On some genera of the family Turridae described from New Zealand

by
C. BEETS

INTRODUCTION

The present note, which is based on a comparison between East Indian Turridae and some species described from New Zealand, was first completed in 1943. In 1949 POWELL's paper, quoted below, became accessible, and some alteration and abbreviation of the original paper became necessary.

The purpose of the present paper is to show that a comparison between members of different faunal provinces may reveal closer ties than is often believed possible. THIELE (1929) has shown that a number of New Zealand genera and sub-genera actually differ very little from old-established genera or not at all. RUTSCH (1931) added some observations with regard to the fossil fauna, one of his conclusions (p. 253) being that comparisons between the New Zealand Tertiary mollusca and those of other provinces would probably result in finding not so much identical species, as similarities between units of a higher systematical order. POWELL's important paper again shows that closer relationships exist between various Turrid groups, as described from different areas, than formerly acknowledged. To his observations, the following notes may be added.

DESCRIPTIONS

1. *Waitara* and its relationships to *Surculites-Clinura-Thatcheria.*

The name *Waitara* was given by MARWICK (1931, p. 149) to a finely lirate, damaged shell, *„Turricula" waitaraensis* Marwick from the Miocene of New Zealand (our Pl. 1 fig. 5). A related species is *W. generosa* Marwick: Pl. 1 fig. 7. WENZ (1943) considered the latter species as the genotype, although POWELL had earlier selected the first-mentioned one (1942, p. 167). MARWICK's diagnosis runs as follows: „Shell large, rather fragile, broadly fusiform. Protoconch not seen. Spire gradate, the whorls with a strong, smooth shoulder-angle and a broad, inclined shoulder. Body-whorl somewhat inflated, strongly shouldered, contracted to a short, wide canal. Sculpture: Weak spirals present, stronger on the base. Aperture long and wide, not notched anteriorly. Outer lip thin, posterior sinus deep, somewhat narrowly convex, the apex about the sutural fourth of the shoulder, and the

outer side much in advance of the inner. Columella straight, smooth, inner lip thin".

WENZ (1943, p. 1390) rightly placed *Waitara* near *Clinura.* On the other hand, there are undoubtedly relationships to *Thatcheria,* a remarkable genus which until recently was considered a member of the family Melongenidae (cf. WENZ, l.c., p. 1215), but on morphological grounds, supported by anatomical investigations (EALES, 1938), was referred to the family Turridae by the writer (1942b), independently of POWELL (1942) who proposed a new family Thatcheriidae. The present writer included *Thatcheria* in the species group *Clinura,* at least, *Clinura* taken in a broad sense.

In the genus *Surculites* one may distinguish, among others, three sub-genera which seem to merge, viz., *Surculites* s. str., *Clinura* and *Thatcheria* (= *Cochlioconus* Yokoyama, 1928, as stated by YOKOYAMA in a paper dated 1930: cf. BEETS, 1942b, p. 356). A number of

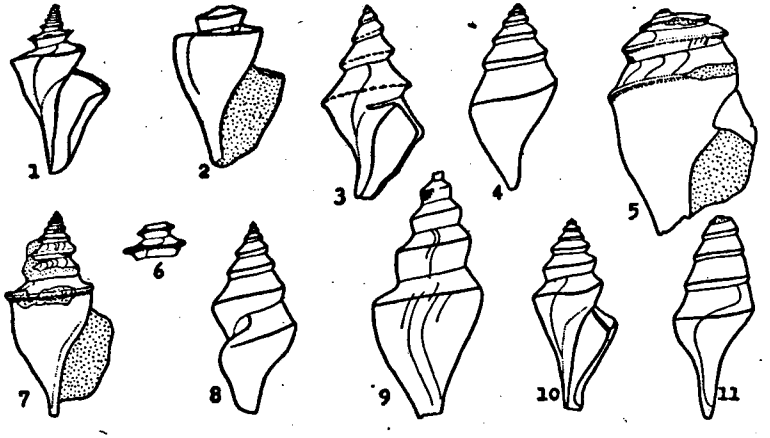
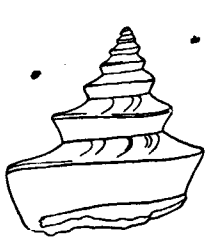


Plate 1. Figures semi-schematical. Fig. 1, *Thatcheria mirabilis* Angas; cf. BEETS, 1942b, p. 361. Fig. 2, *Cochlioconus (Thatcheria) gradatus* Yokoyama; cf. BEETS, l.c., p. 361, Pl. 36 fig. 3. Fig. 3, *Clinura calliope* (Brocchi); cf. BEETS, l.c. p. 359, Pl. 36 fig. 8. Fig. 4, *Clinura trochlearis?* (Hoernes); cf. BEETS, l.c., p. 360, Pl. 36 fig. 19. Fig. 5, *Waitara waitaraensis* (Marwick); cf. MARWICK, 1926, p. 324, Pl. 74 fig. 9. Fig. 6, *Thatcheria* spec. nov.; a portion of a specimen from the Pliocene of East-Borneo to be described in near future. Fig. 7, *Waitara generosa* Marwick; cf. MARWICK, 1931, p. 149. Pl. 18 fig. 339; WENZ, 1943, p. 1390, fig. 3929. Fig. 8, *Clinura trochlearis* (Hoernes); cf. BEETS, 1942b, p. 360, Pl. 36 fig. 11. Fig. 9, *Surculites annosus* Conrad; after WHITEFIELD, 1892, see WRIGLEY (Proc. Mal. Soc. London, vol. 23, 1939, pp. 277—284; cf. WENZ, 1943, p. 1390, fig. 3927. Fig. 10, *Clinura sopronensis* (Hoernes); cf. BEETS, 1942b, p. 359, Pl. 36 fig. 7. Fig. 11, *Clinura bituminatus* (Beets); cf. BEETS l.c., p. 358, Pl. 36 fig. 22 (1942a, Pl. 29 figs. 84-85).

species, themselves often variable, were re-figured by the writer (1942b); they show various intermediate stages between the extreme forms of *Thatcheria, Clinura* and *Thatcheria.* Plate 1 below endeavours to illustrate the similarities and differences between these groups and also *Waitara.*

POWELL (1942) rightly considered the possibility of the synonymy of *Waitara* and *Thatcheria,* probably basing his opinion mainly on the features of two species of *Waitara* newly described by him (See Figs. 1 and 2, below). However, there are also relationships between *Waitara* in its former sense (i.e., as based upon *W. generosa* and *W. waitaraensis*) and *Clinura. W. generosa* has the slender shape and less inclined shoulder as depicted by *Surculites* s.str. and *W. waitaraensis* has a stouter appearance reminiscent of certain *Clinura.* On the other hand, both the new *Thatcheria* (Pl. 1 fig. 6) and *W. liratula* seem to



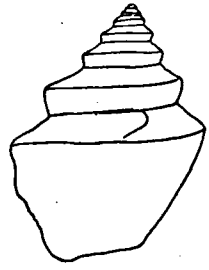


Fig. 1. *Waitara liratula* Powell (semi-schematical) × ½. After POWELL, 1942, p. 169, Pl. 14 fig. 8.

Fig. 2. *Waitara pagodula* Powell (semi-schematical). After POWELL, 1942, p. 168, Pl. 14 fig. 7.

be intermediate between *Waitara generosa* and *Thatcheria mirabilis,* while *W. pagodula* seems to be closer, as regards shape, to *Clinura* s.str. than *W. waitaraensis.* Consideration of the posterior sinuses seems to confirm the impression of a variable assemblage (*Surculites-Clinura-Waitara-Thatcheria*) as based on other morphological features, which it is hard to divide. POWELL (l.c., p. 167) considers the sinus to swing forward immediately in *Thatcheria* as opposed to *Waitara,* in which it is first narrowly convex, yet the sinus in *Cochliconus gradatus* is almost similar to that in *Waitara,* particularly *W. generosa* and *W. pagodula.* If, moreover, the shapes of the shells described as *W. liratula* and *W. pagodula* are taken into consideration, it becomes almost impossible to divide *Waitara* and *Thatcheria.* However, as POWELL remarks, it may be advisable to retain the name *Waitara* for New Zealand usage until more evidence is available.

It may be stressed, however, that the variation of *Waitara* is closely reminiscent of the one shown by *Clinura,* which merges on the one hand into *Thatcheria* and on the other into *Surculites* s.str. Whether this is merely a case of parallel development or of a true relationship, can hardly be decided with this most exasperating group of mollusca, the Turridae.

Finally, a few remarks must be made on another fossil described from New Zealand, *Hemifusus* (*Mayeria*) *goniodes* Suter: SUTER, 1917, p. 23, Pl. 3 figs. 15 and 16. Without doubting its identity (the material not being at hand), one may at least remark that this species is very similar to *Surculites annosus* Conrad (Pl. 1 fig. 9). Unfortunately, neither SUTER's description, nor the figures quoted, give evidence of the shape of its outer lip. If actually a *Hemifusus* (= *Pugilina*), the species would be another example of Melongenidae or Fusinidae which through convergence might be misinterpreted as a Turrid of the *Surculites* group (cf. BEETS, 1942b).

2. On *Cosmasyrinx, Ancistrosyrinx, Tabusyrinx* (and *Parasyrinx*).

MARWICK (1931, pp. 138-139) proposed the genus *Cosmasyrinx* for a number of species from the Oligo-Miocene of New Zealand. The genotype is *C. monilifera* Marwick (Pl. 2 fig. 4). Other species described in the same paper are: *C. ardua* Marwick, *C. latior* Marwick and *C. tereumera* Marwick (Pl. 2 figs 2, 1 and 3 respectively). It is probably doubtful whether *C. semilirata* Powell (1942, p. 70, Pl. 14 fig. 9) is a *Cosmasyrinx* at all.

The following is MARWICK's diagnosis of the genus: „Shell small, fusoid; spire pagodiform. Protoconch paucispiral, smooth, erect, with large bulbous nucleus. Whorls with broad concave shoulder, the keel ornamented with a moniliform cord; base with two strong, smooth spirals; weaker ones below on the straight neck, which has no fasciole. Outer lip with a deep arcuate posterior sinus, its apex about the middle of the shoulder. Columella smooth, with no anterior sinus".

The characteristics of this species group can be compared by means of the figures (Pl. 2) and diagnosis, with the features displayed by the variable, though as yet not prolific, species group *Ancistrosyrinx* Dall, 1881. The latter was proposed for recent species. It remained unmentioned in FISCHER's handbook (1883-1887, p. 591) as far as its fossil occurrence was concerned, while COSSMANN later published a comparative diagnosis referring to both recent and fossil species (1896, p. 71). The genotype is *A. elegans* Dall (Pl. 2 fig. 25). The genus ranges from the Paleocene to the present: cf. WOODRING, 1928, p. 164; THIELE, 1929, p. 359; GRANT & GALE, 1931, p. 506 (481, 504, 505); WENZ, 1943, p. 1402; RUTSCH, 1943, p. 180.

Recent American representatives are: *A. cedonulli* (Reeve) (Pl.

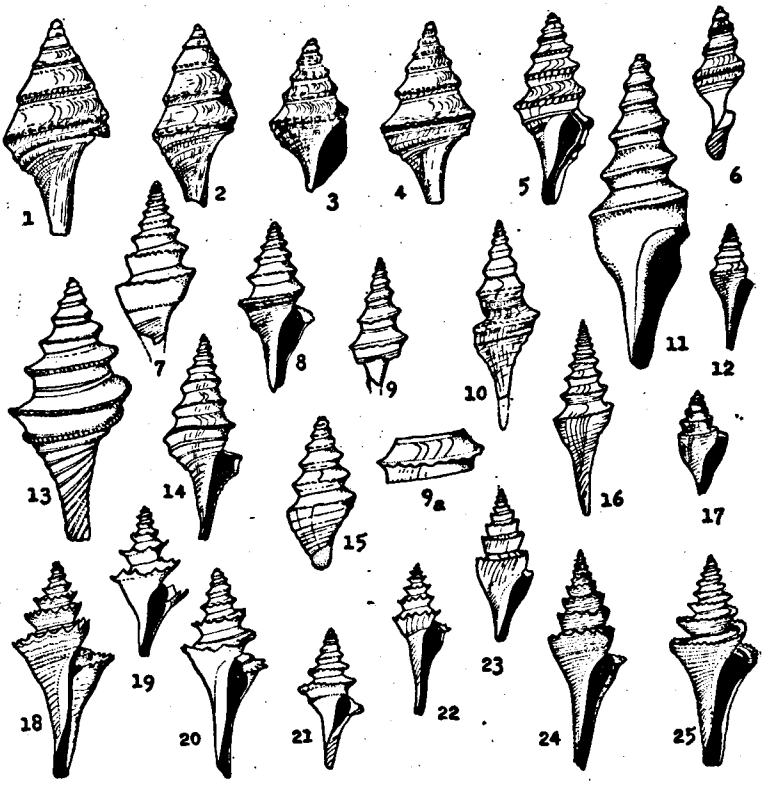


Plate 2. Figures semi-schematical. Fig. 1, *Cosmasyrinx latior* Marwick (M. Miocene); cf. MARWICK, 1931, p. 139, Pl. 16 fig. 294. Fig. 2, *Cosmasyrinx ardua* Marwick (M. Miocene); cf. MARWICK, l.c., p. 138, Pl. 16 fig. 293. Fig. 3, *Cosmasyrinx tereumera* Marwick (L. Miocene); cf. MARWICK, l.c., p. 139, Pl. 16 fig. 295. Fig. 4, *Cosmasyrinx monilifera* Marwick (L. Miocene); cf. MARWICK, l.c., p. 138, Pl. 16 fig. 292; See also WENZ, 1943, p. 1402, fig. 3961. Fig. 5, *Ancistrosyrinx rotifera* (Conrad) (Miocene); cf. MARTIN, 1904, p. 152, Pl. 41 fig. 16. Fig. 6, *Ancistrosyrinx mariana* (Martin) (Miocene); cf. MARTIN, l.c., p. 152, Pl. 41 fig. 17. Fig. 7, *Ancistrosyrinx cornetiformis* (Tesch) (= *A. travancoria* Smith) (Pliocene, recent); cf. TESCH, 1915, p. 29, Pl. 78 (6) fig. 59a. Fig. 8, *Parasyrinx finlayi* Allen (U. Eocene); cf. ALLEN, 1926, p. 344, Pl. 77 fig. 5 (MARWICK, 1931, p. 4). It is the type of *Tahusyrinx* Powell, 1942. Fig. 9. 9a, *Ancistrosyrinx volgeri* (Philippi) (Oligocene); cf. SPEYER, 1870, p. 113 (193), Pl. 14 (19) figs. 12, 12a. Fig. 10, *Ancistrosyrinx glaphyra* (Vincent) (Eocene); cf. VINCENT, 1913, p. 24, Pl. 2 fig. 15. Fig. 11, *Parasyrinx alta* (Harris) (L. Miocene); cf. WENZ, 1943, p.

1401, fig. 3960 (MARWICK, 1931, p. 6). Fig. 12, *Ancistrosyrinx terebralis* (Lamarck) (Eocene); cf. COSSMANN, 1896, p. 72, Pl. 5 fig. 6. Fig. 13, *Ancistrosyrinx perspirata* (Von Koenen) (L. Oligocene); cf. ALBRECHT & VALK, 1943, p. 83, Pl. 19 fig. 738. Fig. 14, *Ancistrosyrinx perspirata* (Von Koenen); cf. VON KOENEN, 1890, p. 323, Pl. 30 fig. 10c. Fig. 15, *Ancistrosyrinx serrata* (Bellardi) (Miocene); cf. SACCO, 1904, Pl. 11 fig. 58. Fig. 16, *Ancistrosyrinx serrata* (Bellardi); cf. HOERNES, 1856, p. 356, Pl. 39 fig. 16b („*subterebralis*"). See also KITTL, 1887, p. 242 (pars), Pl. 8 fig. 4; HOERNES & AUINGER, 1891, p. 305. Fig. 17, *Ancistrosyrinx circumfossa* (Von Koenen) (Miocene); cf. VON KOENEN, 1872, p. 234, Pl. 2 fig. 11a. Fig. 18, *Ancistrosyrinx radiata* Dall (recent); cf. DALL, 1889, p. 78, Pl. 12 fig. 12. Fig. 19, *Ancistrosyrinx orientis* Melvill (recent); cf. MELVILL, 1904, p. 56, Pl. 5 fig. 3. Fig. 20, *Ancistrosyrinx miranda* (Guppy) (Miocene); cf. WOODRING, 1928, p. 165, Pl. 6, fig. 2 (See also OLSSON, 1922, p. 60, Pl. 4 fig. 16: *A. dalli*, a synonym. Fig. 21, *Ancistrosyrinx subserrata* (Boettger) (Miocene); cf. ZILCH, 1934, p. 261, Pl. 17 fig. 26a. Fig. 22, *Ancistrosyrinx cedonulli* (Reeve) (Recent); cf. REEVE, 1843, Pl. 14 spec. 117 (a). See also TRYON, 1884, p. 175 („*Columbarium*"), Pl. 7 fig. 97; DALL, 1889, p. 78. Fig. 23, *Ancistrosyrinx corneti* (Von Koenen) (Miocene); cf. VON KOENEN, 1872, p. 235, Pl. 3 fig. 11b. See also KAUTSKY, 1925, p. 159, Pl. 11 fig. 5; KITTL, 1887, p. 242 (pars), Pl. 8 fig. 3. Fig. 24, *Ancistrosyrinx pulchella* Schepman (Pliocene, recent); cf. SCHEPMAN, 1913, p. 421, Pl. 27 fig. 6a. Fig. 25, *Ancistrosyrinx elegans* Dall (recent); cf. DALL, 1889, p. 78, Pl. 38 fig. 3. See also WENZ, 1943, p. 1402, fig. 3962.

2 fig. 22), *A. elegans* Dall (Fig. 25) and *A. radiata* Dall (Fig. 18). Indo-Western Pacific ones are: *A. orientis* Melvill (Fig. 19), *A. pulchella* Schepman (Fig. 24) and A. *travancoria* Smith and its variety *granulata* Smith (cf. SMITH, 1896, p. 368; 1898, Ill. „Investigator", Pl. 7 figs. 1 and 1a; SMITH, 1904, p. 459; SCHEPMAN, 1913, p. 420).

Fossil species are widespread:

Europe: *A. circumfossa* (Von Koenen) (Fig. 17); *A. corneti* (Von Koenen) (Fig. 23), closely related to, and probably even synonymous with, the former; *A. perspirata* (Von Koenen) (Figs. 13, 14); *A. serrata* (Bellardi) (Figs. 15, 16); *A. subserrata* (Boettger) (Fig. 21); *A. terebralis* (Lamarck) (Fig. 12); *A. volgeri* (Philippi) (Figs. 9, 9a).

W. Africa: *A. glaphyra* (Vincent) (Fig. 10).

Central & North America: *A. columbaria* (Aldrich); *A. elegans* Dall var. (cf. OLSSON, 1922, p. 60, Pl. 4 fig. 17); *A. mariana* (Martin) (Pl. 2 fig. 6); *A. miranda* (Guppy) (Fig. 20); *A.* aff. *radiata* Dall (cf. BOSE, 1910, p. 251, Pl. 13 fig. 26; WOODRING, 1928, p. 165); *A. rotifera* (Conrad) (Fig. 5). Perhaps also „*Pleurotoma*" *veracruziana* Böse (1906, Bol. Inst. Geol. de México, 22, p. 60, Pl. 5 figs. 20-21), although this might well be some *Clinura.*

Asia: *A. cornetiformis* (Tesch) (Fig. 7) which in our opinion is synonymous with *A. travancoria* Smith; *A. haydeni* Cox (1930, p. 195, Pl. 20 figs. 13a, b), an unusually developed Lower Eocene spe-

cies provided with strong spirals, which may be compared in a general sense with *A. pulchella* (with flat spirals); *A.* aff. *perspirata* (Von Koenen), a species from the Neogene of East-Borneo which will be described in the near future; *A. pulchella* Schepman (Fig. 24), which will be described shortly from Neogene deposits in East-Borneo; *A. terebralis* (Lamarck) var. *hypermeces* (Cossmann et Pissarro), a species which will be discussed shortly in a separate paper.

The third genus quoted here is *Parasyrinx* Finlay, 1924, a name originated for a species from the Miocene of New Zealand. Its genotype is *P. alta* (Harris): Pl. 2 fig. 11. Another representative is *P. subalta* (Marshall er Murdock), which was described as a *Leucosyrinx* (1919, Trans. N. Z. Inst., 51, p. 256, Pl. 20 fig. 7). These species have a smooth keel instead of a serrated one. They seem to be more closely related to *Lirasyrinx* Powell (1942, p. 69) than to *Ancistrosyrinx.* It is not clear, however, why *Parasyrinx finlayi* Allen (Pl. 2 fig. 8), which was originally identified by SUTER (teste ALLEN) as *Ancistrosyrinx* sp., has been included in the species group of *P. alta* and *P. subalta.* According to its description and figure, this species is a very characteristic *Ancistrosyrinx.* POWELL, however, recently selected this species as the genotype of his new genus *Tahusyrinx.* (POWELL, 1942, p. 68), quoting *Ancistrosyrinx* as a similar group, which, however, „differs in having the shoulder bisected by a lamellar spiral rib, with the true sinus subsutural, and a pseudo-sinus between this rib and the periphery" (l.c., p. 68, compare p. 30). This does, however, not apply to all, or even many, of the species assigned to *Ancistrosyrinx:* see below.

Considering the variability of *Cosmasyrinx* and *Ancistrosyrinx,* it is doubtful whether one could maintain them as separate species groups: See Plate 2. The shape of the shells and their body-whorls varies considerably: there are plump, slender and very slender shells, provided with varyingly inclined or upturned shoulders, while the width of the whorls anteriorly and posteriorly of the main keel also varies conspicuously. Considering these features, which of course are by no means indicative by themselves, there is no reason to separate *Cosmasyrinx* (Figs. 1-4) from *Ancistrosyrinx* (Figs. 7, 9-10, 12-25), as they are logically connected by *A. mariana* (Fig. 6) and particularly *A. rotifera* (Fig. 5).

Moreover, the main keel again shows considerable variation, both specifically and individually. In *A. pulchella* (Fig. 24) and *A. circumfossa-corneti* (Fig. 17, 23), the keel can be upturned to a varying extent, as is clearly shown by the material on hand (Recent and Neogene of the East Indies; Miocene of the Netherlands and Germany).

Similar variation is shown by the whole group of species; the keel may be horizontal instead of upturned, or even inclined in an anterior direction (Figs. 9 and 9a) (see *Cosmasyrinx*). In addition, the ornamentation of the keel in *Ancistrosyrinx* shows a wide range of variation: the keel may be finely serrated, toothed, or strongly spined, or it may bear small spines, or more or less rounded knobs. The keel may be lamellate (narrow or broad) and it may be developed as a strong spiral (Figs 13, 14) or cord (Figs. 5, 6), which is subdivided into rather flat knobs. Again, the keel may be single or more or less conspicuously double (Fig. 6), as in *Cosmasyrinx*.

In all species assigned to *Ancistrosyrinx, Tahusyrinx* and *Cosmasyrinx,* the ornamentation of the shoulder consists in the first place of growth-lines. To these, a spiral may be added along the posterior suture, or a serrated to ribbon-like spiral lamina which may be absent: there is a marked variation of individual to specific rank, and whose position changes as is shown by *A. pulchella, A. travancoria, A. radiata, A. miranda* and *A. elegans*. It seems doubtful whether one could found a generic or even a merely sub-generic difference on the absence or presence of this lamina (cf. *Tahusyrinx* and a number of species assigned to *Ancistrosyrinx*).

The body-whorl bears either almost no ornamentation or an inconspicuous, shoulder-like spiral in the prolongation of the suture (Fig. 7), or a more pronounced one (Fig. 21), or a limited number of rather inconspicuous, smooth or granulate spirals (*A. travancoria,* and Fig. 16). The sculpture may also consist of numerous flat spirals (Figs. 12, 18, 24, 25) which are more or less granulate and of which one, forming the prolongation of the suture, may be more conspicuous that the others, while in addition it may mark a secondary shoulder. The ornamentation may also consist of a limited number of strong spirals which are more or less granulate and often unevenly distributed (Figs. 5, 13, 14). The variability of the sculpture no doubt also includes the sculpture shown by *Cosmasyrinx*.

The development of both the anal sinus and the outer lip anteriorly of it, again shows considerable variation in *Ancistrosyrinx*. It seems quite impossible to apply any subdivision of the species assigned to *Ancistrosyrinx* on this character, while it is likewise impossible to distinguish *Tahusyrinx* from *Ancistrosyrinx*. Again, *Cosmasyrinx* does not seem to differ to any extent in this respect.

Taking all in all, the writer is unable to separate *Tahusyrinx* and *Ancitrosyrinx,* while even *Cosmasyrinx* may be included in the species group of *Ancistrosyrinx*. While, however, *Tahusyrinx* seems to be a perfect synonym of *Ancistrosyrinx,* it seems advisable to main-

tain *Cosmasyrinx* as a subgenus or sectio, because its protoconch is somewhat different from most of the species of *Ancistrosyrinx*, although *A. travancoria* seems to form the connection between the two. Comparative investigation into the systmatic value of protoconchs in both *Ancistrosyrinx* and *Cosmasyrinx* and related groups is recommended before a final decision is taken.

Finally, attention must be drawn to the similarity in appearance between the Turrid groups discussed above and certain Fusinidae. Similar cases have been reported in connection with the Turrid group *Surculites-Clinura-Thatcheria* (BEETS, 1942b); they were considered as cases of parallel development (convergence). A genus showing close similarity to *Cosmasyrinx* is *Taioma* Finlay et Marwick 1937 [1]: see WENZ, 1943, p. 1256, Fig. 3579. The growth-lines of its genotype show that an unmistakable, though not very conspicuous, posterior sinus is present, just as in certain Fusinidae showing similarity to the *Surculites* group, or in some of the Buccinidae (*Buccinaria-Ootomella-Eosipho*) which are likely to be confused with Pseudotominae [2]. In the species of the *Ancistrosyrinx* group, however, the course taken by the outer lip anteriorly of the anal sinus is entirely independent of the shoulder angle of their whorls, whereas in *Taioma* and other Fusinidae, there is a most intimate connection between the course of the outer lip and the shoulder angle; in front of the main keel, the right lip runs almost axially, while in the keel itself, it suddenly changes its direction, forming a sharp angle (posteriorly merging into the posterior sinus).

REFERENCES

ALBRECHT, J. C. H., & W. VALK, 1943. Oligocäne Invertebraten von Süd-Limburg. Meded. Geol. Stichting, Ser. C-IV-1-No. 3, Maastricht, Van Aelst.

ALLEN, R. S., 1926. Fossil mollusca from the Waihao Greensands. Trans. Proc. New Zealand Inst., vol. 56, pp. 338-346.

ANGAS, G. R., 1877. Description of a new genus of gastropodous mollusca from Japan, and a new species of Bullia from Kurachi. Proc. Zool. Soc. London, p. 529.

[1]) N.Z. Geol. Surv., Pal. Bull. No. 15, p. 72, Pl. 10 figs. 5—7.

[2]) Cf. BEETS, 1944, Basteria, vol. 9, pp. 32—38.

BEETS, C., 1942a. Beiträge zur Kenntnis der angeblich oberoligocänen Mollusken-Fauna der Insel Buton, Niederländisch-Ostindien. Leidsche Geol. Meded., vol. 13, pp. 255-328.

BEETS, C., 1942b. Notizen über Thatcheria Angas, Clinura Bellardi und Clinuropsis Vincent. Leidsche Geol. Meded., vol. 13, pp. 356-367.

BOSE, E., & F. TOULA, 1910. Zur jungtertiären Fauna von Tehuantepec. Jahrb. k.k. Geol. Reichs-Anst. Wien, vol. 60, pp. 215-255 (256-276).

COSSMANN, M., 1896. Essais de Paléoconchologie comparée, vol. 2, Paris.

COX, L. R., 1930. The mollusca of the Hangu Shales, in: The fossil fauna of the Samana Range and some neighbouring areas. Mem. Geol. Surv. India, Pal. Indica, N.S., vol. 15, Prt. 8.

DALL, W. H., 1889. Report on the mollusca, in: Reports on the results of dredging, under the supervision of Alexander Agassiz, in the Gulf of Mexico and in the Caribbean Sea, by the U. S. Coast Survey Steamer „Blake", Prt. II, Bull. Mus. Compar. Zool., vol. 18, pp. 1-192.

EALES, N. B., 1938. On the affinities of Thatcheria mirabilis Angas. Proc. Mal. Soc. London, vol. 23, pp. 15-17.

FISCHER, P., 1883-'87. Manuel de Conchyliologie et de Paléontologie conchyliologique. Paris.

GRANT, U. S., & H. R. GALE, 1931. Catalogue of the marine Pliocene and Pleistocene mollusca of California. Mem. San Diego Soc. Nat. Hist., vol. 1.

HOERNES, M., 1856. Die fossilen Mollusken des Tertiärbeckens von Wien, I (Univalven), Abh. k.k. Geol. Reichs-Anst. Wien, vol. 3.

HOERNES, R., & M. AUINGER, 1891. Die Gastropoden der Meeresablagerungen der I. und II. Mediterranstufe in der österreichisch-ungarischen Monarchie, Prt. 7 (pp. 283-330). Abh. k.k. Geol. Reichs-Anst. Wien, vol. 12, VII.

Illustrations of the Zoology of the R. Ind. Mar. Surv. Ship „Investigator", 1898, No. 2 Fishes V, Crustacea VI, Mollusca part II (Plates 7-8).

KAUTSKY, F., 1925. Das Miocän von Hemmoor und Basbeck-Osten. Abh. Preuss. Geol. Landesanst., N.S., vol. 97, Berlin.

KITTL, E., 1887. Die Miocänablagerungen des Ostrau-Karwiner Steinkohlenreviers und deren Faunen. Ann. k.k. naturhist. Hofmus. Wien, vol. 2, pp. 217-282.

KOENEN, A. VON, 1872. Das Miocän Norddeutschlands und seine Molluskenfauna, I. Schr. Ges. Beförd. gesamt. Naturwiss. Marburg, vol. 10, pp. 139-262.

KOENEN, A. von, 1890. Das norddeutsche Unter-Oligocän und seine Molluskenfauna, II. Abh. geol. Spezialkarte Preuss., vol. 10, Prt. 2.

MARTIN, G. C., 1904. Gastropoda, in: The Miocene deposits of Maryland. Maryland Geol. Surv., Vol. Miocene, pp. 131-270.

MARWICK, J., 1926. New Tertiary mollusca from North Taranaki. Trans. Proc. New Zealand Inst., vol. 56, pp. 317-331.

MARWICK, J., 1931. Tertiary mollusca of the Gisborne district. New Zealand Geol. Surv., Pal. Bull. No. 13.

MELVILL, J. C., 1904. Descriptions of twenty-three species of gastropoda from the Persian Gulf, Gulf of Oman, and Arabian Sea. Proc. Mal. Soc. London, vol. 6, pp. 51-60.

OLSSON, A. A., 1922. The Miocene of Northern Costa Rica, I. Bull. Amer. Pal., vol. 9, No. 39.

OLSSON, A., A., 1929. Contributions to the Tertiary paleontology of Northern Peru, II (Upper Eocene mollusca and brachiopoda). Bull. Amer. Pal., vol. 15, No. 57.

POWELL, A. W. B., 1942. The New Zealand recent and fossil mollusca of the family Turridae. Bull. Auckland Inst. Mus., vol. 2.

REEVE, L. A., 1843. Conchologia Iconica, vol. 1.

RUTSCH, R., 1931. Zur Nomenklatur und systematischen Stellung einiger tertiärer Cassididae aus Neu-Seeland. Eclogae geol. Helvet., vol. 24, pp. 251-254.

RUTSCH, R., 1943. Die Paleocaen - Mollusken der Inseln Trinidad und Soldado Rock. Eclogae geol. Helvet., vol. 36, pp. 139-192.

SACCO, F., 1904. I molluschi dei terreni terziarii del Piemonte e della Liguria, Prt. 30.

SCHEPMAN, M. M., 1913. The Prosobranchia of the Siboga-Expedition, V (Toxoglossa). Siboga Exp. Monogr. 49[1]e.

SMITH, E. A., 1896. Descriptions of new deep-sea mollusca. Ann. Mag. Nat. Hist. (6), vol. 18, pp. 367-375.

SMITH, E. A., 1904. On Mollusca from the Bay of Bengal and the Arabian Sea. Ann. Mag. Nat. Hist. (7), vol. 13, pp. 453-473.

SPEYER, O., 1870. Die Conchylien der Casseler Tertiärbildungen, Prt. 7 of vol. 1 (Univalven). Palaeontogr., vol. 16.

SUTER, H., 1915. Revision of the Tertiary mollusca of New Zealand, II. New Zealand Geol. Surv., Pal. Bull. No. 3.

WOODRING, W. P., 1928. Miocene mollusks from Bowden, Jamaica, II. Carnegie Inst. Washington, Publ. No. 385.

ZILCH, A., 1934. Zur Fauna des Mittelmiocäns von Kostej (Banat), Typus-Bestimmung und Tafeln zu O. Boettger's Bearbeitungen. Senckenbergiana, vol. 16, pp. 193-302.

SUTER, H., 1917. Descriptions of new Tertiary mollusca occurring in New Zealand, I. New Zealand Geol. Surv., Pal. Bull. No. 5.

TESCH, P., 1915. Jungtertiäre and quartäre Mollusken von Timor, I. Pal. Timor, Prt. V, pp. 1-68.

THIELE, Joh., 1929-1931. Handbuch der systematischen Weichtierkunde. Vol. 1, Jena, Fischer.

TRYON, G. W., 1884. Manual of Conchology (First Ser.), vol. 6.

VINCENT, Em., 1913. (in DOLLO, L., M. LERICHE et E. VINCENT). La faune paléocène de Landana (Contributions à la paléontologie des falaises de Landana, Bas-Congo), Mollusques. Ann. Mus. Congo-belge, A, Sér. 3, vol. 1, Prt. 1.

WENZ, W., 1943. Gastropoda, Prt. 6. Handb. Paläozool., ed by O. H. SCHINDEWOLF, Berlin, Borntraeger.