

DINOFLAGELLATA OF THE SAN DIEGO
REGION, V. ON *SPIRAULAX*, A NEW
GENUS OF THE PERIDINIDA

BY

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Among the species which have been erroneously assigned to the genus *Gonyaulax* is *G. jolliffei* Murray and Whitting, a common form in tropical seas and a regularly recurring constituent of the winter plankton at San Diego. A careful analysis of its plates has made its removal from the genus *Gonyaulax* necessary.

Spiraulax gen. nov.

Characterized by the anterior plate of the ventral area not meeting apical $1'$, or in other words, by the absence of the so-called extension of the longitudinal furrow to the apex. Ventral notch in the apex of apical $1'$. Ventral pore absent. Form biconical, apices pointed, widely spreading at girdle, which is much displaced but without marked overhang. Plate formula $1'$, 1^a , $6''$, 6 , $6'''$, 1^b , $1'''$. Precingular $6''$ and posterior intercalary 1^b very wide. The slender apical $1'$, the so-called anterior extension of the ventral furrow upon the epitheca to the apex of *Gonyaulax* is absent in this genus. Either the homologue of this plate in *Gonyaulax* has dropped out entirely here, or has withdrawn anteriorly from the girdle and become greatly expanded into the

wide apical 1' of *Spiraulax*. I incline to the latter alternative, for a widening of this nature may be seen in apical 1' of *Gonyaulax triacantha*. Fission line as in *Gonyaulax*. Surface heavily pitted. The type species is *G. jolliffei* (Murray and Whitting) Kofoid.

***Spiraulax jolliffei* (Murray and Whitting) Kofoid**

Pl. 19, figs. 1-5.

Gonyaulax jolliffei Murray and Whitting (1899), p. 324, pl. 28, figs. 1a, b.

G. jolliffei, Schröder (1900), p. 17.

G. jolliffei, Karsten (1907), pp. 255, 257, 473.

DIAGNOSIS: A stout species, body very broadly and somewhat irregularly fusiform, of medium size, epitheca and hypotheca subequal, subconical, apex truncated, distal end of girdle displaced thrice its width, plates 1', 1^a, 6'', 6''', 1^p, 1''''', girdle lists low, surface coarsely pitted, antapex terminating in a symmetrically located, stout, acute, solid, horn.

DESCRIPTION: The *body* is very broadly fusiform, its length a little less (1.8) than two transdiameters. Apical horn 0.5 transdiameter in altitude. Apex quite pointed. *Epitheca* middorsally almost equal in altitude to hypotheca, both subconical, usually less rotund than figured by Murray and Whitting (1899), the sides somewhat deeply concaved, especially the left anterior and right posterior, and slightly swollen in the right anterior and left posterior faces. Murray and Whitting figure an unusually rotund specimen. Girdle section nearly circular.

The *girdle* is median, descending, displaced distally thrice its own width, not overlapping, very deeply impressed (0.8 of its width) with heavy overhanging ridges of thecal wall or with low lists with close-set ribs. The *ventral area* (pl. 19, fig. 5) is very slightly sigmoid, laterally compressed to a narrow slit between the ends of the girdle. It expands posteriorly into an elongated elliptical area 2 furrow widths across and 3 to 4 in length, depending upon the elongation of the antapex.

The *theca* (pl. 19, figs. 1-3) consists of the following plates: 4', 1^a, 6'', 6, 6''', 1^p, 1'''''. Of the four apicals three are large ones, 1', 2', and 3' and one, 4', a small triangular one above the right intercalary. Murray and Whitting find but three plates. The scarcely truncated apex appears to belong to plate 1' and to be closed by a minute translucent closing platelet (*cl. pl.*) attached at the tip of the plate to the membrane closing the notch. Apical 1' bears on its ventral face at the edge of the apex in the midventral line a rounded notch (*n.*, pl. 19, fig. 3) which is a thin, rather than open region in the wall and recalls the similar region in certain species of *Peridinium*. I have not found it in the genus *Gonyau-*

lax. Apical $1'$ does not in this species extend posteriorly between pre-cingulars $1''$ and $6''$ as in species of the genus *Gonyaulax*, but terminates obscurely some distance above the indenting ventral area. The right intercalary 1^a is not found in the subgenus *Fusigonyaulax*, which contains the species of *Gonyaulax* most resembling *S. jolliffei*. This is, in *Spiraulax*, a large well-developed plate. It was overlooked by Murray and Whitting (1899) but appears in Entz's (1905) figure. There are six precingulars, of which $1''$ is the longest, $3''$ and $4''$ (middorsals) are smallest, and $6''$ is quadrilateral and relatively very large, its size and that of $1''$ being correlated with the spreading equatorial region. Of the six postcingulars $1'''$ is very small and narrow, with a reticulate lip overhanging the left margin of the ventral area. By reason of the pressure of the left intercalary 1^a , the adjacent postcingular $2'''$ is much shorter than the other members of this series. The single antapical $1''''$, is conical in contour with a slight constriction midway of its length. It bears on its distal end a short (1.5 girdle widths) stout, semi-hyaline, solid, median spine. The girdle plates are six in number with sutures (*g. s.*) as shown in the diagrams (pl. 19, figs. 1, 2).

The ventral area (pl. 19, fig. 5) has a small anterior plate, and an elongated posterior one (*post. pl.*). The intermediate plates are hidden in the narrow furrow.

The *surface* of the theca is variously marked. In thick-walled individuals the surface is deeply and regularly pitted with crowded, coarse, circular pits with minute pores at the bottom and the girdle lists are heavily and regularly ribbed. In thin-walled individuals both inner and outer surfaces are faintly reticulate with subregular rounded polygons, each with a minute pore in the center and the girdle lists are not ribbed. In some cases the pits and reticulations are less regular and not all of the pits bear pores. The single large pore of the ventral apical region so conspicuous in species of the genus *Gonyaulax* is not found in *S. jolliffei*. A peculiar round opening (*op.*) in the margin of the suture at the lower median corner of apical plate $1'$ is visible on parting the plates. Low, sparsely ribbed, hyaline lists which increase in height distally guard either side of the ventral area, except in the distal region. The antapical spine is a thickened symmetrical terminal extension of the antapical plate, whose whole surface may be faintly areolated, but in some cases is structureless and hyaline. Intercalary bands along the otherwise unornamented sutures are sometimes to be seen.

Cell contents dense, chromatophores dark yellow. Contents frequently escape through the parted apicals. Empty thecae often abundant in the plankton.

DIMENSIONS: Length, 132μ ; transdiameter, 92μ ; dorso-ventral, 75μ ; width of furrow, 5μ .

VARIATION: San Diego material is more angular and much less rotund than the specimen figured by Murray and Whitting. The surface varies greatly in thickness of the reticulations and

general rugosity. There is much variation also in length of apical and antapical horns.

COMPARISONS: This species is readily distinguished from all those in the subgenus *Fusigonyaulax* (see *Univ. Calif. Publ. Zool.*, vol. 8, no. 4, p. 246) by its stout apical and antapical horns and by the presence of four instead of three apicals, and by its anterior intercalary plate. As yet there is but the one species in the genus.

DISTRIBUTION: Described by Murray and Whitting (1899) from the tropical Atlantic between 42° N and 26° S, from the Caribbean and the Azores; and later recorded by Cleve (1902) from the tropical Atlantic between 28° N and 32° S. Also reported by Schröder (1900) from Naples, by Entz (1902, 1905) from Quarnero, and by Pavillard (1907) from the Gulf of Lyons. Cleve (1903) reports it from the Mediterranean, Red and Arabian Seas, and Karsten (1907) in two localities near the equator in the Indian Ocean.

Taken at surface ten miles off Point Loma, November 12, 1904, and occasionally elsewhere in San Diego region in October-December in oceanic plankton of subtropical facies in association with *Ceratocorys horrida*, *Ceratium reticulatum* and *C. trichoceros*.

For papers cited see bibliography of Article 4 in this volume.

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EXPLANATION OF PLATE 19

Spiraulax jolliffei (Murray and Whitting) Kofoid

All figures magnified 500 diameters.

Fig. 1. Diagram of antapical view of hypotheca, showing plates and fission line (*f. l.*)

Fig. 2. Diagram of apical view of epitheca showing same.

Fig. 3. View of right side of theca, showing plates. Apical plates parted. Seven miles WNW Point Loma, California, November 12, 1904.

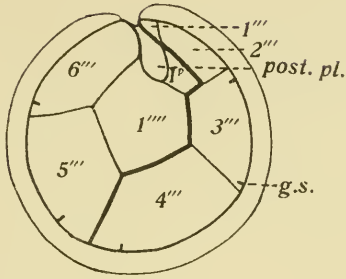
Fig. 4. Dorsal view of same, showing surface structure.

Fig. 5. Ventral view of same.

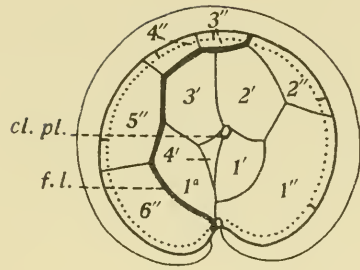
ABBREVIATIONS

<i>4-6</i> —girdle series of plates.	<i>cl. pl.</i> —closing platelet of apex.
<i>1'-4'</i> —apical series.	<i>f. l.</i> —fission line.
<i>1^a</i> —anterior intercalary plate.	<i>g. s.</i> —girdle suture.
<i>1''-6''</i> —precingular series.	<i>n.</i> —ventral apical notch.
<i>1'''-6'''</i> —postcingular series.	<i>post. pl.</i> —posterior plate of ventral area.
<i>1^p</i> —posterior intercalary plate.	
<i>1''''</i> —antapical plate.	

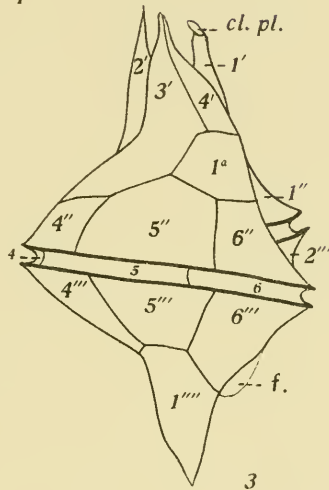
Figures drawn by Mrs. Josephine Rigden Michener.



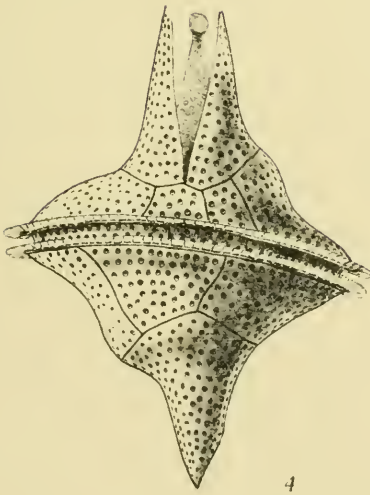
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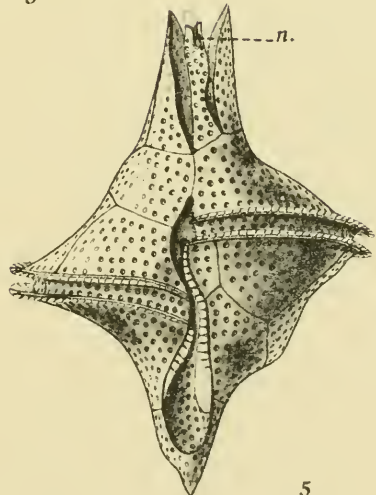
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