

STUDIES OF AUSTRALIAN BEES.

BY TARLTON RAYMENT.

I.—THE LEAF-CUTTING BEES.

(*Megachile macularis*, Dalla Torre, and other species).

The Great War did not pass over my family without leaving its imprint. The anxiety over the safety of those abroad, the grief of stricken relatives at home, the financial losses—all were surfeited with life in a little, old, ramshackle cottage that had but one redeeming feature: around its portals, and straying, unkempt, far over the roof, were the rich masses of a golden-flowered Banksian rose. The name I shall never forget, it was the "Seven Sisters," but that is quite immaterial, for the bonds that chained us to that modest abode were the golden lengths of bloom. This prodigality of wealth on the exterior compensated for the poverty of the drab inside.

The world regained its sanity and returned to work. Once more I could plan and devise. At length, fortune smiled, and my pencil mapped out a dream-house on paper. The ideal developed into the material, and soon pegs were driven in and workmen were busy pouring concrete into wooden moulds; forming walls to withstand the crumbling grasp of Time.

I can hear some impatient reader exclaiming:—"What on earth has his house got to do with the leaf-cutting bees?"

It has everything to do with the subject, for in the building of my habitation a most unexpected provision was made to accommodate thousands of bees and wasps. Why, one cannot find leaf-cutters' nests every year, but in my house I had hundreds of nests each week. Think of it, dozens of leafy cells right at my hand any hour of the day.

Well, you should know that the wooden formes on the exterior and interior of the walls were held together with double-ended iron bolts, having a diameter of $\frac{3}{8}$ of an inch. Prior to insertion, these were greased to prevent the adhering of cement, and, after the concrete had hardened, they were withdrawn. The walls, then, were pierced in hundreds of places with $\frac{3}{8}$ in. holes. When the finishing, white plaster was applied to the inside, that resulted in the closing of the far end of the hole.

The rough, unfinished exterior had a suggestion of the antique that satisfied my sense of beauty, consequently, the outside was untouched for a year or two. But I had observed that many tenants had already taken up their quarters in my walls. True, the "passers by" laughed at my high-pitched, red-tile roof overhanging the solid, unfinished grey of the concrete; but I desired to study bees, not my fellow-creatures.

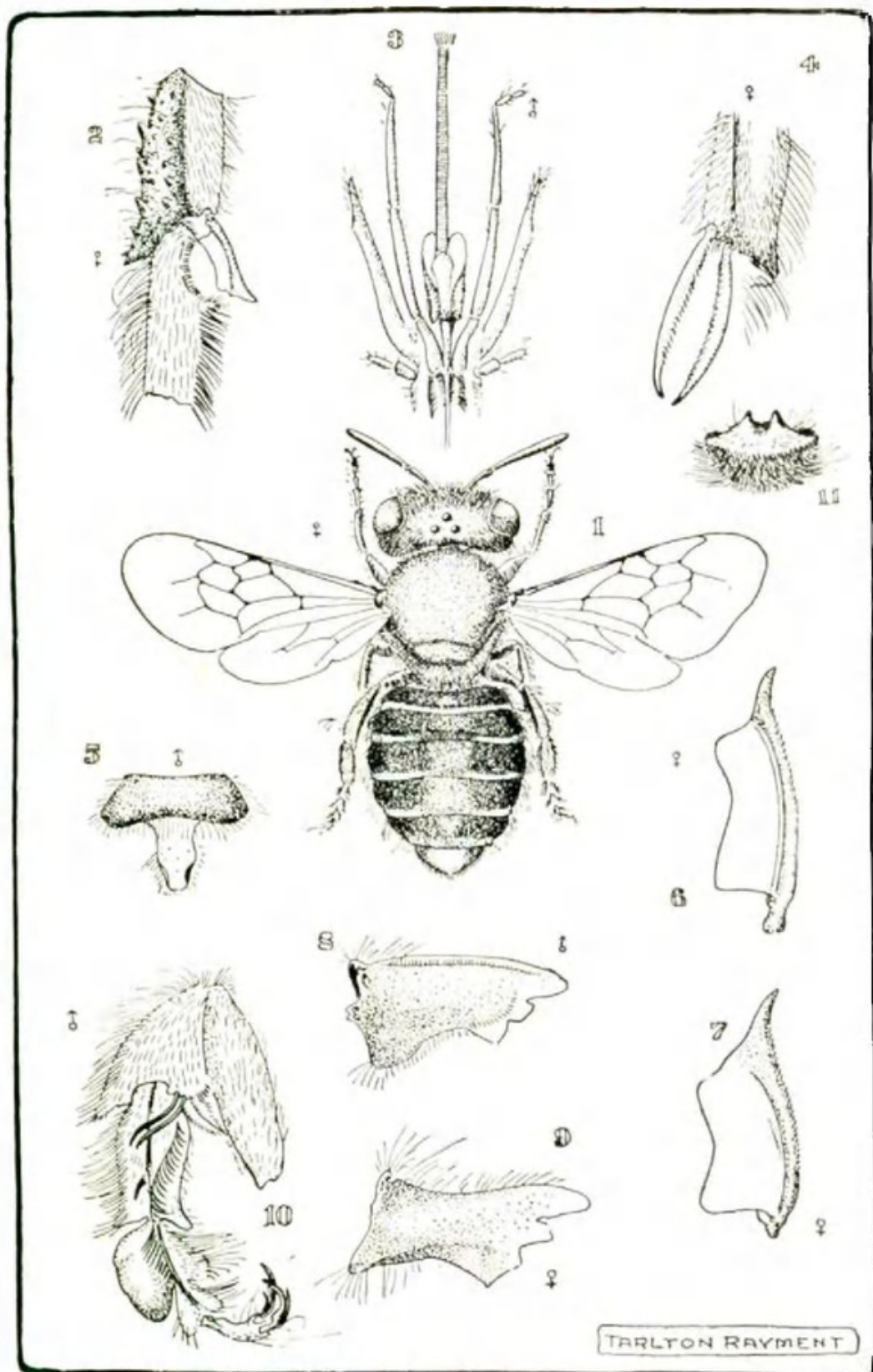
In the newly-formed garden roses, lilac, and cherry-trees were planted, to relieve the bareness of the great mole, of which my house was the crown. First, the young leaves of the roses were mutilated by a series of circular cuts, then the lilacs suffered, and even the cherry and *Robinia* trees were laid under tribute. But I did not mind the petty damage; indeed, I found it a source of great entertainment.

My little vandal is slightly smaller than the hive-bee, and though dark in colour, she has six small light spots



An Australian Leaf-cutter's (*Megachile victoriae*) nest, built in the concrete wall of the author's home. Note the barrier of leaf debris at each end.

on her thorax, and five narrow, pale bands on her abdomen; the belly *scopa* is of a rich, yellow tint. She is a shy creature, refusing to work at her trade under the gaze of the curious. She swoops down over a rose-leaf, hovers for a second and alights. At once she snips off a piece of no particular shape, and grasping it safely in her jaws, with the flap end against her chest, she wings back to her stony cavern. These rough, first cuttings are tossed in higgly-piggly order at the back of the tube, a mere packing, and nothing more. The bee is no sooner out of sight with her remnant than she reappears at the mouth of the tube, and darts away for another piece of foliage. No time is spent in arranging these fragments, there is no need, since they are merely a soft insulation.



I. Details of *Megachile Chrysopyga* and *M. Suffusipennis*.

How many pieces of leaves are required to satisfy these bees? Permit me to consult the masters in other countries, so that I may have a standard for comparison. Fabre, the "inimitable observer," says his French *Megachile* gathered one thousand and sixty-four pieces of leaves for the construction of her seventeen cells; a prodigious labour for the indefatigable mother. The American, Putnam, observing *M. gemula*, Ckll, found thirty cells, in nine rows, contained over one thousand pieces. Reed, another American, records a nest of *M. brevis*, Say, which was built in a curled plum-leaf, but he does not give the number of the component parts. Horne, in India, saw *M. fasciculata* working in pairs, and building cells as large as a woman's thimble, and thought that thirty or forty cradles were made by the two parents.

Well, I did not find more than six or seven cells in the



Rose leaf cut by an Australian Leaf-cutter Bee, *Megachile ferox*. The curled piece was taken from the barrier at front of cells. The circles are the divisions between the cells and the pear-shaped ones, constitute the lining of the walls.

series made by my Australian leaf-cutter, and the remnant pieces numbered about fifteen or twenty. It was a very easy matter to remove the packing, for I simply held a paper screw beneath the entrance, and blew softly until the whole number of pieces came out. To secure the nests intact, so that I could count the wads," I adopted the trick of lining out the holes with paper tubes, a very serviceable method. The leaf debris soon dries, and each piece curls into a spiral, more often than not locking itself into the adjacent remnants.

The requisite amount of packing, or insulation—whichever you please—being in position, the bee altered her design and snipped out small discs, each of which had a diameter of $\frac{3}{8}$ of an inch; three of these are tamped

home, against the packing, like wads in a gunbarrel. Once more the design is varied, and elliptical forms are excised from my rose-leaves to form the lining of the sides. There is always one side with the natural serrations of the leaf and the cut smooth edge of the other side-piece is deftly interlaced.

What plants do the bees of other countries favour? Again I beg of you to let me quote the words of other observers:—*M. anthracina*, in India, makes eight or so cells from the Pigeon-pea (*Cajanus indicus*); in France, *M. albocincta* favours the Hawthorn (*Crataegus oxyacantha*) and *Cistus albidus*; in Britain, *M. argentata* uses the Trefoil of the fields, *Lotus corniculatus*. Fabre includes the Quince, Capsicum, Vine, Bramble, Pomegranate, Sage, and even his garden *Pelargonium* flowers. Why enumerate more; here is sufficient to show her cosmopolitan tastes.

My Australian leaf-cutter worked on the nectar and pollen of the Bramble, and also the minute flowers of a *Melilotus* that I obtained from America. At Ringwood, near Melbourne, I find her on the Black Tea-tree. She did not disdain the flowers of the Red-gum tree (*E. tereticornis*), and searched the yellow heads of the Flat-weed (*Hypochaeris radicata*). Her menu is as varied as is her choice of building material. *M. brevis*, in America, favours the *Peritoma serrulatum*, and other species; *M. campanulae* confines herself to the Bell-flower (*Campanula americana*). In India, *M. proxima* loves the nectar of *Clitoria*, but for industry in fertilization, I beg to refer you to another American species, *M. latimanus*, which has been observed to pollinate in one hour 552 blossoms of the Sweet Pea *Lathyrus odoratus*.

I emerge from that botanical catalogue with great relief, and return to the further details of the Australian nest. The pudding, I say, is a stiff mixture of honey and pollen, and on that rich provision the egg is laid; no, I err, the bees stands the egg on end with greater skill and less damage than Columbus could demonstrate to his peers.

But why go on? each cell is a replica of the first one: wads, lining for the barrel, a pudding, an egg, more wads. At the entrance, there is more insulation, more packing, and closed in their leafy cradles, the babies gorge for a week or two. Some fairy wand wafts them into a deep sleep that lasts over the rigours of the winter, and in the increasing warmth of the following spring

the fully-grown children will emerge to life and love. That is the story of the leaf-cutters, and I might leave it here, but there is another phase that I did not touch.

It seems to me that the leaf-cutters are links joining other genera. One European tailor-bee of the genus *Osmia* cuts out cradle-gowns from Poppies, others use vegetable putty of their own manufacture. *Megachile lanata* makes mud cells like the *Lithurgi*, while *M. acuta* is a carpenter as well as leaf-cutter; another Indian species, *M. disjuncta*, Lepel, uses both mud and leaves. Mr. Henry Hacker, of the Queensland Museum, finds some correlation between the shape of the abdomen and the material chosen for the nests. Those species having a "straight lined" abdomen, work in clay, vegetable putty, or a crude waxy material, whereas the bees with wide "shovel-shaped" bodies are leaf-cutters.

A fact that is of great interest to me is the formation of the forelegs of the Male leaf-cutters: the curious tarsal processes seem to have some relationship to the "shovel-shaped" abdomen. However, I leave the question for the time being, since I cannot devote my life to the anatomy of a single family, the leaf-cutter bees of my walls.

II.—THE CLAY-BEES.

(*Lithurgus atratiformis*, Cockerell.)

Did I tell you that the western shore of Port Phillip Bay is low and wind-swept? Just so, it is as repellant as the eastern shore is attractive. There are but few trees, for the soil is a shallow, stiff, blue-black clay resulting from the decomposing of the surrounding "blue-stone." The sand-loving bees do not favour it; even the species that delight in the abandoned homes of others, have difficulty in finding suitable sites. In truth, it is an inhospitable country for honey-gatherers. In spring there is an abundance of the golden Capeweed, and later, in the heat, when the plains glimmer in the intensity of the summer sun, there are Thistles to deck the fields.

I felt like the boys of the Grammar School:—"Sir, where shall we look for bees?" I had a conviction that those treeless flats afforded little food and less shelter, except for a few burrowing bees that prospered during the fugitive harvest of the spring: frankly, I spend but little time in the uninviting land that shows as a faint, low line on the other side of the bay.

I have a young naturalist friend, who knows the western shore much better than I do, and he delights in

searching for moth pupae in the great grass-tussocks of the plains. When the prevailing wind lashes the land, moths and butterflies seek the shelter of a long fence enclosing the storage magazines for explosives. In every crevice the brown Bogong moths mass in hundreds, glad to escape from the torment of the salt wind. My friend finds his quarry sheltering there. His quick eye perceives other life, such as spiders, thrips, longicorn beetles, and many smaller creatures.

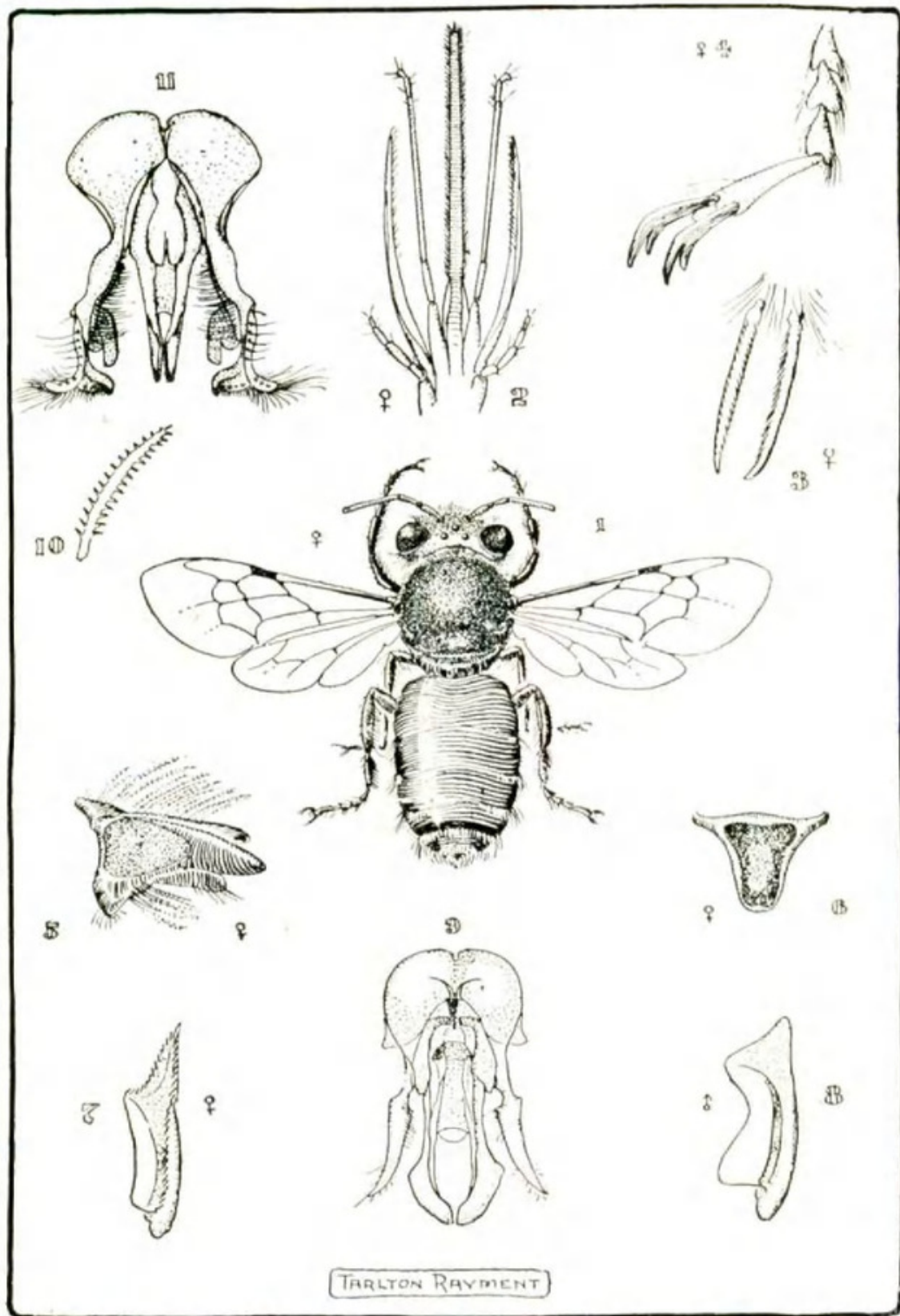
One side of the fence enclosing the quadrangle faces north, and, while hiding from the wind, yet it receives the full warmth of the sun. In the tall, hard-wood pickets there are small chambers, originally, the work of the forest beetles, but in their present situation these short tunnels are occupied by spiders and clay-bees.

You will be surprised, I know I was, to learn that this bee, with the name "stone-worker," is a moulder of clay. A miserable worker, it is true, but a potter, beyond all doubt. Long ago I wanted to tell a fellow-naturalist about one of these potter-bees, and he, a good-natured fellow, invited me to look over his collection of insect earthenware. Each fragile piece was the work of some small craftsman, and among that array of nature's art a few miniature urns rivetted my attention, for they were bijou examples of great beauty. No vase from the wheel of the human potter could be more delicately designed or more gracefully fashioned. I say that no glaze of lead or other rude mordant could rival the exquisite finish of that ware; it was porcelain from the hand of the Greatest of Potters.

But my friend is dead now, and no longer will his hands fondle the masterpieces of the insect world. He told me the vases came from abroad, the tropics, where a large *Lithurgus* has access to a stratum of white china clay. How I should like to have these urns! But the pots are not to be found. Perhaps my old friend had them only on loan. Who knows?

So, you see, I had in my mind a picture of urns of elegant workmanship. I have longed for the day when I would uncover the nest of an Australian *Lithurgus*, and hold in my hands the lovely miniatures. Will they be white or brown? Smooth or rough? Dull or brightly glazed?

My young friend, I say, has taken me to the tunnels of the longicorns in the hardwood fence, at Altona, on the western shore. In the homes are *Lithurgi*, or clay-bees.



II. Details of *Lithurgus Atratiformis*.



Rayment, Tarlton. 1928. "Studies of Australian bees. I. The leaf-cutting bees (Megachile macularis, Dalla Torre, and other species). II. The clay-bees. (Lithurgus atratiformis, Cockerell)." *The Victorian Naturalist* 45, 79–86.

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