Many important geological concepts and features were first recognized and described in the Apennines and Sicily. In these areas, among the most distinctive features are rock units characterized in outcrop by variably disrupted strata or blocks of diverse sizes disposed in a clay-rich matrix. The stratal disruption and the intense weathering give an overall chaotic or non-bedded appearance to these units, and various names have been used for them, including argille scagliose, argille brecciate, caotico eterogeneo, Chaotic Complex, Undifferentiated Complex, Ligurian mélange, and olistostrome. Some of these terms, such as argille scagliose and olistostrome, have been applied to melanges in other mountain chains, even while Apennine geologists continued to debate whether local examples resulted from tectonic or gravitational processes.

The purpose of this chapter is to provide a brief review of past and current research on disrupted rock units in the Apennines. First, we briefly review how the nomenclature originated and evolved. Second, we summarize the criteria that are currently being used in the Northern Apennines to subdivide these units into two major types, tectonosomes and olistostromes, which originated by in situ tectonic deformation and by gravitational mass movements, respectively.

### NATURE AND DISTRIBUTION OF DISRUPTED ROCK UNITS

The various disrupted rock units share certain similarities, even though they may differ in size, fabric, or composition. A singular characteristic is their lack of regular, continuous, and normally ordered bedding. Sedimentary layers that originally were superposed in stratigraphic order have been either modified by different styles of deformation, or partly to completely disaggregated into fragments. Therefore, some bodies consist of millimetre- to metre-wide fragments of limestone, sandstone, or siltstone beds dispersed in a matrix composed dominantly of clay. In outcrops these rocks look like blocks-in-matrix rather than ordered beds. Other units contain bodies of strata that were deformed by folding, or by boudinage and other styles of layer-parallel extension. In some cases, these bodies are tens to hundreds of metres wide, a few to tens of metres thick, and are surrounded by a matrix containing smaller fragments. Thus, these rock units may be regarded as disrupted, instead of chaotic, because in several cases, a certain internal order is still evident in spite of stratal disruption.

Disrupted rock units are a distinctive, widespread component of several widespread units in...
the Northern Apennines (Fig. 12.1). The Northern Apennines can be considered as an eastward tapering orogenic wedge composed of stacked, extensive thrust sheets (Fig. 12.2). Structurally highest is the Ligurian nappe, consisting of upper Jurassic to lower Tertiary sedimentary rocks and subordinate Jurassic ophiolitic rocks that formerly occupied a now-vanished domain to the W: the Ligurian ocean. Approximately 40 percent of the nappe consists of disrupted rock units. Middle Eocene to Pliocene Epiligurian successions that were deposited on the Ligurian nappe locally contain interbedded bodies featuring a block-in-matrix fabric (Bortolotti et al., this vol., Ch. 11).

As the Ligurian nappe, together with its satellite Epiligurian basins, advanced eastward and was emplaced over the Subligurian nappe, the Tuscan nappe, the Cervarola unit and the Romagna-Umbria foreland (Carmignani et al., this vol., Ch. 14; Barchi et al., this vol., Ch. 15), it overrode several Tertiary foreland basins that are progressively younger eastward. The foredeep clastic wedges (Macigno, Monte Cervarola Sandstones, and Marnoso-arenacea Formation (Argnani and Ricci Lucchi, this vol., Ch. 19)) contain interbedded, internally chaotic units and kilometre-scale blocks derived from Ligurian and Subligurian nappes. As a general rule, not only the fragments in chaotic bodies but also the variously disrupted rock sequences in the metre- to kilometre-scale blocks were primarily derived from Ligurian and Subligurian nappes (Abbate et al., 1970; Abbate et al., 1981; Ricci Lucchi, 1975; Pini, 1987b; Landuzzi, 1992, 1994).

Figure 12.1 Simplified geologic map of the Northern Apennines (after Pini, 1999).