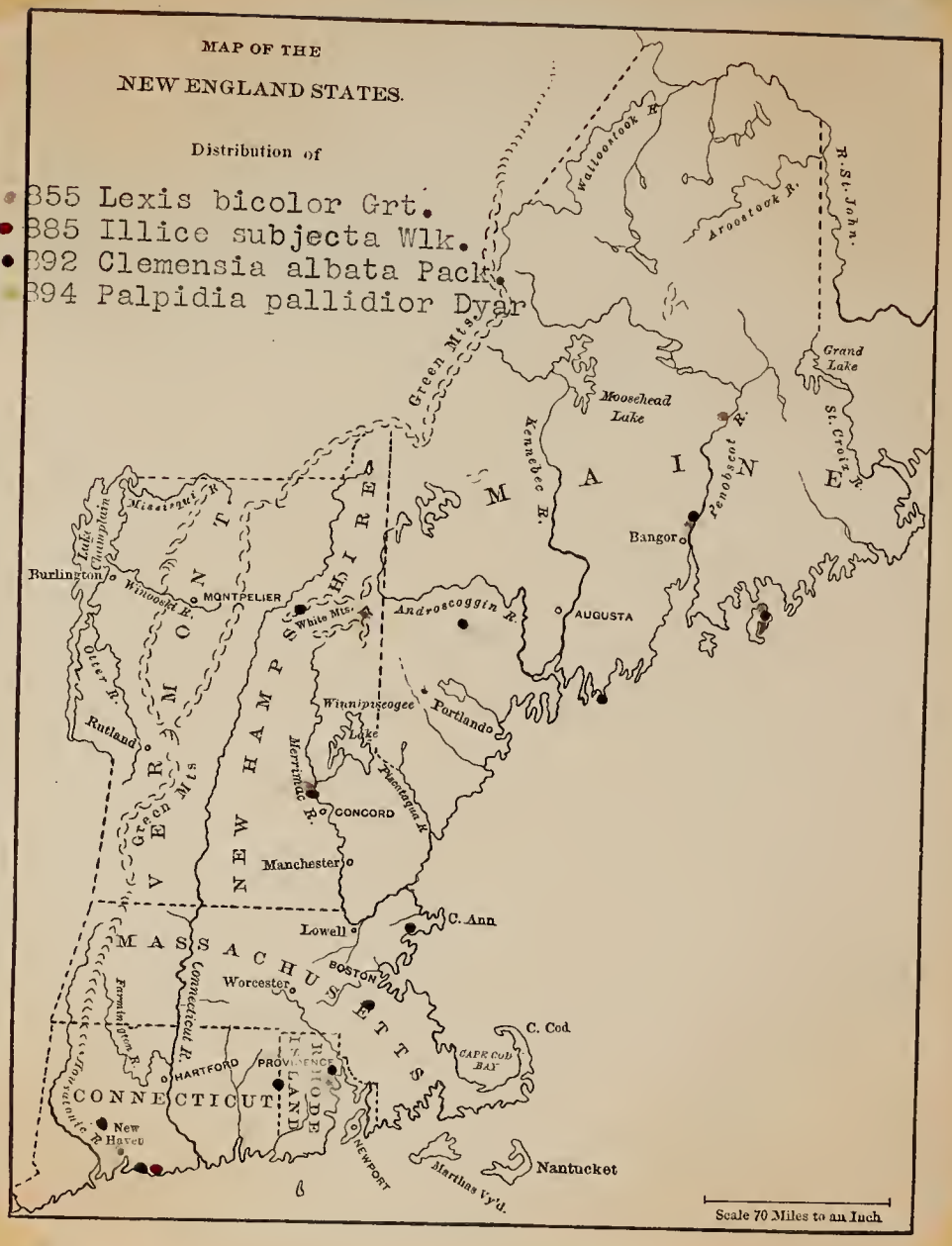

MAP OF THE
NEW ENGLAND STATES.
Distribution of
855 Lexis bicolor Grt.
885 Illice subjecta Wlk.
892 Clemensia albata Pack.
894 Palpidia pallidior Dyar
Green Mts.
Walloostook R.
Aroostook R.
R. St. John.
Grand Lake
St. Croix R.
Moosehead Lake
Kennebec R.
Penobscot R.
MAINE
Bangor
AUGUSTA
Androscoggin R.
White Mts.
NEW HAMPSHIRE
VERMONT
Missisquoi R.
Lake Champlain
Burlington
Winooski R.
MONTPELIER
Otter R.
Rutland
Green Mts.
Winnipiseogee Lake
Portland
Merrimac R.
Piscataqua R.
CONCORD
Manchester
C. Ann
Lowell
MASSACHUSETTS
Worcester
BOSTON
C. Cod
CAPE COD BAY
Connecticut R.
Farmington R.
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
New Haven
Housatonic R.
NEWPORT
Marthas Vy'd.
Nantucket
Scale 70 Miles to an Inch.

Plate V

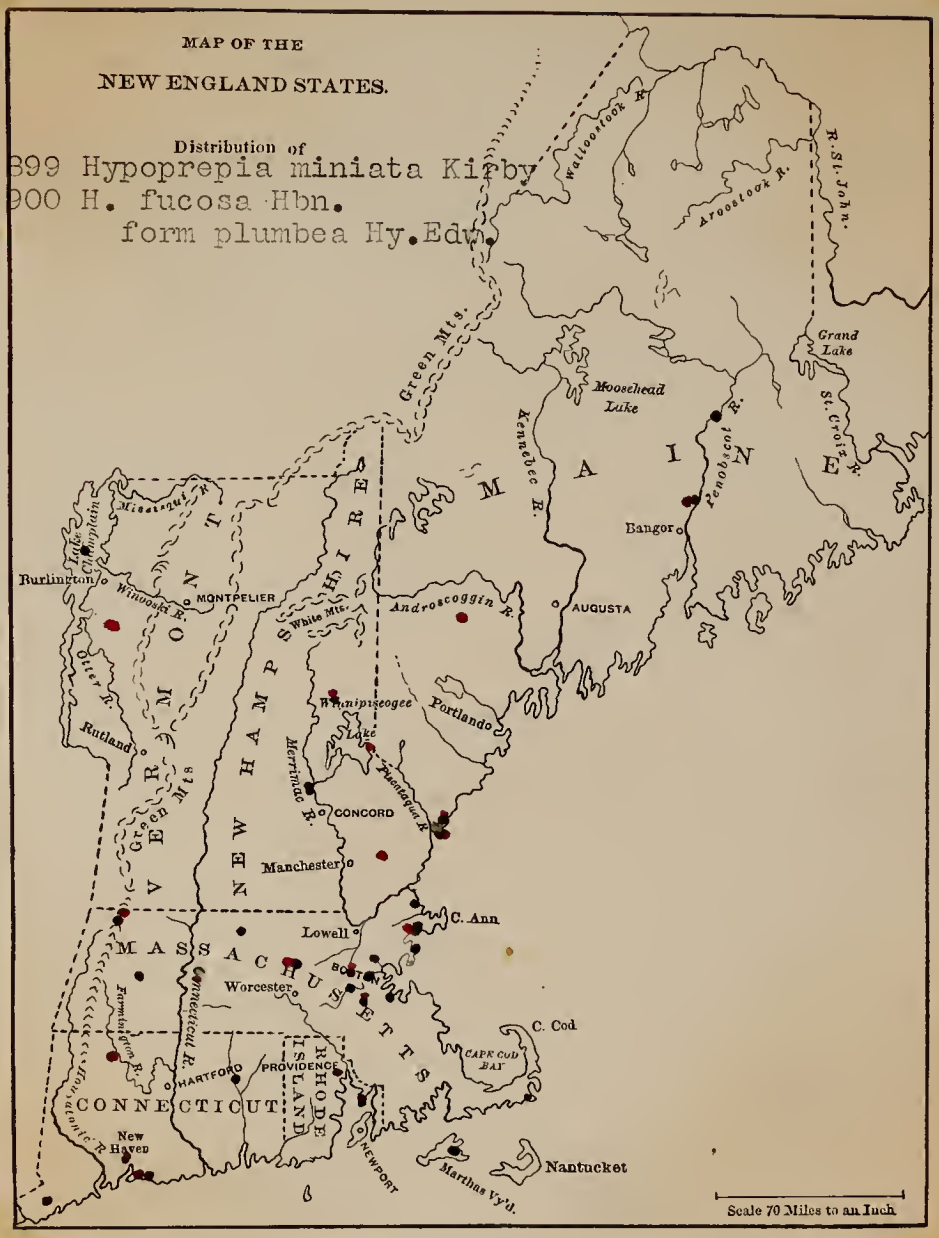

MAP OF THE
NEW ENGLAND STATES.
Distribution of
899 Hypoprepia miniata Kirby
900 H. fucosa Hbn.
form plumbea Hy.Edw.
Walloostook R.
Aroostook R.
R. St. John
Grand Lake
St. Croix R.
Green Mts.
Moosehead Lake
Kennebec R.
Penobscot R.
MAINE
Bangor
Missisquoi R.
Lake Champlain
Burlington
Winooski R.
MONTPELIER
VERMONT
Otter R.
Rutland
Green Mts.
White Mts.
Androscoggin R.
AUGUSTA
NEW HAMPSHIRE
Winnipiseogee Lake
Portland
Merrimac R.
Piscataqua R.
CONCORD
Manchester
C. Ann
Lowell
MASSACHUSETTS
BOSTON
Worcester
C. Cod
CAPE COD BAY
Connecticut R.
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
Housatonic R.
New Haven
NEWPORT
Marthas Vy'd.
Nantucket
Scale 70 Miles to an Inch.

Plate VI

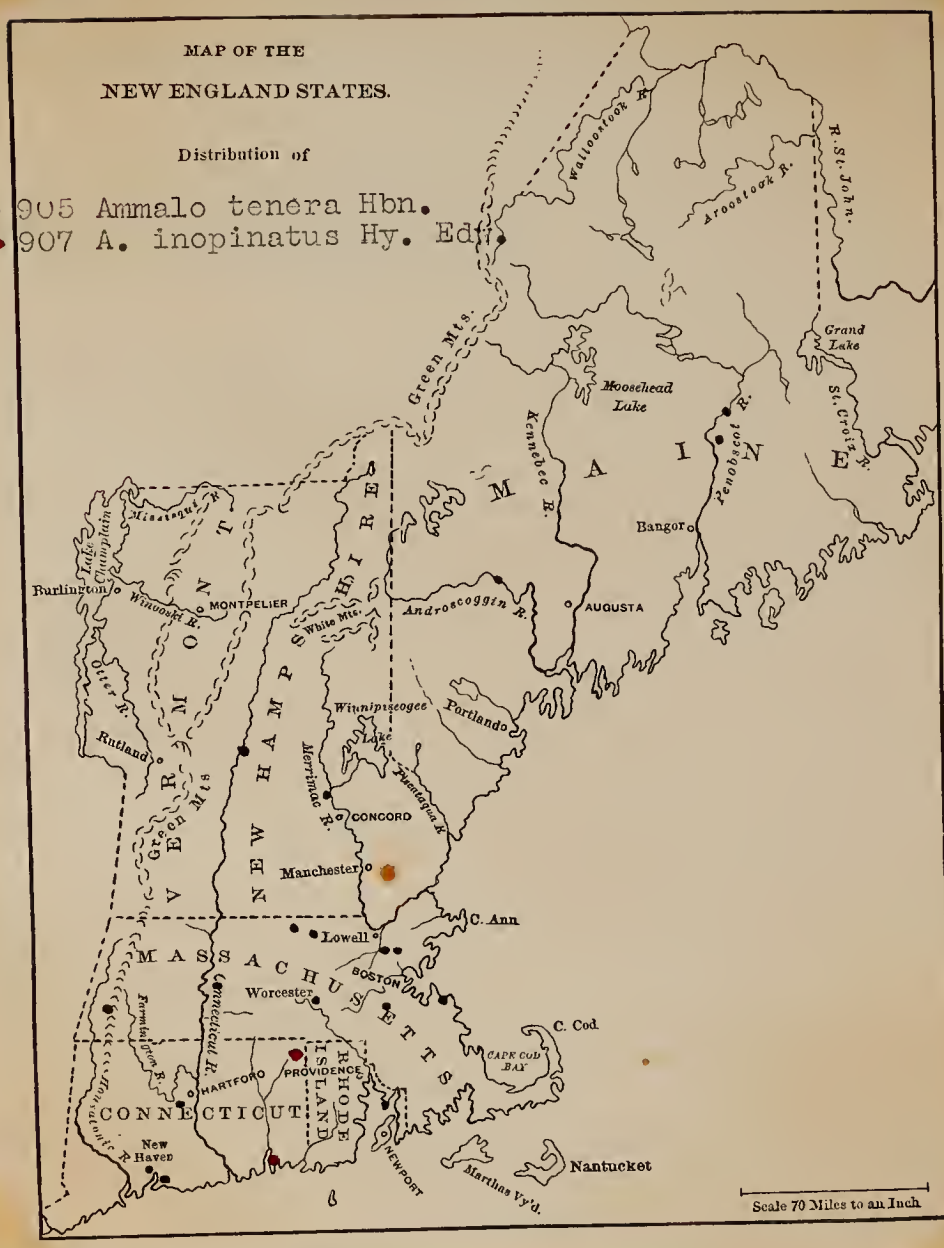

MAP OF THE
NEW ENGLAND STATES.
Distribution of
• 905 Ammalo tenera Hbn.
• 907 A. inopinatus Hy. Edw.
Walloostook R.
Aroostook R.
R. St. John.
Grand Lake
St. Croix R.
Green Mts.
Moosehead Lake
Kennebec R.
Penobscot R.
MAINE
Bangor
AUGUSTA
Androscoggin R.
Lake Champlain
Missisquoi R.
Burlington
Winooski R.
MONTPELIER
VERMONT
White Mts.
NEW HAMPSHIRE
Otter R.
Rutland
Green Mts.
Winnipiseogee Lake
Portland
Merrimac R.
Pemigewasset R.
CONCORD
Manchester
C. Ann
Lowell
MASSACHUSETTS
BOSTON
Worcester
C. Cod
CAPE COD BAY
Connecticut R.
Farmington R.
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
Thames R.
New Haven
NEWPORT
Marthas Vy'd.
Nantucket
Scale 70 Miles to an Inch.

Plate VII

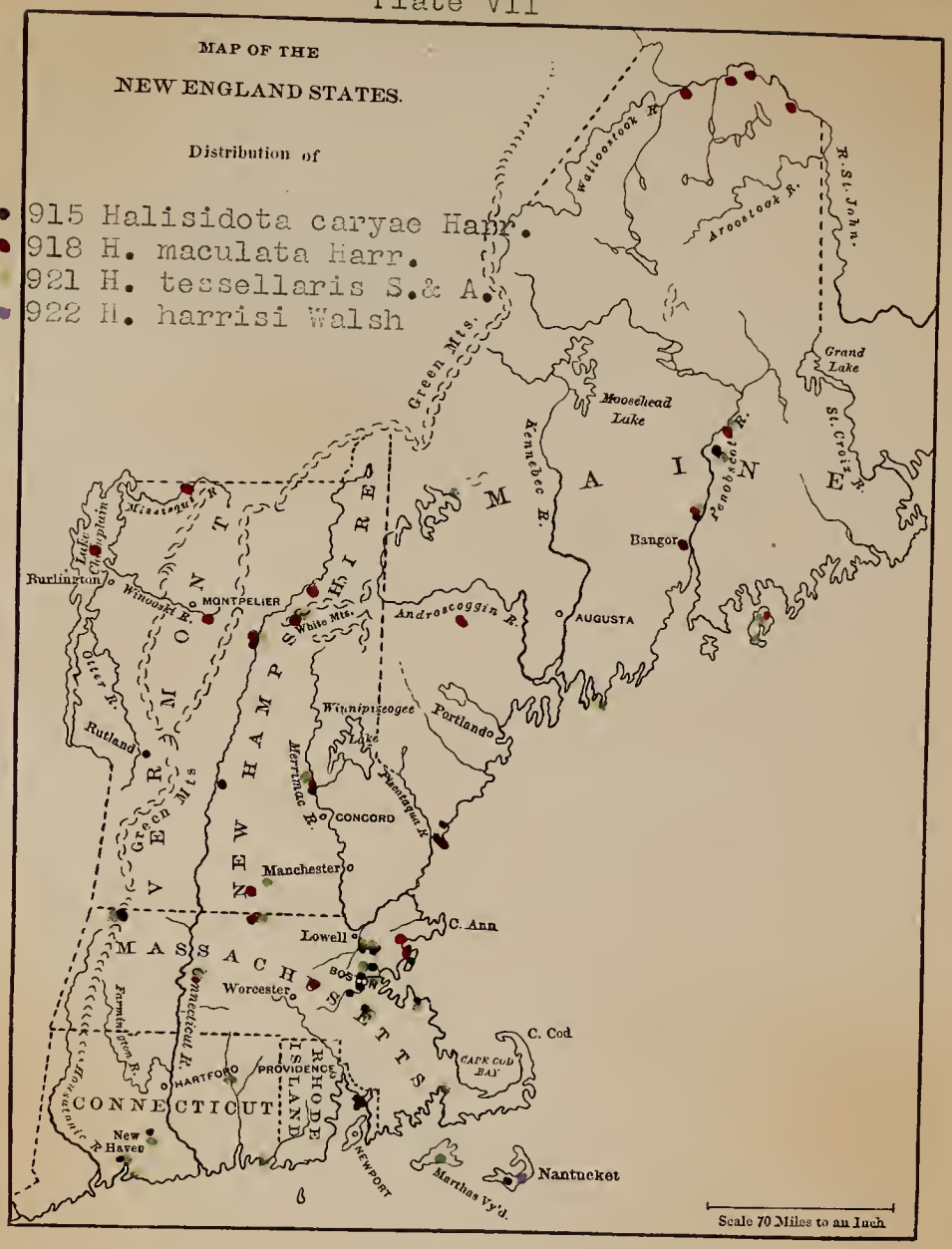

MAP OF THE
NEW ENGLAND STATES.
Distribution of
915 Halisidota caryae Harr.
918 H. maculata Harr.
921 H. tessellaris S.& A.
922 H. harrisi Walsh
Green Mts.
Kennebec R.
Moosehead Lake
Grand Lake
St. Croix R.
Penobscot R.
Aroostook R.
Wallostook R.
R. St. John
MAINE
Bangor
AUGUSTA
Androscoggin R.
White Mts.
Winooski R.
MONTPELIER
Burlington
Lake Champlain
Missisquoi R.
VERMONT
Otter R.
Rutland
Green Mts.
NEW HAMPSHIRE
Winnipiseogee Lake
Portland
Merrimac R.
CONCORD
Manchester
Lowell
C. Ann
MASSACHUSETTS
BOSTON
Worcester
Connecticut R.
Farmington R.
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
New Haven
Housatonic R.
NEWPORT
CAPE COD BAY
C. Cod
Marthas Vy'd.
Nantucket
Scale 70 Miles to an Inch

Plate VIII

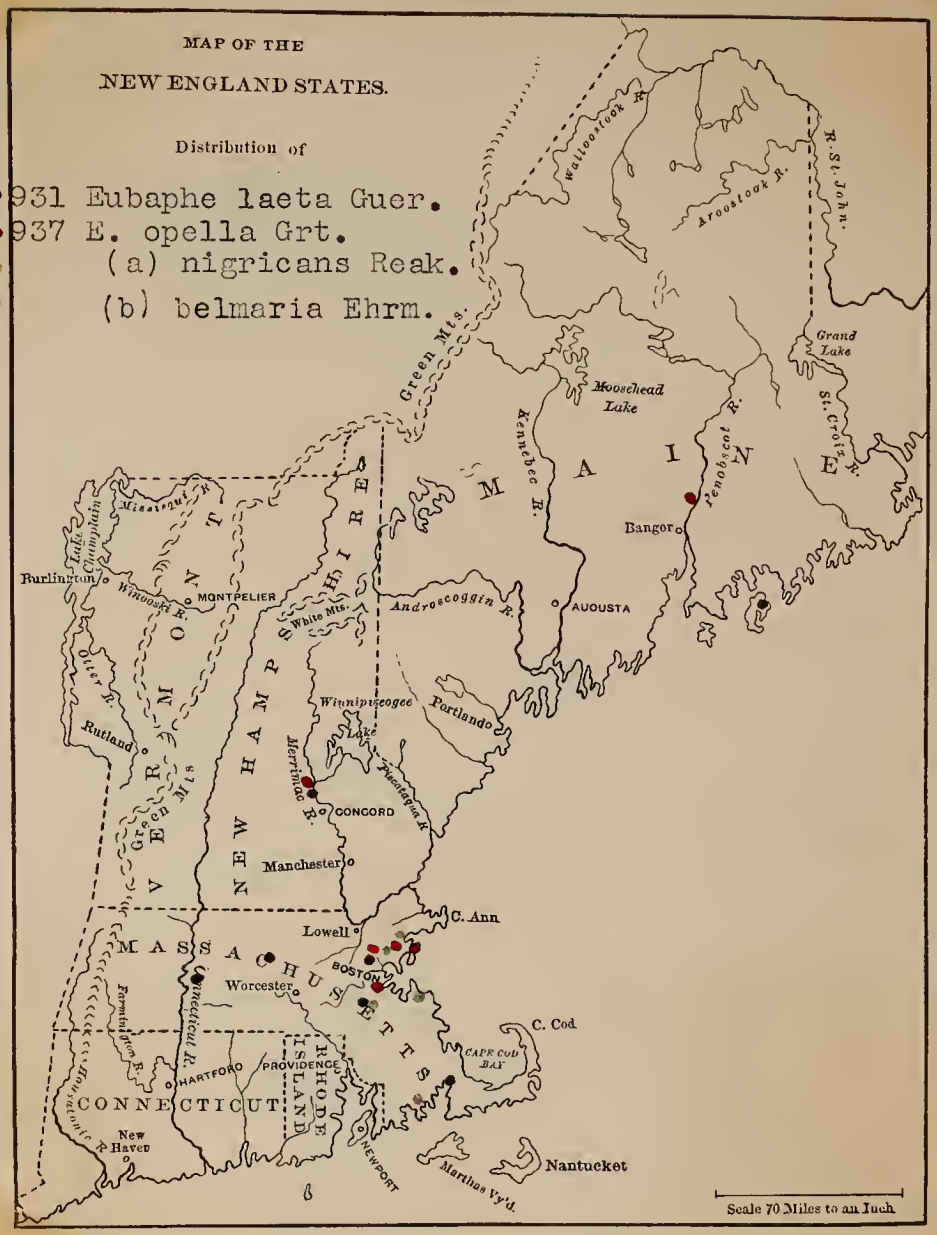

MAP OF THE
NEW ENGLAND STATES.
Distribution of
931 Eubaphe laeta Guer.
937 E. opella Grt.
(a) nigricans Reak.
(b) belmaria Ehrm.
Green Mts.
Walloostook R.
Aroostook R.
R. St. John.
Grand Lake
Moosehead Lake
Kennebec R.
Penobscot R.
St. Croix R.
MAINE
Bangor
Burlington
Lake Champlain
Missisquoi R.
Winooski R.
MONTPELIER
White Mts.
Androscoggin R.
AUGUSTA
Otter R.
Rutland
Winnipiseogee Lake
Portland
Merrimac R.
Pemigewasset R.
CONCORD
Manchester
NEW HAMPSHIRE
VERMONT
Green Mts.
Lowell
C. Ann
MASSACHUSETTS
BOSTON
Worcester
Connecticut R.
Farmington R.
HARTFORD
PROVIDENCE
RHODE ISLAND
C. Cod
CAPE COD BAY
CONNECTICUT
New Haven
Housatonic R.
NEWPORT
Marthas Vy'd.
Nantucket
Scale 70 Miles to an Inch.

Plate IX

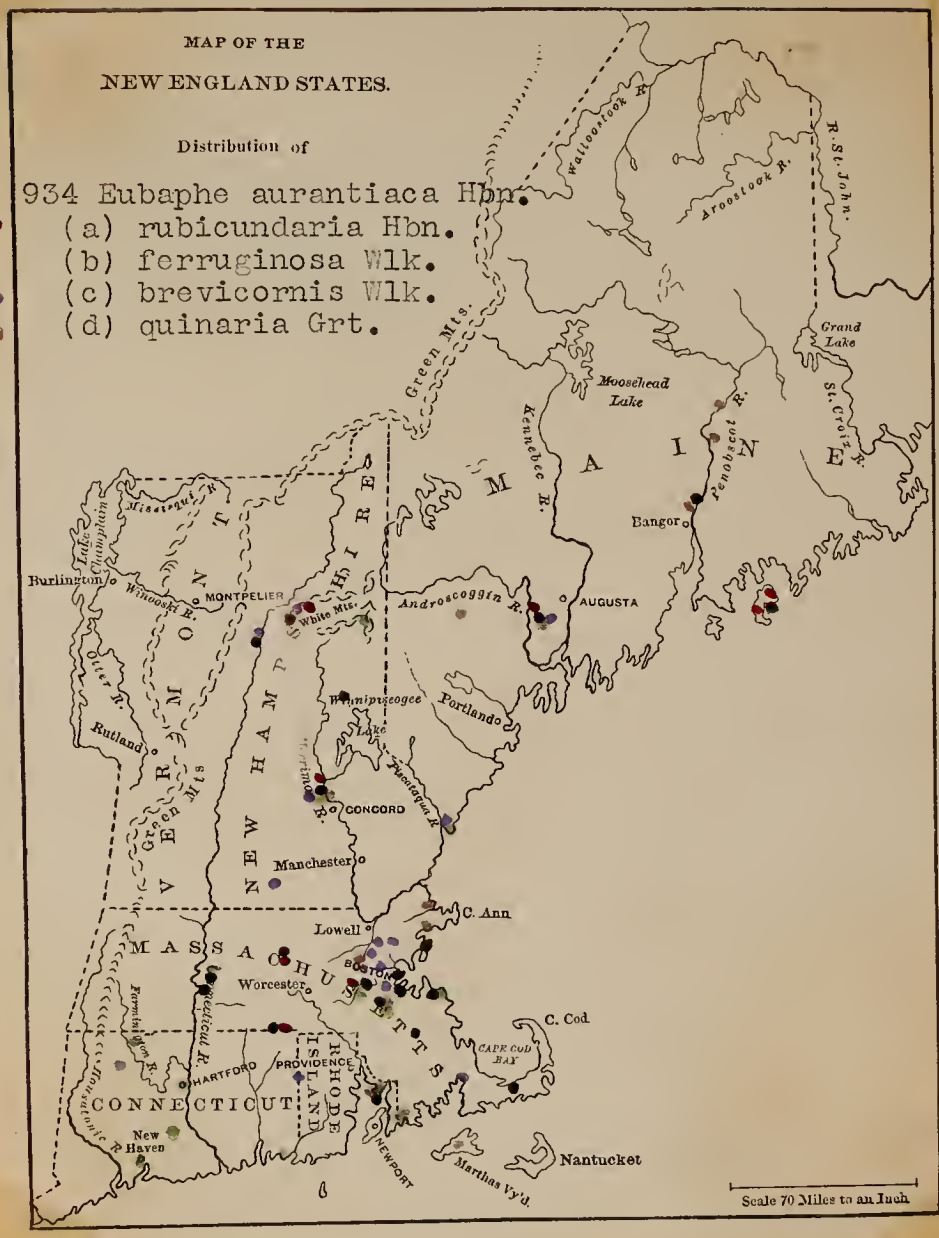

MAP OF THE
NEW ENGLAND STATES.
Distribution of
934 Eubaphe aurantiaca Hbn.
(a) rubicundaria Hbn.
(b) ferruginosa Wlk.
(c) brevicornis Wlk.
(d) quinaria Grt.
Green Mts.
Kennebec R.
Mooselead Lake
Grand Lake
St. Croix R.
R. St. John.
Penobscot R.
Bangor
AUGUSTA
Androscoggin R.
White Mts.
MONTPELIER
Winooski R.
Burlington
Lake Champlain
Missisquoi R.
Otter R.
Rutland
Winnipiseogee Lake
Portland
Pemigewasset R.
CONCORD
Merrimack R.
Manchester
Lowell
C. Ann
BOSTON
Worcester
C. Cod
CAPE COD BAY
Nantucket
Marthas Vy'd.
NEWPORT
PROVIDENCE
RHODE ISLAND
HARTFORD
New Haven
Connecticut R.
Farmington R.
Housatonic R.
Scale 70 Miles to an Inch.

Plate X

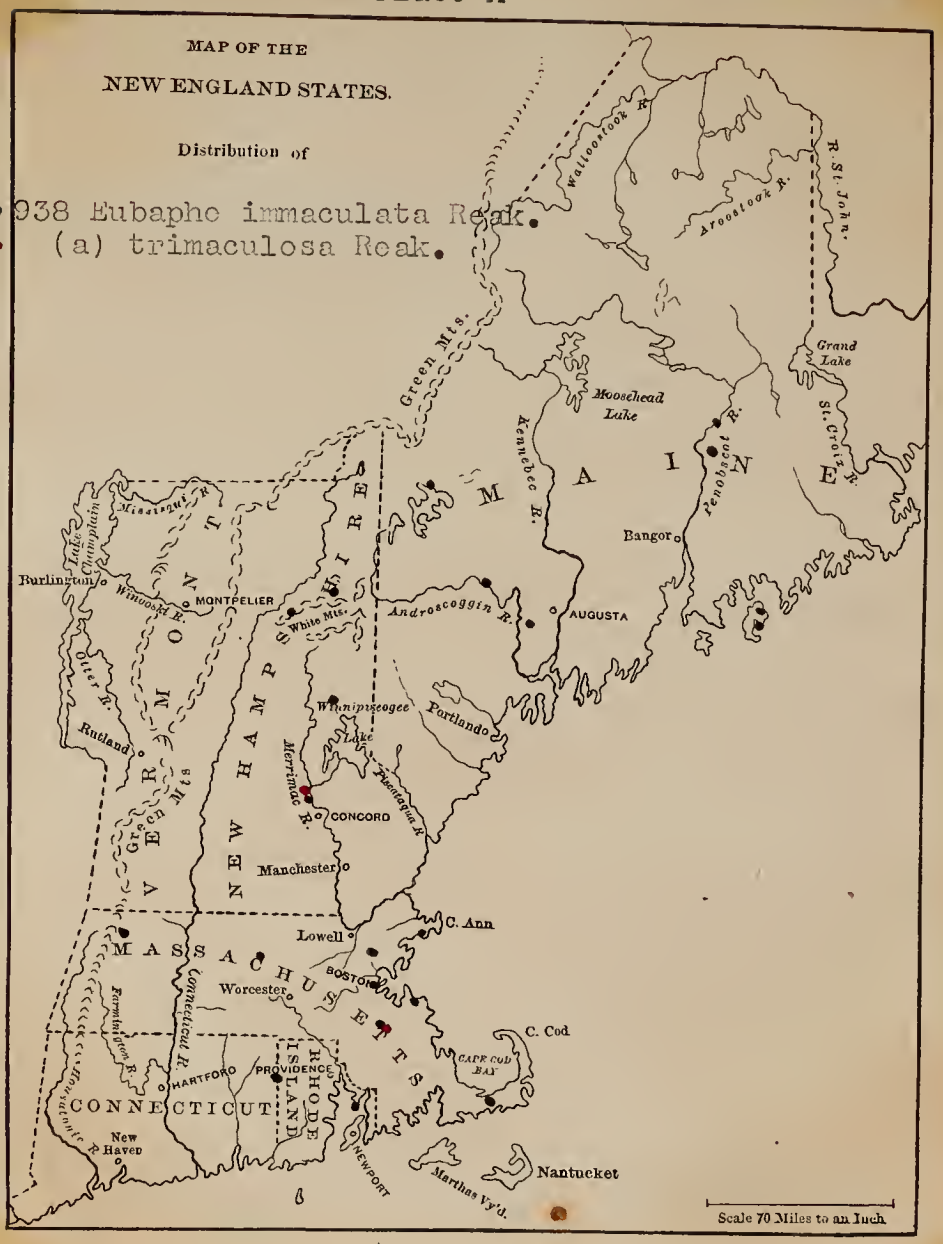

MAP OF THE
NEW ENGLAND STATES.
Distribution of
938 Eubapho immaculata Reak.
(a) trimaculosa Reak.
Walloostook R.
Aroostook R.
R. St. John.
Grand Lake
St. Croix R.
Green Mts.
Moosehead Lake
Kennebec R.
Penobscot R.
MAINE
Bangor
AUGUSTA
Androscoggin R.
NEW HAMPSHIRE
White Mts.
Winnipiseogee Lake
Portland
Merrimac R.
Piscataqua R.
CONCORD
Manchester
VERMONT
Green Mts.
Lake Champlain
Missisquoi R.
Burlington
Winooski R.
MONTPELIER
Otter R.
Rutland
C. Ann
Lowell
MASSACHUSETTS
BOSTON
Worcester
Connecticut R.
Farmington R.
C. Cod
CAPE COD BAY
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
New Haven
Housatonic R.
NEWPORT
Marthas Vyd.
Nantucket
Scale 70 Miles to an Inch.

Plate XI

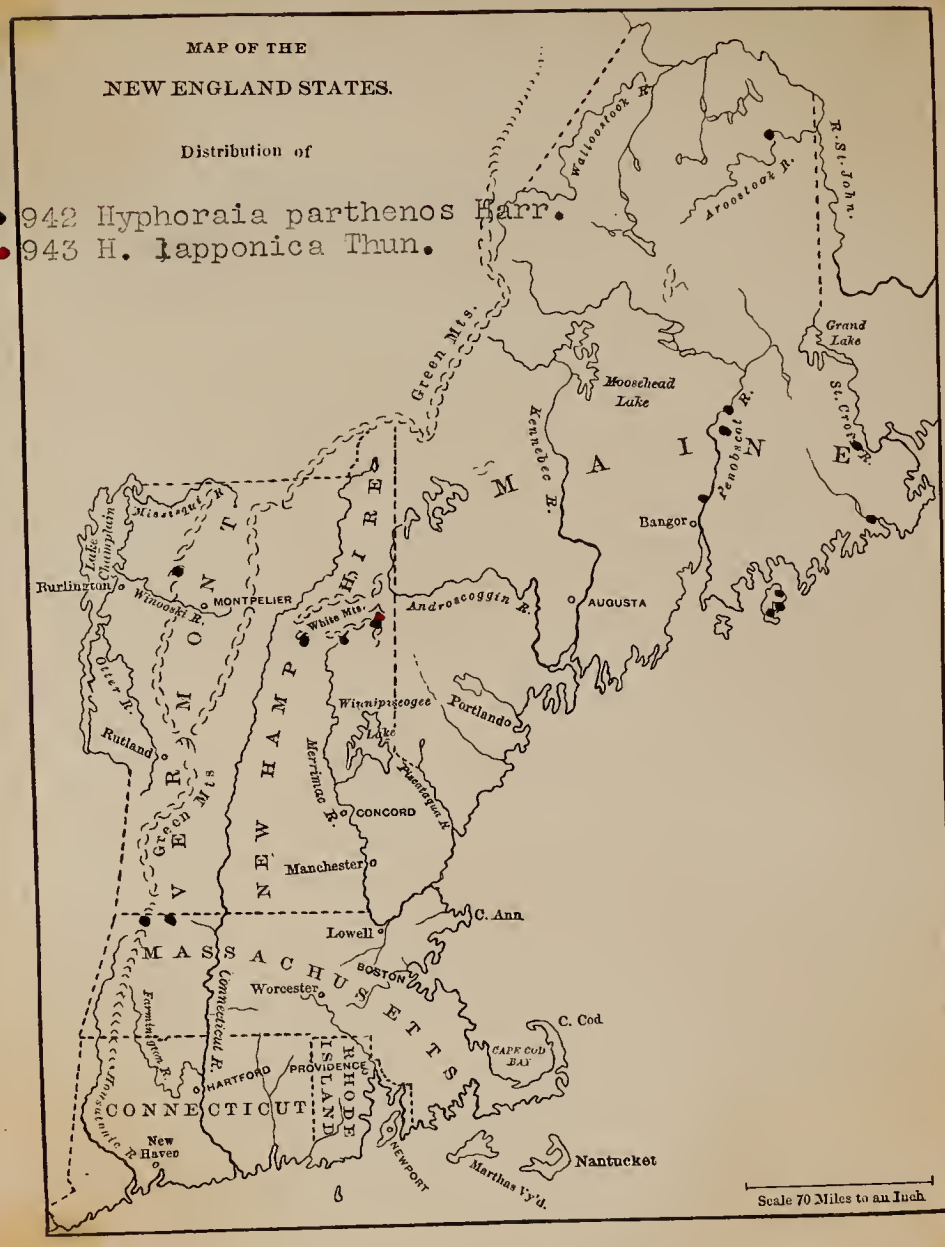

MAP OF THE
NEW ENGLAND STATES.
Distribution of
942 Hyphoraia parthenos Harr.
943 H. Japponica Thun.
Walloostook R.
Aroostook R.
R. St. John.
Grand Lake
Green Mts.
Moosehead Lake
St. Croix R.
Kennebec R.
Penobscot R.
MAINE
Bangor
Lake Champlain
Missisquoi R.
Burlington
Winooski R.
MONTPELIER
White Mts.
Androscoggin R.
AUGUSTA
NEW HAMPSHIRE
VERMONT
Otter R.
Rutland
Green Mts.
Winnipiseogee Lake
Portland
Merrimac R.
CONCORD
Piscataqua R.
Manchester
C. Ann
Lowell
MASSACHUSETTS
BOSTON
Worcester
C. Cod
CAPE COD BAY
Connecticut R.
Farmington R.
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
New Haven
NEWPORT
Nantucket
Marthas Vy'd.
Scale 70 Miles to an Inch.

Plate XII

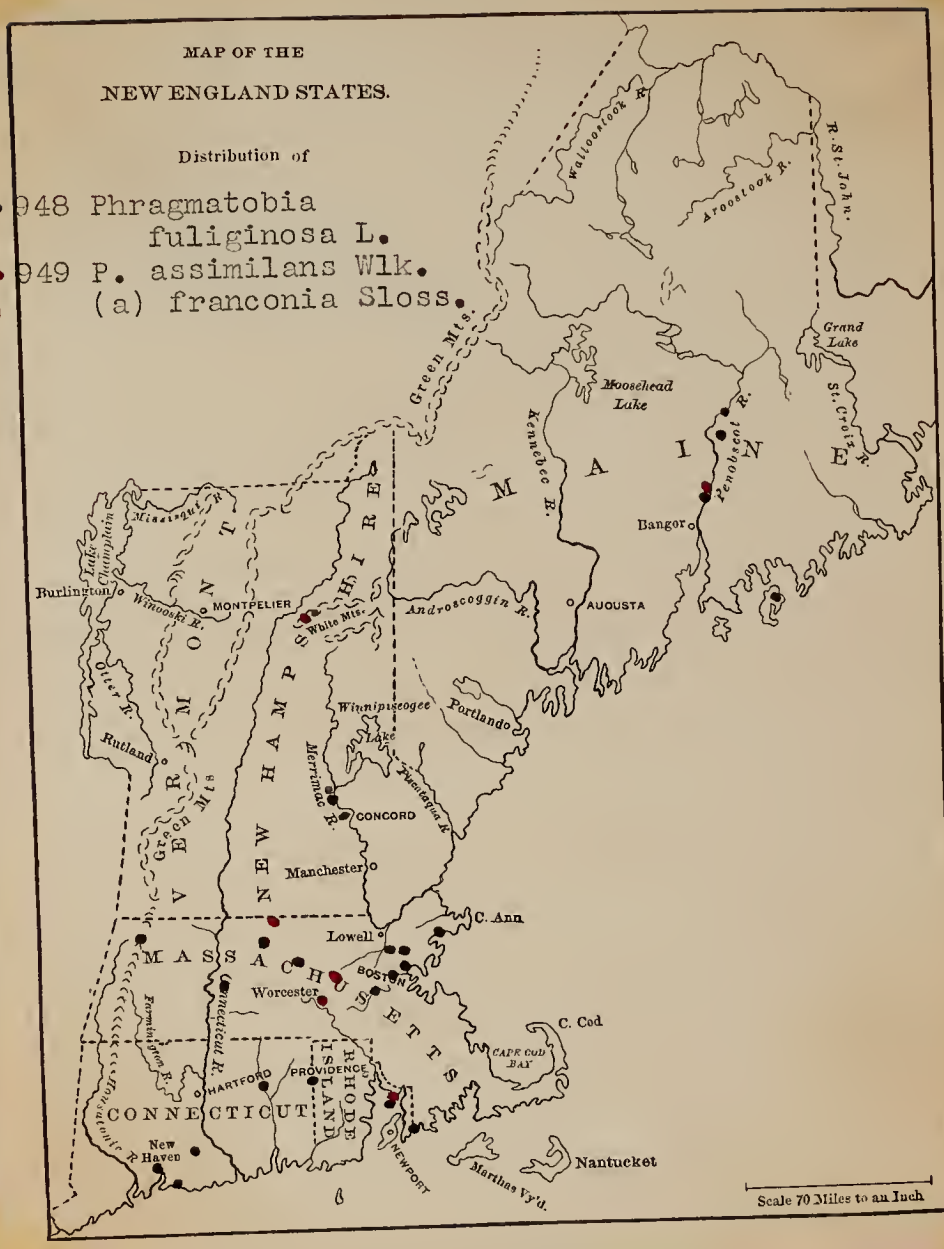

MAP OF THE
NEW ENGLAND STATES.
Distribution of
948 Phragmatobia fuliginosa L.
949 P. assimilans Wlk.
(a) franconia Sloss.
Wallooskook R.
Aroostook R.
R. St. John.
Grand Lake
St. Croix R.
Green Mts.
Moosehead Lake
Kennebec R.
Penobscot R.
MAINE
Bangor
Missisquoi R.
Lake Champlain
Burlington
Winooski R.
MONTPELIER
White Mts.
Androscoggin R.
AUGUSTA
VERMONT
NEW HAMPSHIRE
Otter R.
Winnipiseogee Lake
Portland
Rutland
Merrimac R.
Pemigewasset R.
CONCORD
Green Mts.
Manchester
C. Ann
Lowell
MASSACHUSETTS
BOSTON
Worcester
C. Cod
CAPE COD BAY
Connecticut R.
Farmington R.
HARTFORD
PROVIDENCE
RHODE ISLAND
Housatonic R.
CONNECTICUT
New Haven
NEWPORT
Marthas Vy'd.
Nantucket
Scale 70 Miles to an Inch

Plate XIII


MAP OF THE
NEW ENGLAND STATES.
Distribution of
954 Diacrisia virginica Fabr.
953 D. latipennis Str.
Green Mts.
Walloostook R.
Aroostook R.
R. St. John.
Grand Lake
St. Croix R.
Moosehead Lake
Kennebec R.
Penobscot R.
MAINE
Bangor
AUGUSTA
Androscoggin R.
Portland
Winnipiseogee Lake
Pemigewasset R.
Merrimac R.
CONCORD
NEW HAMPSHIRE
White Mts.
Connecticut R.
Missisquoi R.
Lake Champlain
Winooski R.
MONTPELIER
Burlington
Otter R.
Rutland
Green Mts.
VERMONT
Manchester
Lowell
C. Ann
MASSACHUSETTS
BOSTON
Worcester
C. Cod
CAPE COD BAY
Farmington R.
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
New Haven
NEWPORT
Marthas Vy'd.
Nantucket
Scale 70 Miles to an Inch

Plate XIV

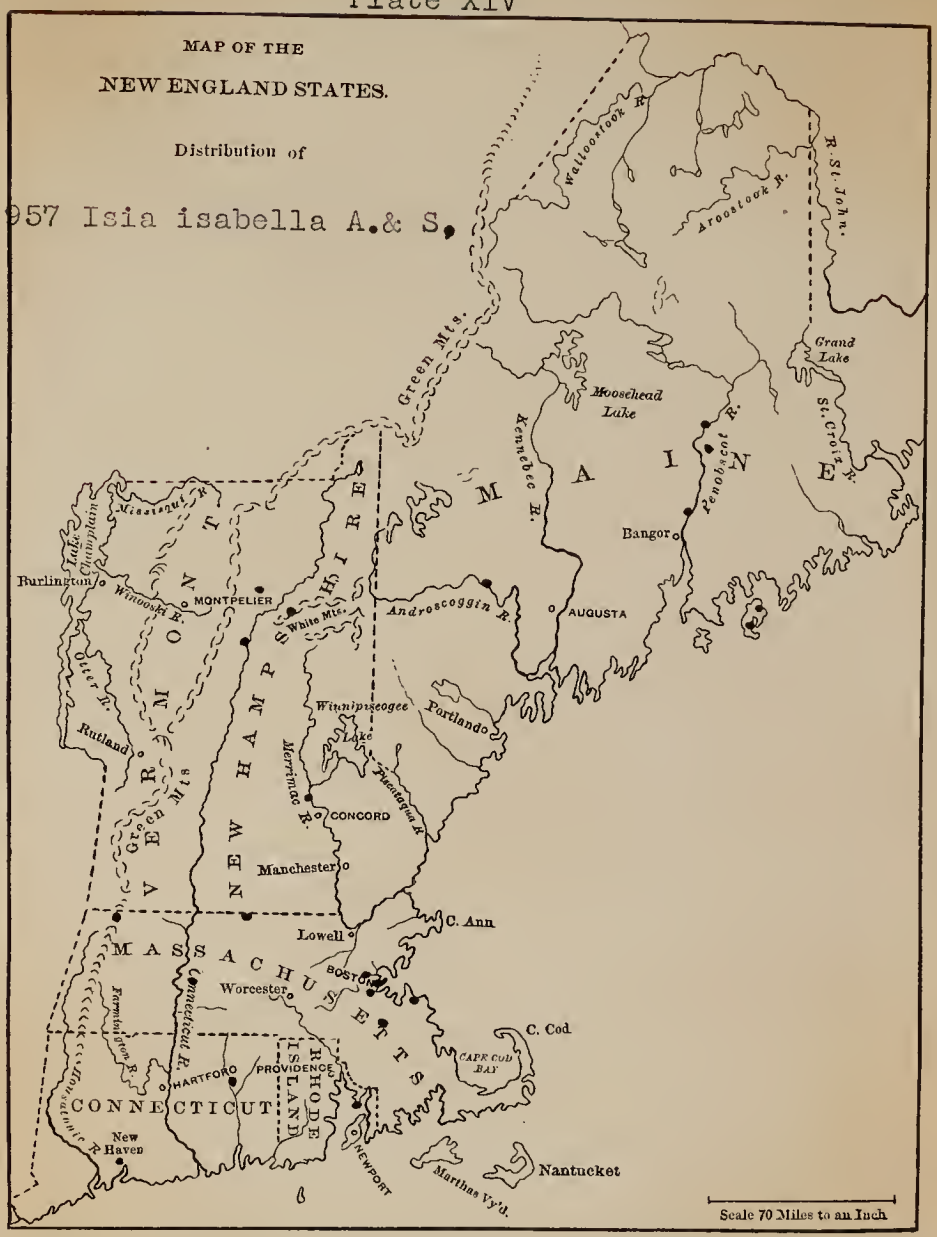

MAP OF THE
NEW ENGLAND STATES.
Distribution of
957 Isia isabella A.& S.
Wallcastook R.
Aroostook R.
R. St. John.
Grand Lake
Green Mts.
Moosehead Lake
Kennebec R.
Penobscot R.
St. Croix R.
MAINE
Bangor
Lake Champlain
Missisquoi R.
Burlington
Winooski R.
MONTPELIER
White Mts.
Androscoggin R.
AUGUSTA
VERMONT
NEW HAMPSHIRE
Otter Cr.
Rutland
Green Mts
Winnipiseogee Lake
Portland
Merrimac R.
Piscataqua R.
CONCORD
Manchester
C. Ann
Lowell
MASSACHUSETTS
BOSTON
Worcester
Connecticut R.
Farmington R.
C. Cod
CAPE COD BAY
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
New Haven
NEWPORT
Martha's Vy'd.
Nantucket
Scale 70 Miles to an Inch

Plate XV

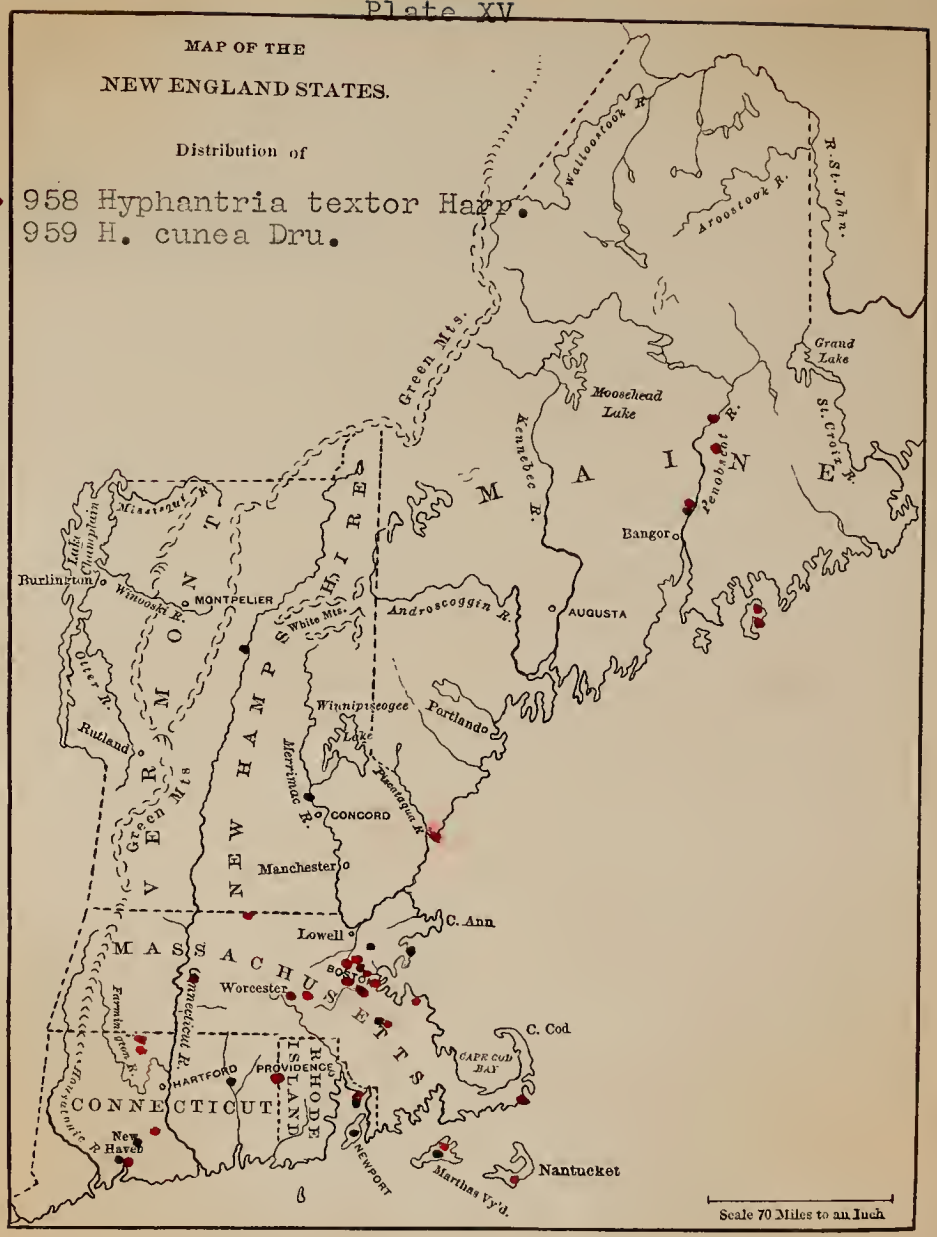

MAP OF THE
NEW ENGLAND STATES.
Distribution of
958 Hyphantria textor Harr.
959 H. cunea Dru.
Wallostook R.
Aroostook R.
R. St. John.
Grand Lake
St. Croix R.
Green Mts.
Moosehead Lake
Kennebec R.
Penobscot R.
MAINE
Bangor
Burlington
Lake Champlain
Missisquoi R.
Winooski R.
MONTPELIER
White Mts.
Androscoggin R.
AUGUSTA
VERMONT
NEW HAMPSHIRE
Otter R.
Rutland
Green Mts.
Winnipiseogee Lake
Portland
Merrimac R.
Piscataqua R.
CONCORD
Manchester
Lowell
C. Ann
MASSACHUSETTS
BOSTON
Worcester
Housatonic R.
Connecticut R.
C. Cod
CAPE COD BAY
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
New Haven
Housatonic R.
NEWPORT
Marthas Vy'd.
Nantucket
Scale 70 Miles to an Inch

Plate XVI

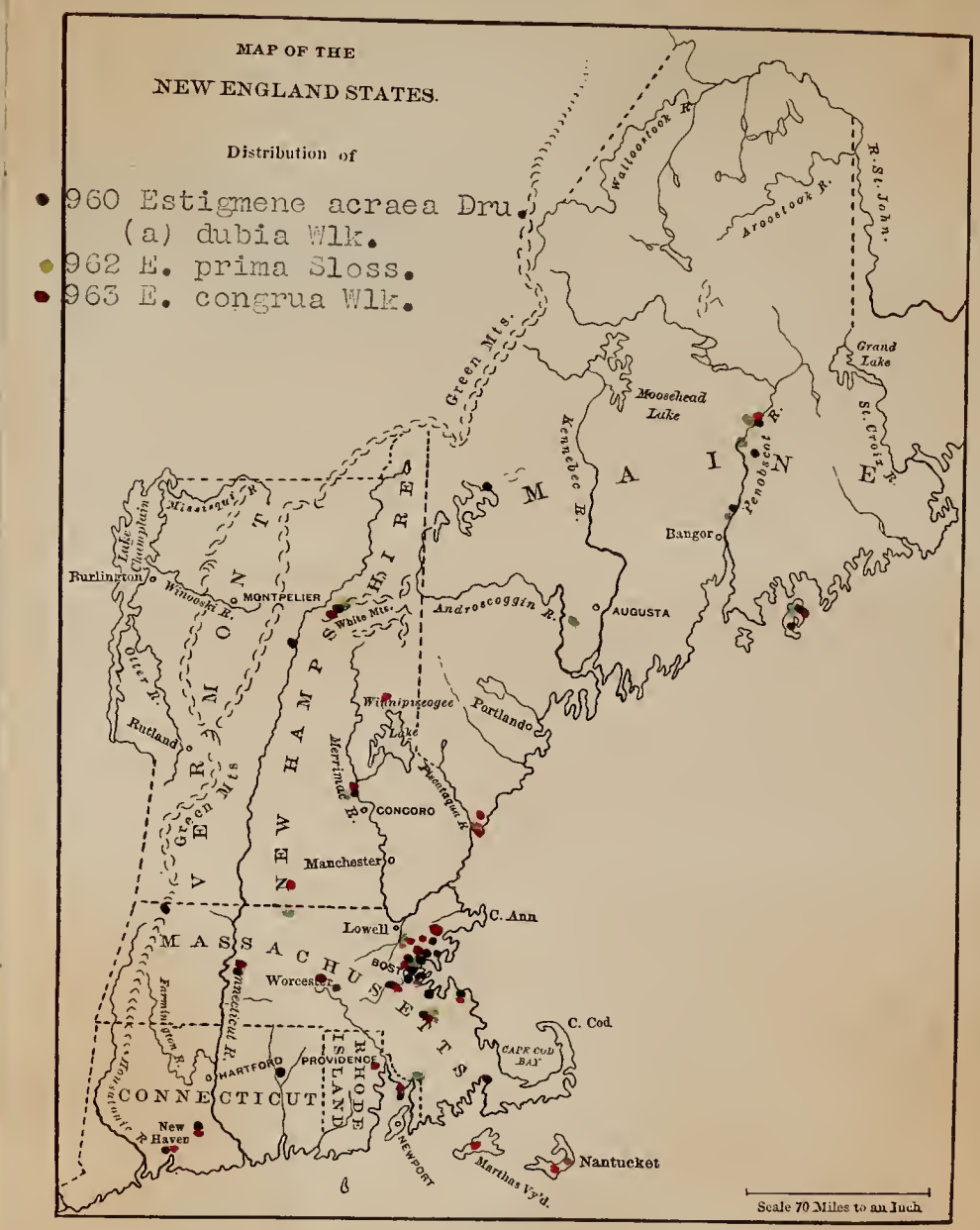

MAP OF THE
NEW ENGLAND STATES.
Distribution of
960 Estigmene acraea Dru.
(a) dubia Wlk.
962 E. prima Sloss.
963 E. congrua Wlk.
Walloostook R.
Aroostook R.
R. St. John.
Grand Lake
Green Mts.
Moosehead Lake
Kennebec R.
Penobscot R.
St. Croix R.
MAINE
Bangor
Burlington
Winooski R.
MONTPELIER
White Mts.
Androscoggin R.
AUGUSTA
Otter R.
Rutland
Winnipiseogee Lake
Portland
Merrimac R.
CONCORD
Manchester
NEW HAMPSHIRE
VERMONT
Green Mts
C. Ann
Lowell
MASSACHUSETTS
BOSTON
Worcester
C. Cod
CAPE COD BAY
Connecticut R.
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
New Haven
NEWPORT
Martha's Vy'd.
Nantucket
Scale 70 Miles to an Inch.

Plate XVII

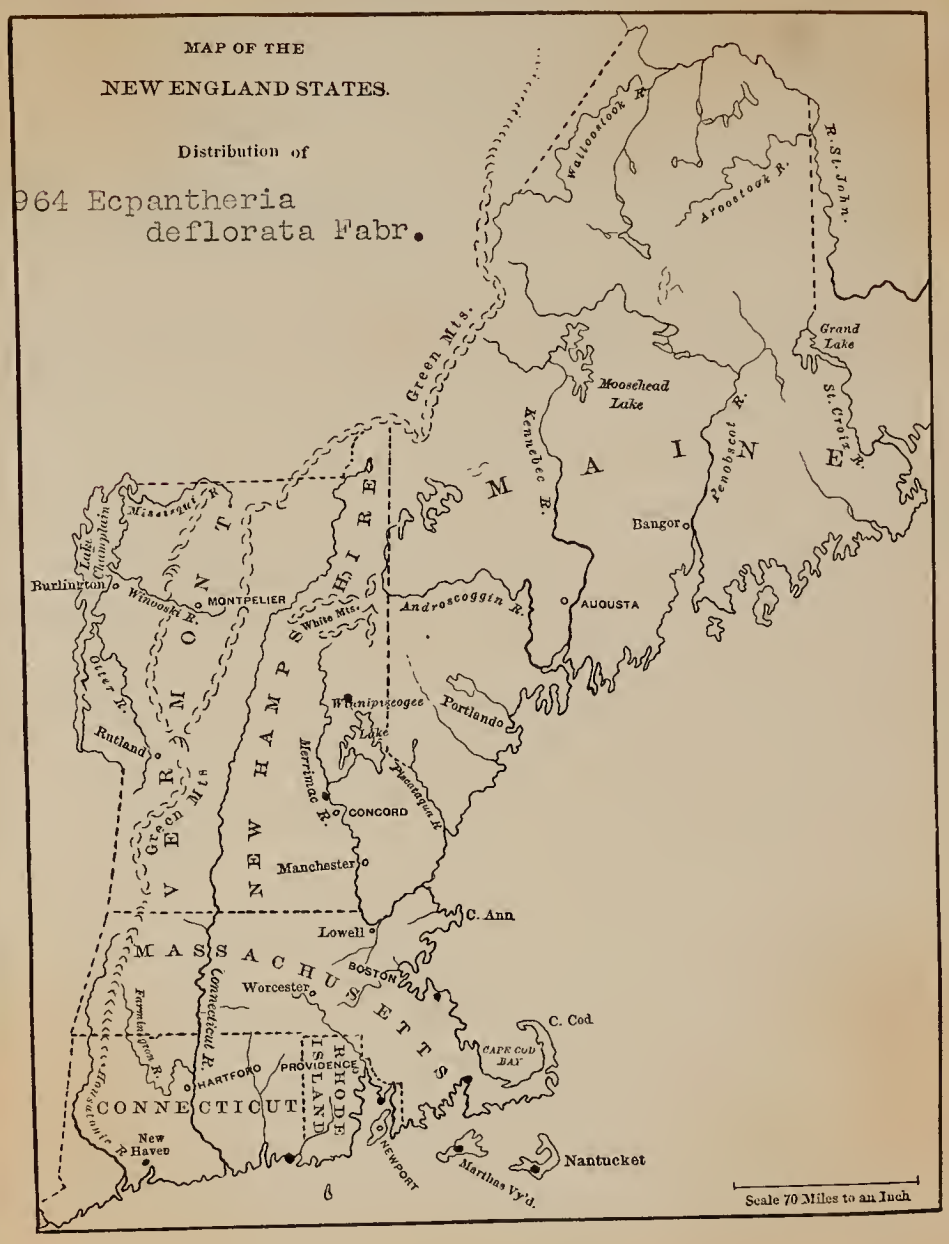

MAP OF THE
NEW ENGLAND STATES.
Distribution of
964 Ecpantheria
deflorata Fabr.
Wallcastook R.
Aroostook R.
R. St. John.
Grand Lake
St. Croix R.
Green Mts.
Moosehead Lake
Kennebec R.
MAINE
Penobscot R.
Bangor
Missisquoi R.
Lake Champlain
Burlington
Winooski R.
MONTPELIER
White Mts.
Androscoggin R.
AUGUSTA
VERMONT
NEW HAMPSHIRE
Otter R.
Rutland
Green Mts.
Winnipiseogee Lake
Portland
Merrimac R.
CONCORD
Piscataqua R.
Manchester
C. Ann
Lowell
MASSACHUSETTS
BOSTON
Worcester
C. Cod
CAPE COD BAY
Connecticut R.
Farmington R.
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
New Haven
NEWPORT
Martha's Vy'd.
Nantucket
Scale 70 Miles to an Inch

Plate XVIII

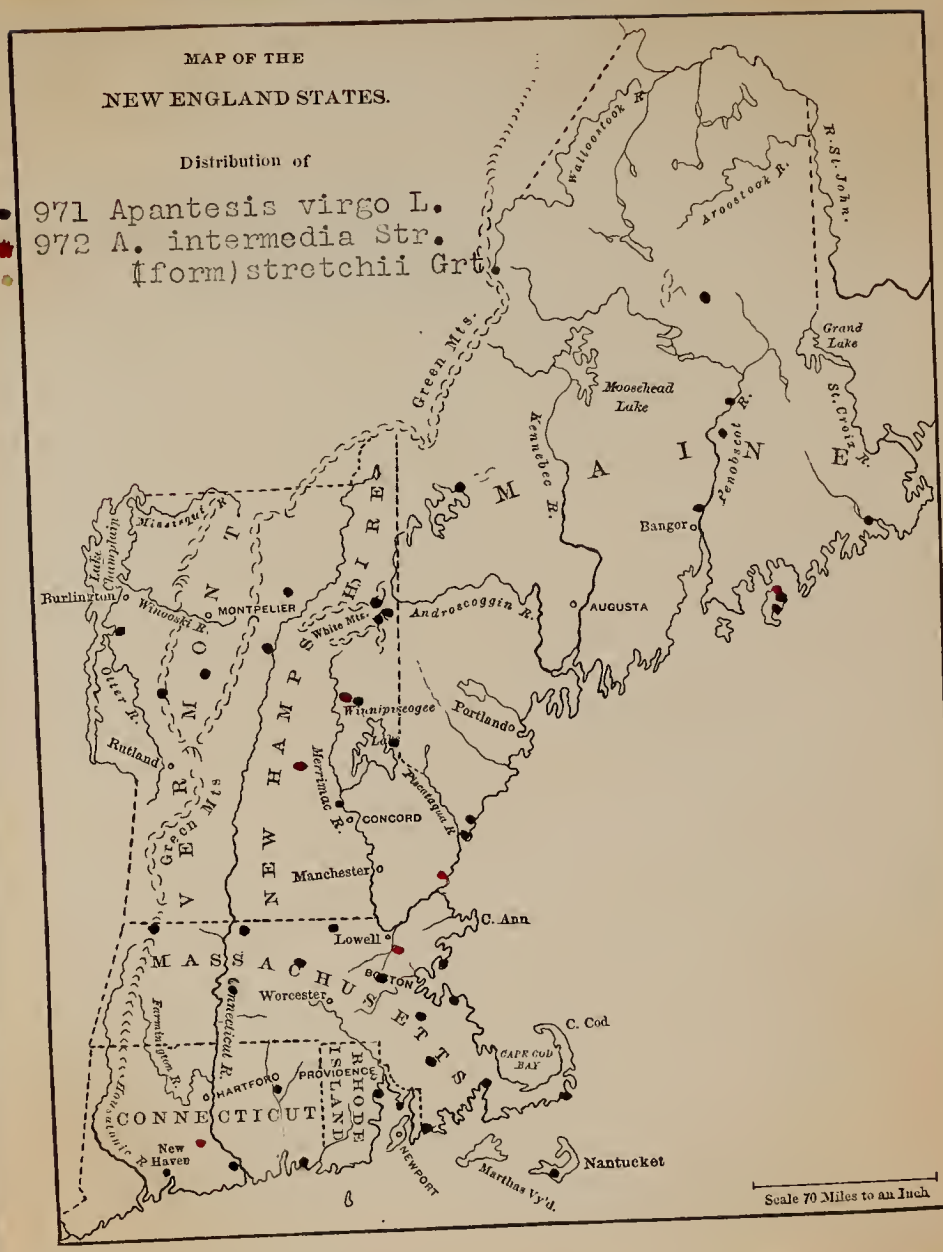

MAP OF THE
NEW ENGLAND STATES.
Distribution of
971 Apantesis virgo L.
972 A. intermedia Str.
(form) stretchii Grt.
Walloostook R.
Aroostook R.
R. St. John.
Grand Lake
Green Mts.
Moosehead Lake
Kennebec R.
Penobscot R.
St. Croix R.
MAINE
Bangor
AUGUSTA
Androscoggin R.
White Mts.
Winnipiseogee
Portland
Lake Champlain
Missisquoi R.
Burlington
Winooski R.
MONTPELIER
Otter R.
Rutland
VERMONT
Green Mts.
NEW HAMPSHIRE
Merrimac R.
CONCORD
Pascataqua R.
Manchester
C. Ann
Lowell
MASSACHUSETTS
BOSTON
Worcester
C. Cod
CAPE COD BAY
Connecticut R.
Farmington R.
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
New Haven
NEWPORT
Marthas Vy'd.
Nantucket
Scale 70 Miles to an Inch

Plate XIX

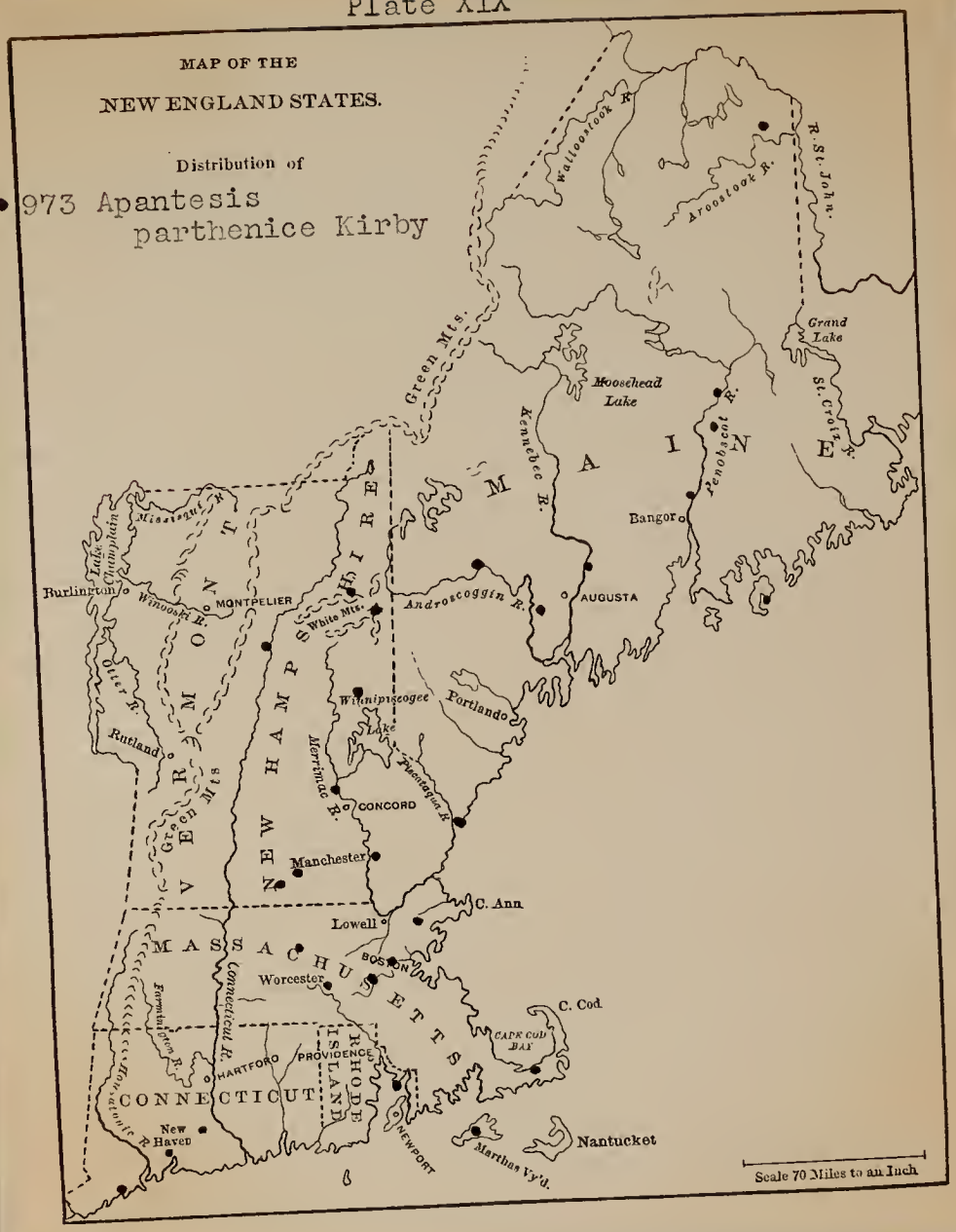

MAP OF THE
NEW ENGLAND STATES.
Distribution of
973 Apantesis
parthenice Kirby
Walloostook R.
Aroostook R.
R. St. John
Grand Lake
St. Croix R.
Moosehead Lake
Penobscot R.
Kennebec R.
Green Mts.
MAINE
Bangor
AUGUSTA
Androscoggin R.
White Mts.
NEW HAMPSHIRE
Winnipiscogee Lake
Portland
Merrimac R.
Piscataqua R.
CONCORD
Manchester
Burlington
Winooski R.
MONTPELIER
Lake Champlain
Missisquoi R.
VERMONT
Otter R.
Rutland
Green Mts.
C. Ann
Lowell
BOSTON
MASSACHUSETTS
Worcester
Connecticut R.
C. Cod
CAPE COD BAY
Farmington R.
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
New Haven
NEWPORT
Marthas Vy'd.
Nantucket
Scale 70 Miles to an Inch

Plate XX .

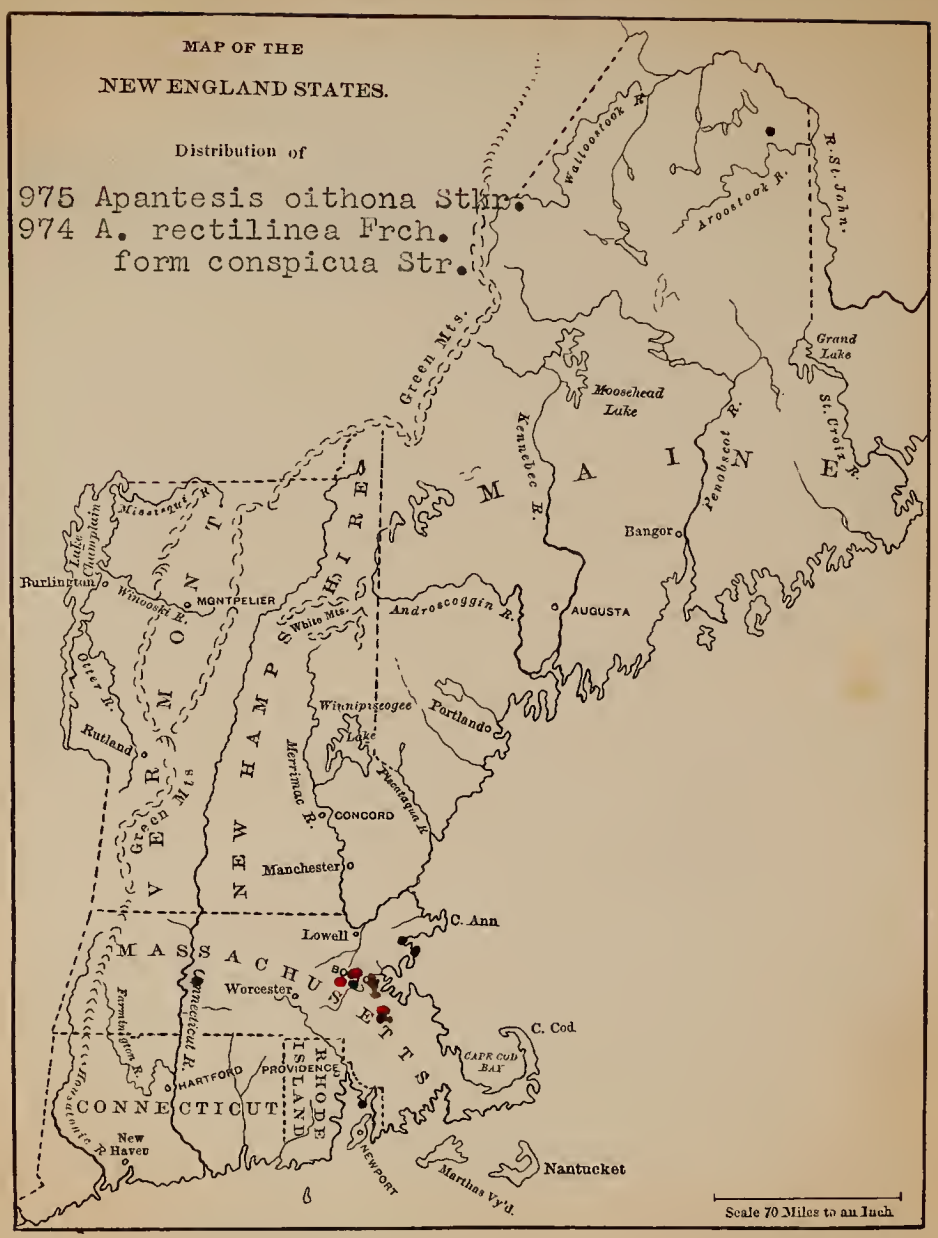

MAP OF THE
NEW ENGLAND STATES.
Distribution of
975 Apantesis oithona Stkr.
974 A. rectilinea Frch.
form conspicua Str.
Wallootook R.
R. St. John.
Aroostook R.
Grand Lake
Moosehead Lake
Green Mts.
Kennebec R.
Penobscot R.
St. Croix R.
MAINE
Bangor
Burlington
Lake Champlain
Missisquoi R.
Winooski R.
MONTPELIER
White Mts.
Androscoggin R.
AUGUSTA
VERMONT
Otter R.
Rutland
Green Mts
NEW HAMPSHIRE
Winnipiseogee Lake
Portland
Merrimac R.
CONCORD
Piscataqua R.
Manchester
C. Ann
Lowell
MASSACHUSETTS
Worcester
Connecticut R.
Farmington R.
HARTFORD
PROVIDENCE
RHODE ISLAND
C. Cod
CAPE COD BAY
CONNECTICUT
New Haven
Quinnipiac R.
NEWPORT
Martha's Vy'd.
Nantucket
Scale 70 Miles to an Inch.

Plate XXI

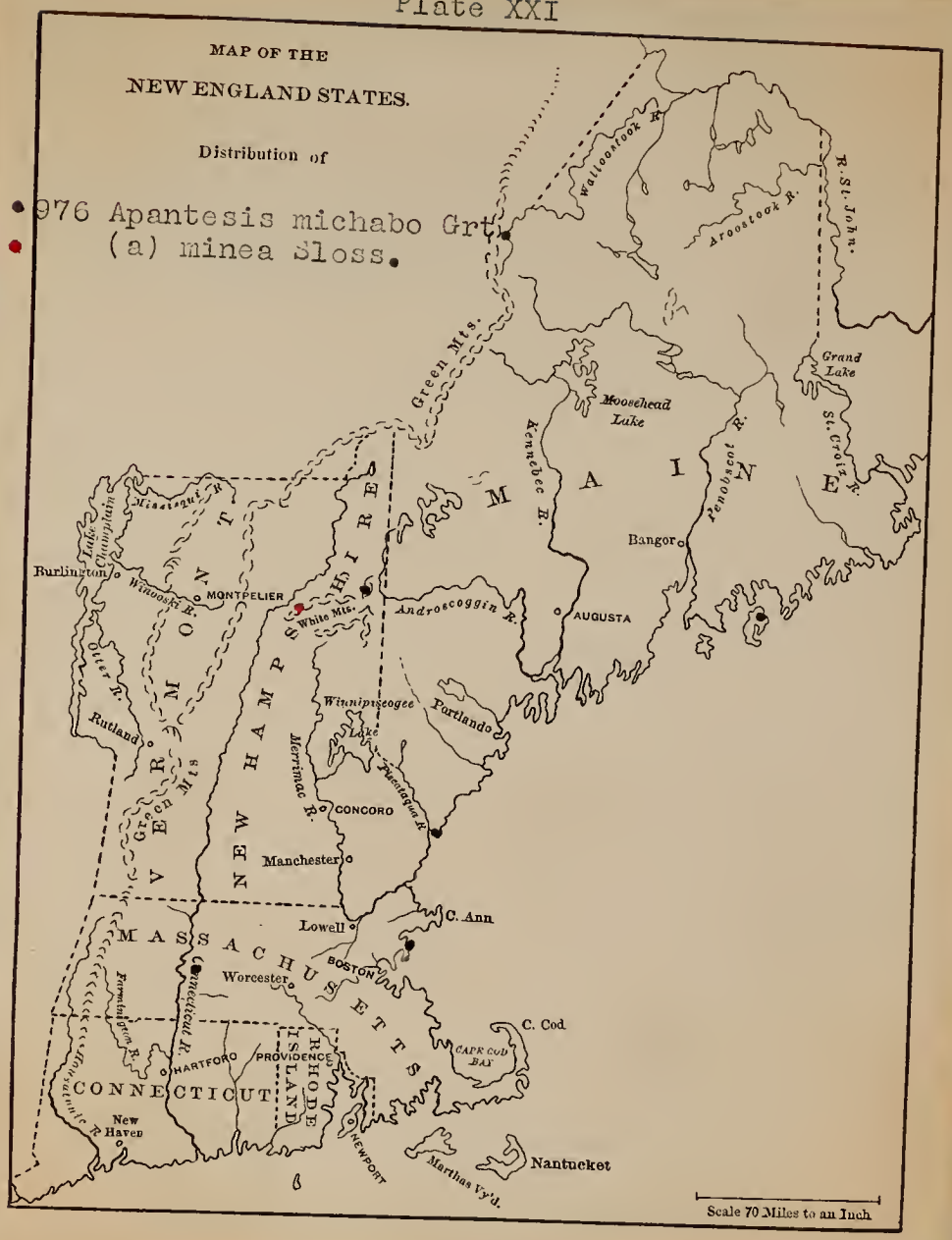

MAP OF THE
NEW ENGLAND STATES.
Distribution of
976 Apantesis michabo Grt
(a) minea Sloss.
Wallcastook R.
Aroostook R.
R. St. John.
Grand Lake
Green Mts.
Moosehead Lake
Kennebec R.
Penobscot R.
St. Croix R.
MAINE
Bangor
Rurlington
Lake Champlain
Missisquoi R.
Winooski R.
MONTPELIER
White Mts.
Androscoggin R.
AUGUSTA
VERMONT
NEW HAMPSHIRE
Otter R.
Rutland
Green Mts.
Winnipiseogee Lake
Portland
Merrimac R.
CONCORD
Pemigewasset R.
Manchester
C. Ann
Lowell
MASSACHUSETTS
Connecticut R.
Worcester
BOSTON
C. Cod
CAPE COD BAY
Farmington R.
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
New Haven
NEWPORT
Marthas Vyd.
Nantucket
Scale 70 Miles to an Inch

Plate XXII

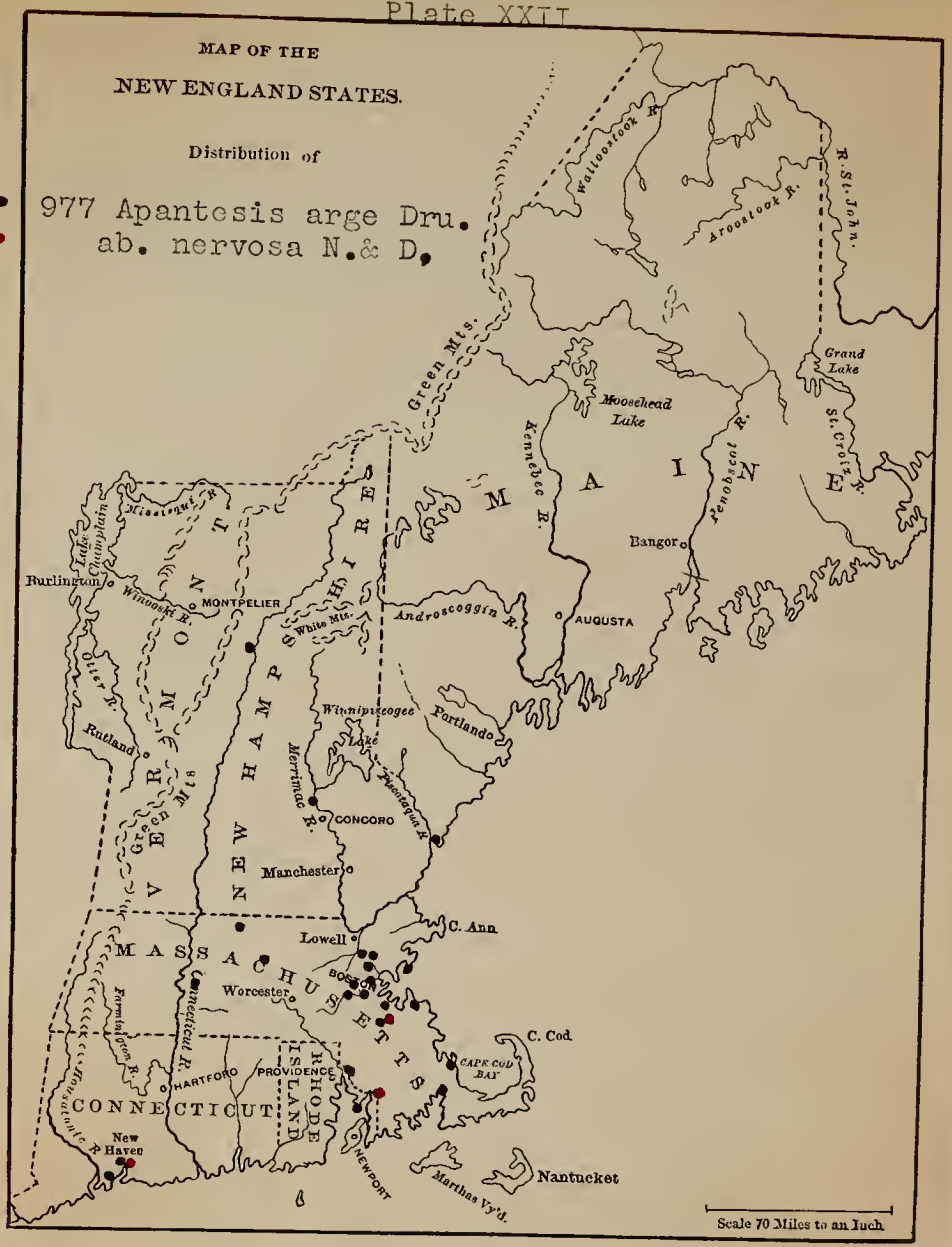

MAP OF THE
NEW ENGLAND STATES.
Distribution of
977 Apantesis arge Dru.
ab. nervosa N.& D.
Wallootook R.
R. St. John.
Aroostook R.
Grand Lake
Green Mts.
Moosehead Lake
Kennebec R.
Penobscot R.
St. Croix R.
MAINE
Bangor
Lake Champlain
Missisquoi R.
Burlington
Winooski R.
MONTPELIER
White Mts.
Androscoggin R.
AUGUSTA
VERMONT
NEW HAMPSHIRE
Otter R.
Rutland
Winnipiseogee Lake
Portland
Merrimac R.
Piscataqua R.
CONCORD
Green Mts.
Manchester
C. Ann
Lowell
MASSACHUSETTS
BOSTON
Worcester
Connecticut R.
Farmington R.
C. Cod
CAPE COD BAY
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
New Haven
NEWPORT
Martha's Vy'd.
Nantucket
Scale 70 Miles to an Inch.

Plate XXIII

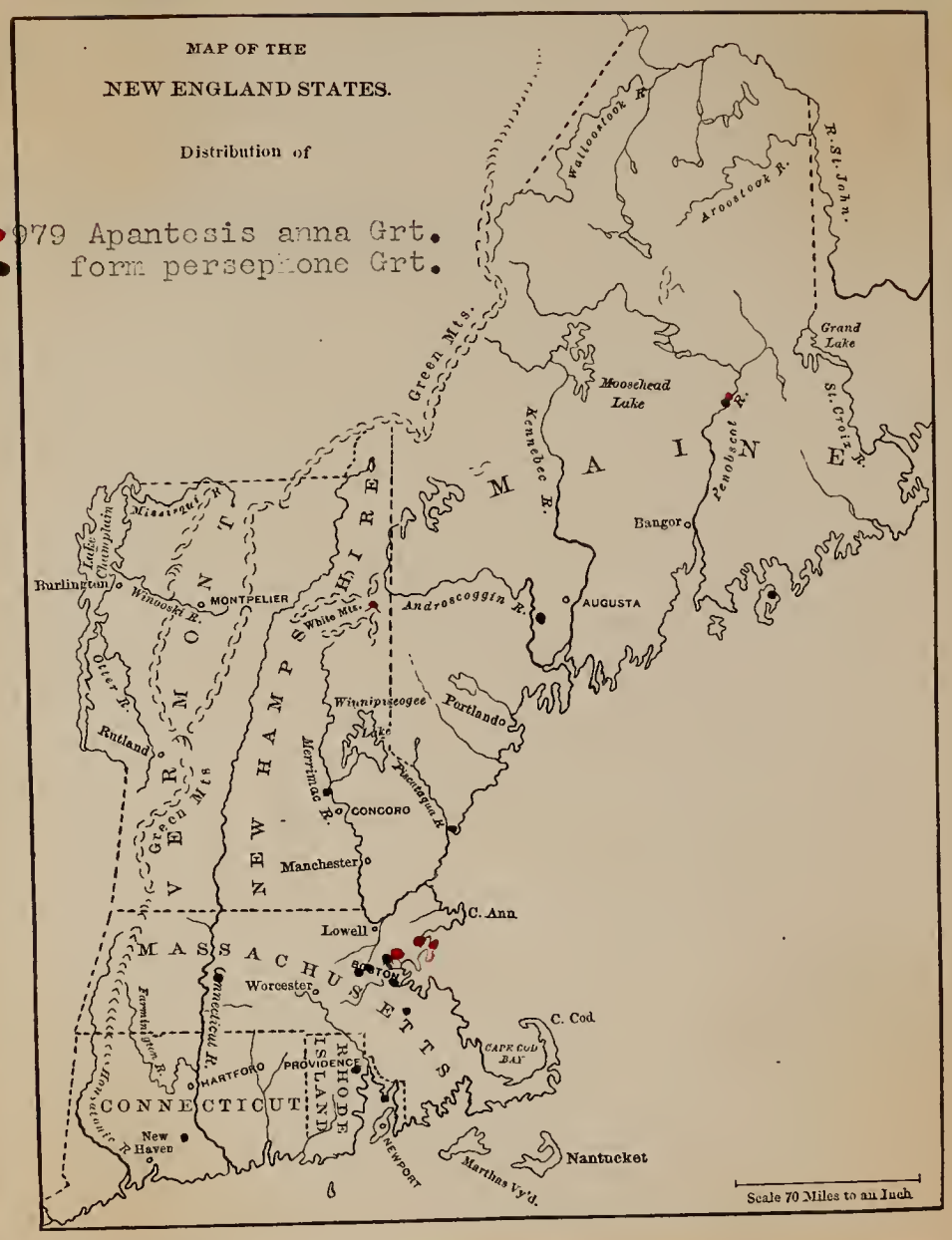

MAP OF THE
NEW ENGLAND STATES.
Distribution of
979 Apantesis anna Grt.
form persephone Grt.
Walloostook R.
Aroostook R.
R. St. John
Grand Lake
St. Croix R.
Moosehead Lake
Penobscot R.
Kennebec R.
Green Mts.
MAINE
Bangor
AUGUSTA
Androscoggin R.
White Mts.
Missisquoi R.
Lake Champlain
Burlington
Winooski R.
MONTPELIER
VERMONT
Otter R.
Rutland
Green Mts
NEW HAMPSHIRE
Winnipiseogee Lake
Portland
Merrimac R.
Piscataqua R.
CONCORD
Manchester
C. Ann
Lowell
MASSACHUSETTS
BOSTON
Worcester
C. Cod
CAPE COD BAY
Connecticut R.
Farmington R.
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
New Haven
NEWPORT
Marthas Vy'd.
Nantucket
Scale 70 Miles to an Inch

Plate XXIV

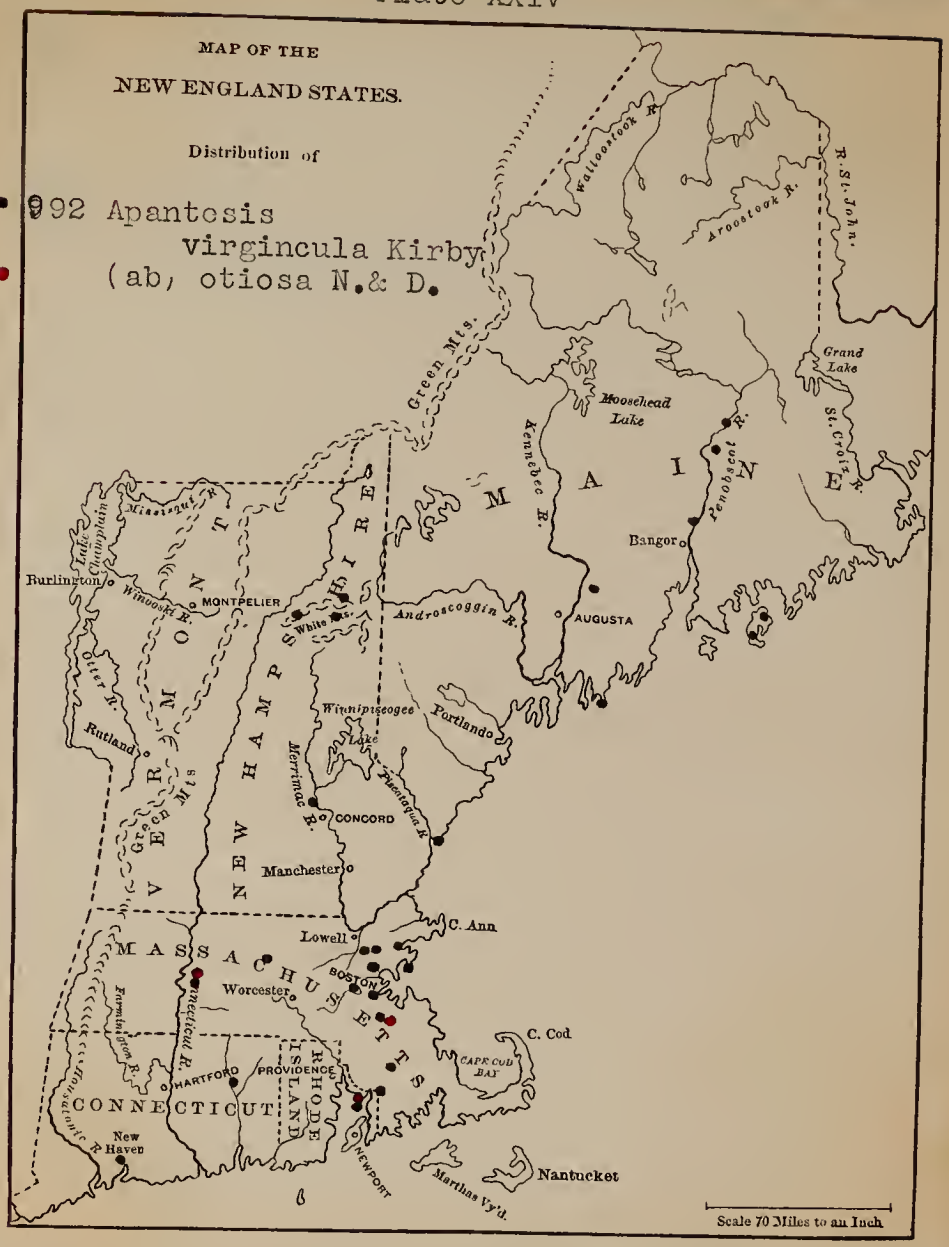

MAP OF THE
NEW ENGLAND STATES.
Distribution of
992 Apantesis
virgincula Kirby
(ab, otiosa N.& D.
Walloostook R.
Aroostook R.
R. St. John.
Grand Lake
Moosehead Lake
St. Croix R.
Penobscot R.
Kennebec R.
Green Mts.
MAINE
Bangor
AUGUSTA
Androscoggin R.
Missisquoi R.
Lake Champlain
Burlington
Winooski R.
MONTPELIER
White Mts.
NEW HAMPSHIRE
VERMONT
Otter R.
Rutland
Green Mts
Winnipiseogee Lake
Portland
Merrimac R.
Pawtuxet R.
CONCORD
Manchester
C. Ann
Lowell
MASSACHUSETTS
BOSTON
Worcester
Connecticut R.
Farmington R.
C. Cod
CAPE COD BAY
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
New Haven
Housatonic R.
NEWPORT
Marthas Vy'd.
Nantucket
Scale 70 Miles to an Inch

Plate XXV

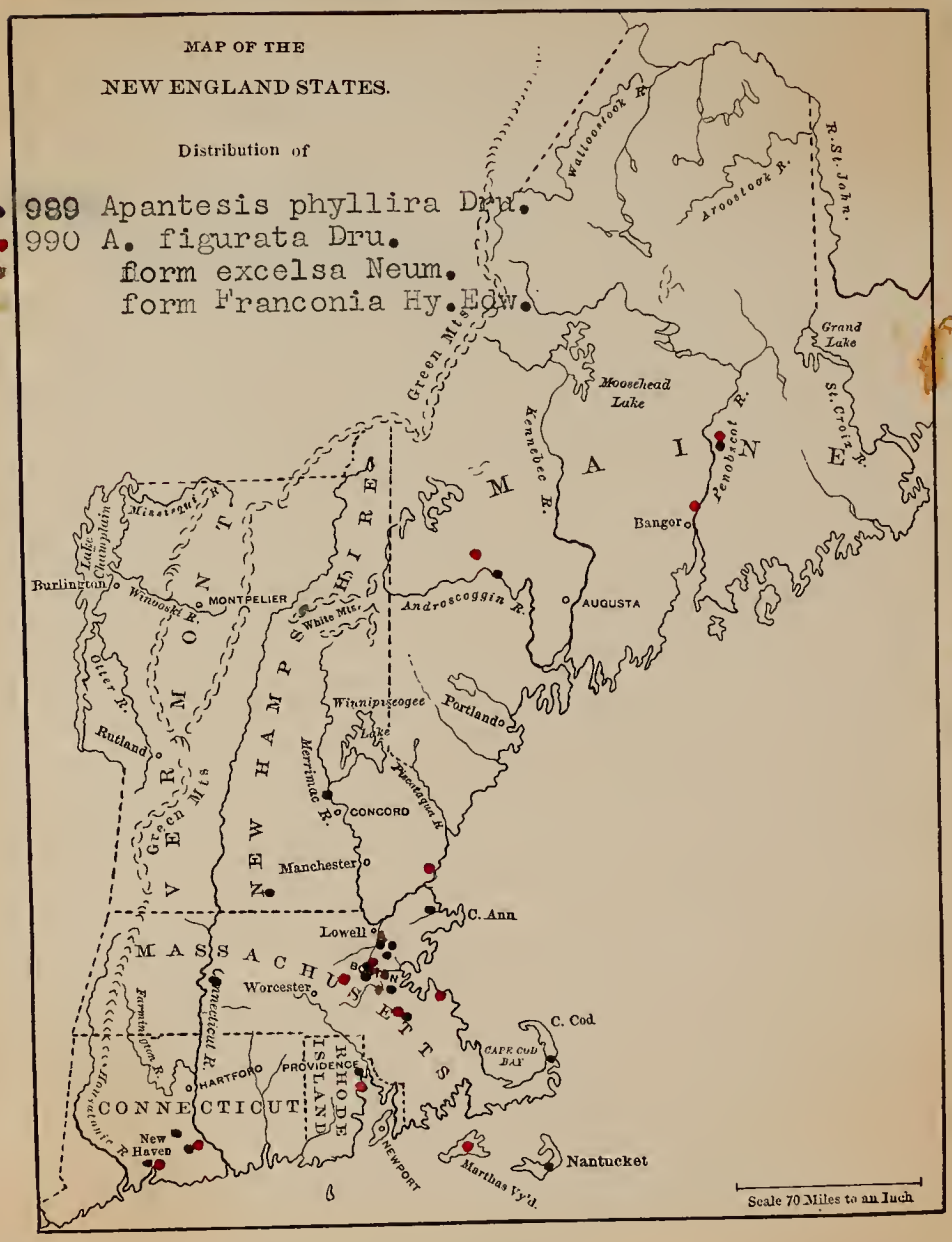

MAP OF THE
NEW ENGLAND STATES.
Distribution of
989 Apantesis phyllira Dru.
990 A. figurata Dru.
form excelsa Neum.
form Franconia Hy. Edw.
Green Mts
Walloostook R.
Aroostook R.
R. St. John.
Grand Lake
Moosehead Lake
St. Croix R.
Kennebec R.
Penobscot R.
MAINE
Bangor
Lake Champlain
Missisquoi R.
Burlington
Winooski R.
MONTPELIER
White Mts.
Androscoggin R.
AUGUSTA
VERMONT
NEW HAMPSHIRE
Otter R.
Rutland
Green Mts
Winnipiseogee Lake
Portland
Merrimac R.
CONCORD
Pemigewasset R.
Manchester
C. Ann
Lowell
MASSACHUSETTS
Worcester
Connecticut R.
Farmington R.
HARTFORD
PROVIDENCE
RHODE ISLAND
C. Cod
CAPE Cod BAY
CONNECTICUT
New Haven
Housatonic R.
NEWPORT
Martha's Vy'd.
Nantucket
Scale 70 Miles to an Inch

Plate XXVI

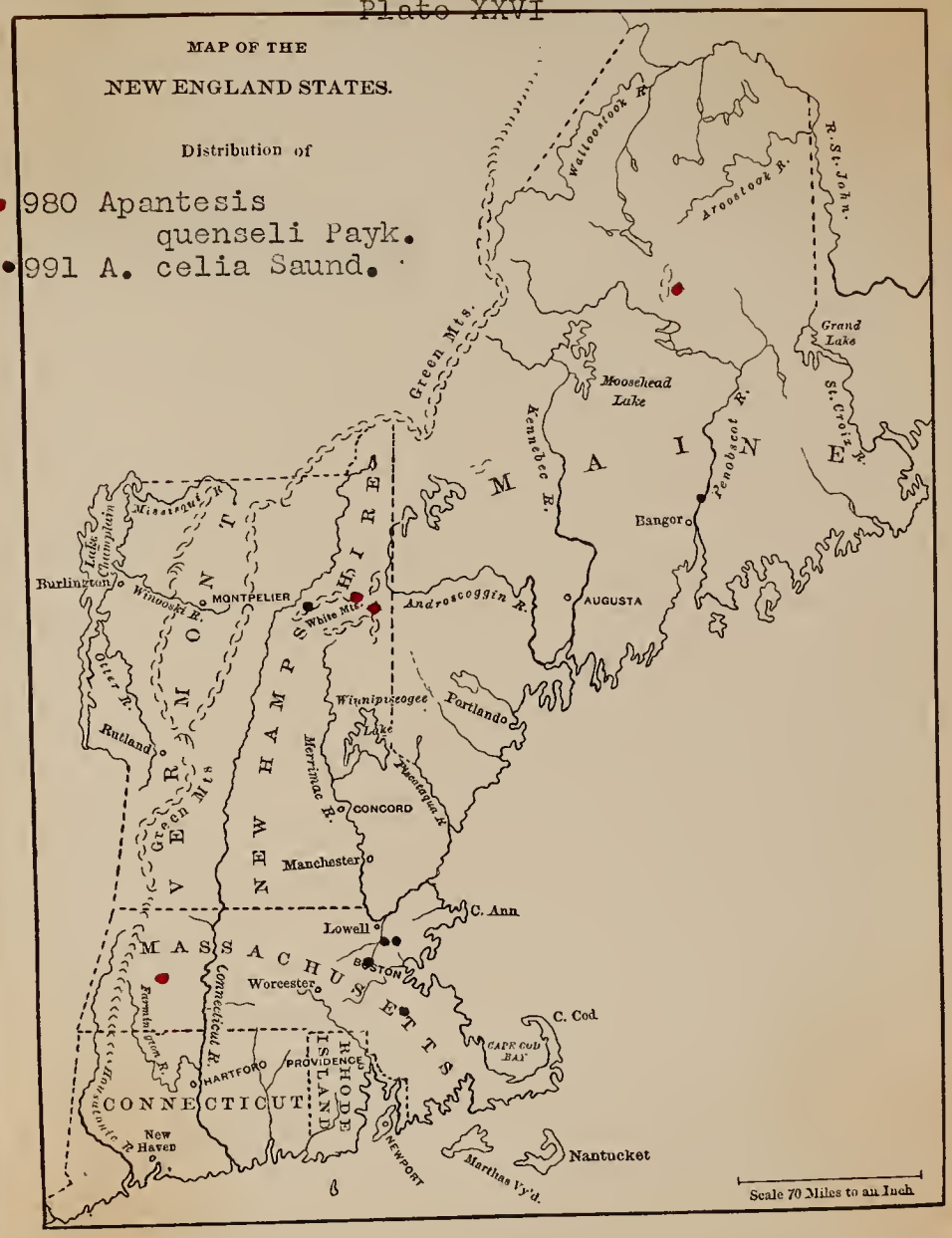

MAP OF THE
NEW ENGLAND STATES.
Distribution of
980 Apantesis quenseli Payk.
991 A. celia Saund.
Wallootook R.
Aroostook R.
R. St. John.
Grand Lake
St. Croix R.
Green Mts.
Moosehead Lake
Kennebec R.
MAINE
Penobscot R.
Bangor
Missisquoi R.
Lake Champlain
Burlington
Winooski R.
MONTPELIER
White Mts.
Androscoggin R.
AUGUSTA
VERMONT
NEW HAMPSHIRE
Otter R.
Rutland
Green Mts.
Winnipiseogee Lake
Portland
Merrimac R.
Piscataqua R.
CONCORD
Manchester
C. Ann
Lowell
MASSACHUSETTS
BOSTON
Worcester
Connecticut R.
C. Cod
CAPE COD BAY
Farmington R.
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
New Haven
NEWPORT
Nantucket
Marthas Vy'd.
Scale 70 Miles to an Inch

Plate XXVII

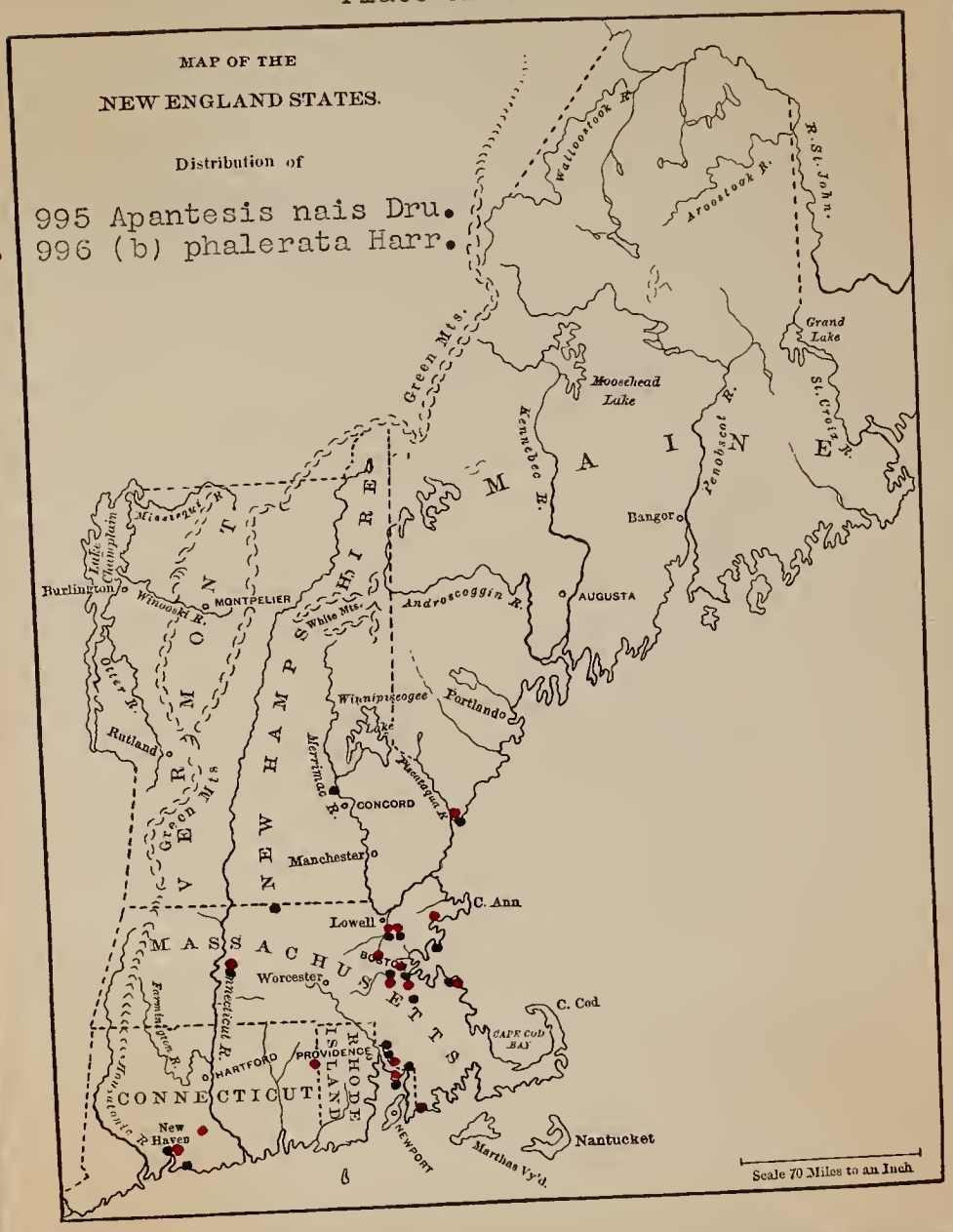

MAP OF THE
NEW ENGLAND STATES.
Distribution of
995 Apantesis nais Dru.
996 (b) phalerata Harr.
Wallooskook R.
Aroostook R.
R. St. John.
Grand Lake
St. Croix R.
Moosehead Lake
Kennebec R.
Penobscot R.
Green Mts.
MAINE
Bangor
AUGUSTA
Missisquoi R.
Lake Champlain
Burlington
Winooski R.
MONTPELIER
VERMONT
White Mts.
Androscoggin R.
NEW HAMPSHIRE
Otter R.
Rutland
Green Mts
Winnipiseogee Lake
Portland
Merrimac R.
Pawtuxet R.
CONCORD
Manchester
C. Ann
Lowell
MASSACHUSETTS
BOSTON
Worcester
C. Cod
CAPE COD BAY
Connecticut R.
Farmington R.
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
New Haven
NEWPORT
Marthas Vy'd.
Nantucket
Scale 70 Miles to an Inch

Plate XXVIII

XX

MAP OF THE

NEW ENGLAND STATES.

Distribution of

996 Apantesis vittata Fabr.
(a) radians Wlk.

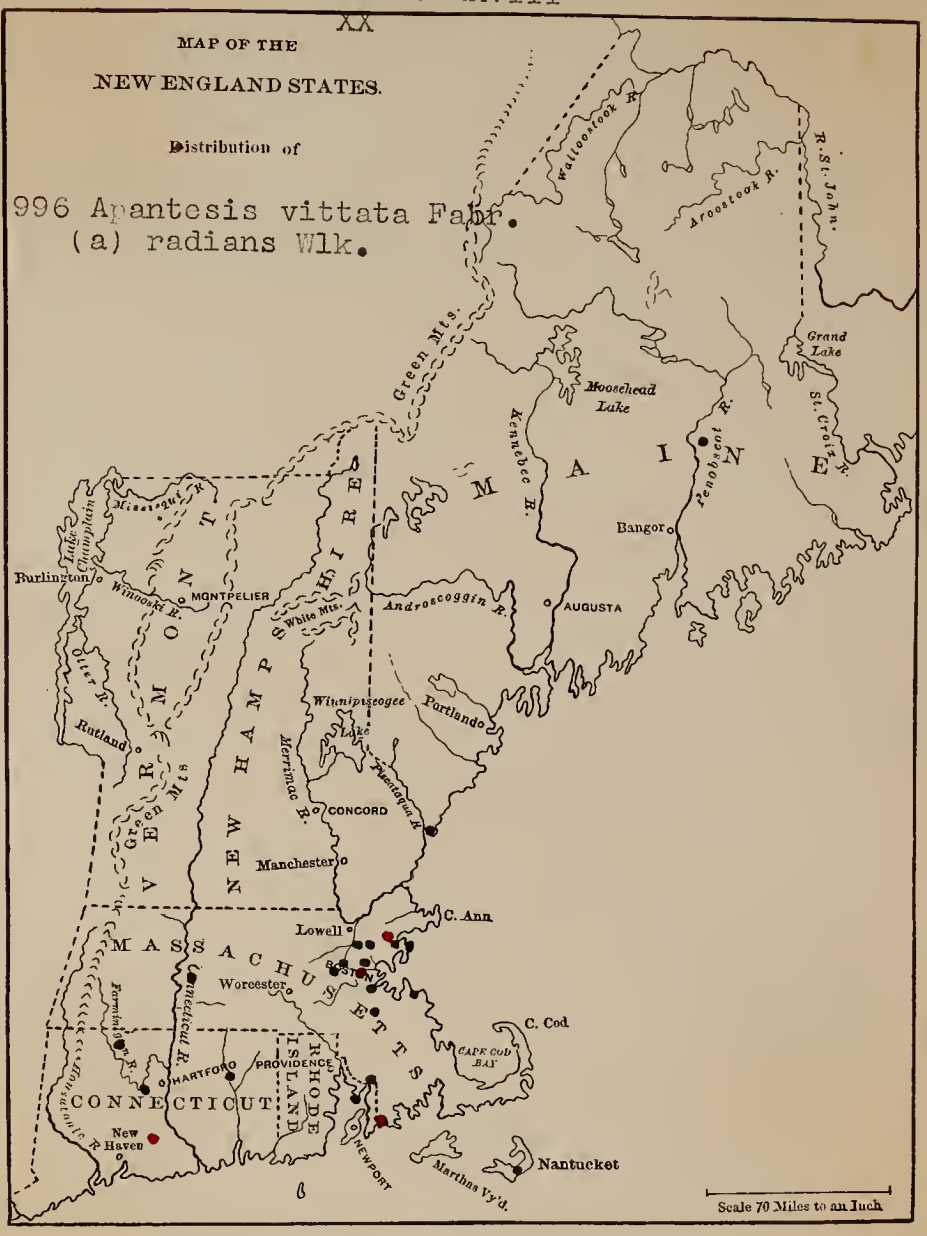


Plate XXIX

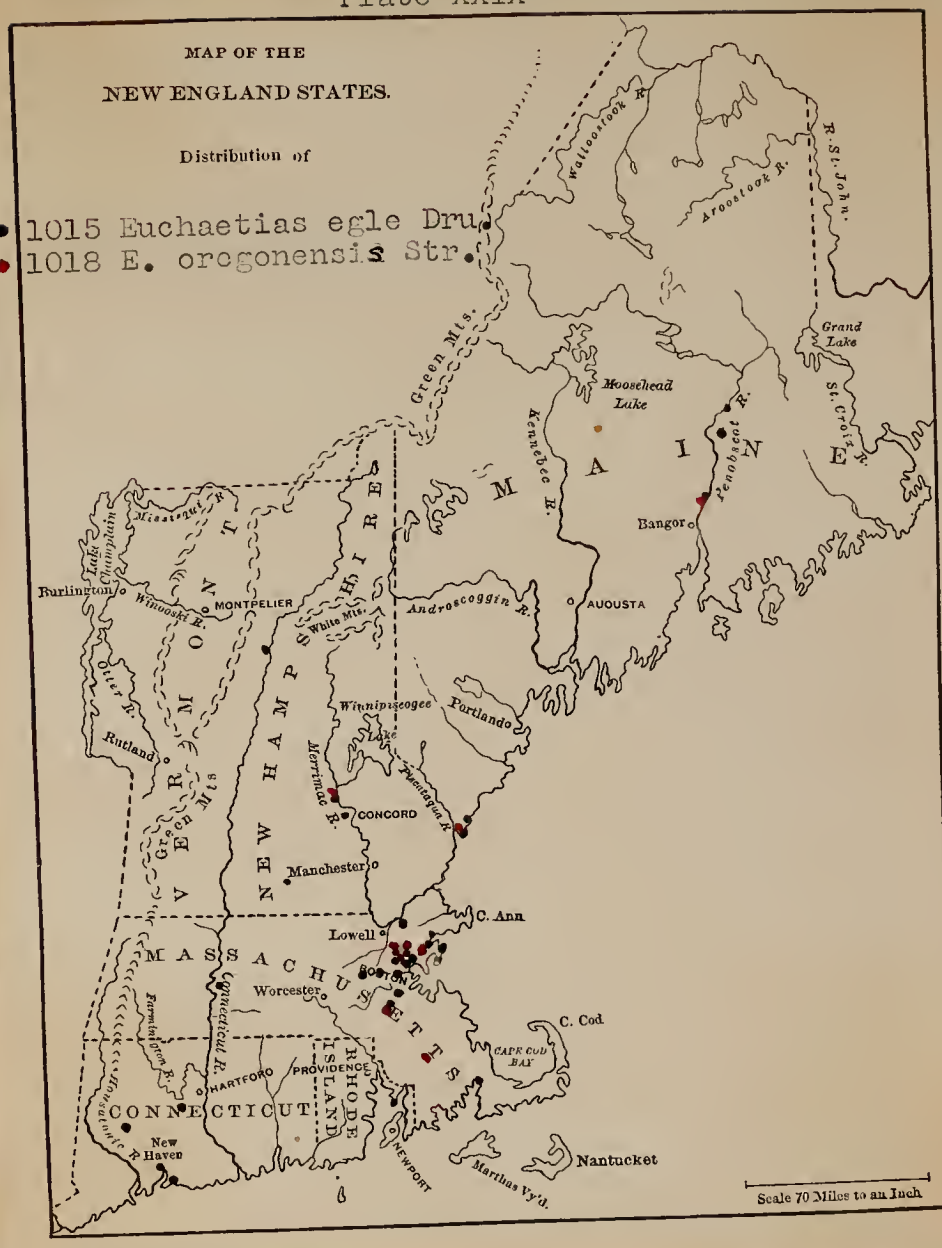

MAP OF THE
NEW ENGLAND STATES.
Distribution of
1015 Euchaetias egle Dru.
1018 E. oregonensis Str.
Walloostook R.
Aroostook R.
R. St. John.
Grand Lake
St. Croix R.
Moosehead Lake
Penobscot R.
Kennebec R.
Green Mts.
MAINE
Bangor
AUGUSTA
Androscoggin R.
White Mts.
Missisquoi R.
Lake Champlain
Burlington
Winooski R.
MONTPELIER
VERMONT
Otter Cr.
Rutland
Green Mts.
NEW HAMPSHIRE
Winnipiseogee Lake
Portlando
Merrimac R.
CONCORD
Pemigewasset R.
Manchester
C. Ann
Lowell
BOSTON
MASSACHUSETTS
Worcester
Connecticut R.
Housatonic R.
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
New Haven
NEWPORT
C. Cod
CAPE COD BAY
Marthas Vy'd.
Nantucket
Scale 70 Miles to an Inch

Plate XXX

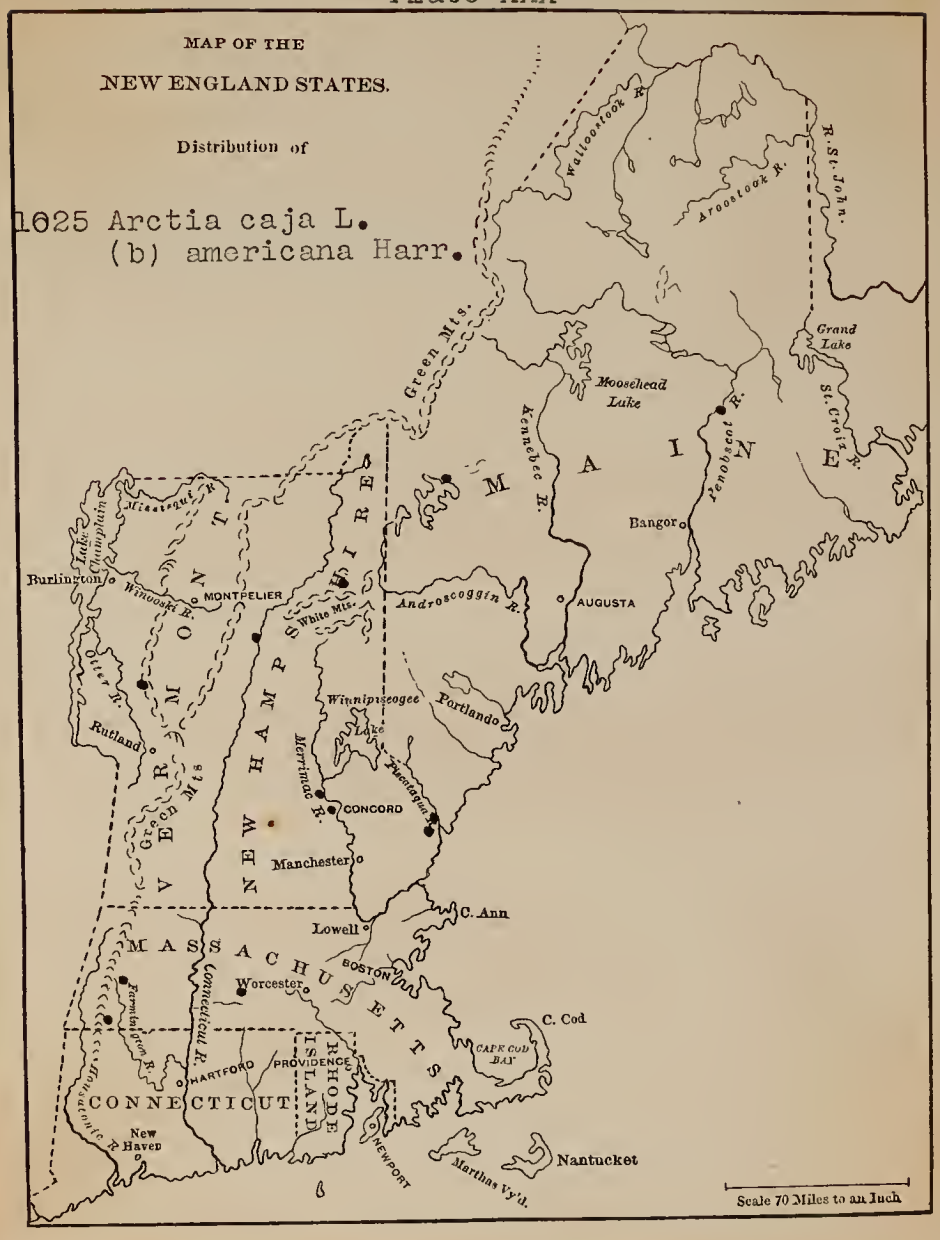

MAP OF THE
NEW ENGLAND STATES.
Distribution of
1025 Arctia caja L.
(b) americana Harr.
Walloostook R.
Aroostook R.
R. St. John.
Grand Lake
St. Croix R.
Green Mts.
Moosehead Lake
Kennebec R.
Penobscot R.
MAINE
Bangor
Lake Champlain
Missisquoi R.
Burlington
Winooski R.
MONTPELIER
White Mts.
Androscoggin R.
AUGUSTA
VERMONT
Otter R.
Rutland
Green Mts
NEW HAMPSHIRE
Winnipiseogee Lake
Portland
Merrimac R.
Piscataqua R.
CONCORD
Manchester
C. Ann
Lowell
MASSACHUSETTS
BOSTON
Connecticut R.
Worcester
C. Cod
CAPE COD BAY
Farmington R.
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
Housatonic R.
New Haven
NEWPORT
Martha's Vy'd.
Nantucket
Scale 70 Miles to an Inch

Plate XXXI

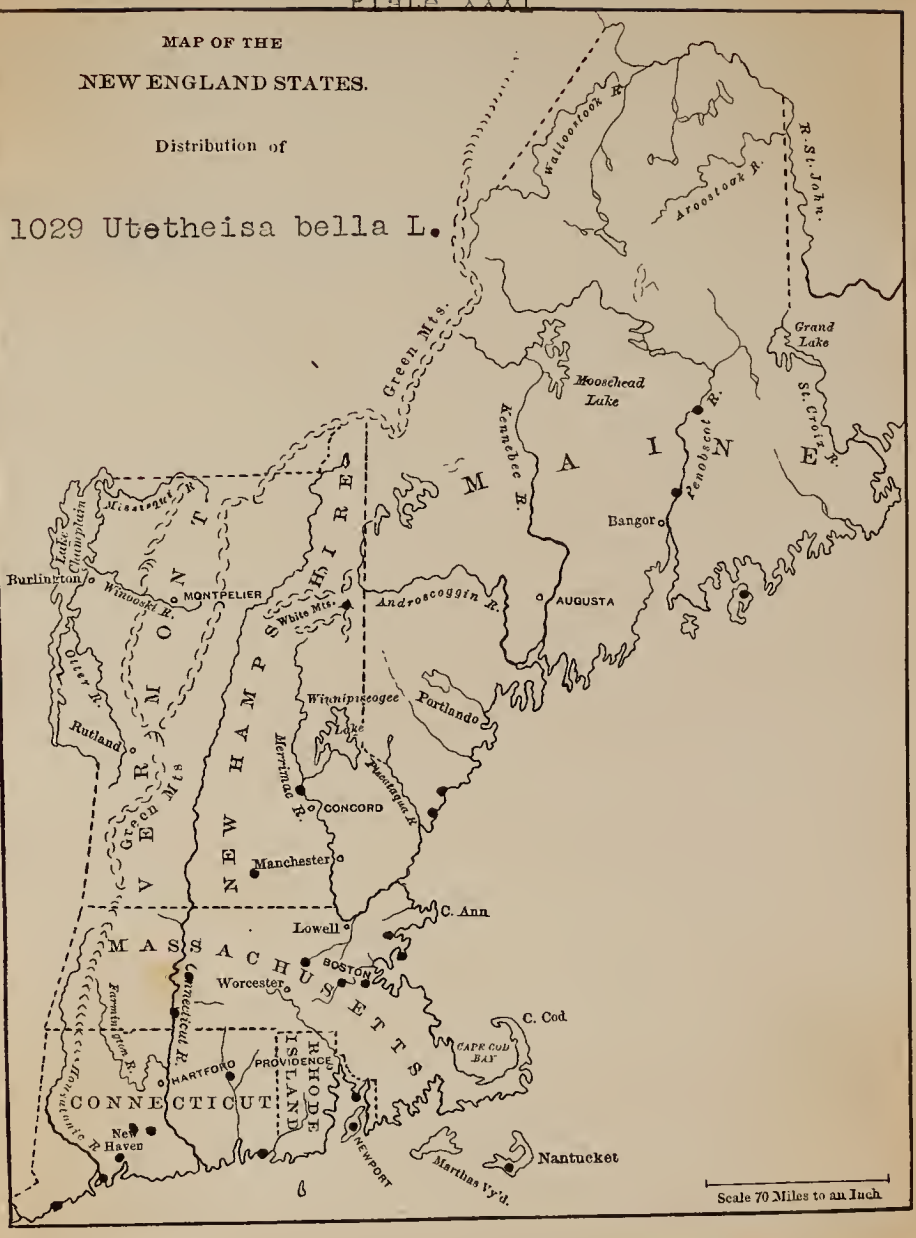

MAP OF THE
NEW ENGLAND STATES.
Distribution of
1029 Utetheisa bella L.
Walloostook R.
Aroostook R.
R. St. John.
Grand Lake
Mooschead Lake
St. Croix R.
Penobscot R.
Kennebec R.
Green Mts.
MAINE
Bangor
AUGUSTA
Androscoggin R.
White Mts.
NEW HAMPSHIRE
Winnipiseogee Lake
Portlando
Merrimac R.
CONCORD
Piscataqua R.
Manchester
VERMONT
Green Mts
Rutland
Otter R.
Winooski R.
MONTPELIER
Lake Champlain
Missisquoi R.
Burlington
C. Ann
Lowell
MASSACHUSETTS
BOSTON
Worcester
Connecticut R.
C. Cod
CAPE COD BAY
Farmington R.
HARTFORD
PROVIDENCE
RHODE ISLAND
CONNECTICUT
New Haven
NEWPORT
Marthas Vy'd.
Nantucket
Scale 70 Miles to an Inch.

Plate XXXII

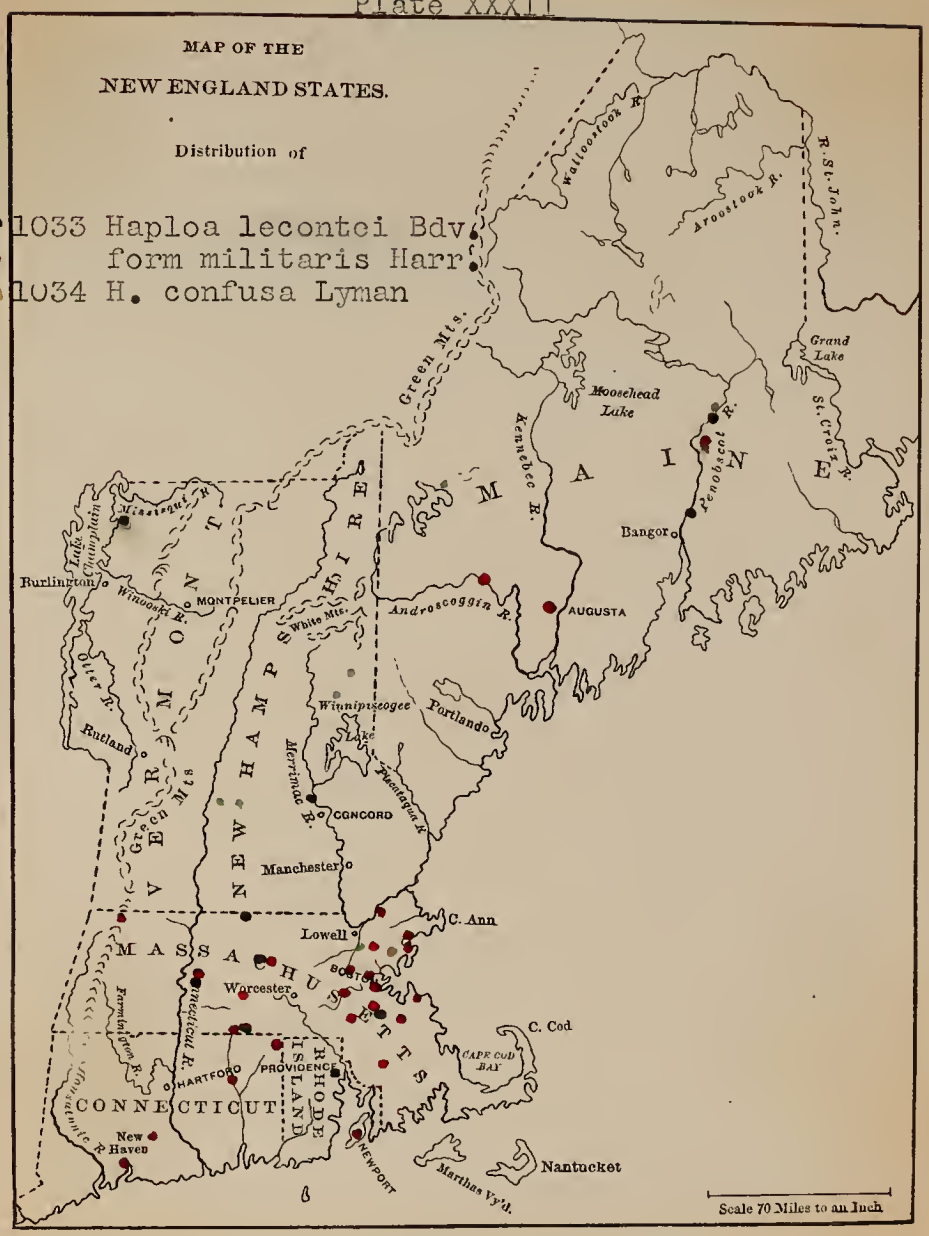
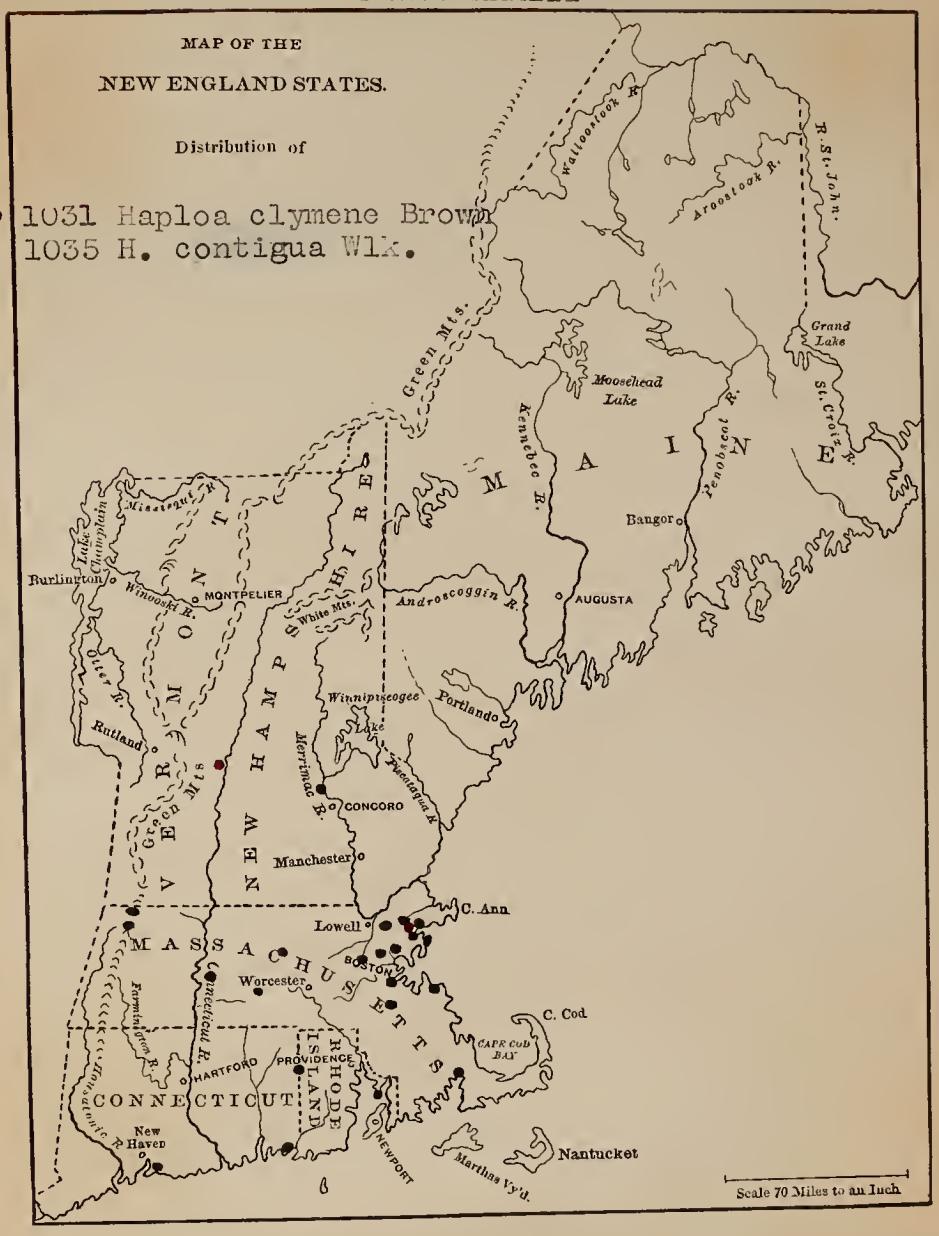

MAP OF THE
NEW ENGLAND STATES.
Distribution of
1033 Haploa lecontei Bdv.
form militaris Harr.
1034 H. confusa Lyman
Wallostook R.
Aroostook R.
R. St. John.
Grand Lake
St. Croix R.
Moosehead Lake
Kennebec R.
Penobscot R.
MAINE
Bangor
AUGUSTA
Androscoggin R.
Green Mts.
Lake Champlain
Missisquoi R.
Burlington
Winooski R.
MONTPELIER
White Mts.
Winnipiseogee Lake
Portland
Otter R.
Rutland
Merrimac R.
CONCORD
Pemigewasset R.
Manchester
Lowell
C. Ann
Worcester
BOSTON
C. Cod
CAPE COD BAY
Connecticut R.
Farmington R.
HARTFORD
PROVIDENCE
RHODE ISLAND
Housatonic R.
CONNECTICUT
New Haven
NEWPORT
Marthas Vyd.
Nantucket
Scale 70 Miles to an Inch

Plate XXXIII



Approved by

Charles P. Alexander

James E. Fuller

William L. Davis.

Graduate Committee

Date June 2, 1936.