112°30′00″

Central Section

Michael Oskin, 2001 112°32′30″ 112°20'00" Punta Reina GEOLOGIC MAP OF WESTERN ISLA TIBURÓN SONORA, MEXICO Michael Oskin, 2001 Tuffs of Dead Battery Canyon. Cooling unit **Young alluvium**. Active arroyo Tmr5. Moderately to densely welded red to I sedimentation. Local aeolian and lacustrine buff-colored tuff. 3% cm-sized pumice and 5 to 10% phenocrysts (feldspar > Fe-Ti Oli Littoral deposits. Beach deposits. Sand, oxides > clinopyroxene). gravel and cobbles. Tuffs of Mesa Cuadrada. Non-welded to Qco | Colluvium. Colluvial slope cover. densely welded ash-flow tuff. Tmr3a: basal Tmr3t 0 to 15 m-thick non-welded pumice-flows and ash-flow tuff. Tmr3: non-welded to Qoal Old alluvium. Moderately incised low-relief partially-welded ash-flow tuff with 5 to alluvial terrace deposits. 10% cm-sized volcanic lithics and 10 to 15% phenocrysts (K-feldspar >> augite = Qae Aeolian Sand. Dune sand. quartz > biotite = Fe-Ti oxides > basaltic hornblende = fayalite = zircon). Dated as Marine terrace. Eroded bench parallel to 5.33 ± 2.18 Ma and 6.15 ± 1.03 Ma by Ar-___ modern coastline covered with thin (1 to 2 Ar on K-feldspar. Probably also dated as m) mantle of cobbles and sand. 5.7 ± 0.6 Ma by K-Ar on feldspar by Gastil **Tuffs of Bahía Vaporeta**. Pliocene (or and Krummenacher (1979). Tmr3t: bedded QTpbrv Quaternary?) non-welded to partially-welded ash and pumice, non-welded ash-flow tuffs, Valle de Tecomate lithic and pumice lappili tuffs. Abundant surge and debris-flow deposits. Mapped as light and dark colored pumice and 1% 300 m thick deposit on northeastern part of anorthoclase phenocrysts. At least three 5-Isla Tiburón. Present as a 0 to 1 m-thick 10 m-thick cooling units present in center of marker between Tmr3 and Tmr4 elsewhere. of outcrop area. Appears to have erupted Tmr4: densely welded ash-flow tuff with 1from a vent west of Isla Tiburón. 3% phenocrysts (plagiocalse > pyroxene > Basin-fill alluvial terrace. Pliocene(?) to quartz) and 1% volcanic lithic inclusions. QTpal Quaternary basin-fill deposits. Moderately Basin-fill alluvium. Miocene basin-fill lithified to unlithified conglomerate and Tmal deposits. Moderately lithified conglomerate sandstone. Geomorphic evidence for a and sandstone. preserved depositional surface. Tmrf2 | Rhyolite lava flows. Lava flows, block and Tpth3 Tuffs of Hipat. Bedded non-welded to ash deposits, local pyroclastic deposits. densely-welded lithic and pumice lappili Tma2 Andesite lava flows. Lava flows. Includes Tpth2 tuffs. 15-20% phenocrysts (plagioclase > clinopyroxene > K-feldspar). Number of volcaniclastic debris flows in outcrops north Tpth1 cooling units and welding grade increases toward a likely vent at Pico Colorado. Basalt lava flows. Tmb2: lava flows of Welded zones mark the bases of units 2 and Tmb2v basalt or basaltic andesite with 30% Tmb2 | phenocrysts (plagioclase >> pyroxene). Dacite of Pico Colorado. Dacitic or Tpdcc andesitic lava flows forming Pico Colorado Tmb2v: central vent plug within basalt volcano. Undated, but probably Pliocene Tuff of San Felipe. Densely-welded phyric age. Probable vent for the Tuffs of Hipat. tuff. 10% phenocrysts of anorthoclase >> Rhyodacite of Cerro Starship. Rhyodacite clinopyroxene > opaques. Distinctive Tprcs | lava flow and dike. 35% phenocrysts dark-brown rhyolite lithics. Dated as Hast Haicuihpec (plagioclase > hornblende > K-feldspar > 9.66 ± 1.31 Ma and 12.96 ± 3.67 Ma by Aropaques > biotite). Base of 0.5 to 1 m of Ar on K-feldspar. ash and pumice, overlain by 0 to 3 m of Undifferentiated Volcanic Rock. Andesite(?) flow breccia and 40 m of lava with trachitic and probably other strata located east of flow texture. Source of flow from a dike Valle Tecomate. May include strata located on the northeast side of Cerro younger than group three. Starship. Dated by K-Ar on plagiocalse at 11.2 ± 1.3 Ma, 3.7 ± 0.9 Ma, and Volcanic Rocks of the La Cruz block. Basalt 4.16 ± 1.81 Ma (Gastil and Krummencacher, and andesite lava flows, volcaniclastic 1977; Neuhaus, 1989). sandstone. The La Cruz block is located Tmpal Basin-fill alluvium. Miocene and/or Pliocene south of the La Cruz fault. Gastil et al., (1999) report K-Ar ages of 15.2 ± 0.5 Ma to basin-fill deposits. Moderately lithified 21 ± 0.5 Ma for these strata. conglomerate and sandstone. Tmlf Latite lava flow. Morphologically distinctive Marine sedimentary rock. Shallow marine lava flow of the La Cruz block. Described to littoral moderately lithified conglomerate as a latite and dated at 15.0 ± 2.2 Ma by Kand sandstone. Rare to abundant Ar by Neuhaus (1989). invertebrate fossils. Topset-foreset bedding relationships indicate deposition as a delta-Tuffs of Cerro Colorado. Two denselyfan in a shallow marine setting. welded rhyolitic ash-flow tuffs of the La Cruz block. The lower member contains Tmprsz4 Tuffs of Arroyo Sauzal. Non-welded to densely-welded ash-flow tuff. Tmprsz1 is 2 20% phenocrysts (K-feldspar >> pyroxene = hornblende >> fayalite) and 5% Tmprsz to 3 m thick, non-welded to slightly welded, volcanic lithic fragments. Dated as 2-3 with 20% phenocrysts (K-feldspar >> 9.58 ± 2.66 Ma by Ar-Ar on K-feldspar. clinopyroxene = hornblende >> biotite = plagiocalse = zircon) and 1% andesite and Tuff of the Sierra Kunkaak. Welded tuff with 50% volcanic lithic fragments. Crops basement lithics. Tmprsz1 was dated at out in the map area at one locality in the 5.67 ± 0.17 Ma by K-Ar on K-feldspar northern Sierra Kunkaak. Much thicker (Neuhaus, 1989) and 5.4 ± 3.9 Ma, sections of this tuff are present in the 6.4 ± 1.6 Ma, and 6.67 ± 0.83 Ma (Ar-Ar on central and southern Sierra Kunkaak, east of K-feldspar). Tmprsz2-3 is a composite of two densely welded cooling units. Member the map area. 2 is 2 m thick, moderately welded, with 3% Tmrf1 Rhyolite lava flows. Lava flows, block and volcanic lithics and 15% phenocrysts ash deposits, local pyroclastic deposits. (plagiocalse >> clinopyroxene = opaques Tma1 Andesite lava flows. Tma1: Lava flows, > fayalite). Member 3 is densely welded, 2 Aiquipoxillat ' local volcaniclastic deposits and breccia. m thick, with 20% phenocrysts (plagioclase Tma1d | Tma1d: Andesite dike. > K-feldspar = clinopyroxene > opaques). Tmprsz4 is densely-welded, 1 m thick, with Volcaniclastic sedimentary rock. Pyroclastic 3% phenocrysts (K-feldspar > plagioclase flows, debris flows, bedded and reworked tuff and volcanic breccia. Tmbr Landslide Breccia. Angular blocks and I fragments of tuff and andesite in a matrix of Tcg Conglomerate. Moderately lithified gravel and cobble conglomerate with interbedded sandstone. Clasts of locally-derived pulverized volcanic rocks and volcanic ash. monolithologic and polylithologic zones form a chaotic assemblage. Blocks of intact metamorphic and granitic basement rocks. bedded pumice and ash locally present. Gulf Shear zone formed at base of breccia. Granitic rocks. Felsic plutonic rocks of Tmrfp Tuffs of Arroyo El Canelo. Non-welded to primarily tonalite composition. Most likely of Cretaceous age based on studies of densely-welded ash-flow tuff. Tmrao: El Tmrec1 🔂 Oculto member. Non-welded and lithic-rich basement elsewhere in coastal Sonora and with 2% phenocrysts (plagiocalse + Baja California MzPzm Metasedimentary Rock. Thinly-bedded (1 to anorthoclase(?) > orthopyroxene). Tmrec: Tmrao | El Canelo members. Densely-welded dark-5 cm beds) quartzite, marble, pelitic schist, J purple tuff with 3 to 10% phenocrysts amphibolite and calc-silicate rock. This unit is intruded by the batholithic rocks. (plagioclase + anorthoclase >> Protolith could be Mesozoic, Paleozoic or orthopyroxene = Fe-Ti oxides > California hornblende). Distinctive pumice fiame up to 50 cm length. Cooling break (marker Mapping completed from 1998-2000. Author affiliation: horizon) indicated by lithic concentration California Institute of Technology. Assisted by Ernesto zone and vitrophyre. Bighorn Sheep Molina, Arturo Martín-Barajas, Claudia Lewis, Scott member forms a lithic concentration zone at Dobner, Matt Bachman, Robert Houston, Jason Wise, and the top of the El Canelo member. The Punta Vaporeta/ Bighorn Sheep member is mapped with the El Canelo member. Tmrfp: Flagpole member. 100 m contour-interval topographic data derived from a Densely welded dark-purple to dark-orange smoothed 90 m per pixel digital elevation model. Aerial tuff with 10% phenocrysts (plagiocalse + photography from CETENAL and a Landsat Thematic anorthoclase >> orthopyroxene = Fe-Ti Mapper image (Path 36, row 40) used as base maps. Universal transverse mercator projection, zone 12, central meridian 111 W. Clarke 1866 spheroid. Valle de Tecomate Bahía Vaporeta

112°25′00″

112°22′30″

112°20′00″