DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

TO ACCOMPANY MAP I-61

GEOLOGY OF THE YAKATAGA DISTRICT, GULF OF ALASKA TERTIARY PROVINCE, ALASKA

By

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INTRODUCTION

This map of the Yakataga district is one of a series showing the geology of the Gulf of Alaska Tertiary province (see index map). In this province, an arcuate belt more than 300 miles long and 2 to 40 miles wide, sedimentary rocks of Tertiary age are exposed or are inferred to underlie lowland areas covered by Quaternary unconsolidated deposits or ice (Miller, Payne, and Gryc, 1959, p. 37–47; Plafker, 1967). Field studies were carried out in the province intermittently from 1944 to 1963 under the Geological Survey's program of petroleum investigations in southern Alaska.

BEDROCK GEOLOGY

The rocks mapped as the crystalline complex in the northeastern part of the Yakataga district were not seen on the ground but were studied from aerial reconnaissance and photographs. These rocks are correlated with, and appear to be continuous along strike with, the metamorphic rocks and associated intrusive igneous rocks in the vicinity of Mount St. Elias in the adjoining Malaspina district (Plafker and Miller, 1957). The crystalline complex is inferred to be either overlain unconformably by, or in fault contact with, younger rocks of the Yakutat Group near the east end of Barkley Ridge.

The volcanic rocks comprise lava flows and flow breccias of dusky-purple and grayish-green amygdaloidal basalt or andesite, and possibly some tuffaceous rocks, where traversed at the end of a spur extending west from Barkley Ridge (Brabb and Miller, 1960, p. 10–11). Massive volcanic rocks, cut by small masses of gabbro and probably more felsic plutonic rocks, form most of the spur that projects northeastward into the Bagley Ice Field about 2 miles from the east end of Waxell Ridge. At the head of this spur the north-dipping volcanic rocks grade southward into well-bedded green and greenish-gray tuffaceous sandstone and argillite, which is in fault contact with sedimentary rocks of Tertiary age. The volcanic rocks appear to be in depositional contact with the Yakutat Group on the west flank of Mount Miller, but at other localities southeast of Mount Miller and southwest of Mount Steller, aerial photographs show discordant bedding trends suggestive of either an angular unconformity or faulting at this contact. Where examined in the vicinity of the Bering Glacier, the volcanic rocks are more highly altered than the Yakutat Group. From this evidence, the volcanic rocks are tentatively considered to underlie the Yakutat Group and to be probably of early or middle Mesozoic age, but possibly older.

The rocks assigned to the Yakutat Group at the west end of Barkley Ridge are argillite and poorly sorted fine-grained sandstone and siltstone of graywacke type (Brabb and Miller, 1962). The argillite is medium dark gray to black and commonly has a well-developed fracture cleavage. At some localities it contains lenticular calcareous concretions. Most of the sandstone and siltstone is medium gray and weathers pale reddish brown or light brown. Interbedded argillite and sandstone similar in lithology was seen at two other localities examined on the ground; on a nunatak southeast of Mount Miller and near the end of a spur extending south from Mount Steller. A depositional contact between the Yakutat Group and overlying sedimentary rocks of Tertiary age is tentatively mapped, from aerial photographs, at one locality near the east end of Waxell Ridge. A foraminifer found in argillite of the Yakutat Group at locality 59AMr-453, near the west end of Barkley Ridge, was identified by Ruth Todd as *Nodosaria affinis* Reuss and is regarded by her as possibly indicating a Late Cretaceous or Paleocene age. Bryozoans, pelecypods, and a turreted gastropod were found in the group along a spur extending north from Barkley Ridge (localities 59ABa291 and 59AMr436), but they are too poorly preserved to date the beds. The Jurassic(?) and Cretaceous age previously assigned to the Yakutat Group (Plafker, 1967) is tentatively accepted for this area.

The Kulthieth, Poul Creek, and Yakataga Formations, as exposed in their type localities in the Robinson Mountains, comprise a sequence of sedimentary rocks exceeding 25,000 feet in thickness and ranging in age from Eocene through Pliocene. The uppermost part of the Yakataga Formation (Pleistocene) is not known to be exposed in outcrop in the Yakataga district. Selected fossils collected from these formations are listed in tables 1 through 3. Previously published descriptions of these formations (Miller, 1957; Plafker, 1967) apply to this map. Major intraformational unconformities occur within the Kulthieth and Yakataga Formations. In the Robinson Mountains the Yakataga Formation overlies the Poul Creek Formation with slight angular unconformity.

The similarity in appearance of the upper part of the Kulthieth Formation and the basal more sandy part of the Poul Creek Formation makes it difficult to identify and trace the contact between these formations in areas of complex structure, either in reconnaissance field mapping or on aerial photographs. For this reason it is likely that the basal part of the Poul Creek is present locally in areas mapped as the Kulthieth Formation between the northeast part of the Bering Glacier and the Kosakuts fault, west of long 142°37′W., and between the Kosakuts and Hope Creek faults, east of this longitude. The presence of the Poul Creek in a narrow belt south of the Hope Creek fault, between the Kulthieth and Duktoth Rivers, is indicated by both lithologic and paleontologic evidence, but the structural interpretation of this occurrence as a fault sliver is highly conjectural.

The undifferentiated sedimentary rocks of Tertiary age mapped in several areas in the northern part of the Yaka-

[1]Deceased. The publication in its present form was prepared by George Plafker and is based largely on an open-file report (Miller, 1961) and unpublished data (U.S. Geol. Survey, 1963).

taga district are believed to consist mainly of a predominantly marine sequence that includes the equivalent of the siltstone sequence in the Malaspina district (Plafker and Miller, 1957), and that is in part equivalent to and in part older than the lower part of the Kulthieth Formation as exposed in the Robinson Mountains. Predominantly nonmarine, coal-bearing beds similar to those in the Kulthieth Formation are present locally in these undifferentiated rocks, as tongues in the upper part of the marine sequence, and partly lying above the marine sequence. Where examined on the ground at the west end of Barkley Ridge (Brabb and Miller, 1962), at the east end of Waxell Ridge, and on a nunatak in the Guyot Glacier, the characteristic rock types in the predominantly marine sequence are dark-gray to black argillite or siltstone, and lighter gray, dense, fine-grained sandstone that weathers pink to dusky red. The fossil marine mollusks collected at these localities (M854, M855, M856, D252(T)) are too poorly preserved for certain identification, but the fauna as a whole suggests to F. S. MacNeil a middle(?) and late Eocene and Oligocene(?) age.

MINERAL RESOURCES

Many oil seeps and some gas seeps have been found in the Yakataga district. Most of the seeps occur on outcrops of the Poul Creek Formation and lower part of the Yakataga Formation in a narrow belt along the coast between Cape Yakataga and Johnston Creek (Miller, 1951, p. 41–44; 1957). Oil claims were located on the coastal belt of seeps as early as 1897 (Maddren, 1914, p. 146–147), but exploration by drilling did not start until nearly 30 years later. By the end of 1963 eleven test wells had been drilled and abandoned in the coastal area between Bering Glacier and Big River (table 4). Federal oil and gas leases in effect at the end of 1969 covered nearly all of the Yakataga district south of the Bering Glacier and the Guyot Glacier.

Coal occurs in the Kulthieth Formation and in some outcrop areas of the undifferentiated Tertiary sedimentary rocks in the Yakataga district. Based on partial analyses of several samples from widely distributed localities, the coal ranges in rank from high-volatile bituminous to anthracite (fig. 1); the maximum observed thickness of a single bed is 6 feet. None of the known outcrops of coal is easily accessible and mining has not been attempted, so far as is known.

Placer mining for gold in the Quaternary deposits of the Yakataga district has been carried on sporadically since gold was discovered in the beach sands at Umbrella Reef about 1897 (Maddren, 1914, p. 133–143). Most of the gold production has come from localized natural concentrations of heavy minerals below high-tide line along the beach between Poul Creek and the mouth of the south channel of the Yakataga River—in recent years mainly from the beach just west of Cape Yakataga. Attempts have been made to mine gold in the stream deposits along the White River, and the raised beach deposits east of Cape Yakataga also have been prospected by drilling. Radioactive minerals have been identified in small concentration in the beach deposits (Moxham, 1952).

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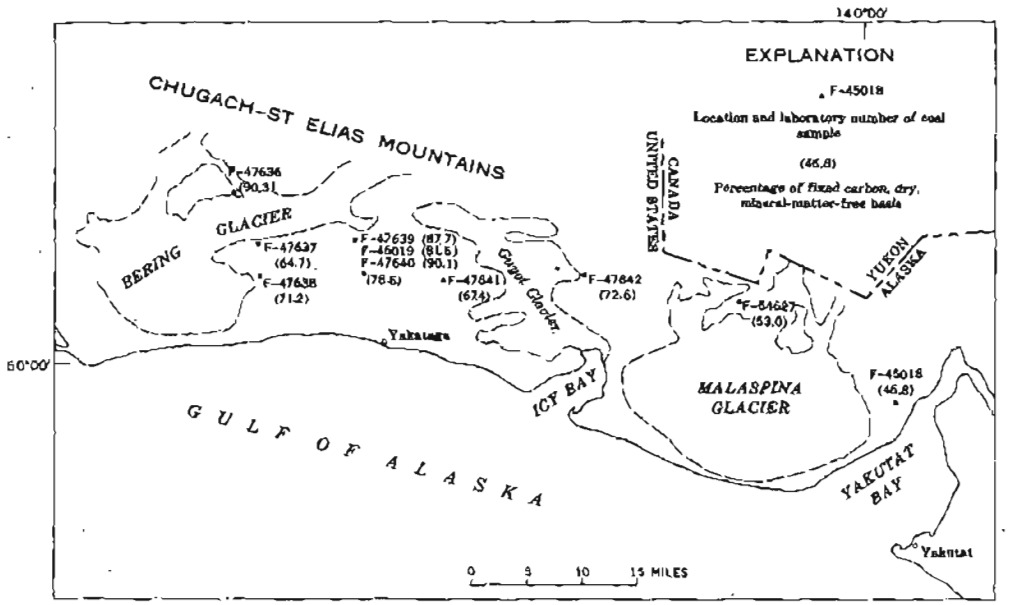

Figure 1.—Map showing variation in rank of coal in the Kulthieth Formation in the Yakataga and Malaspina district

TABLE 1.—*Selected mollusks from the Poul Creek and Yakataga Formations, Yakataga and Malaspina districts showing tentative identification and stratigraphic range*

(Identifications by F. Stearns MacNeil)

7	Stratigraphic range and number of collections containing species cited
×	Species cited present at stratigraphic position indicated, range not known
*	Species cited present at approximate stratigraphic position indicated
?	Species cited doubtfully present at stratigraphic position indicated

	Top: Yakataga Formation	Base: Poul Creek Formation
PELECYPODA:		
Acila gettysburgensis (Reagan) (+*alaskensis* Clark) (strongly developed lunule)		7
Acila sp. (variable; includes *taliaferroi* Schenck (=*hamiltonensis* Clark and *yakatagensis* Clark). Some specimens resemble *empirensis* Howe, *blancoensis* Howe, and *conradi* (Meek) (lunule not developed or very weak)	? * 16	
Yoldia cf. *Y. scissurata strigata* Dall (with diagonal sculpture)	4	
Nuculana aff. *N. washingtonensis* (Weaver) (posterior slender and elongate)	? 3	?
Nuculana aff. *N. chehalisensis* (Weaver)	? * ×	
Anadara aff. *A. osmonti* (Dall)		2 ? ×
Amussium n. sp.? (45 millimeters in diameter)		
Patinopecten (Lituyapecten) yakatagensis (Clark)	? 11	
Chlamys (Swiftopecten) donmilleri MacNeil	× 2	
Lima cf. *L. twinensis* Durham (over 100 millimeters)		2 ×
Crenella porterensis Weaver		×
Astarte aff. *A. alaskensis* Dall (heavy concentric ribs)	×	
Crassatellites cf. *C. washingtoniana nygreni* Durham		×
Cardita (Cyclocardia) aff. *C. (C.) hannibali* (Clark) (very granular ribs)		3
Cardita (Cyclocardia) yakatagensis (Clark), (deep lunule, 25 ribs)		5
Cardita (Cyclocardia) cf. *C. (C.) hamiltonensis* (Clark) (shallow lunule, 21–22 ribs, ribs weak anteriorly)		4
Cardita (Cyclocardia) n. sp. (small 12–14 millimeters, ribs obsolete antero-ventrally)	* *	
Cardita (Cyclocardia) n. sp.? aff. *C. (C.) crassidens* (Broderip and Sowerby) and *C. (C.) pauciocostata* (Krause) (large – 40 millimeters, 12–13 broad low ribs)	5	
Thyasira cf. *T. bisecta* (Conrad)	*	3
Nemocardium weaveri (Anderson and Martin)		×
Nemocardium Lorenzanum (Arnold)		×
"Cardium" alaskensis Clark and *"C."* aff. *"C." alaskensis* Clark (small—15 millimeters or less, many very fine ribs)		19
"Cardium" hamiltonensis Clark (paper thin, medium sized—40 millimeters) (possibly two species are included)	14	
Clinocardium aff. *C. coosense* Dall	3	
Clinocardium yakatagensis Clark. Possibly 2 species are included	6	
Serripes groenlandicus (Bruguiere)	×	
Chione securis cf. var. *alaskensis* Clark	* 3	
Pitar aff. *P. Dalli* (Weaver)		5
Compsomyax aff. *C. angustifrons* (Conrad) (may be *Marcia oregonensis* of Weaver; W.G.S. Bull. 15, p. 63—Lincoln and Blakeley)		4
Macrocallista pittsburgensis (Dall)		3
Katherinella cf. *K. arnoldi* (Weaver)		4
Mya salmonensis Clark		9
Mya cf. *M. truncata* Linne	* 9	
Panomya cf. *P. turgida*] Dall	×	
Panomya aff. *P. norvegica* (Spengler)	2	?
Myadesma sp.		×
Solena aff. *S. eugenensis* (Clark) and *S. Lorenzana* (Wagner and Schilling)		3
Panope cf. *P. snohomishensis* Clark		2
Thracia cf. *T. trapezoides* Conrad	* ?	×
Cochlodesma bainbridgensis Clark		×
Periploma cf. *P. besshoensis* (Yokoyama)		×
Pododesmus (Monia) macrochisma (Deshayes)	×	

TABLE 1.—*Selected mollusks from the Poul Creek and Yakataga Formations, Yakataga and Malaspina districts showing tentative identification and stratigraphic range—continued*

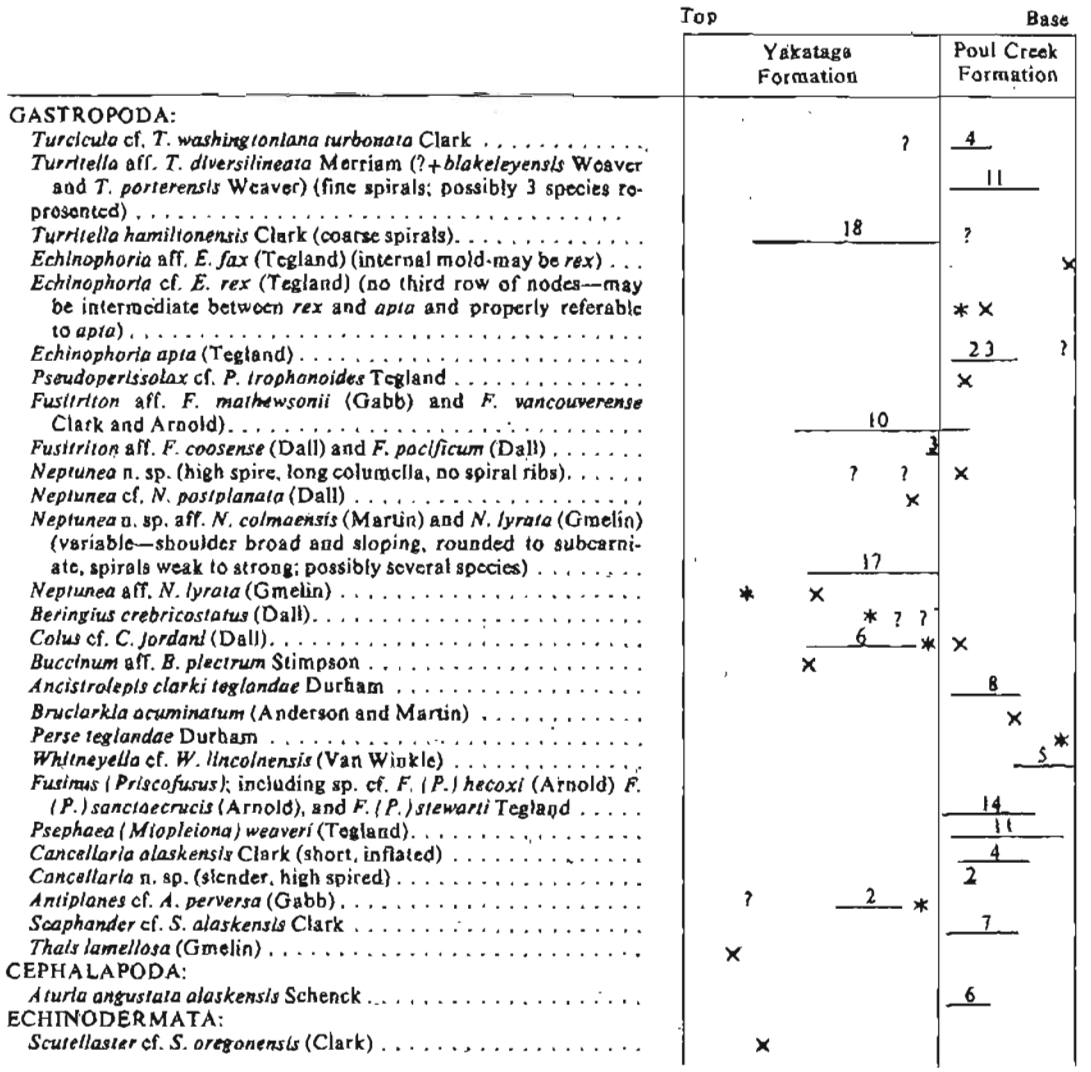

TABLE 2.—*Mollusks from the Kulthieth Formation, Yakataga district*

(Identifications by F. S. MacNeil. Figure indicates number of collections containing species cited)

PELECYPODA:
- *Nuculana* or *Yoldia* n. sp. (very elongate) . . . 1
- *Venericardia* sp. (small) . . . 1
- *Pitar* cf. *P. californianus* (Conrad) . . . 3
- *Pitar* (*Lamelliconcha*) cf. *P.* (*L.*) *clarki* (Dickerson) . . . 1
- *Pachydesma?* sp. . . . 1
- *Gari* cf. *G. columbiana* (Weaver and Palmer) . . . 1
- *Spisula* sp. . . . 6

GASTROPODA:
- *Epitonium* (*Boreoscala*) cf. *E.* (*B.*) *insecuritum* Hanna and *E.* (*B.*) *condoni* Dall . . . 3
- *Natica* sp. . . . 2
- *Turritella uvasana* Conrad cf. var. *washingtoniana* Weaver and Palmer . . . 1,1?
- *Ficopsis cowlitzensis* (Weaver) . . . 1
- *Molopophorus californicus* Clark and Woodford subsp. *lonsdalei* Turner . . . 1
- *Whitneyella sinuata* (Gabb) ?var. *aragoensis* Turner . . . 4

SCAPHOPODA:
- *Dentalium* sp. . . . 1

TABLE 3.—*Selected foraminifera from the Poul Creek Formation, Yakataga district*

	Upper part		Middle and lower part	
	CAS2926	48AMr51[1]	51AMr61[2]	Well samples[3]
Anomalina cf. *A. californica* Cushman and Hobson, .				×
Angulogerina aff. *A. hughesi* (Galloway and Wissler .	×			
Bathysiphon sp. fragments			×	
Bolivina marginata adelaidana Cushman and Kleinpell	×			
Bulimina cf. *B. inflata alligata* Cushman and Laiming	×			
Buliminella subfusiformis Cushman	×			
Cancris Cancriformis (Kleinpell).	×			
Cassidulina cf. *C. californica* Cushman and Hughes .	×			
C. cf. *C. crassipunctata* Cushman and Hobson.	×			
C. translucens Cushman and Hughes	×			
Cibicides aff. *C. americanus* Cushman (somewhat like *C. miradensis* Nuttall)	×			
C. elmaensis Rau				×
C. hodgei Cushman and Schenck			×	
C. aff. *C. ungerianus* d'Orbigny and *C.* aff. *C. pseudoungerianus evolutus* Cushman and Hobson.	×			
C. Cibicides spp		×		
Clavulina? cf. *C. communis* d'Orbigny	×			
Cyclammina sp.				×
Dentalina consorbrina d'Orbigny?	×			
Eponides mansfieldi oregonensis Cushman, Stewart, and Stewart.				×
Gaudryina alasanensis Cushman , ...				×
Globigerina bulloides d'Orbigny	×			
Gyroidina cf. *G. altiformis* R. E. and K. C. Stewart . .			×	
G. orbicularis planata Cushman				×
Lagena sulcata Walker and Jacob	×			
L. semistriata Williamson, of Cushman and Parker .	×			
Lenticulina subbullata (Hantken)	×			
Nodosaria sciuta Bornemann? (fragments)			×	
Melonis cf. *N. pompilioides* (Fichtel and Moll)			×	
M. umbilicatulus (Montagu)	×			
Lenticulina nikobarensis (Barbat and Von Estorff) var.	×			
Sphaerodina chilostomata Galloway and Morrey?			×	
S. variabilis Reuss	×			
Siphonodosaria aff. *S. koina* (Schwager)	×			
Siphogenerina kleinpelli Cushman	×[4]			
Siphogenerina cf. *S. paucicostata* Cushman and Todd .	×			
Triloculina trigonula (Lamarck)?	×[4]			
Uvigerina subperegrina Cushman and Kleinpell			×	
Valvulineria cf. *V. menloensis* Rau		×		
Virgulina cf. *V. floridana* Cushman var.	×			

[1]Identified in 1938 by S. G. Wissler, Union Oil Company of California
[2]Identified by Ruth Todd
[3]Identified by H. R. Bergquist and Ruth Todd
[4]Identified by W. W. Rau. A full description of the foraminiferal fauna in sample CAS29268 is given by Rau (1963). [Foraminifera from the upper part of the Poul Creek Formation of southeastern Alaska: Contributions from the Cushman Foundation for Foraminiferal Research, v. 14, p. 135–145.]

TABLE 4.—*Wells drilled for petroleum in the Yakataga district, Alaska, through year 1968*

Location no. on map	Company and name of well	Location	Year	Total depth (feet)	Formation penetrated	Results
1	General Petroleum Corp. Sullivan 1	Johnson Creek	1926–27	2,005	Poul Creek formation	Abandoned. Shows of oil and gas
2	Phillips Petroleum Co. and Kerr-McGee Oil Industries, Inc. Sullivan Strat. 1	Big River	1954	4,837	Poul Creek formation	Abandoned. Strong flow of slightly saline water
3	Phillips Petroleum Co. and Kerr-McGee Oil Industries, Inc. Sullivan Unit 1	Little River	1954–55	10,013	Poul Creek and Kulthieth(?) Formations	Abandoned. Shows of oil and gas
4	Phillips Petroleum Co. and Kerr-McGee Oil Industries, Inc. Sullivan Unit 2	Little River	1956–57	12,052	Poul Creek and Kulthieth(?) Formations	Abandoned. Shows of oil and gas
5	Richfield Oil Corp. Kaliak River Unit 1	Near Tsivat River	1959–60	14,699	Yakataga and Poul Creek(?) Formations	Abandoned. Shows of gas
6	Richfield Oil Corp. Kaliakh River Unit 2	do	1960	9,575	Yakataga and Poul Creek Formations	Abandoned
7	Richfield Oil Corp. Kaliakh River Unit 2, re-drill	do	1960–61	12,135	Yakataga and Poul Creek Formations	Abandoned
8	Richfield Oil Corp. Duktoth River 1	Near Kaliakh River	1961	10,390	Yakataga, Poul Creek, and Kulthieth(?) Formations	Abandoned. Shows of gas
9	Richfield Oil Corp. White River 1	Near Cape Yakataga	1961	7,982	Yakataga and Poul Creek Formations	Abandoned. Shows of gas and strong flow of saline water
10	British Pet. Explor. Co., Inc. White River 2	White River	1962	12,417	Yakataga, Poul Creek, and Kulthieth Formations	Abandoned
11	British Pet. Explor. Co., Inc. White River 3	do	1963	6,984	do	Abandoned. Shows of gas