

knowledge of the attractive shells of California. To these little books we may fairly ascribe much of the wide-spread interest which is to-day found among Californians and which by the coöperation of amateurs with specialists, has immensely increased our knowledge of the Pacific Coast fauna.

The last of these manuals was published only shortly before his death. Professor Keep was one of the founders of the Chautauqua Assembly which meets at Pacific Grove, and frequently lectured to its classes on his favorite subject. He was also one of the most earnest supporters of the Museum and Library at Pacific Grove.

Modest, courteous, indefatigable and enthusiastic, he was primarily a teacher and organizer; beloved by his classes and appreciated by those reached through his books and so led to the study of nature. In his unassuming way he has done a good work and found his reward in doing it. He leaves a widow, son and daughter to mourn his loss.

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#### ADDITIONAL NOTES ON THE LOCOMOTIVE DISK OF STYLOMMATOPHORA.

BY V. STERKI.<sup>1</sup>

During the last years some additional observations on this subject were made. Nearly all of the species mentioned in the former article have been seen again and the data were verified, and some others were examined. To repeat, there are marked differences in this respect, between species, genera and groups apparently or really closely related, especially among the *Zonitidæ*, and these features have probably much significance in classification, in connection with the formation of the lateral (marginal) longitudinal groove or grooves, on the upper surface of the foot (pedal grooves), and possibly the presence or absence of the caudal mucus gland, as pointed out, *e. g.*, by Dr. Pilsbry.<sup>2</sup> More observations and morphological and anatomical examination are needed on the subject.

#### *Zonitidæ.*

*Omphalina fuliginosa* (Griff.). The median zone was seen (or

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<sup>1</sup> See article in THE NAUTILUS, XXII, p. 49, 1908.

<sup>2</sup> In the generic position of *Patulastra* \* \* \* with suggestions of a classification of the American *Zonitidæ*, THE NAUTILUS, IX, p. 19.



appeared) to extend to the very posterior end of the sole, and each wave starts there.

*O. inornata* (Say). Foot very long and slender; zones rather distinct, narrow, but widening to nearly the whole width of the sole at the anterior end. Apparently there is an additional marginal zone along each margin, quite narrow and whitish. Waves distinct in the median zone, about 10 simultaneously.

*O. lævigata perlævis* (Pils.) (from Ky.). Three zones slightly marked, not in color, which is grayish with a slight olive tinge. Waves plainly visible, about 8.

*Vitrea* [= *Hyalina*] *wheatleyi* (Bld.). Sole very narrow; zones rather distinct, even with slight furrows marking them when the sole is detached; the median about the width of the marginals, in the middle, wider near the anterior end. Waves distinct in the anterior two-thirds (as in *radiatula*).

*V. draparnaldi* (Beck). Sole narrow; three zones distinct, the median slightly wider than the marginals, very narrow posteriorly, and not reaching the posterior end. Here also, when the sole is detached from the substratum, there are two rather deep sulci between the zones. Waves distinct, 8-10, in rapid succession; anterior end of the foot progressing with a slight jerk as each wave reaches it. Margin of the foot above marked off by two longitudinal furrows (on each side).

*Gastrodonta intertexta* (Binn.). No zones marked, not a trace of waves, just as in *G. ligera*. The margin of the foot above, outside of the longitudinal furrow, is rather broad and of a more yellowish tinge than the balance of the dorsum.

*G. suppressa* var.?<sup>1</sup> No zones, and no waves seen, even in direct sunlight, transmitted.

*Euconulus chersinus* (Say). No waves seen; no zones on the surface; zones slightly marked internally in transmitted light (as it would be in all snails).

#### *Limacidæ.*

*Limax maximus* L. Sole with three zones rather sharply defined, the median rather narrower than the marginals. Waves very distinct, about 20 in large specimens, from very near the tail end, each

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<sup>1</sup> Rather large, with higher spire; a heavy deposit (callus) in the last whorl near the aperture, but no lamellæ; may be distinct.



wave (= muscle contraction) much shorter than the interval (in space).

*Agriolimax agrestis* (L.).<sup>1</sup> Three zones distinct, the median, rather narrow, does not reach the anterior end, so the marginal is continuous all around. Waves distinct, about 16 (in specimens 35 mm. long) in rapid succession.

#### *Arionidæ.*

*Arion rubellus* [St.]<sup>2</sup> A slightly and not sharply marked median zone, wider towards the anterior end, somewhat hyaline, that is: with few or none of the yellowish opaque (glandular?) granules disseminated in the rest of the sole. Waves visible, but not distinctly, more remote from the surface of the sole than in *Polygyra* and *Limax*, and more remote from each other than in *Agriolimax agrestis*, and proceeding slower.

#### *Philonaycidæ.*

*Philomycus dorsalis* (Binn.). No well marked zones, and no waves seen.

#### *Helicidæ—Polygyrinæ.*

Some additional *Polygyræ* examined show essentially the same features as those noted before; all with distinct zones and waves.

*P. albolabris* (Say). Foot and sole light-colored, not drab, and color in the three zones little different; waves about 12.

*P. multilineata* (Say). Sole drab-colored; waves 9-10.

*P. appressa* (Say). Sole long and narrow; waves 10-11, comparatively numerous for the size of the snail.

*P. stenotrema* (Fér.). Waves about 7.

*P. hirsuta* (Say). Median zone grayish, marginal dull, pale reddish to purplish, with strongly marked transverse lines. Waves about 7.

#### *Pupidæ.*

*Bifidaria pentodon* (Say). Foot very short; zones not evident on the sole; waves distinct, about 3, extending over nearly the whole width of the sole.

<sup>1</sup> From one place (in Lake Co., Ohio) several dozen were collected, showing extremes of color: from whitish without any dark mottlings to almost entirely black; some of a tan to brownish tint.

<sup>2</sup> From a nursery in Lake Co., Ohio. Appears to be distinct from *hortensis*; described about 1682; European.



Sterki, Victor. 1911. "Additional notes on the locomotive disk of Stylommatophora." *The Nautilus* 25, 62–64.

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