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BIRD POLLINATION PROBLEMS IN CALIFORNIA

WITH ONE ILLUSTRATION

By A. L. PICKENS

One of the most interesting phases of nature study is the unraveling of the various problems presented by winged creatures seeking the nectar of flowers, and being forced in turn to transfer pollen for those flowers. Some time since, holiday journeys with the family to see the yuccas in bloom afforded a pleasant surprise, an opportunity to learn more intimately the white sage (*Ramona polystachya*). The odd shape of the flowers so excited my curiosity that the yuccas were almost overshadowed in interest. What insect had developed so rare a form in a flower? Pilfering ants, small beetles and some other smaller species were plainly out of the question. The domestic honey bees, present by thousands, are also out of the running because of their late addition to our fauna.

The front of the white sage flower is closed by an upward folded shutter that must be pulled downward to open the tube, and on this the stamens are attached like two horns, while the pistil hangs out to one side, being forced to grow so by the uplifted shutter that turns it aside from the usual medial course (no. I in fig. 66). When the shutter is pulled down it brings with it the stamens, the whole assuming the same general angle (no. III in fig. 66). Sometimes a bee would light on the anterior drooping fold of the shutter and pull it downward. It would occasionally seize the now horizontal stamens and swing on them as a gymnast swings on horizontal bars, thus dusting its abdomen with pollen; and once I saw one, as if seeking a better footing, lay hold of the pistil and draw this to the pollinated surfaces of the body. Other bees stood on the tube, and sought to push the shutter open from behind, while some slipped right between the divergent stamens without dusting off the pollen.

For a large bee like *Xylocopa* the flower is ideal. It alights on the shutter, pulls it down by its weight, and probes under a smaller downward flap that still guards entrance to the tube. Hugging the outer shutter for support turns the pollen faces of the anthers upward, and the divergent stamens bring them up snug, one under each wing of the large bee. Still grasping for a secure footing it reaches out and draws the pistil up under one wing, touching a part of the same dusted by a previous flower. It is a beautiful example of natural reciprocity, but

the striking absence of these insects from large areas of treeless mesas where sage flowers are abundant seems to demand a complementary pollinator. Such a possibility I found in the Costa Hummingbird (*Calypte costae*).

In the afternoon hummingbirds were in evidence on the heated mesa around clumps of *Rhus ovata* which bore berries with an acrid, syrupy coating that possibly lured insects palatable to the birds. As the sun dropped behind the mountains the Costa Hummingbirds became more and more in evidence about the white sage blossoms. It was a marvel of skill for these birds to manipulate the outer shutter and draw the nectar from under the inner and smaller flap without doing this treasury of sweets any harm, though it must originally have been evolved for some

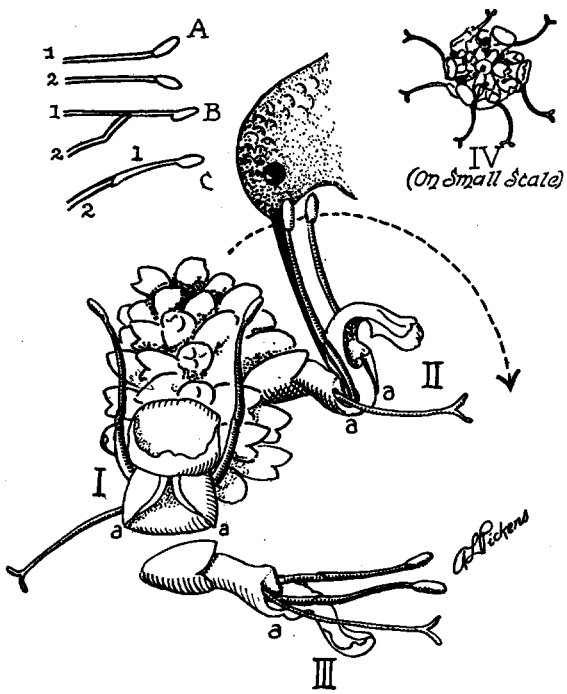

Fig. 66. FLOWERS AND FLOWER PARTS OF THE WHITE SAGE. DRAWN TO SHOW HOW HUMMINGBIRDS BRING ABOUT THE TRANSFER OF POLLEN FROM THE STAMENS TO THE PISTIL.

such insect as the *Xylocopa*. The bird, if I may so express it, had learned the combination and was working it more rapidly and gracefully than the insect. I watched in sheer delight the amethystine iridescence of the males' gorgets glowing gloriously in the gently subdued semi-twilight. It is a surprise to an Easterner, familiar with the Ruby-throated Hummingbird's ways, to find a hummer after pale flowers as if they were favorites, and to see them feeding by twilight. I had forgotten reading in Bailey's "Handbook of Birds of the Western United States" of Dr. Fisher seeing a Costa feeding by moonlight.

In great numbers of these flowers the shutters do not stand vertically in front of the tube, but actually lie backward over them so that the stamens recline on

the supporting mass of calyx and bud material. The bird approaches on wing, inserts its beak delicately beneath the shutter, lifting it gently forward and upward from its normal position and raising the stamens at the same time. The longer ones, when the bird plunges the tip of the beak into the tube, reach the feathers at the base of the mandibles. The shorter ones may merely dust the beak itself. The throat and breast of the bird appear to receive pollen at times, during the position incident to opening the shutter. The hinge of this (see a a in fig. 66), being a flexible fibrous one, unlike the rigid metal type has more than one line of motion, so that the anthers move, not only back and forth, but wig-wag from side to side, as they do so thus increasing greatly the area that may be dusted. From the top, some of these clusters, owing to the outward reach of the pistils, suggest the appearance of a very thin bottle-brush flower. (See IV in fig. 66.) This favors the brushing off of pollen if a bird approaches sufficiently close.

Some pistils turn upward and forward and are even better fitted to make contacts, while a few flowers actually have the shutter down, permitting the receiving organ to sweep forward symmetrically between the stamens, as is usual in most species. This is better adapted for receiving bird-borne pollen. Such plants are particularly interesting as affording a possible transmutation more favorable to new conditions. The soft shade of the flowers is one fitted for conspicuousness both before and after sunset, a valuable point with the partially twilight-feeding Costa. I have not so far found a nocturnal moth visiting them.

The long stamens, jointed as they are, hold in themselves an interesting story. They have apparently developed from the simple type seen in more primitive labiates. The next step, seen in *Salvia* of our lawns, shows the lower stamen elbowing to support the upper, sacrificing its anther to do so. In the present species the upper stamen has lost its own base and derives its nourishment from the lower, extended for sake of length. (See A, B, C in fig. 66.)

With Costa Hummingbirds in favor on the treeless mesas, and the large bees in the wooded mountains, the present evolutionary stage of the white sage is an interesting one, and is rendered even more complex by the introduction of the honey bee into its habitat. The Costa, however, at the proper season, turns readily from this flower to the scarlet larkspur (*Delphinium cardinale*) or to hen-and-chickens leek (*Dudleya brauntoni*), while in the nearby tree tobacco thickets (*Nicotiana glauca*) it vies with the Anna and the Black-chinned hummers. One bird I noted showed a preference for the yellowish buds of the white sage, inserting the beak gently between the unopened petals to try the contents, driven perhaps to this by keen honey bee competition. In the nearby mountain cañon, white sage was found growing abundantly in the Black-chinned Hummingbirds' nesting territory, and the birds there were dividing their attention between it and purple pentstemon (*Pentstemon spectabilis*), California thistle (*Cirsium californicum*), and monkey flower (*Mimulus glutinosus*). I wondered if there would be a variation of anther lengths to suit the beaks of the species, but variation and intergradation of length as determined on museum specimens of both birds would make any such point hard to work out.

In passing to another head, I beg to caution the reader that I do not hold *Ramona* (*Audibertia*) *polystachya* to be a hummingbird flower in the sense that its relative the hummingbird sage (*R. grandiflora*) is. I am merely giving evidence to show that its favors are divided, and that its evolution may be more affected by the avian influence than has heretofore been noted.

Nectar-drinking is far more common among birds than some observers have

suspected. During the short period incident to a long-distance telephone message one afternoon, I noted a fraction of a dozen species of native birds drink from the flowers of the avenue of silk oaks in the nearby street. I add here a list of such species as have come to my knowledge, which either visit flowers for nectar or transport pollen.

Flicker (*Colaptes cafer*). C. F. Saunders' "Western Flower Guide", following Chesnut, states that the Yellow-hammer frequents the Indian warrior (*Pedicularis densiflora*) for the abundant nectar.

Scott Oriole (*Icterus parisorum*). Bailey's "Handbook of Birds of the Western United States" tells of orioles feeding among the flowers of a giant agave, the greenish yellow color of which they match in a suggestively protective manner. Dr. Joseph Grinnell states in conversation that this is a habit with the Scott Oriole.

Arizona Hooded Oriole (*Icterus cucullatus nelsoni*). I have observed this bird drinking from silk oak (*Grevillea robusta*) flowers, and the century plant blossoms. Probably the same species is reported drinking from the tree tobacco flowers.

The California Linnet (*Carpodacus mexicanus*) appears to be the chief drinker at the silk oaks.

Pine Siskin (*Spinus pinus*). A specimen brought into the Los Angeles Museum, shot from a yellow-flowered tree, was temporarily yellow possibly from pollen.

Western Tanager (*Piranga ludoviciana*). I have seen this bird drinking from silk oak flowers.

Phainopepla (*Phainopepla nitens*) was drinking from the same species of tree.

Bush-tit (*Psaltriparus minimus*). Dr. L. B. Bishop reports this species as frequently dusted with willow pollen. I have noted it drinking from silk oak flowers.

Verdin (*Auriparus flaviceps*) was observed near Niland feeding from the flowers of purple loco (*Astragalus purpureus*). No insect could be found in these flowers, and the quest was evidently for nectar.

Mockingbird (*Mimus polyglottos*). A single bird was seen in Alhambra, feeding from silk oak nectaries.

The reception given the silk oak is truly noteworthy, but in its native land it belongs to a genus often visited for nectar by birds. The gladioluses, favorites of hummingbirds in both Atlantic and Pacific states, appear almost as if developed under the birds' influence. Our Anna Hummingbird (*Calypte anna*) has taken strongly to *Grevillea thelemannia*, the color of whose flowers so strongly suggests that of its gorget when lighted for display. Bottle-brush (*Melaleuca hypericifolia*) and its relatives, also the coral tree (*Erythrina christi-galli*) and the various species of eucalyptus, especially the scarlet, are visited by Californian hummingbirds. From the second "Vogelblumenstudien" of Dr. Otto Porsch of Vienna I find all these, or at least members of the same genera, were subject to an avian influence in their own lands (Jahrbüchern für wissenschaftliche Botanik, LXX, 2). Students of ornithophily are indeed indebted to Dr. Porsch for his careful work in this and preceding publications.

Some very highly specialized exotics are finding their way into our gardens. It is easy to observe the migrating hummingbirds visit the flowering oranges and the over-loaded wistaria vines, but not everyone has a chance to study the reaction of these feathered nectar-seekers to plants such as *Streletzia*. More than one representative of this genus is occasionally found in the open in southern gardens, and *Streletzia reginae* was developed for pollination by an African bird. I should think anyone, favorably situated to study the reactions of our birds to this floral oddity, would make no unworthy contribution to science if he enlightened us as to the African flower's reception by American birds.

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