CHAPTER 1
AN INTRODUCTION TO 2014 FIELD STUDIES IN WESTERN COOK INLET, ALASKA
Marwan A. Wartes1, editor

INTRODUCTION

Resource assessments of the Cook Inlet region in south-central Alaska indicate that significant hydrocarbons likely remain to be discovered in the basin (BOEM, 2011; Stanley and others, 2011). The Alaska Division of Geological & Geophysical Surveys is leading a multi-agency collaborative effort to acquire new geologic data relevant to the petroleum system in Cook Inlet. This type of information is critical to improving the understanding of the basin’s evolution and provides new constraints on exploration models.

The Cook Inlet program has resulted in a number of publications to date, most notably a milestone synthesis of the framework geology of the basin, published as a book chapter by the American Association of Petroleum Geologists (LePain and others, 2013). Earlier noteworthy reports stemming from this program include a series of papers on the geology of reservoir analogs exposed in the Kachemak Bay area (LePain, 2009). Investigations along the western margin of Cook Inlet have also produced vital new information on the migration of oil within the basin, including the discovery of several new examples of oil-stained Cretaceous and Jurassic outcrops (LePain and others, 2012; Stanley and others, 2013a; Wartes and others, 2013a; Wartes and Herriott 2014a, 2014b). Petrologic work on newly collected samples has dramatically increased the available data on the reservoir quality of various units around the basin (Helmold and others, 2013). In addition to field geologic studies, the program has also integrated oil and gas well and seismic data to produce an important new map of the depth of the basal Tertiary unconformity in the Cook Inlet subsurface (Shellenbaum and others, 2010).

To provide timely results from ongoing studies, the program has produced an annual series of short reports highlighting noteworthy aspects of the previous year’s field studies (Gillis, 2013, 2014). This volume includes preliminary summaries of topical studies undertaken during the 2014 field season in western Cook Inlet. Much of this new information will contribute to a planned geologic mapping effort north of Chinitna Bay in summer 2015 (Gillis and others, 2014).

2014 FIELD STUDIES

This volume includes two papers detailing important aspects of the structural geology of western Cook Inlet. The first examines the complex kinematics of the Bruin Bay fault system, which marks the western boundary between the magmatic arc and the forearc basin (Detterman and Reed, 1980; fig. 1-1). This study examines a key locality at Ursus Head (fig. 1), and builds on prior work reported in Gillis and others (2013b) and Betka and Gillis (2014). The second structural geology paper summarizes new data on the nature of fractures in western Cook Inlet. Due to relatively low bulk porosity and permeability of Mesozoic rocks, fractures may prove to be a key factor controlling a number of potential exploration plays (Detterman and Hartsock, 1966; Blasko, 1976; Gillis and others, 2013a).

- The superposition of strike-slip and reverse-slip faults in the Bruin Bay fault system, Ursus Head, lower Cook Inlet (chapter 2)
- Preliminary investigation of fracture populations in Mesozoic strata of the Cook Inlet forearc basin: Iniskin Peninsula and Lake Clark National Park, Alaska (chapter 3)

The third chapter in this volume summarizes new field data from the volcanic and volcaniclastic rocks that comprise much of the hanging wall of the Bruin Bay fault (fig. 1-1). This report builds on preliminary discussions provided in Bull (2014), and will contribute significantly to criteria used in geologic mapping.

- Preliminary observations: Continued facies analysis of the Lower Jurassic Talkeetna Formation, north Chinitna Bay, Alaska (chapter 4)

The Middle Jurassic Tuxedni Group is the primary source of Cook Inlet oil (Magoon and Anders, 1992) and has been an important target of stratigraphic studies during the Cook Inlet program (LePain and others, 2013; Stanley and others, 2013b). The following three chapters provide new information on the sedimentology and reservoir quality of these rocks.

1Alaska Division of Geological & Geophysical Surveys, 3354 College Rd., Fairbanks, AK 99709-3707; marwan.wartes@alaska.gov
The final two chapters discuss ongoing stratigraphic studies of the Upper Jurassic Naknek Formation, building on prior stratigraphic work reported in Wartes and others (2013b) and Herriott and Wartes (2014). Although available data indicate reservoir quality in this unit will be challenging (Helmold and others, 2013), it is locally oil-stained (Stanley and others, 2013a) and may represent an important unconventional tight oil/gas play.

- Preliminary facies analysis of the lower sandstone member of the Upper Jurassic Naknek Formation, northern Chinitna Bay, Alaska (chapter 8)
- Evidence of a submarine canyon in the Snug Harbor Siltstone and Pomeroy Arkose Members, Naknek Formation, south-central Alaska—Implications for the distribution of coarse-grained sediment in Upper Jurassic strata of Cook Inlet (chapter 9)

ACKNOWLEDGMENTS

This work was primarily funded by a State of Alaska Capital Improvement Project. Work on the Iniskin Peninsula was also supported with funding from the National Cooperative Geologic Mapping Program administered by the U.S. Geological Survey (STATEMAP award G13AC00157). DGGS’s Cook Inlet basin program also received important funding contributions from Apache Corporation. We thank Jeff Shearer at Lake Clark National Park and Preserve for help with permitting. Critical access to Native lands was provided by Cook Inlet Region, Inc. (CIRI), and the following village corporations: Chickaloon, Knik, Ninilchik, Salamatof, Seldovia, and Tyonek. Helicopter and fuel logistics were ably provided by Pathfinder Aviation.
We thank the staff of Bear Mountain Lodge for their hospitality. We are grateful to Rebekah Tsigonis for providing field assistance, camp support, and patience. Robert Gillis and Paul Betka provided a simplified digital version of the geologic map that is the basis for figure 1-1. James Clough generously provided helpful review comments for this introduction and all the chapter contributions.

REFERENCES CITED


