Canada
Department of Mines
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LEGEND

RECENT
- 20 — *Lava, tuff, breccia*

RECENT AND PLEISTOCENE
- 19 — *Recent alluvium and glacial drift*

TERTIARY

MIOCENE OR PLIOCENE
- 17 — MASSET: *Basalt, agglomerate, some sediments*

MIOCENE
- 16 — SKONUN: *Shale, sandstone, conglomerate; coal*
- 18 — *Basalt, tuff, agglomerate, some sediments*

EOCENE (?)
- 15 — *Granite*

MESOZOIC

UPPER CRETACEOUS
- 14 — *Argillite, greywacke*

LOWER (AND, OR) UPPER CRETACEOUS
- 13 — SKIDEGATE: *Shale, sandstone*
- 12 — HONNA: *Sandstone, conglomerate*

LOWER CRETACEOUS
- 11 — 11A: HAIDA. 11B: SKEENA: *Shale, sandstone, conglomerate; coal*

UPPER JURASSIC (AND, OR) LOWER CRETACEOUS
- 10 — COAST RANGE INTRUSIVES: *Granite, granodiorite, quartz diorite, etc; undifferentiated, small bodies of schist, etc.*

MIDDLE AND UPPER JURASSIC
- 5 — YAKOUN: *Agglomerate, tuff, lava flows*

LOWER JURASSIC
- 4 — MAUDE: *Argillite, feldspathic sandstone, tuff*

HAZELTON GROUP

MIDDLE (AND, OR) UPPER JURASSIC
- 9 — *Argillite, tuff, quartzite, conglomerate; andesite, rhyolite, breccia, tuff*

MIDDLE JURASSIC
- 8 — *Argillite, quartzite, tuff*

LOWER (AND, OR) MIDDLE JURASSIC
- 7 — *Tuff, breccia, andesite*

UNDIFFERENTIATED
- 6 — *Tuff, breccia, andesite, etc.; sediments*

TRIASSIC
- 3 — 3A: *Limestone, slate, quartzite, conglomerate*; 3B: *Argillite, limestone, tuff, andesite*

JURASSIC (AND, OR) OLDER
- 2 — 2A: *Quartzite, argillaceous quartzite, mica schist*; 2B: *Argillite, limestone, schist*; 2C: *Schistose volcanics*; 2D: *Basic schist*; 2E: *Chlorite schist, hornblende schist, biotite schist, gneiss, crystalline limestone, and, locally, andesite, basalt, breccia*

PRE-JURASSIC (?)
- 1 — *Granite*

Symbols

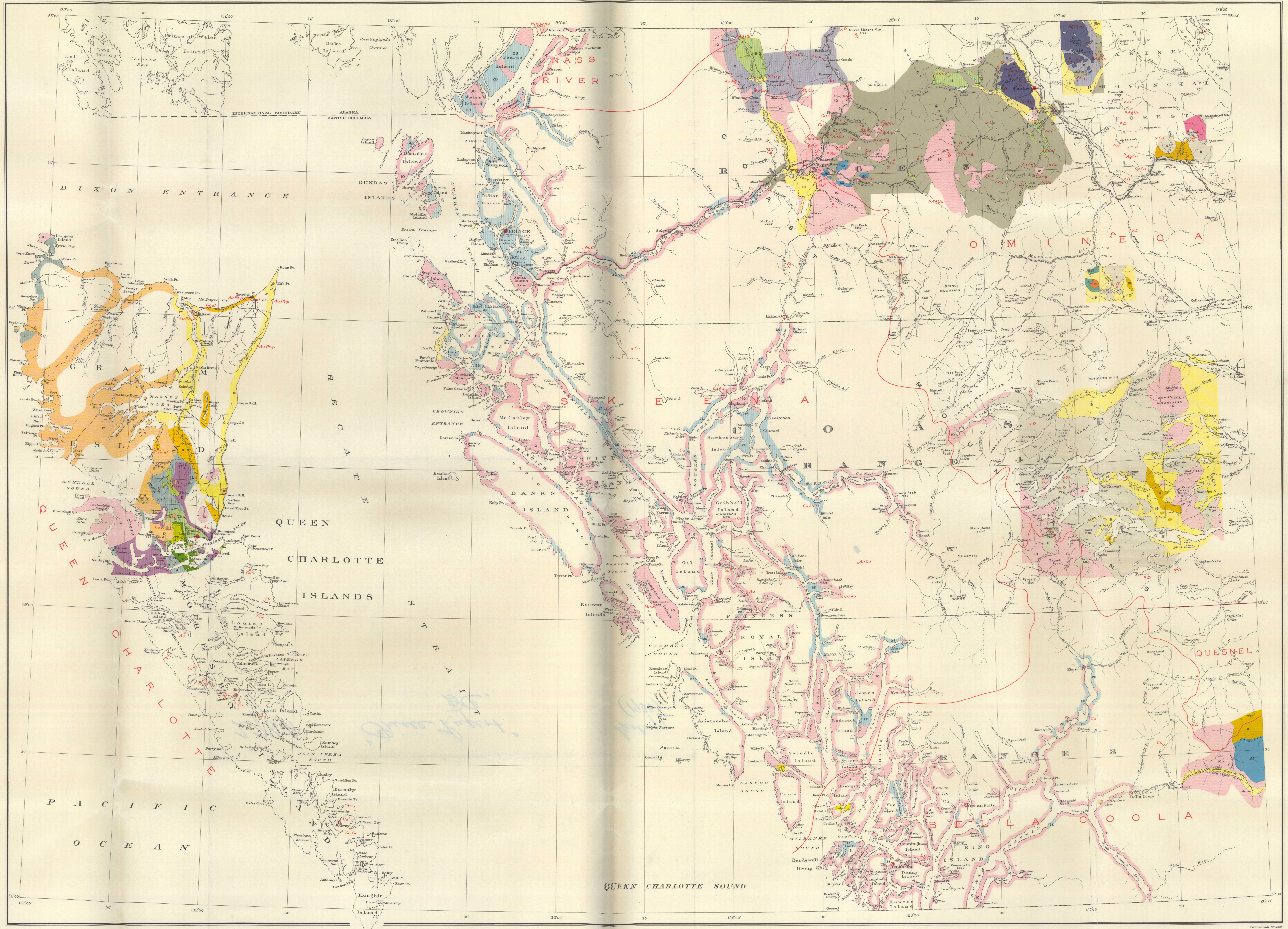
- *Geological boundary*
- *Mining Recording Office*
- *Road*
- *Mining Division boundary*
- *Mining Sub-recording Office*
- *Trail or portage*

PRINCIPAL MINERAL OCCURRENCES

× Ag	Silver	× Cu	Copper	× Mo	Molybdenite
× Au	Gold	× Fe	Iron	× NaCl	Salt *(in drift)*
× Au-p	Gold, placer	× G	Graphite	× Pb	Lead
× Bi	Bismuth	× Ls	Limestone quarry	× Pt-p	Platinum, placer
× Coal	Coal	× Mica	Mica	× W	Tungsten
× D	Deposits containing lead, zinc, copper, gold, and silver			× Zn	Zinc

SOURCES OF INFORMATION

Geology compiled from surveys by the Geological Survey.



GENERAL GEOLOGY

PRE-JURASSIC (?) GRANITE. An area northeast of Topley, is floored with granite, fragments of which occur in conglomerate and breccia of a bordering volcanic assemblage that resembles the Hazelton group, of Jurassic age. If the volcanics are Jurassic the granite is probably Palæozoic or Precambrian.

JURASSIC (AND,OR) OLDER. Numerous bodies (many more than represented) lie within the granitic rocks of the Coast Range batholith. Some are basic schists of doubtful origin but most are still recognizable as sediments and volcanics. Possibly two or more groups of strata of different ages may be present. They may be largely Triassic and Jurassic since strata of these ages occur over much of the region, but they may be in part Palæozoic.

TRIASSIC. The several small areas of Triassic sediments in Zymoetz river valley are fossiliferous. A conglomerate member has yielded boulders holding Permian fossils, the only direct evidence of former Palæozoic strata in the region. The volcanics with some sediments bordering the upper part of Bella Coola river resemble undoubted Triassic rocks found a short distance south.

Fossiliferous Triassic sediments (shales, sandstones and limestones) with, probably flows, agglomerates, etc., and closely associated with numerous basic intrusives are widespread on Moresby and bordering islands. They are cut by a number of stock-like and perhaps larger bodies of the Coast Range intrusives.

JURASSIC: HAZELTON GROUP. A conformable succession, possibly 10,000 feet thick, consisting of a lower volcanic member overlain by a sedimentary member followed by an upper volcanic member on which lies an upper sedimentary member. The base of the group is not revealed, so the relations with the presumably underlying Triassic is unknown. Marine fossils of lower Middle Jurassic age have been found in the lower sedimentary member. Sediments on Hudson Bay mountain assigned to the upper sedimentary series may be in part of Skeena age. They hold several seams of coal. In Whitesail lake district the Hazelton strata include important sedimentary horizons but it has not been possible to correlate them with the sedimentary members recognized farther north.

The Hazelton strata near the main batholithic area may be schistose but elsewhere are not greatly altered. Usually they lie in open folds but locally are steeply inclined, sheared and faulted. They are penetrated by numerous dykes and many small bodies of granitic rocks belonging to the Coast Range intrusives and by dykes of still later age. The volcanic assemblages contain many basic intrusions that are, presumably, of about the same ages as the volcanics.

JURASSIC: MAUDE AND YAKOUN FORMATIONS. The Maude is richly fossiliferous and grades upwards into the Yakoun. Their combined thickness may reach 15,000 feet. They have been recognized on both sides of Skidegate inlet, and presumably extend southward on Moresby and bordering islands. Their relations with the Triassic are unknown. They lie for the most part in open folds but locally are closely folded.

COAST RANGE INTRUSIVES. The Coast Range batholith and many large and small granitic bodies to the east and west are, presumably, of one general age. On Graham island, large, stock-like bodies invade Jurassic strata, the assemblage is truncated by an uneven surface, and on this rests late Lower Cretaceous sediments. On the mainland, the granitic rocks are not known to cut the Lower Cretaceous Skeena formation, which is less deformed than the Hazelton and in different areas rest on widely different horizons in the Hazelton group, thus implying that the Jurassic Hazelton group suffered vigorous folding and erosion before deposition of the Skeena. The available evidence indicates that in the main the granitic rocks are not older than late Upper Jurassic nor younger than early Cretaceous. They may not all be one age. Granitic rocks east of Whitesail lake hold blocks of granite. At Owen lake stocks of granite cut strata holding plant remains indicating an Upper Cretaceous age.

The Coast Range intrusives are fairly uniform over large areas. Quartz diorite and granodiorite prevail. They are gneissic in the vicinity of inclusions of older rocks. Locally they are cut by many dykes of pegmatite and of aplite. More basic dykes occur everywhere; in the vicinity of Bellabella, they are so numerous that they almost replace the granites and older rocks, and similar dykes occur in large numbers as far west as Bardswell island, but in other directions they rapidly diminish. They are presumably of late Tertiary and early Recent age.

LOWER AND (?) UPPER CRETACEOUS: HAIDA, HONNA AND SKIDEGATE FORMATIONS. The three formations, which are known only on Queen Charlotte islands, have a total thickness of 8,000 to 10,000 feet. They form an apparently conformable succession but contacts between successive formations are rather abrupt. Marine fossils of late Lower Cretaceous age are abundant in the Haida. The Honna is mainly composed of conglomerates and the pebbles are largely of granitic rocks presumably derived from the Coast Range intrusives. The Skidegate consists mainly of shales. The strata occur in separate synclinal basins. Folding, though locally severe, is gentle on the whole. This deformation and the great erosion to which they have been subjected was mainly accomplished before deposition of the Miocene Skonun formation. They are intruded by numerous dykes and sills of presumably Tertiary age.

LOWER CRETACEOUS: SKEENA FORMATION. The Skeena strata occur in small basins at comparatively low levels. Though locally tilted at high angles, they are much less folded and less indurated than the Hazelton strata on a deeply eroded surface of which they rest. The formation in most places consists of conglomerate overlain by shales. The greatest preserved thickness is not more than 800 feet. Plant remains indicate a Lower Cretaceous age but the precise horizon is unknown. Dykes cut the Skeena beds but are presumably unrelated to the Coast Range intrusives.

UPPER CRETACEOUS ARGILLITE AND GREYWACKE; EOCENE (?) GRANITE. Near Owen lake sediments carry plant remains of Upper Cretaceous age. They rest on volcanic rocks resembling the Hazelton group. They are cut by two bodies of granite. The intrusives cannot be older than late Upper Cretaceous and are probably not younger than early Eocene since widely spread Tertiary volcanics and associated sediments, partly at least of Eocene age, are not known to be cut by granite.

TERTIARY. Dyke rocks of many kinds and presumably from early Tertiary to Recent in age cut the Cretaceous and older strata. Tertiary volcanics, chiefly basalt, with considerable sediments locally at their base are extensive in the southeast. They occur at comparatively low altitudes and are for most part nearly horizontal. Plant remains from some of the sediments indicate an Eocene age. On Graham island, the Tertiary sediments (Skonun formation) are as much as 1,000 feet thick and consist of sands and gravels, in places only slightly cemented. They and the younger Masset formation consisting mainly of basalt and coarse agglomerates possibly 5,000 feet thick, are horizontal or gently inclined.

RECENT VOLCANICS. On Lake and Lady Douglas islands, small areas of tuffs accompanied by lava flows rest on glaciated surfaces. The maximum thickness is 1,000 feet. Small areas of similar rocks occur on other islands to the northwest.

MINERAL OCCURRENCES

METALLIFEROUS LODE DEPOSITS. The occurrences marked on the map are only a small part of the total number discovered but they indicate the relative numbers of discoveries made in different areas. The discoveries have been largely made in strata older than the Coast Range intrusives and lying either east or west of the main body of these intrusives. No Metalliferous deposits have been found in the Cretaceous and Tertiary strata. Most of them occur in areas largely occupied by volcanic rocks and where intrusives of about the same ages as the volcanic rocks are common. Possibly some or many are connected in origin with these local intrusives; but more probably they are directly related to the Coast Range intrusives and occur mainly in the volcanic assemblages because these rocks, as contrasted with sediments, were more readily fractured, brecciated and otherwise deformed for passage of mineral-bearing solutions.

As regards metalliferous mineral deposits the region is divisible into three areas; Queen Charlotte islands, the Coast Range batholith, and the area east of the Coast range. The deposits in each of these areas vary greatly in form, mineral composition, etc., and include most, if not all the main types; but each area is characterized by a predominance of certain types.

On Queen Charlotte islands most of the deposits consist largely of magnetite. This occurs in irregular and lenticular bodies from a few feet to several hundred feet long; also in vein-like or dyke-like bodies and disseminated through rock. The deposits occur in volcanics, sediments and granitic rocks close to the contacts of granitic bodies. Chalcopyrite almost invariably accompanies the magnetite and may be in considerable amounts; pyrite and pyrrhotite are usually present. Epidote, garnet, etc., are usually abundant. A related type consists of copper and iron sulphides with only little magnetite but much epidote, hornblende, etc. Other possibly related types, consist of copper and iron sulphides deposited in sheared zones in volcanics or granite. Gold-bearing quartz veins are known.

On the islands bordering the main coast and inland across the Coast Range batholith, quartz veins carrying auriferous pyrite or free gold and pyrite, with pyrrhotite and in some cases molybdenite, copper sulphides, etc., occur in sheared zones in the granitic rocks or in schistose rocks lying in the batholith. At one place large, irregular pegmatite dykes hold important amounts of copper sulphides and appreciable values in gold and silver. Magnetite bodies with varying amounts of sulphides and resembling those found on Queen Charlotte islands, occur in the pre-batholithic rocks, particularly in limestone.

East of the Coast Range batholith, the numerous deposits are mainly vein-like with a quartz gangue and in very many instances follow sheared or brecciated zones. Many are typical quartz veins, some of which carry free gold and small quantities of iron and copper sulphides, whereas others hold larger amounts of these and other sulphides including tetrahedrite, galena and sphalerite. The proportions of the different sulphides and of the gold, silver and base metal contents vary greatly. All gradations exist from regular quartz veins to narrow zones along which the rock is heavily impregnated with sulphides and little or no quartz gangue is present.

PLACER DEPOSITS. At several places along the coast of Graham island, the black sands of the beaches hold appreciable quantities of gold. Placer gold deposits have been worked on various streams entering Skeena river west of the axis of the Coast range.

COAL. No large coal field is known but many of the small areas of the Skeena formation carry one or more seams varying in quality from lignitic to semianthracitic. The larger seams vary in thickness from 2 feet to 8 feet or more. On Graham island, coal seams occur in the Haida formation. At one place a seam contains 16 feet of coal. The coal varies from place to place from anthracitic to bituminous.

MAP 278 A

PRINCE RUPERT SHEET

BRITISH COLUMBIA

Scale, $\frac{1}{506,880}$ or 1 Inch to 8 Miles

Miles: 8 0 8 16 24 32

Kilometres: 10 0 10 20 30 40 50