

RECONSTRUCTING THE PALEOENVIRONMENT AND SOURCE OF THE HAUNTED HILL FORMATION (PLIOCENE-PLEISTOCENE), SOUTH GIPPSLAND, VICTORIA, AUSTRALIA

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INTRODUCTION

The purpose of this study is to reconstruct the paleogeography of the Yanakie Isthmus during the deposition of the Haunted Hill Formation. Six field locations where the Haunted Hill Formation is exposed were used for this reconstruction. By determining the paleogeography of the Yanakie Isthmus, local sea level changes from the Miocene to the present could be assessed.

GEOLOGIC SETTING

The Haunted Hill Formation (Fig. 1 of Gardner et al., this volume) of the regressive Sale Group is a late Tertiary/early Quaternary deposit composed of well to poorly cemented quartzose gravel, sand, and clay. The Sale Group is mostly found on the onshore part of the Gippsland Basin in South Gippsland, Victoria, Australia, and blankets the Latrobe Valley Group and Seaspray Group (Hocking et al., 1988). Deposition of the Sale Group was a result of a marine regression across southeast Gippsland during the late Miocene and early Pliocene.

This regression caused the spread of alluvial or coastal plain sand, clay, silt, and minor coal deposits across most of southeast Gippsland (Hocking et al., 1988). Differential crustal movements of the Kosciusko Uplift became pronounced during the late Pliocene and Pleistocene (Hocking et al., 1988) resulting in

the present structure and topography of the onshore and nearshore Gippsland Basin.

METHODS

The majority of the research for this project was field-based. Known outcrops of the Haunted Hill Formation on geologic maps and reconnaissance field trips around the Yanakie Isthmus determined field locations. Field locations include Lester's Quarry, Shire Quarry, Tracy's Beach, Red Bluff, Duck Point, and Shallow Inlet Beach. Data was collected at each site including sorting, angularity, and basic mineralogy of the Haunted Hill Formation. Quantitative data includes average clast size within the conglomerate. Samples of the Devonian granite, Liptrap Formation, and the Haunted Hill Formation were collected for hand sample and petrographic analysis. One sample from Tracy's Beach was collected for an Optically Stimulated Luminescence (OSL) date. Stratigraphic columns were made at Shire Quarry and Lester's Quarry. These stratigraphic columns were used to determine flow direction within the Haunted Hill Formation at Shire Quarry. Elevations and thickness of the Haunted Hill Formation at each field location were measured with both a GPS receiver and a tape measure.

Petrographic analysis was conducted on samples of the Haunted Hill Formation from Duck Point and Red Bluff. The quartz in

these thin sections was compared to quartz in thin sections from the Devonian granite and vein quartz within the Liptrap Formation.

RESULTS AND DISCUSSION

Lester's Quarry represents an alluvial fan deposit (Miall, 1992). The base of the Haunted Hill Formation at Lester's Quarry is at 60 m, and the deposit is approximately 2 m thick. Lester's Quarry is also at the base of the Hoddle Mountain Range. The quartz clasts are medium pebble size and larger. The average clast size is 18 cm, and the clasts are mostly angular. Bedding is poorly developed.

Because of the textural and fabric characteristics of the Haunted Hill Formation at Shire Quarry, it can be inferred that the depositional environment there was a braided stream. Like other ancient braided stream deposits (Miall, 1992), the deposit at Shire Quarry has beds with variable grain sizes. The crossbedding within the deposit indicates a flow direction to the south. The pebble-sized quartz clasts range from subangular to rounded, showing that the sediments have been reworked in a fluvial system.

Duck Point, Red Bluff, Tracy's Beach, and Shallow Inlet Beach all contain marine terrace/beach deposits of the Haunted Hill Formation at approximately 10 meters above sea level. The conglomerate is moderately well sorted, almost purely quartz, and shows no bedding. The granule-sized grains within the deposit are similar to the modern beach sediments in grain size and angularity (Einsele, 1992). This indicates that the Haunted Hill Formation at these locations most likely was deposited in a beach environment. The OSL age of the marine terrace at Tracy's Beach is 124 KA. This suggests that the Haunted Hill Formation at the above locations was deposited during the Pleistocene.

Before the Pliocene, the Yanakie Isthmus was submerged. The Kosciusko Uplift during the late Pliocene and early Pleistocene caused uplift on the Walkerville Fault. A peninsula formed, which later became the Yanakie Isthmus (Fig. 1). Since the Miocene, the

Paleozoic Hoddle Mountains shed alluvial material as the peninsula grew. As uplift increased, the alluvial fan progressed into a braided stream. A beach deposit surrounded this system. The majority of the Haunted Hill Formation is composed of material shed from the Hoddle Mountains and nearby Liptrap Formation. Some material from the Upper Devonian granite can be found at Duck Point, Red Bluff, and Shire Quarry. The granitic component at these sites indicates that some material from the Upper Devonian granite to the east and south was shed from a topographic high as the isthmus was developed. This hypothesis explains the beach deposits at Duck Point, Red Bluff, Tracy's Beach, and Shallow Inlet Beach, the alluvial deposit at Lester's Quarry, and the braided stream deposit at Shire Quarry.

CONCLUSIONS

- The Haunted Hill Formation was deposited in a beach environment on top of a marine terrace during the Pliocene (Hocking et al., 1988) at Tracy's Beach, Red Bluff, Duck Point, and Shallow Inlet Beach and was eroded during another marine terrace-forming event during the Late Pleistocene.
- The quartz in the Haunted Hill Formation was derived from two sources: quartz veins in Lower Devonian Liptrap Formation and Upper Devonian granite.
- The Haunted Hill Formation at Lester's Quarry and Shire Quarry was deposited in a terrestrial environment. The conglomerate at Lester's Quarry, with boulder-sized clasts and poorly developed bedding is most likely a deposit from an alluvial fan forming from the Hoddle Mountain Range. The Haunted Hill Formation deposited in Shire Quarry, which contains crossbedding along with variable grain size beds, may be a braided stream deposit.

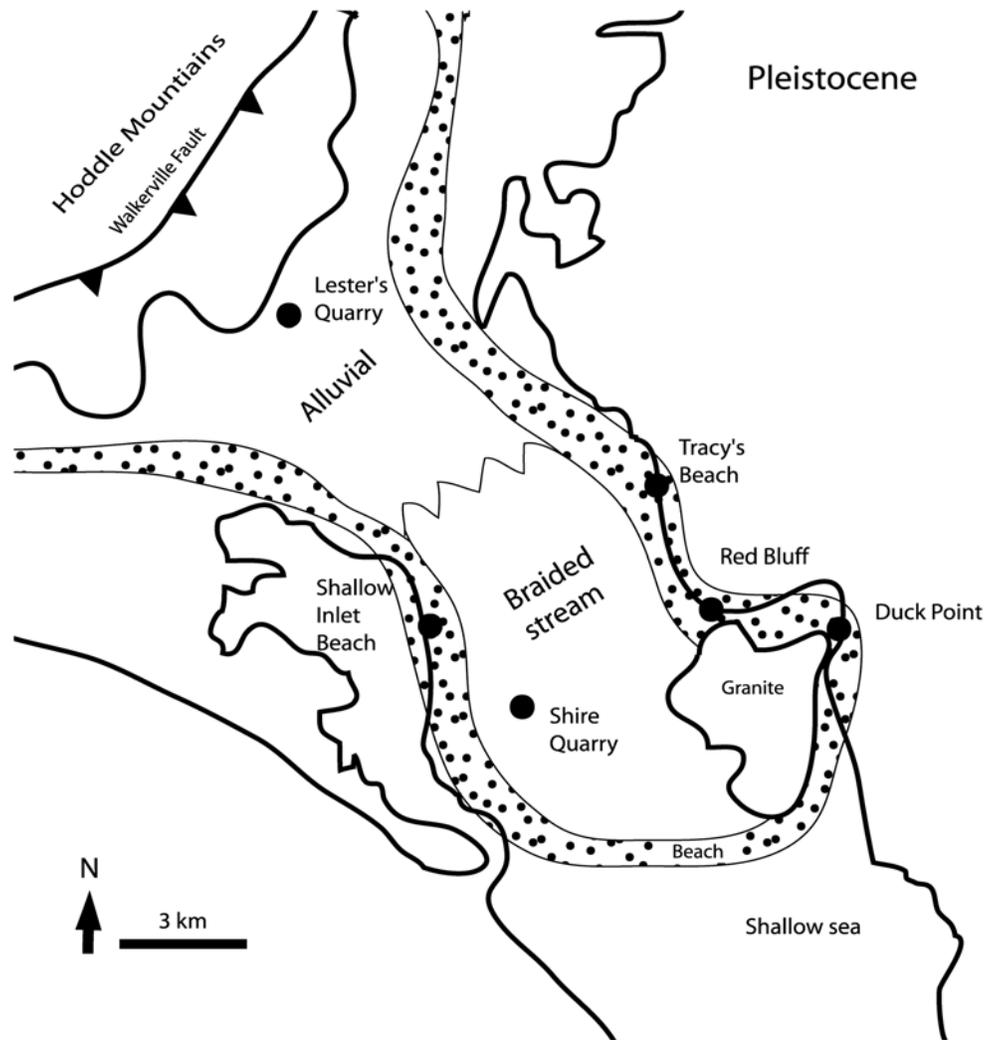


Figure 1. Paleogeographic reconstruction of the Yanakie Isthmus during the Pleistocene.

- At the time of higher sea level, the Yanakie Isthmus was submerged until uplift along the Walkerville Fault during the Late Pliocene and Early Pleistocene exposed a growing peninsula (later to form the isthmus) that allowed for the deposition of the Haunted Hill Formation.

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