

**Stratigraphy of the Kodomari-Kanita
District, Aomori Prefecture**

By

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Abstract

The district in the Tsugaru peninsula belongs to the so-called "green tuff region" of the inner zone of northeastern Honshu. Neogene Tertiary sediments contain abundant pyroclastic rocks. The writer clarified the stratigraphy of the sediments and volcanic rock, and made a correlation with those of the southwestern Hokkaido.

Introduction

The area under consideration is situated in the Tsugaru peninsula, Aomori prefecture, and belongs to the so-called "green tuff" region. It is well known that the area holds the key to the problem of stratigraphical correlation between "Tohoku green tuff region" and "southwestern Hokkaido green tuff region".

Various geological studies have been done. The writer also surveyed the Kodomari-Kanita district with UEMURA F., whose results were published in the 1:50,000 geological map sheets, namely, "Kodomari" and "Kanita" in 1959.

The purpose of this paper is to clarify the stratigraphy of the sediments and volcanic rock, and to make a correlation with those of the southwestern Hokkaido.

Geology

The area is covered with Paleozoic, Neogene and Quaternary rocks, lacking Mesozoic and Paleogene rocks. The stratigraphical sequence is shown in table 1.

1) Paleozoic Formation

The rocks of the Paleozoic strata in the area are exposed only at the head of the Kodomari peninsula and its neighbouring small island, Keimon-tō, in Japan Sea. The formation consists of clayslate, chert and limestone. No paleontological evidence has been found.

2) Neogene Tertiary

The Neogene comprises the Gongenzaki, Isomatsu Fuyube, Nagane, Kodomari, Shiwokoshi and Kanita Formations in ascending order as the main stratigraphic sequence, and includes the Tappi Andesite, Horozuki Rhyolite, Mimmaya Rhyolite, Imabetsu Andesite and Masukawadake Dacite as prominent volcanic rocks contem-

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Table 1 General Stratigraphy

Age	Formation	Thick-ness	Columnar Section	Volcanic rocks
Quaternary	Quaternary deposit			
Neogene Tertiary Miocene	Kanita Formation	800m	✕	
	Shiwokoshi Formation	400m	Da A	A: Imabetsu andesite Da: Masukawadake dacite
	Kodomari Formation	1050m (H)	R Rh D	R: Mimmaya rhyolite Rh: Horozuki rhyolite D: Dolerite
	Nagane Formation	350m	✕	A: Tappi andesite
	Fuyube Formation	750m	A R B B	B: Basalt
	Isomatsu Formation	500m	✕	
	Gongenzaki Formation	500m	A A	A: Andesite
Paleozoic	Paleozoic Formation			

✕ marine fossil

Plant fossil

poraneous with the sediments. Beside them, basic rocks mostly hypabyssal are distinguished under the name of dolerite.

Gongenzaki Formation

The Gongenzaki Formation, the lowermost of the Neogene in this area, consists mainly of purplish green tuff and tuff breccia, accompanied with lava flows of propylite. It rests unconformably on the Paleozoics, with a basal conglomerate



Fig. 1 Geological map of Kodomari-Kanita district

1. Alluvial deposit 2. Quaternary deposit 3. Kanita formation 4. Masukawadake dacite 5. 6. Imabetsu andesites (Dacite, Pyroxene andesite and its breccia) 7. Mimmaya rhyolite 8. Shiwokoshi formation 9. Dolerites 10. Horozuki rhyolite 11. Pumiceous tuff 12. Andesitic tuff 13. Kodomari formation 14. Nagane formation 15. Tappi andesites 16. 17. 18. 19. 20. 21. Fuyube formation (Basalt, Anorthite andesite, Propylite, Rhyolite, Shale, Andesitic green tuff and tuff-breccia) 22. Isomatsu formation 23. 24. Gongen-zaki formation (Propylite, Andesitic purplish brown-green tuff and tuff-breccia) 25. Paleozoic formation

which contains pebbles derived from the Paleozoics. The plant leaves which belong to the Aniai flora were found. From the evidence of fossils and lithologically, the Gongenzaki Formation corresponds to the Monzen Formation in the Akita district, and to the Fukuyama Formation in southwestern Hokkaido.

Isomatsu Formation

The Isomatsu Formation is considered to overlie the Gongenzaki Formation conformably. It is commonly composed of conglomerate, sandstone and mudstone, but is highly variable in its thickness and facies. The sandstone contains fossils of oyster and other marine molluscs belonging to the Kadonosawa fauna. The fossils* are as follows.

Littorinopsis sp. nov.

"*Turritella*" sp.

Cerithidea kanpokuensis MAKIYAMA

Batillaria tateiwai MAKIYAMA

B. yamanarii MAKIYAMA

Vicaryella tyosenica otukai (NOMURA)

V. ancisa (YOKOYAMA)

Crepidula isimotoi OTUKA

C. jimboana YOKOYAMA

Simum yabei OTUKA

Scarlesya kurodai MAKIYAMA

Truncaria nakamurai OTUKA

Rhizophorimurex tiganouranus (NOMURA)

Nassarius sp.

N. simizui OTUKA

Fulgoraria sp.

Dentalium sp.

Acila sp.

Yoldia sp.

Mytilus k-sakurai NOMURA et HATAI

Modiolus tugaruana NOMURA et HATAI

Patinopecten kobiyamai KAMADA

Nanaochlamys notoensis (YOKOYAMA)

N. hitamurai (KOTAKA)

Crassotrea takiana (YOKOYAMA)

Trapezium isomatsuense KOTAKA

Venericardia siogamensis NOMURA

V. cfr. orbica YOKOYAMA

Diplodonta ferruginata MAKIYAMA

Lucinoma otukai HATAI et NISIYAMA

Clinocardium sp.

Callista sp.

Protothaca tateiwai MAKIYAMA

* The molluscan lists are reprinted from those by MIZUNO (1964)

Saxidomus ? sp.
Dosinia nomurai OTUKA
Cyclina lunulata MAKIYAMA
Pitar aiutiensis (NOMURA et HATAI)
Nipponomarsia nakamurai (IKEBE)
Tapes siratoriensis OTUKA
Soletellina minoensis YOKOYAMA
Nuttalia ? sp.
Macoma cfr. *incongrua* (v. MARTENS)
Arcopagia ? sp.
Solen sp.

The Isomatsu Formation paleontologically closely resembles the Daijima Formation, and stratigraphically is correlated roughly with the Yoshioka Formation in southwestern Hokkaido.

Fuyube Formation

It is called "green tuff". The Formation is characterized by the dominance of altered, green colored pyroclastic rocks. The volcanic rocks of this formation are rhyolite, propylite, anorthite-andesite and basalt. The formation has an intercalation of sandstone and mudstone which contains molluscan fossils. It is partly inter-fingered with the Isomatsu Formation. From the Fuyube Formation, the twenty-three species were identified by MIZUNO.

Ampullina ? sp.
Sinum hataiana (KOTAKA)
Crepidula jimboana YOKOYAMA
Ancistrolepis sp.
Acila cfr. *eximia* (YOKOYAMA)
Nuculana pennula (YOKOYAMA)
Mytilus sp.
Modiolus cfr. *tugaruana* NOMURA et HATAI
Brachidontes sp.
Lima cfr. *smithi* SOWERBY
Chlamys sp.
C. cfr. *arakawai* NOMURA
Patinopecten yamasakii iwasakiensis (NOMURA)
Ostrea "rosacea" DESHAYES"
Venericardia siogamensis NOMURA
V. sp.
Dosima nomurai OTUKA
Pitar itoi MAKIYAMA
P. sp.
Nipponomarcia nakamurai (IKEBE)
Macoma calcarea (GMELIN)
Macoma cfr. *tokyoensis* MAKIYAMA
Solen sp.

Tappi Andesite

The Tappi Andesite, developing typically at the head of the Tsugaru peninsula, consists mainly of lava flows of pyroxene andesite, and pyroclastic rocks of the same origin. Stratigraphically this rock roughly corresponds to the upper part of the Fuyube Formation and the lower part of the Nagane Formation.

Nagane Formation

This Formation is generally composed of green, tuffaceous sandstone and andesitic tuff, but has scarcely intercalations of volcanic rocks. Marine fossils are contained in the sandstone. The Fuyube and Nagane Formations may be correlated with the Kunnui Formation in respect that the both are almost occupied by pyroclastic rocks intercalating fossiliferous sediments.

List of molluscs is as follows :

- Calyptraea* sp.
- Euspira meisensis* (MAKIYAMA)
- Shichiheia yabei* (NOMURA et HATAI)
- Glycymeris vestitoides* NOMURA
- G. cisshuensis* MAKIYAMA
- Arca* sp.
- Pinna* ? sp.
- Anomia* ? sp.
- Chlamys* cfr. *kaneharai* (YOKOYAMA)
- C.* cfr. *arakawai* (NOMURA)
- Patinopecten yamasaki iwasakiensis* (NOMURA)
- Ostrea* "rosacea" DESHAYES"
- Lucinoma otukai* HATAI et NISIYAMA
- Pitar itoi* (MAKIYAMA)
- Dosinia nomurai* OTUKA
- Cyclina lunulata* MAKIYAMA
- C.* ? sp.
- Clementia* ? sp.
- Tapes siratoriensis* OTUKA
- Soletellina minoensis* YOKOYAMA
- Spisula* sp.
- Thracia* sp.
- Macoma* sp.

Kodomari Formation

The Kodomari Formation represents "hard shale" facies. The bed of hard shale sporadically carries andesitic tuff, rhyolitic tuff, black mudstone and calcareous nodules, and is penetrated by Mimmaya Rhyolite, Horozuki Rhyolite and Dolerites. Except for the occurrence of *Cyclammia* and sponge spine, fossils have not been discovered. In stratigraphical and lithological points, however, this Formation is correlated with the Yakumo Formation of southwestern Hokkaido.

Horozuki Rhyolite

The Horozuki Rhyolite occurring as small bodies on the eastern wing of the Kanita anticline is typically exposed in the Horozuki area to the north and consists of acidic rocks contemporaneous with the Kodomari Formation.

Dolerites

The Dolerites occur as lava flows, tuff breccia and intrusive rocks, which are contemporaneous with the Kodomari Formation. They mostly occupy the flank of the Hakamagoshi-dome and the axis of the Kanita anticline.

Shiwokoshi Formation

It conformably overlies the Kodomari Formation. It consists generally of massive pumiceous diatomaceous mudstone. In the type locality the Formation is exposed along the coast of Shiwokoshi. It begins with diatomaceous mudstone and its main part consists of an alternation of diatomaceous mudstone, shale, tuffaceous sandstone, pumiceous tuff and conglomerate. This facies changes laterally when traced northeastward, with increase in volcanic material, and finally passes into the Imabetsu Andesites. Consequently the Formation and the Imabetsu Andesites may be of the same age.

Meanwhile, the rhyolitic pumiceous tuff of the Formation is allied to the acidic effusive rock which is common in the upper Neogene of Northeast Japan.

The mudstone and shale contain fossils of sponge, diatom, foraminifera and radiolaria. Lithologically the Shiwokoshi Formation corresponds to the Kuromatsunai Formation of southwestern Hokkaido.

Mimmaya Rhyolite

The Mimmaya Rhyolite occurs mainly as sheets or lava flows, inserting into the Kodomari Formation in the northern part of the area.

Imabetsu Andesite

The Imabetsu Andesite comprises dacite, quartz bearing andesite and pyroxene andesite. The quartz bearing andesite appears as thin lava flow interbedded in the upper part of the Kodomari Formation. The pyroxene andesite is most widespread. It occurs chiefly as lava and tuff breccia, contemporaneous with the Shiwokoshi Formation, although a part of hypersthene-augite andesite forms volcanic neck penetrating the Kodomari Formation. The dacite occurs locally, and forms lava flows and pyroclastic beds contemporaneous with the pyroxene andesite. The Imabetsu Andesite may correspond to the "Kuromatsunai Agglomerate" in southwestern Hokkaido.

Masukawadake Dacite

This rock mainly located at Masukawa-dake and Yatsudaki-yama may be the products of the volcanic activities, which occurred at the stage of the Shiwokoshi Formation.

Kanita Formation

The Kanita Formation is of marine sediments, which comprise generally semi-consolidated sandstone and mudstone, and contain molluscan fossils in abundance. It is typically exposed along the coast of Kanita, and widely extends to the north-

west, composing a broad syncline called Imabetsu Syncline. In the type locality, it consists of alternating beds of semi-consolidated sandstone and mudstone, intercalated with tuff and conglomerate, but the rock facies changes laterally to the northwest, and tuff and conglomerate become predominant.

The molluscan species from the Kanita Formation are listed below.

- Acila* sp.
- Yoldia notabilis* YOKOYAMA
- Yoldia* sp.
- Glycymeris yessoensis* (SOWERBY)
- Crenella* sp.
- Swiftopecten swiftii* (BERNARDI)
- Chlamys* spp.
- Patinopecten yessoensis* (JAY)
- Ostrea gigas* THUNBERG
- Venericardia ferruginea* (A. ADAMS)
- Nemocardium samarangae* (MAKIYAMA)
- Nemocardium* sp.
- Serripes laperousii* (DESHAYES)
- Macra* sp.
- Spisula* cfr. *hemphilli* DALL
- Macoma* cfr. *nasuta* CONRAD
- Macoma tokyoensis* MAKIYAMA
- Macoma* sp.
- Hiatella arctica* (LINNE)
- Panope japonica* A. ADAMS
- Entodesma* sp.
- Thracia* sp.
- Tectonatica janthostoma* (DESHAYES)
- Tectonatica* sp.
- Turritella* sp.
- Buccinidae* gen. et sp. indet.
- Crepidula* sp.
- Echinarachnius* cfr. *laganolithinus* NISHIYAMA

The Kanita Formation is of Pliocene age and can be correlated with the Pliocene Setana Formation in southwestern Hokkaido.

Conclusion

Neogene sediments in southwestern Hokkaido are divided into the following six Formations in standard sequence: the Fukuyama, Yoshioka, Kunnui, Yakumo, Kuromatsunai and Setana Formations in ascending order. At first, the writer can correlate the Shiwokoshi Formation to the Kuromatsunai Formation, both of which mainly consist of diatomaceous mudstone. The Kodomari Formation can be correlated to the Yakumo, both being represented by hard shale. The Fuyube and

Nagane Formations may be correlated with the Kunnui Formation in respect that they are almost prevailed by pyroclastics intercalating fossiliferous sediments. The Gongenzaki Formation probably corresponds to the Fukuyama Formation in composing exclusively of characteristic volcanic rocks. The Kanita Formation and the Setana Formation belong to the uppermost Tertiary, and are of same age lithologically and paleontologically.

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青森県小泊-蟹田地域の層位

対馬坤六

要旨

調査地域は、東北日本のいわゆるグリーンタフ地域に属し、西南北海道のグリーンタフ地域に発達する新第三系によく類似する。両地域の新第三系を、層位、古生物、火山層序から次のように対比させた。

小泊-蟹田地域	西南北海道
蟹田層	瀬棚層
塩越層	黒松内層
小泊層	八雲層
長根層 冬部層	訓縫層
磯松層	吉岡層
権現崎層	福山層