A NEW SPECIES OF *SPONDYLUS* (MOLLUSCA:BIVALVIA) FROM THE EOCENE OF ALABAMA

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Some time ago Royal D. Suttkus, Professor of Biology, Tulane University, collected the paired valves of a moderately sized specimen of *Spondylus* from the Middle Eocene Gosport Sand, at the exposure on Little Stave Creek, near Jackson, Clarke County, Alabama (locality TU 306). The only previous record of the genus from the Middle Eocene of the Atlantic and Gulf Coast fauna has been by Harris (1919, p. 29) who reported "a fragment of *Spondylus* of *dumosum* type but too imperfect for further characterization," from the "St. Maurice Stage" (Cook Mountain Formation) west of Winnfield, Winn Parish, Louisiana. A second, Early Eocene specimen from Hatchetigbee Bluff, Alabama, reported by Harris (1897, p. 234, pl. 12, fig. 11) as *Spondylus* sp., is an incomplete upper valve that shows no trace of spines on the radial ribs, which also are of a wholly different shape and number than are those in the present specimen.

This Early Eocene species has a surface ornament of alternating larger and smaller radial ribs but no spines, similar to that seen in the California Middle Eocene ("Domengine Stage") species named *Spondylus cliffensis* Hanna (1927, p. 278, pl. 32, figs. 2, 7). Another California Eocene species is *Spondylus carlosensis* Anderson, 1905, which has about nine of the radial ribs more enlarged but also has no spines. In contrast, the third known West Coast species, *S. bataquensis* Squires and Demetrion, recently described (1990, p. 385, figures 2.6-2.12) from Baja California Sur, is extremely spinose and is compared by the authors with the Mississippi Oligocene *S. dumosus* (Morton, 1834), their new species differing primarily in having more numerous radial ribs.

Family SPONDYLIDAE Gray, 1826
Genus SPONDYLUS Linné, 1758

Spondylus LINNÉ, 1758, Systema Naturae, ed. 10, p. 690.

Type species: *Spondylus gaederopus* Linné, 1758, by subsequent designation, Schmidt, 1818; Recent, "Mare Mediterraneo" (Linné, 1758) and "in the eastern Atlantic from Morocco to Senegal, and in the Atlantic Islands" (Dodge, 1952, p. 126).

Discussion: Species of *Spondylus* are perhaps the most variable of bivalved mollusks, as a result of the fixation of the right valve to the substrate. The nature and size of the material to which the shell becomes affixed strongly affects the shape of the valve and its ornamentation. If the shell area is held relatively high above the surrounding sediment the valve surface tends to develop normal spinose radial ribs, but if it is not above the sediment the valve surface commonly produces relatively well-spaced concentric laminae to hold itself above the softer sediments. Consequently, the lower valve in its early stages often has concentric laminae, which subsequently change to spines as the shell grows larger. But the upper valve will be uniformly spinose over the entire surface.

Similarly, as noted by Root (1988, p. 7) the strength of the currents in the water in which the specimens are living affects the "feathery, fingerlike projections" of the mantle margin that produce the external spines. Large, elongate spines can be produced only in quiet waters, for in swift currect areas the mantle projections cannot be held out long enough to permit the secretion of the large calcareous spines.

The result of these variable environmental factors has been the formation of highly diverse forms within each of the species and the assignment of many specific names to what are only infraspecific variations. Lamarck (1819), for example, described four species for variations of the form that we now know as *S. americanus* Hermann, 1791.

SPONDYLUS SUTTKUSI Vokes, n. sp.
Text-figures 1-3

Description: Shell of moderate size for the genus, slightly elongate-oval, with a small attachment area resulting in a regular outline. Surface of lower (right) valve is marked by regularly spaced lamellar foliations and lacks any radial ornamentation. The upper (left) valve is relatively low, arched; initially with about 15 primary radial ribs, which bear small narrow nodose projections, and usually with four secondary ribs between each pair of primary radials. With growth the projections on the primary ribs become moderately broad spines, the secondary ribs increase in strength and develop nar-

row needle-like ribs. In addition, narrow low tertiary radial ribs with sub-microscopic nodose projections appear. In the adult stage the primary and secondary ribs become almost equally strongly spinose, the tertiary ones develop relatively narrower projecting spines and three quaternary ribs are added in the interspaces, with the middle of the three tending to have smaller, relatively narrow spines, the marginal ones somewhat nodose and weak.

Holotype: USNM 450391.

Type locality: TU 306, Gosport Sand; Little Stave Creek, about 4 miles north of Jackson, Clarke County, Alabama.

Measurements of holotype: right (lower valve), height 65.2 mm, length 56.5 mm; left (upper valve), height 59.3 mm, length 56.5 mm; diameter of paired valves 29.6 mm.

Discussion: The two valves of this specimen display strikingly the different types of surface ornamentation developed in response to the environment. The lower valve is marked by strong concentric laminae, indicating its position on a relatively soft sediment bottom, and the upper valve is ornamented by numerous short, sharp spines, indicating a habitat of moderately strong current-flow. If the two valves had been taken separately they would have probably been assigned to two different species.

As noted above the only specimens previously known from the Eocene beds of the Atlantic and Gulf Coastal Plain have not been named. The named species are from the younger Oligocene beds: *Spondylus dumosus* (Morton, 1834), from the Red Bluff Formation, Alabama and Mississippi; *S. filiaris* Dall, 1916, from the Mint Springs Formation, Mississippi, and the Flint River Formation, Georgia; and *S. granulocostatus* Dockery, 1982, Red Bluff Formatiom, Alabama. All three have been figured by Dockery (1982, pl. 14, figs. 1-9 [*dumosus*]; pl. 15, figs. 1-3, 6, 7 [*filiaris*]; and pl. 15, figs. 4, 5 [*granulocostatus*]) and it may be seen that *S. dumosus* differs from *S. suttkusi* in having fewer, and relatively stronger primany and secondary ribs, ornamented by narrower, more elongate spines. *Spondylus filiaris* has almost no spinose ornamentation and *S. granulocostatus* has six of the radial ribs with heavy upturned spines, and between these numerous nodulose secondary radials.

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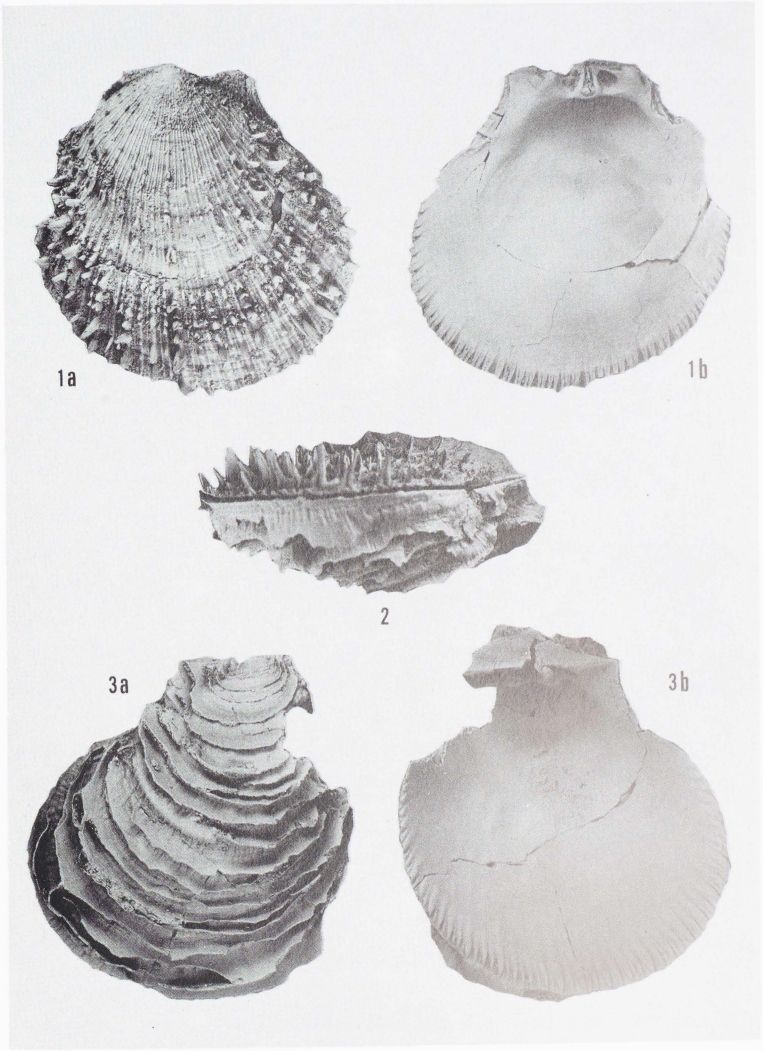
Text-figures 1-3. *Spondylus suttkusi* Vokes, n. sp.; USNM 450391 (holotype). Fig. 1, left (upper) valve; Fig. 2, paired valves; Fig. 3, right (lower) valve. (X 1)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