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GEOLOGICAL RECONNAISSANCE IN THE RAMU VALLEY AND ADJACENT AREAS, NEW GUINEA.

by

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GEOLOGICAL RECONNAISSANCE IN THE RAMU VALLEY AND ADJACENT AREAS, NEW GUINEA.

SUMMARY

This report incorporates data accumulated during the course of geological reconnaissances carried out in the Ramu Valley, the north-east foothills of the Schrader Ranges, and the Adelbert Mountains, together with the brief visit to the Kumbrup area, Simbai Valley. The foothills of the Schrader Ranges in the areas investigated comprise low-grade metamorphic rocks of unknown age. Limited evidence suggests the Adelbert Mountains to be a basically simple anticlinal structure developed in Tertiary rocks. No core of basement rocks is apparent. Volcanic activity of late Tertiary to Recent age is prevalent over much of the area. Microfossils of Miocene and Pliocene age occur in the rocks of the Adelbert Mountains and the Ramu Valley.

No evidence of mineralization was found in the region investigated.

INTRODUCTION

The geological data forming the basis of this report were collected while the author was attached to the C.S.I.R.O. Land Research and Regional Survey team engaged in the Lower Ramu - Atitau Survey between 1st August and 21st October 1958. As the area covered by the survey was approximately 4700 square miles, it was impossible in the time available to obtain more than a general picture of the geology. Because the survey team was highly mobile, and much of their work was confined to the flood plain of the Ramu river, where geological exposures are rare, a large part of the geological work was carried out independently from base camps. This made it possible to concentrate attention on the more favourable areas from the point of view of geological interest and frequency of exposures.

Several traverses which were made with the survey team had the object of general reconnaissances into areas which did not warrant close geological attention, or where time did not permit a more detailed investigation.

The petrography of rock specimens collected during the survey has been described by W.R. Morgan in B.M.R. Record 1960/6. An account of the geomorphology of the area has been given by Dr. E. Reiner in the Divisional Report No. 59/1 of the L.R.R.S. Division of C.S.I.R.O. entitled "The Lands of the Lower Ramu - Atitau Area, New Guinea".

METHOD OF SURVEY

Work was concentrated on the mountain areas rather than the lowlands, primarily because of their greater geological interest, but also because here the actively downcutting rivers have exposed good sections in the country rock. Rock exposures are so infrequent elsewhere that the distribution and accessibility of the river valleys determined the course of the geological work. Apart from the river sections, exposures do occur rarely on some of the steeper slopes of the ridges, and a denuded village site on the top of a ridge would sometimes yield an outcrop of rock, invariably highly weathered.

The only maps available at the time of the survey were the unreliable wartime military one inch to one mile sheets. Complete photo-coverage was carried out by Adastra Airways Pty Ltd in 1957 and 1958. The vertical photographs have a scale of 1:50,000 at sea level, reduced to 1:40,000 (approx.) in the mountain areas.

A base map on the scale of two miles to the inch has been produced from the air photographs by the Division of National Mapping. The maps accompanying this report are on the scale of 4 miles to one inch and cover only those sections of the survey area in which geological work was carried out. All major traverse routes are indicated.

THE GEOLOGY OF THE LOWER RAMU - ATITAU REGION.

The major units into which the survey area has been divided are as follows :

1. The north-east slopes of the Schrader Ranges.
2. The Adelbert Mountains.
3. The Northern Foothills.
4. The Lower Ramu Uplands.
5. Alluvial areas, terraces, and fans.

THE NORTH-EAST SLOPES OF THE SCHRADER RANGES.

The Schrader Ranges form a part of the Main Ranges of New Guinea. They occupy the south-west part of the survey area. The mountains rise very abruptly from the flood plain of the Ramu River and reach a height of over 7000 feet. Relief is strong and the rivers have very steep gradients and are still actively downcutting their deep V-shaped, steep-sided valleys.

Investigations were made in three of these valleys :

The Asai Valley. Six miles of the Asai valley were surveyed between the village of Apenam, at the mountain foot, and the village of Kwibta. The rocks comprise a monotonous sequence of schists and phyllites, with interbedded lavas and some limestone. Metamorphism has been of low to medium grade and of regional type. A well-developed cleavage is shown, and dips are moderate to high (45° to 80°). The general strike is north-west, swinging in places to west. Minor folds of low amplitude (less then six feet) occur, but no large-scale structures are developed. Some contortion of beds was seen, and calcite veining is common. One bed of hard, sheared, conglomerate was located. No fossil remains were found in the sequence.

The Tigananse Valley. Four miles of the river were surveyed, starting approximately one mile south of Aiome and working south-west. The sequence is identical in lithology to that of the Asai section, but dip evidence indicates that it occurs higher in the suggession.

The Aunja Valley. The Aunja river is separated from the Tigananse by seven miles of unknown ground formed of dissected fans at various levels. Several small creeks cross this area although no outcrops were seen. A three-mile section of the Aunja was investigated and revealed a succession similar to that south-west of Aiome. One of the specimens described from this area shows thin banding - probably original sedimentary structures. The schistosity cuts across this banding at a large angle. (See W.R. Morgan, B.M.R. Record 1960/6.)

Summary : The rocks of the northern slopes of the Schrader Ranges are low grade derivatives of greywackes and arkosic siltstones. They can be placed in the greenschist facies of regional metamorphism.

THE ADELBERT MOUNTAINS

The Adelbert Mountains are a series of coastal ranges trending north-west from the west coast of Astrolabe Bay at Madang towards the lower Ramu. Only the north-west section of the mountains lay in the survey area. The Adelberts form an area of rugged country, nowhere rising to more than 4000 feet, but consisting of a succession of steep ridges and deep intervening valleys which make communication difficult. The watershed is on the coastal side of the ranges; so the drainage is asymmetrical; the longer westward-flowing rivers join the Ramu system, and the shorter northward-flowing rivers drain into the Bismarck Sea. The ranges for the most part are clothed in thick rain forest.

The north-west Adelberts can be treated as one geographical unit, but geologically can be subdivided into three main regions. These are :

1. The lower south-west slopes - predominantly volcanics.
2. The volcanic escarpment of the north-east margin.
3. The central core of the ranges.

Two reconnaissance traverses were made from Josephstaal into the north-west Adelberts. Both traverses were continuous, that is, camp was moved from day to day, and in the time available no detailed work was possible. Several geological elements were distinguished and will be described in turn.

The Volcanics of the lower south-west slopes : These are separated from the Ramu Uplands by a topographic break. This break, which is believed to be a fault line, is very marked on the air photographs and was investigated on the ground near the villages of Pangansop and Kisila, but no direct evidence of faulting could be found. The line of the break is taken to mark the south-west margin of the Adelbert Mountains.

In the vicinity of Pangansop, highly weathered basic lava, agglomerate, and banded tuff overlie a succession of brown weathered mudstone and interbedded breccia which is faulted against the mudstone of the Lower Ramu Uplands. The overlying volcanics are not believed to be of great thickness in this locality and have a somewhat patchy distribution. Farther to the south-east, in the area around Koave, a considerable thickness of compact and nodular basaltic lavas partly vesicular, together with agglomerates and tuffaceous deposits, occur in both the creek beds and high on the intervening ridges. No rocks other than volcanics were found in the area by the writer, but unfossiliferous limestones have been reported by Dr E. Reiner (personal communication). The whole of the volcanics here are directly faulted against the mudstones of the Ramu Uplands. Unfortunately very little information was obtained regarding the structure and relationships of these volcanics as no reliable dips were found. The evidence obtained from the two localities shows a considerable variation in thickness within the volcanics, from a complete filling of the river valleys near Koave, to total absence at Pangansop village.

The Volcanics of the north-east Adelberts : These were briefly examined in a traverse inland from the coast at Bunabun. Some twelve miles inland, behind the village of Soberam, a steep escarpment marks the north-east boundary of the Adelbert Mountains. This escarpment is composed of coarse volcanic agglomerate and can be traced by photo-interpretation for twenty miles to the north. It is possible that this line represents a structural break, i.e. a fault scarp, and that the Adelbert Mountains are bounded on both sides by faults. Immediately to the east of Soberam the margin of the mountains swings northwards to form a bulge into the foothills region, and the distinct escarpment of the area to the south-west of the village is broken up into a series of scarps and ridges which may be fault-controlled.

It is believed that both the northern volcanics at Soberam and the southern volcanics at Kaove are of similar age and can probably be related to such young volcanic centres as Mount Uvo, which is probably of Pleistocene age.

The Core of the north-west Adelberts : The higher ranges of the north-west Adelberts were covered in a continuous traverse from Josephstaal to Yaverra. As this reconnaissance was carried out in the highest parts of the mountains, cloud cover on the air photographs made determination of position and routes difficult.

Coarse-grained, whitish-grey limestone crops out in a wide belt between the villages of Sabanga Savenda and Kangerangate, and is believed to form the core of a major anticlinal structure. It contains abundant planktonic foraminifera and has been placed in the upper part of the lower Miocene ("e" stage). In the hand specimen it is a coarse-grained whitish-grey rock. Some of the limestone is sheared and shows the effect of alteration. As the limestone is commonly found in association with volcanic rocks which are possible minor intrusives, the alteration may be a contact metamorphic effect, although the relationships of the limestone to the volcanics could not be established with any certainty. In a creek below the village of Kangerangate large blocks of fine-grained white limestone were found. Despite the considerable extent of the limestone belt, it has been found impossible to delimit the area from a study of the air photographs.

The succession overlying the limestone comprises a varied sequence of sandstone, medium grade conglomerate with some limestone and frequent volcanics. This succession is typically developed between Pangansop and Sabanga Savenda and between Kangerangate and Moisiamanat. No fossils have been found in these rocks.

To the north-east of Kangerangate the succession is believed to be faulted against a sequence composed principally of mudstone and siltstone. These are well exposed in the creek to the east of Moisiamanat, and contain microfossils of Upper Miocene age. They are faulted against limestone containing a Lower Miocene fauna.

Within this area, between the village of Moisiamanat and the Guam river, a small subsidiary tributary of the Guam, the Siwa Creek, was found to have its source in a series of small bubbling pools surrounded by sulphur-encrusted rocks. The water issuing from the pools is milky white and the deposited silt smells strongly of sulphur dioxide. Small terraces of sulphur-encrusted calcareous tufa are developed in the stream bed below the pool and the whole area around the source is devoid of vegetation, probably poisoned by sulphur dioxide fumes. There is a considerable flow of water from these springs, whose temperature was that of normal river water, that is, no thermal effect was evident. The country rock in the vicinity of the springs is mudstone of Lower Miocene age.

The presence of the springs with their associated deposits gives a strong indication of volcanic activity within comparatively recent times, and may be a late-stage manifestation of the volcanic activity with which Mount Uvo was associated. Volcanic rocks, though widespread in the Adelberts, do not occur in the Siwa Creek area.

A series of northward-dipping coarse conglomerates occurs as a downfaulted block in the section of the Guam traversed between Moisiamanat and Yaverra. They crop out in the river bed and on the ridge to the north-east on which Yaverra is situated. They are believed to be younger than the bulk of the rocks of the Adelbert Mountains, although no palaeontological evidence is available.

The Volcanic rocks in the Adelbert Succession : Reference has already been made to the occurrence of volcanic rocks within the limestones of the core of the north-west ranges. These volcanics are also prevalent in the overlying rocks, and are well exposed around the village of Sabanga Savenda. They are typically coarse-grained basic rocks with porphyritic euhedral crystals of augite. In some localities, particularly immediately below Sabanga Savenda, the rocks are highly weathered. Similar rocks were met with at intervals throughout the traverse. The route from Kangerangate to Moisiamanat passed over the highest point reached in the Adelberts (3,700 feet), and between the two villages outcrops of volcanic rocks are numerous.

One of the major problems presented by the Adelbert succession is the relationship of the volcanics to the sedimentary sequence. In no locality was a volcanic rock found to suggest that the volcanic rocks overlie the sedimentaries as on the south-west slopes. The coarsely crystalline nature of the bulk of the volcanics suggests that they might be sills intrusive into the sedimentary sequence.

The structure of the north-west Adelberts : The sparsity of exposures and particularly the almost complete lack of measurable dips and strikes makes the relationships of the various rock groups to each other difficult to determine. However, the structure of the Range is probably a simple broad anticlinal fold uncomplicated by later tectonic movements. This interpretation is based on rather scanty geological knowledge, but agrees reasonably well with the known tectonic and sedimentation histories of the region.

The boundary fault on the south-west side of the Adelbert Mountains has already been referred to; a similar fault along the north-east margin of the range is also probable. Two faults have been invoked in the Moisiamanat-Yaverra area to account for the succession. No field evidence is available, but undetected major faults are quite probably present. The drainage patterns of the Upper Guam and the Upper Kaukomba strongly suggest the presence of tectonic control, possibly a fault of some magnitude, crossing the Adelberts from north-north-east to south-south-west.

THE NORTHERN FOOTHILLS.

The northern foothills, extending between the Adelbert Mountains and the coast, were examined in two traverses from the Kaukomba river to Bunabun, and from Bunabun to the Gilagil River. The foothills region is a large one, and contains a diversity of rock types. A large part of the area covered by the traverses is composed of mudstone and siltstone, with subordinate amounts of limestone and sandstone. An excellent section is exposed in the Dibor river below the village of Sarasaben. Here sub-horizontal banded mudstone is seen, showing block-faulted structures on a small scale.

The rocks of the Kaukomba valley are predominantly siltstone and mudstone, but the succession is varied by the presence of beds of sandstone and coarsely crystalline limestone, and in one locality, volcanics. The country around Mount Uvo is composed primarily of mudstone, mostly limy, but some sandy and with occasional pockets of breccia or conglomerate. Close to the village of Waba, coral breccia and sandy limestone occur.

Between the village of Ulatebun and the Kumil river, fine-grained hard sandstone is traversed. It is associated with basic volcanics which appear to be intrusives.

The area between the Kumil and Frug rivers forms a distinct geological unit because of the development in this region of well-marked limestone strike ridges. These ridges strike north-north-west and the dip is about 45 degrees to the west. The limestone is impure, for the most part sandy. Although the sandy limestone is the dominant rock from the point of view of its topographic expression in distinctive scarp features, it forms part of a varied sequence which also includes gritty medium-grained sandstone and limy shale. The shale forms the valleys between the ridges and extends a little way up the flanks. Also associated with this sedimentary succession are a series of highly weathered volcanics. The strike ridges cannot be traced north of the Kumil river, where it is possible that the eruptive centre of Mount Uvo has obliterated all pre-existing structures. Microfossils obtained from three widely separated localities within the Northern Foothills region have shown the rocks to be of upper Miocene age.

Volcanic rocks of the northern foothills :

The topographic form of the eruptive centre of Mount Uvo indicates that the original volcanic plug forms the central part of the mountain. The existence of traces of the original volcanic cone gives a strong indication of the youthfulness of the volcano. Most probably the activity was of late Pleistocene age. It is believed that volcanic rocks occupy a considerable part of the Northern Foothills region in areas other than those crossed by the traverses. Recognition of these volcanic areas from a study of the air photographs is difficult, but the rugged nature of the hills which rise above the surrounding mudstones, and the absence of strike patterns, are held to be indicative of such areas. Such an interpretation has proved valid in the hills to the north of Bogia, where in the valley of the Sakula river volcanic rocks - lavas and ashes, are found. Because of the complete lack of field evidence, no attempt has been made to delimit these possible volcanic areas on the map.

The coastal belt :

The coastal belt cannot be mapped as a separate unit as there is no topographical break between this region and the foothills lying farther inland. The north-east coastline of New Guinea is one of elevation. This is evidenced by the presence of upraised coral reefs at varying levels met with in all localities. Many of the higher reef deposits are much dissected. Much dissected low hills are to be found behind many of the upraised reefs. They are predominantly composed of calcareous sandstone as are, for instance, the hills to the south of Kaukomba village. Fragmental limestones, themselves old reef deposits, commonly occur.

THE LOWER RAMU UPLANDS

The Lower Ramu Uplands cover an extensive area between the Ramu river and the region of Atemble and the south-west margin of the Adelbert Mountains, and also flank the north-west end of the Adelberts in the Middle Guam region. The Lower Ramu Uplands were investigated in three localities :

1. East of Atemble village - traverse from Atemble to Guaringiri (Map 2).
2. North and east of Josephstaal (Map 1)
3. The Basin of the Middle Guam (Map 1)

The successions in the Atemble and Josephstaal areas are very similar, consisting of a series of grey mudstones with conglomeratic layers. Topographically the areas are composed of a series of low but sharp ridges, usually with a conglomeratic capping. Dips in the Atemble region are low, mostly less than 10 degrees, but around Josephstaal dips of up to 40 degrees were recorded. Occasional pockets of conglomerate occur in the mudstone, and probably represent deposits laid down after the channelling of the soft mudstone. Several low-amplitude anticlinal folds were found east of Atemble, and sedimentary structures in the form of deltaic bedding and contorted slump structures are present. Microfossils of Pliocene age were found in mudstone east of Atemble village.

Between Josephstaal and the Adelbert Mountains the mudstone has a general north-west strike. Palaeontological evidence gives the rocks an upper Miocene age.

The succession in the Middle Guam differs from that in the areas previously described in comprising a series of fine-grained banded sandstone with some pebble-conglomerate layers. The rocks are well exposed in the banks of the Guam some four miles west of Yaverra village, and the section extends at least three miles downstream. The beds are sub-horizontal and are believed to lie along the axis of a syncline trending west-north-west in this section of the Guam. The syncline was detected by photo-interpretation. A complementary anticline appears to exist to the south, but was not investigated on the ground. Limy mudstone is prevalent throughout the greater part of this region.

This section of the Middle Guam has been separated from the north-west Adelberts because of the absence of limestone and volcanic rocks in a sequence comparable with the Lower Ramu Uplands.

ALLUVIAL PLAINS, TERRACES, AND FANS

The drainage pattern of the Lower Ramu - Atitau region is quite dense and all the larger river valleys are floored by fairly extensive tracts of alluvium. The major rivers flowing to the coast from the north-east flanks of the Adelbert Mountains, namely the Kumil, the Frug, and the Dibor, all have fairly well graded courses in their lower sections and quite extensive alluvial areas are developed. A lower and a higher terrace can often be distinguished along these rivers, especially near the coast.

By far the largest alluvial area is the floodplain of the Ramu, Sogeram, and Guam rivers. In the Ramu valley the Patrol Post of Aiome is situated on the highest level of a dissected fan formed at the foot of the Schrader Ranges. A section in the deposits of this fan is exposed a quarter of a mile east of the airstrip, and consists of a fairly coarse gravel with highly weathered pebbles. Similar fan deposits can be traced all along the foot of the Schrader Ranges. The age of these fans and the younger river terraces is believed to be late Pleistocene to Recent.

Extensive sandy beach deposits are found along the coast near the Ramu mouth, whereas slightly raised coral reefs are found locally along the coast, north and east of the Adelbert Mountains. West of the Ramu River and close to the coast, an extensive low plateau occurs, 30 to 60 feet above the floodplain and consisting of late Pleistocene to Recent marine muds with shell bands and occasional sandy beach deposits.

GEOLOGICAL HISTORY

As a true evaluation of the geological history of the region is dependent upon a knowledge of the relative ages of the various rock groups, this summary, which lacks detailed palaeontological evidence, must be regarded as an interim one.

Very little is known of the Palaeozoic history of New Guinea. Rocks of pre-Permian age are widespread in the Central Highlands, where they consist primarily of low-grade regional metamorphic types. Other masses of presumably Palaeozoic metamorphics occur in the Cyclops and Bewani Mountains close to the Dutch New Guinea border (Van Bemmelen, 1949). These mountains are believed to have formed a part of a large northern landmass, the Melanesian continent, which during Tertiary times provided the material for the geosynclinal region lying to the south (the New Guinea Geosyncline). The rocks of the Schrader ranges found within the survey area are believed to be similar in age to some of the pre-Permian metamorphics of the Central Highlands and thus to be the oldest rocks in the survey area. They could probably be equated with the Omung metamorphics of Rickwood (1955) and the Goroka Formation of McMillan and Malone (1960).

During the Eocene period, the site of the present coastal ranges formed the foredeep of the Melanesian continent. This condition lasted until the end of the Miocene or early Pliocene, during which time the deep-sea trough was receiving a continuous supply of sediment from the northern continent.

During the Pliocene the foredeep region was arched-up to form the geanticlinal structure of the coastal ranges, and the axis of the geosyncline shifted southwards to the present site of the Ramu - Markham Depression.

The structure of the Adelbert Mountains conforms to the simple geanticlinal form as originally elevated and the basic arched structure has not apparently been affected by later folding movements. No rocks older than Miocene have been found in the area. As would be expected the oldest rocks in the Adelberts occur in the core of the anticline and are fairly pure crystalline limestone. They indicate a period of quiet sedimentation in clear water some little distance from land, but not necessarily in deep water. The limestone south of the Kumil river is notably sandy and probably indicates deposition closer to the existing shore-line.

Above the limestone in the Central Adelberts comes a very variable sequence of sandstone, conglomerate, and siltstone, with volcanics. These are essentially shallow water littoral deposits and foreshadow the final infilling of the trough of deposition. North of the Middle Guam occurs a considerable thickness of coarse conglomerate which is believed to have been faulted against the siltstone and mudstone of the area around Moisiamanat. The conglomerate is a very shallow water shore-line deposit and indicates close proximity to the northern side of the trough of deposition.

The elevation of the Adelbert Mountains and the shifting of the centre of deposition to the south created new zones of deposition, and the deposits of the Ramu valley and also of the area between the Adelberts and the coast are essentially derived from the erosion of the recently uplifted geanticline during Plio-Pleistocene times. One of the last phases in the evolution of the Adelbert Mountains has been the late Pleistocene volcanism, which was widespread over the entire area and of which striking evidence exists in the presence of the remains of some of the original volcanic cones, for example Mount Uvo.

The Central Highlands during the Tertiary had a complex history. At some time during the Oligo-Miocene period a median ridge was elevated in this western section of the New Guinea geosyncline, and basin structures formed on either side. The Pliocene saw the rise of the Eastern Ranges on the site of the Miocene basin and the development of a median trough on the back of a broad anticlinal structure. During the Pleistocene the Ramu - Markham Depression formed a marginal trough to both the Coastal Ranges and the rising Central Highlands. At this time the Adelbert Mountains probably formed a low island off the shore-line formed by the rising Central Highlands, of which the Schrader Mountains formed the north-easterly margin.

An important feature of the orogenic evolution of eastern New Guinea is the comparison between the system as developed on the main island and its eastward extension into New Britain. The Inner Volcanic Arc, which off the north coast of New Guinea is represented by a string of islands, passes eastwards into the broad volcanic geanticlinal structure of New Britain. Similarly the Inner Non-Volcanic Zone of New Guinea (the Coastal Ranges), passes into the foredeep of the New Britain Volcanic Arc. Thus the evolution of the New Britain area is in a much younger stage of development (with only a Volcanic Inner Arc with flanking foredeep), than the New Guinea section, with its well developed tectonic units.

Nevertheless the geological history of New Guinea and in particular the area under review is from the point of view of earth history a very recent one, being almost exclusively Tertiary, and the features presented by the landscape are youthful. The present day volcanic activity of Manam Island is a measure of the geological immaturity of the region.

ECONOMIC POSSIBILITIES

No evidence of mineral deposits of possible economic value was found in the areas surveyed. Parts of the Adelbert Mountains have been prospected for metals and reconnaissances have been made to assess the possible oil-bearing potential of the Tertiary rocks.

The only mineral at present being worked is the gold of the Upper Simbai Valley, a region outside the limits of the survey area, but which was visited and will be described below:

GEOLOGICAL OBSERVATIONS IN THE TUNONK RIVER AREA - SIMBAI VALLEY

During the early part of the Lower Ramu Survey, a short period was spent in the Upper Simbai Valley area some 15 miles south-west of Aiome, where gold is being extracted. As no photo-coverage of the area was available a sketch-map based on the work of several patrols through the region was used as a base map (see Map 3). It is the only map of the area available at the present time.

The Simbai river flows between the high ranges of the Bismarck Ranges, which bound the valley to the south-west, and the Schrader Ranges which lie to the north. The course of the river is in the form of a deep bow, south-east in its upper section, changing to east and finally to due north in the last few miles before joining the Ramu. Tributaries off both ranges are numerous, the majority flowing northwards from the Bismarcks.

The object of the investigation was to determine the geology of the gold-producing region in the Tunonk valley. Incidentally to this, it was hoped to gain some information on the general geology of the Simbai valley region.

A geological sketch-map was compiled for the Tunonk valley and observations made near the confluence of the Nanoi and Simbai rivers, and also in the headwaters of the Simbai itself.

The headwaters of the Simbai River drain from the Schrader Ranges and in the vicinity of the Kaven airstrip several creeks unite to form the main river. The head of the valley forms a fairly level area through which the creeks flow with low gradient. No rock crops out in the area, but the evidence from boulders in the creeks indicates that somewhere to the north in the Schrader Ranges there exists a mass of granite; boulders of medium-grained grey granite are the predominant rock type in the creek flowing from the north. The creek flowing from the south-west gives evidence of a series of volcanic rocks occurring in that direction.

The Tunonk River is one of a series of small tributaries flowing northwards from the Bismarck Ranges to join the Simbai towards the lower end of its upper section. Gold is at present being extracted from a bed of wash lying with a slightly irregular base on a series of volcanic lavas and agglomerates. The maximum thickness of the wash is 15 feet. Large rounded boulders of volcanic rock are present, being most numerous towards the base of the wash. These boulders include a wide variety of rocks of volcanic origin, including vesicular lavas, hybrid rocks, and lavas with tabular feldspar phenocrysts. All rocks are of basic type. Some of the boulders are as much as 6 feet in length.

The base on which the wash is resting comprises steeply dipping (70°) bedded purple lavas overlain by a series of coarse volcanic agglomerates in which the bedding is obscure. These volcanics are much shattered. Several minor creeks which cut through the wash to join the Tunonk are filled with boulders of agglomerate and lava derived from the wash. There is a close similarity between the boulders incorporated in the wash and the underlying bed-rock. Farther downstream the gold-bearing wash rests on highly weathered fine-grained tuffs. Some mudstone and siltstone (or fine-grained tuff) are intercalated within the succession.

In the section of the river above the present gold workings, the succession of volcanic rocks continues. They comprise a sequence of hard, nodular lavas with occasional belts of mudstone, the latter hard and brittle. In one locality a vertical acid dyke intruded into mudstones. This was the only intrusive rock found in the area.

Below the present gold workings a similar succession of lavas and mudstones is found, together with slumped and rolled lavas. A well-marked zone of sheared and crushed rock also occurs. Dips throughout the section are high (30°-65°) and two fold structures occur, trending east-north-east. From the hard brittle nature of the sedimentary or pyroclastic deposits, and the extreme hardness and shattered nature of the volcanics, it is suggested that the rocks of the Tunonk valley are of considerable age - at least pre-Tertiary and possibly Palaeozoic. No fosil-bearing rocks were found in the Tunonk valley.

A brief investigation was carried out in the Middle Simbai valley, between the confluences of the Tunonk and Nanoi rivers with the Simbai main stream. Here on the slopes of the valley side are outcrops of coarse-grained grey limestone. These limestones overlie contorted and slumped shales dipping north of west at 40 degrees. An age determination of these sediments may be possible and would be of great value.*

Geological Structure :

Apart from the two folds in the Tunonk succession described above, no major structures were found in the Simbai valley area.

* Eocene fossils have since been found in these rocks. (D. Dow, pers. comm.)

Minor structures including slumping, contortion, and rolling of strata have also been referred to. These minor structural features are very prevalent in the mudstone and shale of the Middle Simbai region.

Evidence obtained from the Tunonk section supplemented by the many volcanic boulders in the headwater region to the south of the Simbai seems to indicate a considerable development of volcanics on the northern flanks of the Bismarck Range. The strike of the rocks is generally parallel to the trend of the ranges.

The relationship of the Simbai limestone and shale succession to the Tunonk Volcanics is uncertain, but the discrepancy in strike between the highest volcanics measured and the shales underlying the limestone seems to indicate an unconformity between the two sets of rocks.

Geological History.

The few data obtained in the time available preclude anything but generalizations on the geological history of the Simbai Valley region. The evidence obtained from the Tunonk valley indicates a considerable amount of volcanic activity at some time (Palaeozoic?) in the past, followed by tilting and the unconformable overlap of the shales and limestones of the Middle Simbai. The moderate dip of the latter sediments indicates at least one later period of earth-movement.

Economic Geology.

Gold is being obtained from the wash overlying the volcanics in the Tunonk valley. The gold-bearing wash runs for some distance (at least two miles) along the left hand side of the valley both to the north and south of Dumbrup, and extends on the opposite side of the river for an unknown distance. Gold recovery is at present in its early stages and it is impossible to assess the potential of the region, but the extent of the wash is considerable and conditions appear favourable. At present gold is obtained from the base of the wash, chiefly from pockets in the irregular surface of the volcanics.

The wash, which is largely composed of river gravel with a yellow clay matrix, probably had its origin from the coalescence of several rapidly flowing streams descending from the youthful, rising Bismarck Ranges. On reaching the foot of the Range, slackening of gradient would lead to the deposition of material and fan formation would result. The overlap of several such fans would result in the present bed of wash, through which the Tunonk has carved its present channel.

Origin of Gold.

The source of the gold is unknown. The presence of granite boulders in the stream flowing from the Bismarck Ranges gives an indication that masses of igneous rock occur in the core of the ranges. No granite or allied igneous intrusion, with the exception of the small dyke referred to above, was encountered in the area.

Acknowledgement.

The writer was introduced to the area by Mr. J. McKinnon, who is at present working the gold in the Tunonk valley. For much assistance in the examination of the Tunonk section, and for the hospitality received at Kaven and Kumbrup, he wishes to extend his grateful thanks.

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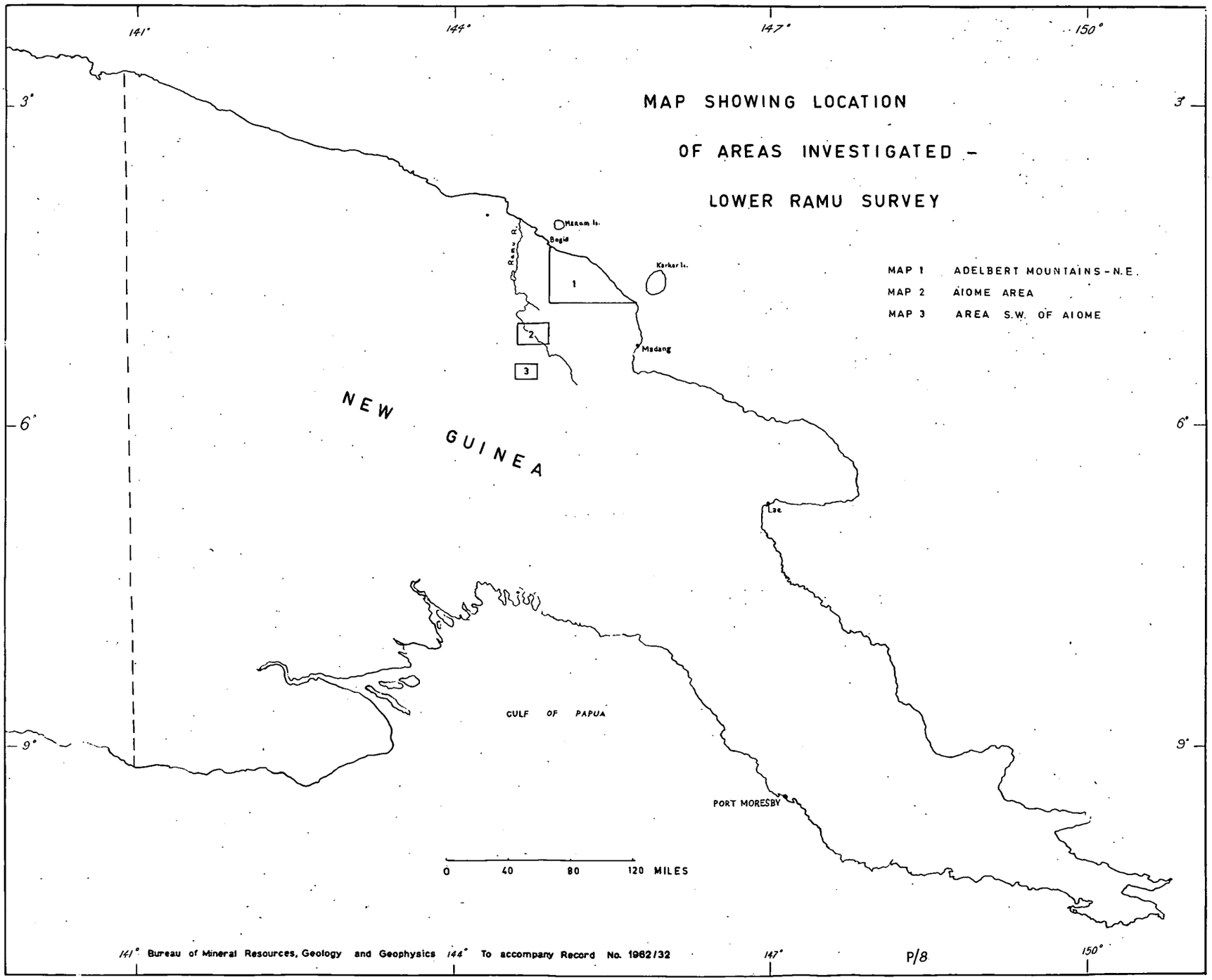
APPENDIX

LIST OF ROCK SAMPLES COLLECTED IN THE LOWER RAMU - ATITAU REGION FOR WHICH A DEFINITE AGE CAN BE GIVEN.

Samples examined and age determinations made by D.J. Belford. (see also Belford, 1962, Bur.Min.Resour.Aust.Bull., 62-1.)

	Sample	Locality Number	Fauna
PLIOCENE	A9	10	Abundant smaller foraminifera Globigerina, Globorotalia, large Rotalia, miliolidae
UPPER MIOCENE ("g" stage)	B1	8	Abundant smaller foraminifera with planktonic species forming at least 90% of the fauna. The assemblages are very similar to those of the Upper Miocene of Papua.
	B2	9	
	B15	1	
	B37	5	
	C60	6	
	C77	7	
	B47	3	Abundant large planktonic foraminifera (Globigerina, Globorotalia, Sphaeroidinella, and rare benthonic forms)
LOWER MIOCENE	B36, B40, B43	2	All fine-grained limestones containing abundant planktonic foraminifera. Lithologically they resemble the Puri Limestone of Papua, which is referred to the "f1-2" stage, that is the upper part of the Lower Miocene.
	B51, B53	4	
	B61		
("e" stage)	B35	2	Common larger foraminifera and algae. Spiroclypeus, Miogypsinoides, small Lepidocyclina.

Localities from which the above samples were collected are indicated on the geological map.



Reduce AB(12") to AC(6")

THE N.W. ADELBERT MOUNTAINS

AND ADJACENT AREAS

MAP 1

BISMARCK SEA

KAUKOMBA

Kaukomba R.

MALALA

WABA

ULINGAN

ULATEBUN

MT. UVO

Guam R.

YAVERRA

MOISIAMANAT

KANGERANGATE

SABANGA SAVENDA

PANGANSOP

JOSEPHSTAAL

KISILA

KAOVE

PAPUL

Kumil R.

BUNABUN

Patup River

Frieg R.

REINDUK

SOBERAM

SARASABEN

Diber River

MALAS

GILAGIL RIVER

Area not surveyed

Tmu

Tm

Tml

T

145°30'

4°30'

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REFERENCE

Geographical Units	Geological Elements	Geological Age (where known)
NORTHERN FOOTHILLS	Alluvium	
	Tmu — Varied Sedimentary Succession with some volcanics	UPPER MIOCENE
LOWER RAMU UPLANDS	Tmu — Mudstones, Siltstones, Fine Sandstones with conglomerates	UPPER MIOCENE
	T — Coarse Conglomerates	
ADELBERT MOUNTAINS	Tm — Mudstones and Siltstones	MIOCENE
	Tm — Sandstones and Limestones with volcanics	
	Tml — Limestones	LOWER MIOCENE

Geographical boundaries

Geological boundaries – inferred

Faults – inferred

Traverse routes

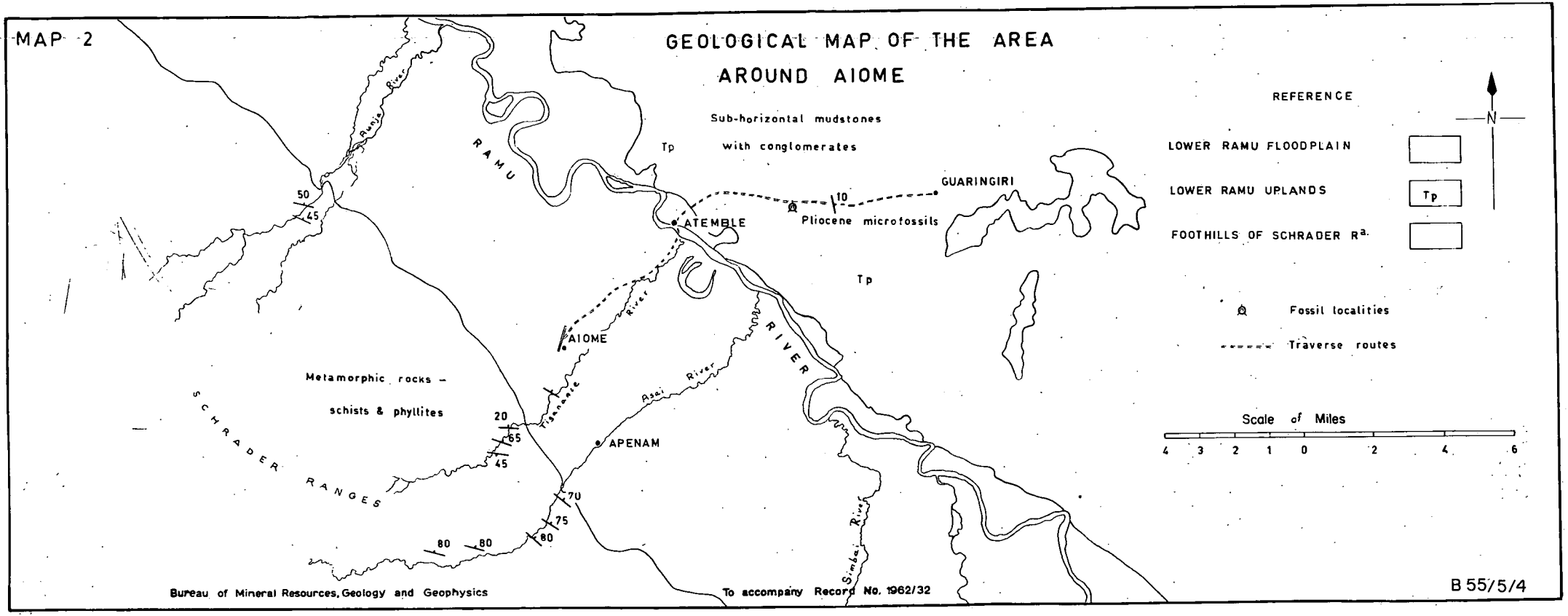
Fossil localities

Scale of Miles

4 3 2 1 0 2 4 6

MAP 2

GEOLOGICAL MAP OF THE AREA AROUND AIOME



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B 55/5/4

A C B

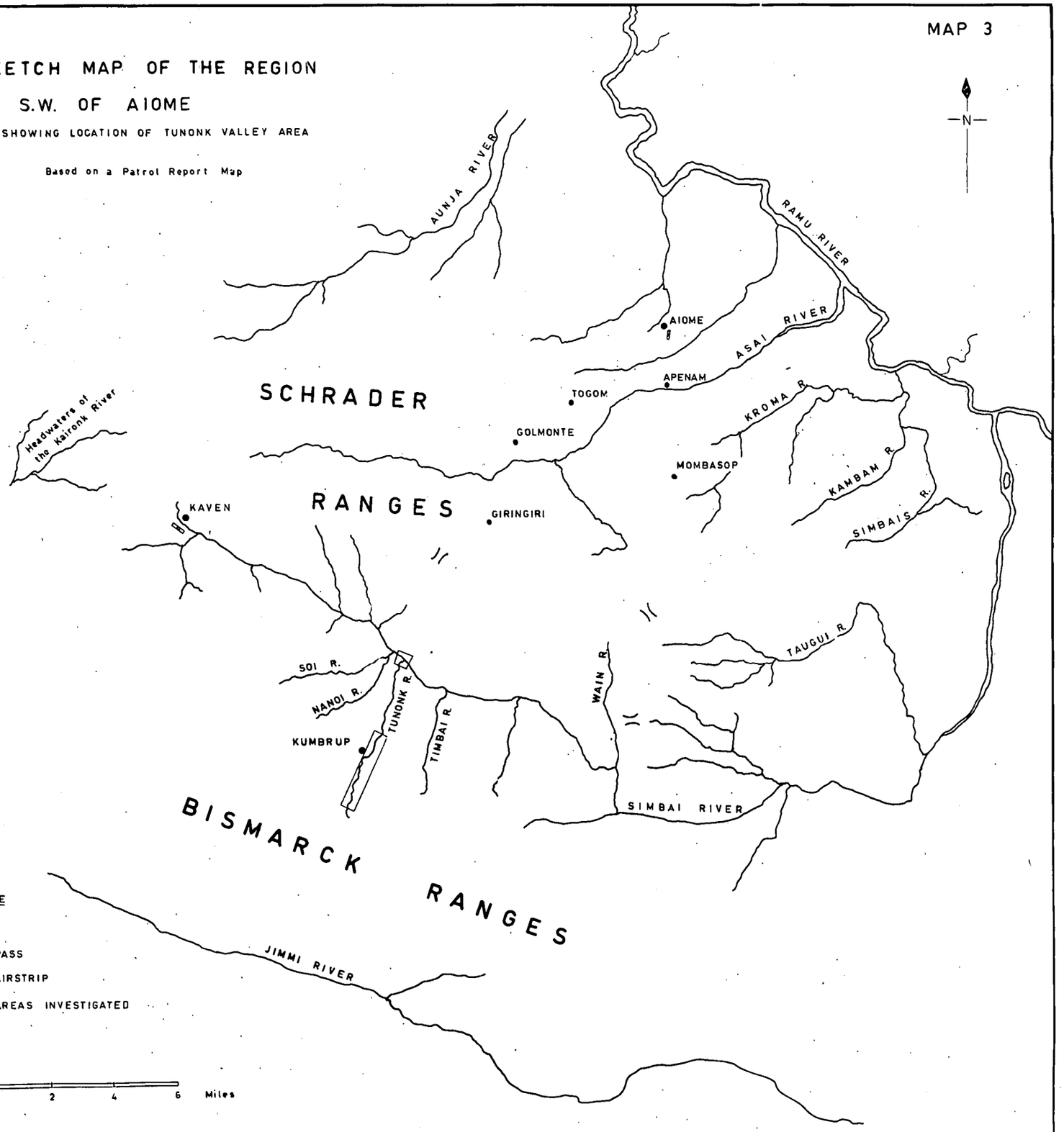
Reduce AB (12") to AC (6")

MAP 3

SKETCH MAP OF THE REGION S.W. OF AIOME

SHOWING LOCATION OF TUNONK VALLEY AREA

Based on a Patrol Report Map



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