Art and the Pearl River Delta Environment

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Abstract:

History tells us that South China and the Pearl River Delta region in particular began to suffer environmental damage about 1000 years ago when large numbers of people migrated from north to south. The forest vegetation was removed for a variety of reasons: to provide firewood, building materials, and to make charcoal; to clear land for farming and settlements; to provide safety from fire, wild animals, snakes, and bandits. Much of the land in the Pearl River Delta region is still in a damaged and degraded state.

Western and Chinese artists who frequented the Pearl River Delta region recorded the damage in paintings and drawings. In addition, land and vegetation damage is shown in some early photographs taken in China.

Until about 1750, Chinese art lacked perspective. The local Chinese artists learned to draw using the perspective technique from foreign artists and then began to incorporate the technique in their works. Even though the Western and Chinese artists probably were not trained in geology/geomorphology, they demonstrated keen observations in their art works related to the nature of the land surface. The Western and Chinese artists show that the land was largely deforested and badly eroded 200 years ago. Historical art depicting the Pearl River Delta region can be used in geological and geomorphological applications, such as to determine the type of local bedrock, determine the intensity of rock weathering, and to assess the status of soil erosion.

This study finds that
• much of the artwork produced by Western and Chinese artists about 150-200 years ago shows that they accurately represented the Chinese landscape,
• the land and the wildlife habitats were already severely damaged in the 1700s and 1800s,
• geological information inadvertently recorded in historic art matches current geological knowledge.
Considerable agreement exists among historical art works produced by different artists over 200 years regarding the condition of the environment of the Pearl River Delta region. It is unlikely that there were extensive, undamaged wildlife habitats that remained in this region at this time. Using art to determine the condition of the land and vegetation in the Pearl River Delta region 200 years ago may provide some difficulties. However, it may be even more difficult to determine the condition of the Pearl River Delta region in just 15 years when an estimated additional 70 million people move into the area.

**Introduction:**

History tells us that South China and the Pearl River Delta region (fig. 1) in particular began to suffer environmental damage about 1000 years ago when large numbers of people migrated from north to south (Marks, 1998; Parham *et al*., 1993). As agriculture expanded, the loss of vegetation caused destruction of wildlife habitats for large animals like elephants, tigers, deer, and buffalo.

![Figure 1: Map of the Pearl River Delta Region](image)

The forest vegetation was removed for a variety of reasons: to provide firewood, building materials, and to make charcoal; to clear land for farming and settlements; to provide safety from fire, wild animals, snakes, and bandits (Grant, 1960; Marks, 1998; and Parham *et al*., 1993). Elephants disappeared from the region in about 1400 primarily because of forest destruction (Marks, 1998; Elvin, 2004). Tigers persisted until the early
19th century when their forest habitat became highly fragmented (Marks, 1998) and the number of tigers has continued to decline since then.

The region is composed largely of granite and volcanic rock, chemical weathering reaches depths of 60 to 80 meters, soil fertility is poor, and fires and landslides are common. Once deforested, the land eroded easily.

Much of the land in the Pearl River Delta region is still in a damaged and degraded state. It is likely that much of the land’s appearance is a result of past, damaging land-use practices. Biological and physical scientists who study this region recognize clues that support the story of past, widespread, damage to the land, vegetation, and wildlife. Nevertheless, we can only imagine how the appearance of the land changed as human activities altered the land and its vegetation. It is evident from recent studies (Parham et al., 1993) that land abuse continued to have additional adverse affects over the last 50 years. World War II, China’s Great Leap Forward and its Cultural Revolution, coupled with the region’s booming economic development, certainly are recognized as contributing factors to further environmental damage. Nationwide, natural ecosystems are degrading, habitat loss has accelerated, and the number of native species is decreasing (SEPA, 2002).

Western and Chinese artists who frequented the Pearl River Delta region have recorded the damage in numerous paintings and drawings. These works of art are one way to look back into the past to examine how the landscape appeared 200 years ago. Other researchers have tried similar techniques to link art and the environment. For example, one researcher, who was interested in whether or not cloud cover increased during the Little Ice Age during 1450 to 1850, examined thousands of art works in European and American museums that were painted during that period (Fagan, 2000). He recorded the type and amount of cloud cover in each painting and showed statistically that cloud cover was significantly more common over Europe during the Little Ice Age. His results show how art and environmental change can be linked effectively.

Environmental damage is also documented in some of the earliest photographs taken in China. These only date back to 1844; a few daguerreotype photographs of Hong Kong (Hacker, 1997) show some environmental damage in the 1860s. Many early photographs were taken in the Treaty Ports and not the countryside. One drawback is that finding non-inventoried China photographs today requires an unreasonable amount of time for the researcher (Thiriez, 2000).

Background:

While visiting local Hong Kong art museums, I saw paintings of the Pearl River Delta region by Western and Chinese artists. Many showed that the artists paid careful attention to land-form detail. It seemed possible to extend our visual knowledge of the Delta region’s land surface back in time using these early art works. The goal of this study is to answer these questions:
1. Did the Western and Chinese artists accurately represent the Chinese landscape in the 1700s and 1800s?
2. What does art tell us about the past condition of the land and wildlife habitats in the Pearl River Delta region?
3. What can we learn from historic art about the region’s geology and geomorphology?

Source material:

A recent publication (Sargent, and Palmer, 1996), which combines much of the Asian Export Art from the Hong Kong Museum of Art (www.lcsd.gov.hk/CE/Museum/Arts/) and that of the Peabody Essex Museum (www.pem.org) in Salem, Massachusetts, contains a number of examples in which geological and geomorphological features are well depicted, and where the general state of the land is recorded. The Wason Collection of East Asia at Cornell University Library (www.explore.cornell.edu) also has useful images. In addition, Asian Export Art dealers have Internet sites that show relevant Chinese and Western art.

Some of the first European artists who visited the Pearl River Delta on trading ships and naval vessels sketched and painted the local landscapes. These artists, in the process, passed some of their skills on to local Chinese artists who later incorporated the new skills in subsequent art work. The blending of Chinese art techniques with those from the West developed into Asian Export Art, an important new business activity at the time (Sargent, and Palmer, 1996). Many of the artists noted as “Anonymous” in the images of this paper probably were local Chinese artists.

Until about 1750, Chinese art lacked perspective, a technique of geometry that local artists learned from foreign artists and began to incorporate in their works (Sargent, and Palmer, 1966). Sargent and Palmer (1996) point out also that “truth” and “accuracy” in many Chinese paintings from the Pearl River Delta region became established about 1788. Interestingly, Elvin (2004) notes that Chinese maps also improved their precision by 1850.

Method:

I examined a large part of the 1200 image historical collection of the Hong Kong Museum of Art (HKMA) available to the public on the Internet. Some of these works from the collection are referenced in this paper. In addition, I searched the literature for collections of old-photographs from Hong Kong and South China without a great deal of success. Numerous collections of Asian art also exist in American universities and museums, but only part of their collections are available today on the Internet.

Environmental assessment of historical art:

Past condition of the land and wildlife habitats
Dinghushan (fig. 2) is a Man and the Biosphere Reserve situated 86 km west of Guangzhou (Kong et al., 1993).

Figure 2: The moist, tropical, broad-leaf forest at Dinghushan is at least 400 years old, and once provided habitat for the South China Tiger (Photo by W. Parham, 2003)

This 900 hectare remnant of original tropical evergreen, broad-leaf forest is at least 400 years old and is all that remains today of a forest that originally covered much of Guangdong Province and adjacent areas. The forest was the home of the elephant until 1400, and the South China tiger (Figure 3, below)
until the early 19th century. This tiger may have become extinct in the wild as of 2004 (Tilson, 2004) as habitat and prey decreased, though about 50 remain in zoos. The tiger population has decreased from about 4000 in 1949 (Koehler, 1991).

Now, compare the picture of Dinghushan to South China’s Pearl River Delta region of about 200 years ago. The sketch (fig. 4) by a HMS Lion crew member shows that grasslands prevailed, forest cover had been destroyed along the east side of the Pearl River near its mouth, and that landslides were clearly evident.

Figure 4: Deforested land, and landslides near the mouth of the Pearl River in 1793 (with permission of Cornell University Library, Wason Collection of East Asia)

Landslides during rainy seasons, like this one, still are common today. Arrows mark vehicles (Figure 5, below), (Hong Kong Geological Survey Collection).
Lan Tau Island (fig. 6), about 20 km further south, still exhibits an extensive grass-land cover and an absence of its original forest. Fires commonly sweep across such grasslands generally in the fall requiring as much as five to ten years for the vegetation to grow back to its pre-fire condition. These fires, caused by man, continue to threaten wildlife habitats in the region today.

Figure 6: Lan Tau Island, Hong Kong, once forested, is now covered with grasslands (Photo by W. Parham, 1967)

About 20 km east of Lan Tau Island in eastern Hong Kong, Murdoch Bruce’s painting (fig. 7) shows grasslands spreading far across the land, as well as deep erosion scars.

Figure 7: Eroded and deforested Hong Kong mainland, 1846 (Hong Kong Museum of Art Collection)
Two paintings of the north side of Hong Kong Island, probably by different Chinese artists (fig. 8) and (fig. 9), are similar in showing the deeply eroded mountain side, the general lack of forest cover, and the presence of some grass cover.

Figure 8: Hong Kong Island, 1847 (Hong Kong Museum of Art Collection)

Figure 9: Deeply eroded Hong Kong Island, 1855-60 (Hong Kong Museum of Art Collection)

Opposite Hong Kong Island on the mainland, John Collins shows Kowloon, where Fort Victoria once existed. The land is barren and treeless (fig. 10).
The view from western Hong Kong Island with its outlying islands (fig. 11) painted by Edward Hildebrandt, also shows a badly damaged landscape with very few trees anywhere.

Closer views of the land show severe damage. For example, William Lodder shows that the tombs (fig. 12), which people dug by hand into Hong Kong’s deeply weathered, granite hillsides, are surrounded by a scalped or denuded landscape with vegetation consisting of no more than a few bushes hidden in small depressions. Such
sites composed of weathered granite are subject to severe erosion during the rainy season and it is difficult for vegetation to reestablish itself.

Figure 12: Denuded landscape, Hong Kong, 1833-57. Tombs dug into deeply weathered granite (*Hong Kong Museum of Art Collection)*

Similarly, Auguste Borget shows the north side of Hong Kong Island where either soil erosion has exposed the tree’s root system or the roots shown are natural for a banyan tree (fig. 13). All of the surrounding soil surfaces also are barren.

Figure 13: Eroded soil showing tree roots and barren land, 1838 (*Hong Kong Museum of Art Collection*)
The eroded south side of Hong Kong island (fig. 14) shown in Edward Hildebrandt’s painting, is deforested and deeply eroded exposing large, granite core-stones. Small patches of grass cover are scattered over the eroded weathered granite.

Figure 14: Eroded south side of Hong Kong Island, 1860s *(Hong Kong Museum of Art Collection)*

In another view of the island’s south side (fig. 15), William Lodder shows some orderly replanting of trees near sea level that may be a plantation, but high on the hills, a barren landscape prevails.

Figure 15: South side of Hong Kong Island’s barren hills, 1833-57 *(Hong Kong Museum of Art Collection)*
Geology and geomorphology

Historical art depicting the Pearl River Delta region provides several geological and geomorphological applications such as determining the type of local bedrock, intensity of rock weathering, and the status of soil erosion. Certain land forms, such as *inselbergs*, core stones, and *beng-gang* erosion, can be identified readily from the art. These features help to identify the composition of the underlying bedrock geology. The features that the artists depicted pre-date the first rudimentary geological description of Hong Kong in 1865 and Hong Kong Island’s first geological map in 1880 (Davis, 1953). Nevertheless, it is clear that the art in a large part is an accurate representation of what modern geological maps show.

**Pearl River Inselberg island**

Situated in the Pearl River near Humen, is a rounded, dome-shaped island that geologists refer to as an *inselberg*. This particular granite *inselberg* is formed from concentric layers of rock having an onion-like structure (fig. 16).

![Generalized layered-model of an inselberg island](Photo by W. Parham)

As layers of the granite exfoliate, or fall away, during the process of weathering, the island continues to maintain its smooth, dome-like form (Fairbridge, 1968). The *inselberg* island is easily distinguished (fig. 17) from the more common islands that are irregular, eroded rock remnants lacking this structure.
The inselberg island is situated where the Pearl River narrows rapidly traveling from the South China Sea to Canton (Guangzhou), an area referred to at Bocca Tigris, the “tiger’s mouth”. The Bocca Tigris was the historical site of several old Chinese forts that were important during the Opium Wars, and was apparently a favorite place for artists to draw or paint pictures of the islands, and of the inselberg island in particular. The following seven paintings or art works cover a 53-year time span.

John Meares’ sketch of the inselberg island (fig. 18) shows some vertical exaggeration but the island still is recognizable.
The artist from the *HMS Lion* also exaggerated the island’s height somewhat but he caught more of the *inselberg’s* dome-like form (fig. 19) than John Meares.

**Figure 19: Pearl River *inselberg island*, 1793-94 (*Permission of Cornell University Library, Wason Collection of East Asia*)**

A somewhat later depiction of the island (lower left) by William Alexander (fig. 20) clearly is recognizable in form.

**Figure 20: Pearl River *inselberg island*, 1796 (*Hong Kong Museum of Art Collection*)**

A later artist, probably Chinese, drew the island’s shape in greater detail (fig. 21).
Another anonymous artist, also probably Chinese, produced an image of the island from a long distance but one that is recognizable (fig. 22).
William Lodder accentuated the rock separation in the island’s form as is evident in some other of the island’s drawings but he did not emphasize the dome form (fig. 23).

Figure 23: Pearl River *inselberg* island, 1833-57 (*Hong Kong Museum of Art Collection*)

Lt. Martin showed the rock separation too, but drew sharper peaks on the island (fig. 24).

Figure 24: Pearl River *inselberg* island, 1847 (*Hong Kong Museum of Art Collection*)
J.W. Johnson painted a small island with a prominent vertical rock at its center and surrounded by what appear to be core stones (fig. 25).

Figure 25: Granite tor, Hong Kong, 1840s (Hong Kong Museum of Art Collection)

Though not an *inselberg*, this geological feature, called a *tor*, is not unusual for areas where core-stone formation is common.

The unusual shape of the *inselberg* island obviously caught the attention of the various artists spanning the fifty-three years of art cited above. In many cases it was the artist’s focal point. All of the *inselberg* island’s images are recognizable and have common features. Other than some vertical exaggeration in a few works, the likenesses are reasonably similar. The artists basically produced images of what they saw rather than what they imagined. Though they probably lacked geological training, the images they produced are useful to the geologist and geomorphologist in reconstructing the history of the landscapes’ formation.

Core stones

Core-stone formation is common where granite is subjected to chemical weathering in the wet tropics. Weathering along joint planes in granite leaves adjacent rock unaltered. Once the vegetative cover is removed, erosion carries away the weathered material from the joint planes, forming collections of fresh core stones on the land’s surface resembling a pile of sugar cubes (fig. 26).
During periods of heavy rains, the core stones, some as large as automobiles, slide or roll down hills threatening people and man-made structures.

Core stones are common in the Pearl River Delta region. A dense collection covers part of Tai A Chau, a small granite island west of Hong Kong (fig. 27).
Core stones show up in many historical drawings and paintings from the region. A sketch of a section of a village shoreline (fig. 28) by William Lodder shows an assemblage of large core stones along the shore as well as some smaller ones on the barren land of the hills above.

Figure 28: Barren land and core stones, Hong Kong, 1833-57 (Hong Kong Museum of Art Collection)

One of the first daguerreotype photographs taken in Hong Kong (fig. 29) shows the entire hillside behind a temple covered with core stones of various sizes. Modern geological maps indicate that this hill is composed of granite (Allen, and Stephens, 1971).

Figure 29: Daguerreotype of Hong Kong core stones, 1860s (Wattis Fine Arts Collection, Hong Kong)
The Chinese artist Sunqua may have painted this view of Hong Kong (fig. 30). The left half of the painting of Hong Kong Island shows a surface covered with numerous core stones. The right half, on the other hand, shows very few. Geological maps (Allen, and Stephens, 1971) show that the left half of the island is composed of granite as is the lower right-hand part, and the upper right half is composed of volcanic rocks. Core stones form more readily in areas where granite is the bedrock and are less likely to form from volcanic rocks which have a different texture and structure.

**Figure 30: Numerous core stones on granite area of Hong Kong Island, 1854 (Hong Kong Museum of Art Collection)**

*Beng-gang gully erosion*

*Beng-gang* is the Chinese name for the horse-shoe shaped, gully erosion features common in deeply weathered granite areas of South China. Typically, the gully has a steep back wall and a narrow outlet like the one in Zhuhai (fig. 31). *Beng-gang* gully erosion can develop rapidly on hill slopes during heavy rains where vegetation is sparse or absent. Chinese researchers (*in Parham et al., 1993*) found that a combination of biological and engineering techniques works effectively to halt the *beng-gang* erosion process.
Murdoch Bruce’s Hong Kong painting (fig. 32) shows well developed *beng-gang* gully erosion in grass-covered, weathered-granite hills in the background of his picture.

In addition, core stones are evident on the hilltop to the right. Lt. Martin, a navy artist, shows advanced *beng-gang* erosion in grass-covered hills at Annunghoi, within a Chinese fort at *Bocca Tigris* (fig. 33).
The artist produced a second painting (fig. 34) at the same location during that year but this painting lacks some definition of the *beng-gang* erosion.

William Lodder’s sketch (fig. 35) and his painting (fig. 36) were drawn from two overlapping sea views of the land. The sketch shows advanced *beng-gang* erosion.
cutting through a low hill on the left. His painting shows the same erosion site directly behind the mast of the ship. Both images show badly eroded hills, some core stones, and a devastated zone above the painting’s shoreline.

Figure 35: **Beng-gang** gulley erosion, Hong Kong, 1833-57 (*Hong Kong Museum of Art Collection*)

Figure 36: **Beng-gang** gulley erosion, Hong Kong, 1833-57 (*Hong Kong Museum of Art Collection*)
William Lodder also sketched treeless Green Island (fig. 37) where evidence of *beng-gang* erosion existed. Geologic maps verify that the island is at least half granite (Allen, and Stephens, 1971).

Figure 37: *Beng-gang* gulley erosion, Hong Kong, 1857 (*Hong Kong Museum of Art Collection*)

Another William Lodder sketch of a sampan at West Point, Hong Kong (fig. 38) shows some vertical exaggeration of the barren land in the background but *beng-gang* erosion and core stones are evident at this granite site.

Figure 38: *Beng-gang* gully erosion and core stones, West Point, Hong Kong, 1857 (*Hong Kong Museum of Art Collection*)
Conclusions:

- Much of the artwork produced by Western and Chinese artists about 150-200 years ago shows that they accurately represented the Chinese landscape.
- The land and the wildlife habitats were already severely damaged in the 1700s and 1800s.
- Geological information inadvertently recorded in historic art matches current geological knowledge.

Considerable agreement exists among historical art works produced by different artists over 200 years regarding the condition of the environment of the Pearl River Delta region. The artists painted what they saw even though they probably knew little of the scientific significance of the land features they recorded.

The Western and Chinese artists show that the land was largely deforested and badly eroded 200 years ago. The condition of land then and now appears to be similar even though efforts have been made in some areas in recent years to restore tree cover. It is unlikely that there were extensive, undamaged wildlife habitats that remained in this region 200 years ago. Habitat destruction in the Pearl River Delta region depicted in the cited historical art works, combined with continued hunting and trapping of native prey species, may already have led to the extinction of the South China tiger. The estimated tiger population in the wild was 4000 in 1949, 150-200 in 1981-82, and 30-50 in 1991, with about 50 more housed in zoos (Koehler, 1991). Recent, broad, field surveys of South China sites where the tiger should most likely live, show nothing but its absence (Tilson, 2004).

Even though the artists probably were not trained in geology, they demonstrated keen observations in their art works related to the nature of the land surface. Early geologists visiting the Pearl River Delta region could have, or perhaps even did, benefit from examining the local art of that time. Their assessment of the correctness of the artists’ observations regarding the state of the land could have provided useful information early on about the bedrock geology, and the weathering and erosion history of the region. The presence of core stones, core-stone distributions, wide-spread heng-gang gully erosion, the presence of tombs dug by hand, prominent exposure of tree roots, for example, are all important clues in reconstructing the region’s geological history and geological processes affecting the region.

Using art to look back 200 years to determine the land’s condition in the Pearl River Delta may seem somewhat difficult. However, determining what the condition of the delta region’s land will be in just the next 15 or 20 years may be equally difficult. Today, the Pearl River Delta economic zone accounts for about one-third of China’s total trade and land development is taking place here very rapidly. Nevertheless, it is likely that today’s artists will continue to record the rapidly moving land changes for us, and that within these images, they will record important information useful to ecologists and geologists.
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