HHS Public Access

Author manuscript

J Agromedicine. Author manuscript; available in PMC 2024 August 23.

Published in final edited form as:

J Agromedicine. 2023 July ; 28(3): 433–443. doi:10.1080/1059924X.2023.2171524.

Workplace Injuries Caused by Commercial Fishing Winches—Alaska, 2000–2020

Tristan M. Victoroff[a], **Samantha L. Case**[a], **Lakshmi D. Robertson**[a,b], **Laura N. Syron**[a]

[a]Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Western States Division, Spokane, Washington, USA

[b]Lexmark International, Inc, Boulder, Colorado, USA

Abstract

Objectives: Deck machinery is a leading source of hospitalized injury for commercial fishing workers in Alaska. More detailed data are needed about the specific circumstances leading to injuries for developing targeted prevention efforts.

Methods: This study analyzed claims submitted to the Alaska Fisherman′s Fund (AFF) to identify patterns among injuries in Alaska from commercial fishing winches.

Results: During January 1, 2000–November 1, 2020, 125 traumatic injuries from commercial fishing winches were identified, mainly occurring among males (94%), frequently among fishermen aged 30 years or younger (54%). Over 80% of winch injuries occurred in salmon fisheries. By gear type, 40% of injuries occurred on vessels using purse seine gear, 30% on vessels using drift gillnet gear, and 12% among set gillnet operators. Most injuries involved a fisherman having a body part caught in or compressed by a winch or cables attached to a winch (67%). Injuries mainly affected upper extremities including fingers (50% of cases) or hands/wrists (together 22% of cases). Injury severity was not formally assessed, but injuries ranged from contusions, sprains, and strains to finger or hand crushing injuries, upper limb amputation, skull fracture, spinal fracture, and chest trauma. Most cases involved fractures (23%), amputations (18%), lacerations (16%), and contusions (16%). Of all injuries, 51% were caused by anchor winches, 32% were caused by deck winches, 9% were caused by trailer winches, and 9% were caused by other types of winches.

Conclusions: Practical solutions are needed for avoiding entanglement and struck-by hazards when operating fishing winches. Anchor winches warrant focused attention, having accounted for more than half of all winch injuries identified in this study. Engineering solutions, including

CONTACT Tristan M. Victoroff, TVictoroff@cdc.gov, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Western States Division, Spokane, Washington, USA.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Disclaimer

The findings and conclusions of this report are those of the authors and do not necessarily represent the official position of the National Institute for Occupational Safety and Health.

emergency stop devices or other simple mechanical interventions depending on winch type, could help to avert potentially disabling injuries from winches. Administrative controls such as task-specific training for winches should be emphasized, especially for younger or less experienced commercial fishing crew, who may be at increased risk for injury.

Keywords

Nonfatal injury; occupational safety and health; fishing; winch safety

Introduction

Commercial fishing has historically been one of the most hazardous industries in the United States, particularly in Alaska, where 352 commercial fishermen died at work during 1992–2019.[1] The yearly number of fishing fatalities in Alaska has decreased in recent decades, from an average of 20 deaths per year during 1992–1999 to 8 - per year in 2010–2019.[1] However, commercial fishing in Alaska remains one of the country's deadliest industries: In 2019, the workplace fatality rate for Alaska's agriculture, forestry, and fishing sector was 179.9 deaths per 100,000 full-time equivalent workers (FTE), and all of the deaths occurred in commercial fishing. In contrast, the overall fatality rate for US workers was 3.5 deaths per 100,000 FTE.[2]

The National Institute for Occupational Safety and Health (NIOSH) has conducted commercial fishing safety research in Alaska since the 1990s. This work largely focused on preventing drowning caused by vessel disasters and falls overboard.[3-8] More recently, NIOSH has expanded efforts to characterize and prevent nonfatal injuries.[9-12] The events leading to nonfatal injuries are lesswell described, but deck machinery has been recognized as a primary source of injury on fishing vessels.[13] Among the deck machinery fishermen use, winches can be especially dangerous.[14,15] On fishing vessels, winches come in a variety of configurations but typically share the feature of a powered rotating shaft around which cable, chain, or other lines can be wound for the purpose of hoisting or hauling loads. Winches are integral to commercial fishing operations but due to the nature of their use often have minimal, if any guarding to separate fishermen from rotating parts.[16] Winch entanglements can occur, for example, if loose clothing gets caught in fishing line while hauling gear and a fisherman is pulled into the rotating mechanism.[17] The frequency of such events is not well documented, but when they do occur, they can result in severe injuries including finger and limb amputations, and can be career-ending for fishermen. NIOSH manages the Commercial Fishing Incident Database (CFID)[18] and has recorded three fatal injuries from fishing winches in Alaska during 2000–2017 (unpublished data) but does not systematically track nonfatal winch incidents.

Few published studies have examined injury risk from fishing winches. Two studies in the Southeast United States focused on injuries from commercial shrimp winches,[17,19] but it is uncertain how applicable these findings would be to other fisheries, since deck equipment can vary substantially by region. A 2001 analysis of Alaska Trauma Registry data reported 41 hospitalized fishermen with injuries from winches and pulleys from 1991 to 1998[13] in Alaska. Additionally, a more recent (2021) publication, one of the most comprehensive

studies of non-fatal injuries in the Alaska commercial fishing industry to date, attributed five injuries to winches in the salmon purse seine fleet during the period 2012–2016, although it was not expressly seeking to identify winch injuries.[12] More detailed information about winch injuries in Alaska is needed. The current study is meant to provide a quantitative estimate of winch injuries in Alaska from a longer time period, as well as improved qualitative information about the circumstances surrounding winch injuries.

In general, commercial fishermen injured at sea are not eligible for workers' compensation.[20] However, the state of Alaska established the Alaska Fisherman's Fund (AFF) as a dedicated compensation fund, financed through commercial fishing permitting and license fees, to pay for treatment of illnesses or injuries directly connected to commercial fishing operations in Alaska.[21] Eligibility for AFF claims is restricted to commercial fishing incidents. To qualify for benefits, claimants must hold a commercial fishing license or limited entry permit prior to injury. The AFF is a payer of last resort, and fishermen are eligible for benefits only after consideration of other medical coverage.[21] The current study is a descriptive analysis of injury narratives from claims submitted to the AFF. The purpose is to provide an estimate of nonfatal injuries caused by winches in Alaska fisheries over the past 20 years, and to better understand the sources and characteristics of these injuries with respect to specific equipment, fisheries, and vessel gear types involved. This information could aid risk communication efforts and guide injury prevention research and practice in the Alaska fishing industry.

Methods

In response to a public records request, the Alaska Department of Labor and Workforce Development provided a de-identified data extract of AFF claims. For this project, data were examined beginning January 1, 2000, and continuing to the most recent data available, which at the time of writing included claims up to November 1, 2020. The dataset included variables for date of injury, fishery type, gear type, sex, nature of injury, body part injured, diagnosis, claimant date of birth, claim status, and injury narrative. Because information was not available about the reasons for the status of individual claims, and in order to capture as many potential winch injury cases as possible, claims were examined regardless of claim status at the time data were provided (i.e., claims that were pending, approved, denied, appealed, withdrawn, or closed were all included). The injury narrative variable consisted of a text field typically containing one to three sentences of free text describing events leading to the condition for which the claimant sought care. Although the dataset included claims for both illnesses and injuries, this study focused solely on injuries. The injury narrative was the primary variable used to identify winch-related incidents.

Case identification

A text query was developed and applied to the injury narrative field to identify records containing the phrases "winch" and "winching," as well as potential misspellings including wench, wenching, wrench, wrenching, wynch, whinch, wnich, wnech, whench, winsh, wensh, or wenshing. Analyses were performed using Microsoft Excel® (2016). Initial query matches were considered potential cases. Records for potential cases were manually

reviewed by two commercial fishing subject matter experts at the NIOSH Center for Maritime Safety and Health Studies (CMSHS). Disagreements about case inclusion between the two initial reviewers were resolved by a third subject matter expert at CMSHS. A case definition was developed for categorizing potential cases as winch-related or non-winch-related. Case selection criteria were as follows:

Inclusion criteria—Any traumatic injury that occurred in the course of performing fishing related work on land or at sea, due to direct contact with a winch *during operation*, was included as a case. A traumatic injury was defined as an injury or disorder "resulting from a single incident, event, or exposure over the course of a single shift," consistent with Bureau of Labor Statistics guidelines.[22] Injuries caused by contact with an object connected to a winch while in operation (such as a line or cable connected to a winch) were also included. Dermal infections were included if they developed from cuts or scratches originally caused by traumatic contact with a winch.

Exclusion criteria—Injuries that occurred during maintenance or repair activities, or from lifting winches, were excluded based on the assumption that the winch would not have been in operation during such activities. Cumulative injuries such as tendonitis or hearing loss were excluded. Narratives that mentioned a winch incidentally but clearly described another primary source of injury were excluded (Table 1). Records with missing injury narratives were excluded.

Analysis

Records meeting all inclusion criteria were further categorized by winch type and event type. Two subject matter experts separately reviewed injury narrative fields and assigned injury cases to one of five winch types based on the injury narrative: Deck winch, anchor winch, trailer winch, other winch type (including boom winch, level winch, hanger winch, and picking winch), or unknown winch type. Event type was ascribed to cases using a modified application of the Bureau of Labor Statistics (BLS) Occupational Injury and Illness Coding guidelines (OIICS) version 2.01.[22] For this study, as with other NIOSH commercial fishing studies, OIICS standard event coding rules were modified slightly. Standard OIICS coding would result in the majority of cases in this study being coded as water vehicle incidents because incidents occurred on fishing vessels; instead, cases were assigned to categories that more precisely described the event leading to injury.[10] For example, the cause or event for a claim record containing the narrative, "finger caught in anchor winch," instead of being coded as a water vehicle incident, would be coded under the summary category, "caught in running equipment or machinery."[22] Fishery and gear type were obtained from categorical variables in the AFF dataset. Nature of injury and body region affected were coded according to BLS OIICS coding guidelines.[22] Generally, in cases with multiple injuries, the case was coded with the more severe nature of injury code. However, in some cases with two or more injuries, it was not possible to differentiate which was most severe. Some cases also involved injuries to two or more separate body regions. In these cases, per BLS guidelines, codes for multiple injuries were assigned. Therefore, tabulation of the number of injuries by injury nature or body part affected resulted in totals exceeding the total number of winch injury events identified.

Results

During the period January 1, 2000, to November 1, 2020, there were 11,719 claims submitted to the AFF. Among these, the initial text query for winch-related terms returned 148 potential winch injury cases. During manual review 23 potential cases were excluded. Most exclusions involved records with the word “winch” used incidentally or narratives describing repair operations, maintenance operations, or lifting of winches (Table 1). After manual review, a total of 125 traumatic injuries caused by winches during operation were included as cases. Cases occurred every year during the study period except in 2020 (a year for which data were only available to November 1). The highest number of cases (13) was recorded in 2009. During the overall study period, an average of six winch injuries occurred annually (Figure 1). The majority of winch injuries occurred among males (94%). Cases occurred in fishermen ranging from 14 to 70 years of age, with a mean age of 34.5 years. More than half of the cases (67 cases; 53.6%) occurred in fishermen aged 30 years or younger.

Winch injuries by fishery

Table 2 displays winch injuries by fishery and vessel gear type. Over 80% of winch injuries occurred in salmon fisheries. Winch injuries were identified in eight other fisheries (black cod, halibut, other bottomfish, Dungeness crab, sea cucumber, herring roe, sea urchin, and rockfish), each accounting for less than 5% of total winch injuries.

Winch injuries by vessel gear type

Among cases with vessel gear type reported, 40% occurred on vessels using purse seine gear, 30% occurred on vessels using drift gillnet gear, and 11.7% occurred among set gillnet operators. The remaining cases were distributed among 9 other vessel gear types (Table 2).

Cause of winch injuries – event type

The most common event leading to injury was being caught in or compressed by a winch or cables attached to the winch. This type of event accounted for 84 incidents (67% of cases). Twenty-one cases (17.5%) were cause by being struck by a winch (including being struck by a cable while hauling gear with a winch). Nine cases (7.5%) were from striking one’s body against a winch, five (4.2%) were caused by falls onto a winch, and five cases (4.2%) did not provide enough information to determine the event that caused injury. One case was determined to be exertion-related, from pulling a purse line attached to a winch.

Nature of injury and body regions affected

Table 3 displays winch injuries by nature of injury and body region affected. The majority of injuries were to the fingers (63 injuries; 50% of total cases) or the hand or wrist (28 injuries together; 22% of total). Additional injuries occurred to the arm, head, face chest, back, legs, and feet, and ankles. The most common injuries were fractures (29 injuries; 23%), amputations, (22 injuries; 18%) lacerations, (20 injuries; 16%), contusions (20 injuries; 16%), and other types of traumatic injuries which together affected 23 individuals (18% of total cases). Injuries ranged from contusions, sprains, and strains, to finger or hand crushing injuries, upper limb amputation, skull fracture, spinal fracture, and chest trauma.

Winch type

Among 114 winch injury claims with an identified winch type, 58 (51%) were caused by anchor winches, 36 (32%) were caused by deck winches, 10 (8.8%) were caused by trailer winches, and 10 (8.8%) were caused by other types of winches (boom winch, level winch, hanger winch, picking winch) (Figure 2). Eleven injury narratives described injuries caused by a winch but did not specify a type of winch. Table 4 further delineates winch injuries by type of winch involved and nature of injury. Deck winches caused injuries of every type, with amputations (8; 19% of deck winch injuries), other traumatic injuries (11; 26%) and fractures (7; 16%) being the most frequent. Anchor winches caused every type of injury except for joint dislocations, with fractures (15; 25% of anchor winch injuries), amputations (14; 23%), and other traumatic injuries (10; 16%) being most frequent. Trailer winches primarily caused contusions (5; 50% of trailer winch injuries) and lacerations (4; 40%), and one fracture. Injuries from other and unspecified winch types included lacerations, fractures, contusions, crushing injuries, and other traumatic injuries, but were not associated with any amputations, avulsions, sprains, strains, or dislocations (Table 4).

Winch type separated from vessel gear type

Table 5 displays winch accidents by vessel gear type and winch type. Winch accidents associated with purse seine vessels most frequently involved deck winches (34 cases; 71% of events involving purse seine gear), but in some cases involved anchor winches (9 cases; 19% of events involving purse seine gear). Accidents associated with drift gillnet gear primarily involved anchor winches (31 cases; 86% of events involving drift gillnet gear). Accidents among set gillnet operations mainly involved anchor winches (five cases; 36%) and trailer winches (eight cases; 57%). Injuries were associated with other fishing gear types and unknown gear types in smaller numbers, together accounting for 27 injury events (22% of total cases).

Discussion

This study identified 125 nonfatal injuries caused by commercial fishing winches in Alaska during a nearly 21-year period, an average of approximately six per year. By comparison, Thomas et al.[13] reported 41 nonfatal hospitalized injuries from winches and pullies during 1991–1998, an average of 5.1 per year. These results demonstrate that although commercial fishing in Alaska has undergone significant changes in the past three decades in terms of fisheries management, fishery participation, and equipment used,[23] winch injuries remain an ongoing problem. Some injuries in our dataset may have been minor, such as sprains or contusions. However, other injuries identified here such as avulsions, dislocations, crushing injuries, and amputations can be severe, are likely to result in lost fishing time and income, and could be permanently disabling. Therefore, it is important to understand any patterns in fisheries affected, equipment involved, or characteristics of injured crew.

Winch injuries identified here occurred in nine different fisheries but were mainly concentrated in salmon fisheries (82% of known cases). However, these results are probably explained at least in part by broader patterns in the type of fishing operations that submit claims to the AFF. During the study period, 60.3% of AFF claims from all causes were

from salmon fisheries (data not shown). This proportion is similar to results reported by Syron et al.[12] for AFF claims submitted during 2012–2016. Furthermore, a separate study of AFF claims submitted for injuries to workers under age 18 found that 80% of claims from all causes came from salmon fisheries.[24] The representation of salmon fisheries in the AFF database is generally consistent with employment trends in Alaska's fishing industry; from 2005 through 2020, salmon fisheries employed at least 50% of Alaska's fish harvesting workforce each year.[25]

In this dataset, winch accidents were most frequently associated with purse seine gear, consistent with previous NIOSH research and intervention efforts. Qualitative interviews with Alaska fishermen in the mid-2000s identified purse seine deck winches as being particularly dangerous.[14] In response, NIOSH engineers developed a prototype emergency stop system, or "e-stop" for hydraulically powered deck winches on purse seine vessels.[15] The e-stop was commercialized in 2008.[26] The original design has been further refined and is available for new winches or retrofitting to existing winches.[27] Yet, in the time since the e-stop was made commercially available, this study found 19 winch accidents caused by deck winches on purse seine vessels. It was not clear from the AFF injury narratives whether any of these incidents were associated with winches equipped with e-stops. Further research should be done to determine possible barriers to adoption of e-stop systems and what can be done to promote their use in commercial fishing. Additionally, these results highlight a need to focus injury prevention efforts on salmon fisheries using other gear types such as drift gillnet and set gillnet operations, which together accounted for 42% of winch injury cases with known gear types.

Importantly, this study categorized winch type from free text injury narratives, independent from the vessel gear type variable. This allowed identification of anchor winches as the source of more than half of the winch accidents (51%), across fisheries and vessel gear types. This result was unexpected. No previous published data has drawn attention to the risk specifically from anchor winches. The e-stop system discussed above, though theoretically compatible with any hydraulically powered winch, was not intended primarily for anchor winches. Anchor winches caused injuries among nearly every gear type reported in this study, but particularly affected fishermen using drift gillnet gear. There may be opportunities for other simple engineering controls or operating procedures to help keep body parts clear of anchor winches during operation, such as while leveling chains during anchor retrieval.

Fishermen injured by winches were predominantly male (94%) and more than half (54%) were under 30 years of age. Younger fishermen may be less experienced working with winches, and may not always receive adequate supervision from more experienced crew on vessels. Focused training on safe winch operation, including procedures for handling unexpected or adverse scenarios that can arise during operation, might help less experienced crew members avoid injury. A case series of winch injuries from the Gulf of Mexico found certain risk factors were associated with winch entanglements among shrimp fishermen, such as working alone on deck and wearing loose clothing. In 14 of 35 of these incidents, an article of loose clothing was cited as the first thing entangled in the winch.[17] Common factors in winch entanglements in Alaska fisheries may also exist. Future work should

attempt to identify best practices for avoiding winch injuries, which could be shared especially among younger and less experienced fishermen.

Strengths

This study focused on injuries from a specific source of deck machinery that has been the subject of long-term research investment from NIOSH, but for which injury statistics have been sparse. The AFF database has collected relevant variables from injury claims for more than twenty years, enabling analysis of commercial fishing injuries over a relatively longer timeframe than has been done in some studies.[9-13,17,24] AFF injury narratives contained sufficient detail to parse injury event and winch type in most cases. Furthermore, the AFF provides data on commercial fishing injuries that is largely not available from other sources, since prior research has found there is relatively little overlap between injuries reported to the AFF, injuries reported to the US Coast Guard, and injuries reported in the Alaska Trauma Registry (ATR).[12]

Limitations

The results presented here likely underestimate the true number of winch injuries that have occurred in Alaska during the study period. Because the AFF is a payer of last resort, with fishermen eligible for benefits only after consideration of other coverage, it would not be expected to capture all winch injury cases from Alaska fishermen.[21] An unknown number of commercial fishing injuries are covered by private insurance and may not be submitted as AFF claims. Furthermore, two other data sources for commercial fishing injuries were not consulted in this study: the ATR and the US Coast Guard database of marine casualty investigation reports. Both have been used in previous studies. In a recent (2021) paper, Syron et al.[12] linked injury and illness data across the AFF, ATR, and US Coast Guard reports for 2012–2016, a subset of years covered by this study, and found that up to 20% of nonfatal injuries/illnesses were not captured in the AFF, instead being captured only in the US Coast Guard database (16%) or the ATR (4%). Both of these databases may contain information on additional winch injuries not found in the AFF. Syron et al. also noted that AFF claims primarily came from small, independently owned salmon vessels, in contrast to US Coast Guard reports, which mainly came from larger company-owned vessels operating in other fisheries. Hence, use of the AFF alone may tend to exclude injuries that occur in certain fishing fleets. In the current study, while AFF injury diagnosis field contained sufficient information to assess the nature of injury, many records did not describe injuries precisely enough to assign injury severity. Consequently, no attempt was made to formally score injury severity. Additionally, a bias might have been introduced in this study with regard to findings by gear type or fishery, by focusing on records containing the term “winch.” Fishing terminology can be highly specific. Similar powered equipment for hauling nets, pots, or other gear may be referred to using other terms. Other terms were not included in the text query in this study, which could have led to cases being missed from other vessel gear types or fisheries. Finally, fishing equipment is often adapted to the species, conditions, and permitting that exist in specific areas. Consequently, the distribution of injuries by fishery, gear type, and winch type found in this study may have limited reproducibility outside of Alaska.

Conclusion

Only two prior publications have analyzed AFF injury data.[12,24] The AFF database represents an important data source for describing Alaska fishing winch injuries in more detail than has been available to date. These data have the potential to inform injury prevention activities, such as targeted safety messages. The study provides an updated estimate of winch-related injuries showing that winch accidents continue to be a problem in the Alaska fishing industry, particularly among purse seine and drift gillnet vessels. E-stops are available for purse seine winches, and safety messaging should emphasize the potentially serious injuries that purse seine winches can cause, which e-stops can help to prevent. However, practical solutions are needed for keeping body parts clear of entanglement hazards on all types of winches. Focused attention is needed especially for anchor winches. Anchor winches cause injuries of the type that can be severe and life altering, including fractures, crushing injuries, lacerations, and amputations. Simple mechanical interventions such as guiding rods for anchor chains could potentially prevent some injuries associated with anchor retrieval. Administrative controls and training are also critical for preventing injuries. Safety training for winch operations should target younger and less experienced fishermen, who may be at increased risk for injury.

Acknowledgments

The authors would like to thank the Alaska Department of Labor and Workforce Development, which provided data for this study from the Alaska Fishermen's Fund. The authors also thank Devin Lucas, Alice Shumate, and Christa Hale for reviewing and providing feedback on the manuscript.

Funding

The authors did not receive any specific grant for this work from funding agencies in the public, commercial, or not-for-profit sectors.

References

1. Alaska Department of Labor and Industries. Research and analysis section. workplace fatalities homepage. historical data. [Internet]. Available at: https://live.laborstats.alaska.gov/fatal/index.html [Accessed May 23, 2022]
2. Bureau of Labor Statistics [BLS]. Census of fatal occupational injuries. [Internet]. Available at: https://www.bls.gov/iif/oshcfoi1.htm [Accessed November 3, 2021]
3. Conway GA, Lincoln JM, Jorgensen SA, et al. Preventing deaths in Alaska's commercial fishing industry. Int J Circumpolar Health. 1998;57(1):503–509. [PubMed: 10093333]
4. Lucas DL, Lincoln JM. Fatal falls overboard on commercial fishing vessels in Alaska. Am J Ind Med. 2007;50(12):962–968. doi:10.1002/ajim.20509. [PubMed: 17910031]
5. Lucas D, Lincoln J, Somervell P, Teske T. Worker satisfaction with personal flotation devices (PFDs) in the fishing industry: evaluations in actual use. Appl Ergon. 2012;43(4):747–752. doi:10.1016/j.apergo.2011.11.008. [PubMed: 22123533]
6. Lucas DL, Lincoln JM, Carozza SE, et al. Predictors of personal flotation device (PFD) use among workers in the Alaska commercial fishing industry. Saf Sci. 2013;53:177–185. doi:10.1016/j.ssci.2012.10.002.
7. Lucas DL, Case SL, Lincoln JM, et al. Factors associated with crewmember survival of cold water immersion due to commercial fishing vessel sinkings in Alaska. Saf Sci. 2018;101:190–196. doi:10.1016/j.ssci.2017.09.009. [PubMed: 29861549]
8. Case SL, Lucas DL. Predicting commercial fishing vessel disasters through a novel application of the theory of man-made disasters. J Saf Res. 2020;75:51–56. doi:10.1016/j.jsr.2020.07.005.

9. Lucas DL, Kincl LD, Bovbjerg VE, et al. Work-related traumatic injuries onboard freezer-trawlers and freezer-longliners operating in Alaskan waters during 2001-2012. Am J Ind Med. 2014;57(7):826–836. doi:10.1002/ajim.22310. [PubMed: 24585666]
10. Syron LN, Lucas DL, Bovbjerg VE, et al. Occupational traumatic injuries among offshore seafood processors in Alaska, 2010–2015. J Saf Res. 2018;66:169–178. doi:10.1016/j.jsr.2018.07.008.
11. Syron LN, Lucas DL, Bovbjerg VE, et al. Injury and illness among onshore workers in Alaska's seafood processing industry: analysis of workers' compensation claims, 2014-2015. Am J Ind Med. 2019;62(3):253–264. doi:10.1002/ajim.22953. [PubMed: 30688374]
12. Syron LN, Case SL, Lee JR, Lucas DL. Linking datasets to characterize injury and illness in Alaska's fishing industry. J Agromedicine. 2021;26(1):31–44. doi:10.1080/1059924X.2020.1845893. [PubMed: 33146590]
13. Thomas TK, Lincoln JL, Husberg BJ, et al. Is it safe on deck? Fatal and non-fatal workplace injuries among Alaskan commercial fishermen. Am J Ind Med. 2001;40(6):693–702. doi:10.1002/ajim.10010. [PubMed: 11757046]
14. NIOSH. The Most Powerful Thing … Deck Safety Awareness for Purse Seiners. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. National Institute for Occupational Safety and Health; April 2007. DHHS (NIOSH). Available at: https://www.cdc.gov/niosh/docs/video/seining.html [Accessed May 23, 2022].
15. Lincoln JM, Lucas DL, McKibbin RW, et al. Reducing commercial fishing deck hazards with engineering solutions for winch design. J Saf Res. 2008;39(2):231–235. doi:10.1016/j.jsr.2008.02.027.
16. Lincoln JM, Woodward CC, King GW, et al. Preventing fatal winch entanglements in the US southern shrimp fleet: a research to practice approach. J Saf Res. 2017;60:119–123. doi:10.1016/j.jsr.2016.12.007.
17. Lucas D, Woodward C, Lincoln J. Fatal and nonfatal injuries involving fishing vessel winches—southern shrimp fleet, United States, 2000-2011. MMWR Morb Mort Wkly Rep. 2013;62:157–160.
18. Commercial Fishing Incident Database [CFID]. Managed at the National Institute for Occupational Safety and Health. AK: Anchorage; 2016. https://www.cdc.gov/niosh/topics/fishing/projects.html.
19. Schroeder FA, Viegas SF, Carmichael K. Shrimp winch injuries. J Trauma. 2008;65(1):142–146. doi:10.1097/TA.0b013e3180a02ee0. [PubMed: 18580527]
20. The Alaska State Legislature. Alaska Statutes 2021. Chapter 30. Alaska Workers' Compensation Act. Sec. 23.30.230. Persons not covered. [Internet]. Available at: https://www.akleg.gov/basis/statutes.asp#23.30.230 (Accessed August 22, 2022).
21. State of Alaska Department of Labor and Workforce Development. Fisherman's Fund. [Internet]. Available at: https://labor.alaska.gov/wc/ffund.htm (Accessed November 3, 2021).
22. Bureau of Labor Statistics [BLS]. Occupational Injury and Illness Classification Manual, Version 2.01. Washington, D.C: U.S. Department of Labor; 2012. (Accessed November 2, 2021. Available at. https://www.bls.gov/iif/oshoiics.htm
23. Beaudreau AH, Ward EJ, Brenner RE, et al. Thirty years of change and the future of Alaskan fisheries: shifts in fishing participation and diversification in response to environmental, regulatory and economic pressures. Fish Fish. 2019;20:601–619. doi:10.1111/faf.12364.
24. Rudolphi JM, Berg RL. Injuries and illnesses to children in commercial fishing in Alaska: a brief report. Am J Ind Med. 2021;64(5):398–402. doi:10.1002/ajim.23232. [PubMed: 33616281]
25. Alaska Department of Labor and Workforce Development. Fish harvesting employment by species and month. [Internet]. Available at: https://live.laborstats.alaska.gov/seafood-harvest-by-species (Accessed May 27, 2022).
26. NIOSH. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health (NIOSH). Commercial fishing safety: engineering solutions. [Internet]. Available at: https://www.cdc.gov/niosh/topics/fishing/engineering.html (Accessed November 3, 2021).
27. Kolstrand Marine. [Internet]. Available at: https://www.kolstrand.com/kolstrand-e-stop-emergency-stop-switch-kit-for-purse-winch/ (Accessed November 3, 2021).

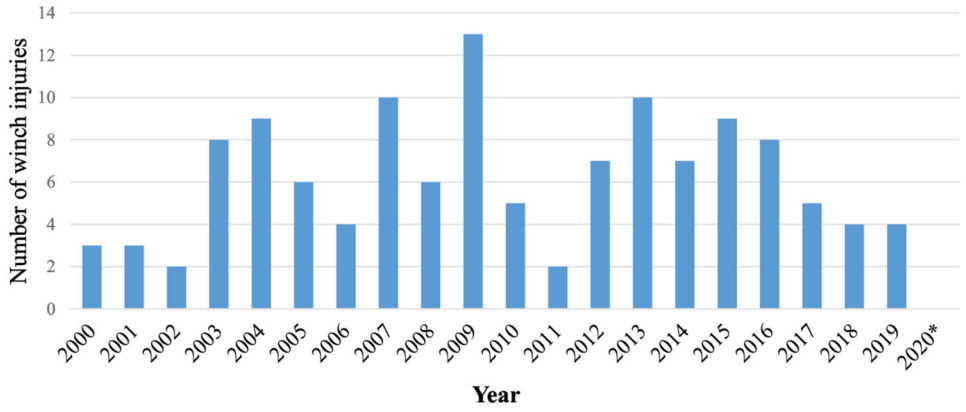

Figure 1.

Commercial fishing winch injury claims by year, Alaska Fisherman′s Fund, Alaska, January 1, 2000–November 1, 2020.

*No winch injuries were identified in 2020

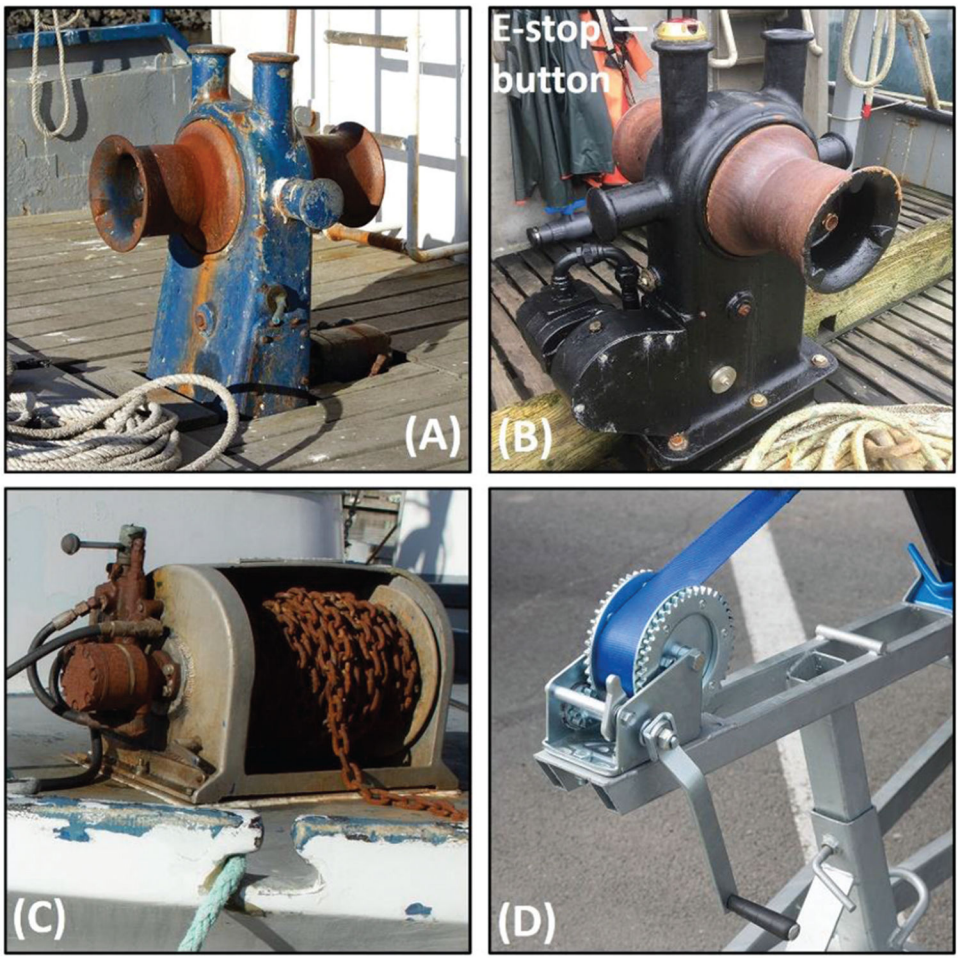

Figure 2.

Representative images of winches commonly used in commercial fishing in Alaska. (A) Purse seine deck winch (photo by Ted Teske, NIOSH). (B) Purse seine deck winch, retrofitted with emergency stop device ("e-stop") (photo by Ted Teske, NIOSH). (C) Fishing vessel anchor winch (photo by Ted Teske, NIOSH). (D) Boat trailer winch (photo by ©K-Paul/Getty Images).

Table 1.

Representative examples of injury narratives from claims for potential winch-related injuries – Alaska Fisherman′s Fund, January 1, 2000-November 1, 2020.

	Injury narrative	Determination
Example 1	*“Right forearm was wrapped in the anchor winch.”*	Included
Example 2	*“Closing seine set, arm wrapped into deck winch.”*	Included
Example 3	*“Hand caught in deck wench while pulling in the end of the net.”*	Included
Example 4	*“Hand cranking winch on boat trailer, hit in the head by handle.”*	Included
Example 5	*“Dropped anchor on finger while servicing anchor winch.”*	Excluded
Example 6	*“Taking purse line to the winch, forgot fish hold was open stepped back and fell into the fish hold.”*	Excluded
Example 7	*“Lifting a winch, back strain.”*	Excluded

Table 2.

Winch injuries among Alaska commercial fishermen by fishery and vessel gear type, January 1, 2000–November 1, 2020.

	Number of injuries (%)
Fishery *(n = 123)* *	
Salmon	101 (82.1)
Black cod	6 (4.9)
Halibut	4 (3.3)
Other bottomfish	3 (2.4)
Dungeness crab	3 (2.4)
Sea cucumber	3 (2.4)
Herring roe	1 (0.8)
Sea urchin	1 (0.8)
Rockfish	1 (0.8)
Vessel gear type † *(n = 120)*	
Purse seine	48 (40.0)
Drift gillnet	36 (30.0)
Set gillnet	14 (11.7)
Longline (vessel over 5 tons)	4 (3.3)
Pot gear (vessel undocumented or under 50 ft)	4 (3.3)
Other, multiple gears	4 (3.3)
Dive, hand-pick	2 (1.7)
Longline	2 (1.7)
Power troll	2 (1.7)
Beam trawl	2 (1.7)
Pot gear (vessel regulated, length over 50 ft)	1 (0.8)
Tender/packer	1 (0.8)

* Fishery not reported for 2 cases

† Gear type not reported for 5 cases

Table 3.

Body region affected and nature of injury for 125 winch injury events reported to the Alaska Fisherman´s Fund – Alaska, January 1, 2000–November 1, 2020*.

		Body region affected							
Nature of injury	**Fingers**	**Hand/wrist**	**Arm**	**Head/face**	**Neck**	**Chest/back**	**Leg**	**Foot/ankle**	**Row Totals**
Fracture	16	7	1	2	-	3	-	-	**29**
Other traumatic injury†	2	4	5	1	1	5	4	1	**23**
Amputation	21	-	1	-	-	-	-	-	**22**
Contusion	2	9	2	2	-	2	3	-	**20**
Laceration	11	3	-	6	-	-	-	-	**20**
Crushing	6	2	-	-	-	-	1	-	**9**
Avulsion/degloving	4	1	-	-	-	-	-	-	**5**
Sprain/strain	-	2	-	-	-	1	1	1	**5**
Dislocation	1	-	2	-	-	-	-	-	**3**
Column Totals	**63**	**28**	**11**	**11**	**1**	**11**	**9**	**2**	

*Percentages not presented because some cases included multiple types (natures) of injury, or injuries to multiple body regions. Therfore, row and column totals sum to greater than the total number of winch injury cases.

†Other traumatic injuries included: Chest trauma; closed head trauma; tendon rupture; rib injury; arm, neck, and back pain; hand burn; other injury to hand, wrist, arm, knee, or foot; tenosynovitis of arm; unspecified surface wound.

Table 4.

Types of winches involved in 125 injury events, by nature of injury, reported to the Alaska Fisherman´s Fund – Alaska, January 1, 2000–November 1, 2020*.

	Winch type associated with injury					
Nature of injury§	**Deck winch**	**Anchor winch**	**Trailer winch**	**Other type†**	**Unspecified winch type**	**Row totals**
Fracture	7	15	1	3	3	**29**
Other traumatic injury††	11	10	-	2	-	**23**
Amputation	8	14	-	-	-	**22**
Contusion	5	7	5	1	2	**20**
Laceration	2	5	4	4	5	**20**
Crushing	3	4	-	1	1	**9**
Avulsion/degloving	2	3	-	-	-	**5**
Sprain/strain	2	3	-	-	-	**5**
Dislocation	3	-	-	-	-	**3**
Column totals	**43**	**61**	**10**	**11**	**11**	

*Percentages not presented because some cases included more than one type of injury. Therefore, column and row totals exceed the total number of injury events.

§Cells display the number of injuries of each nature that each type of winch produced. For example, deck winches caused a total of eight amputations.

†Other winch types included: boom winch, level winch, hanger winch and picking winch.

††Other traumatic injuries included: Tendon rupture; closed head trauma; rib injury; arm, neck, and back pain; hand burn; other injury to hand, wrist, arm, knee, or foot; tenosynovitis of arm; unspecified surface wound; other unspecified pain.

Table 5.

Vessel gear type and winch type* reported for 125 winch injury events reported to the Alaska Fisherman´s Fund – Alaska, January 1, 2000–November 1, 2020.

	Winch injury cases (N)					
Reported vessel gear type	**Deck winch**	**Anchor winch**	**Trailer winch**	**Other type†**	**Unknown**	**Total injuries by gear type (N, %)††**
Purse seine	34	9	1	2	2	**48 (38.4)**
Drift gillnet	-	31	-	3	2	**36 (29.0)**
Set gillnet	1	5	8	-	-	**14 (11.2)**
Longline (vessel over 5 tons)	-	1	-	2	1	**4 (3.2)**
Pot gear (vessel undocumented or under 50 ft)	-	2	-	2	-	**4 (3.2)**
Other, multiple gears	-	2	-	-	2	**4 (3.2)**
Dive, hand-pick	1	1	-	-	-	**2 (2.0)**
Longline	-	1	-	-	1	**2 (2.0)**
Power troll	-	1	-	1	-	**2 (2.0)**
Beam trawl	-	1	-	-	1	**2 (2.0)**
Pot gear (vessel regulated, length>50 ft)	-	-	-	-	1	**1 (1.0)**
Tender/packer	-	1	-	-	-	**1 (1.0)**
Unknown/unreported	-	3	1	-	1	**5 (4.0)**
Total injuries by winch type	**36**	**58**	**10**	**10**	**11**	

*Winch type unknown/unrecorded for 11 cases.

†Other winch types described included: boom winch, level winch, hanger winch and picking winch.

††Row percentages reflect the percent of all winch injury events attributed to the type of vessel gear reported. Sum of row percentages exceeds 100% due to rounding.