

Italy.—As the Pliocene series is traced eastward into Italy its lacustrine intercalations disappear and it becomes mainly a marine formation, which is so amply developed there that it might be taken as typical for the rest of Europe. Along both sides of the chain of the Apennines it forms a range of low hills, and has been named from that circumstance the “sub-Apennine series.” In the Ligurian region, according to C. Mayer, it consists of the following groups in ascending order: 1, Messinian (=Zanclean of Seguenza), composed of (a) marls, conglomerates, and molasse (65 feet), with *Cerithium pictum*, *C. rubiginosum*, *Venus multilamella*, *Pecten cristatus*, *Turritella communis*, *T. subangulata*; (b) gypsiferous marls, limestones, dolomites (320 feet), traceable along the range of the Apennines as far as Girgenti in Sicily by its well-known gypsum zone, and containing *Turritella subangulata*, *Natica helicina*, *Pleurotoma dimidiata*, etc.; (c) gravels and yellow marls, with beds of lignite (upward of 300 feet). 2, Astian, composed, at the foot of the Ligurian Apennines, of two groups (a) blue marls with *Dentalium sexangulare*, *Turritella communis*, *T. tornata*, *Murex trunculus*, *Natica millepunctata*, etc.; (b) yellow sands with few fossils (300 feet and more).¹⁰⁹ More recently Prof. Sacco has estimated the whole series in the central portion of the northern Apennines to have a thickness of nearly 1500 feet, which he groups as in the subjoined table:¹¹⁰

Villafranchian (100 metres).	{	Fluvio-lacustrine alluvial sands, marls, clays and conglomerates, with shells indicating a warm, moist climate, <i>Rhinoceros etruscus</i> , <i>Mastodon arvernensis</i> , etc.
Astian (100 metres).		Yellow sands and gravels, rich in littoral, marine or estuarine fossils.
Plaisancian (150 metres).		Marls and sandy clays with abundant marine fossils, from one-third to one-half of the shells belonging to living species.
Messinian (100 metres).		Sandy and clayey marls with seams of gypsum and limestone marking alternations of brackish-water and marine conditions. The shells include <i>Dreissena</i> , <i>Adacna</i> , <i>Cyrena</i> , <i>Neritodonta</i> , <i>Melania</i> , <i>Melanopsis</i> , <i>Hydrobia</i> , etc. Some of the marls are full of leaves (<i>Thuja</i> , <i>Phragmites</i> , <i>Myrica</i> , <i>Quercus</i> , <i>Castanea</i> , <i>Fagus</i> , <i>Ulmus</i> , <i>Ficus</i> , <i>Liquidambar</i> , <i>Laurus</i> , <i>Sassafras</i> , <i>Cinnamomum</i> , <i>Rhamnus</i> , etc.).

In Sicily a similar threefold grouping has been made by Seguenza, who has traced the same arrangement throughout

¹⁰⁹ C. Mayer, Bull. Soc. Gool. France (3), v. 292.

¹¹⁰ F. Sacco, “Il Bacino Terziario del Piemonte,” Milan, 1889. See also De Stefani Atti. Soc. Tosc. Sci. Nat. 1876–84.