B.10 Southern California Steelhead

PRIMARY CONTRIBUTOR: DAVID BOUGHTON
SOUTHWEST FISHERIES SCIENCE CENTER – SANTA CRUZ LAB

B.10.1 Summary of Previous BRT Conclusions

The geographic range of the ESU was determined to extend from the Santa Maria River basin near the town of Santa Maria, south to the U.S. border with Mexico. There is a report of *O. mykiss* populations in Baja California del Norte (Ruiz-Campos and Pister 1995); these populations are thought to be resident trout, but could be found to have an anadromous component with further study (note that they do not lie within the jurisdiction of the Endangered Species Act). NMFS (1997) cites reports of several other steelhead populations south of the border. The Southern California ESU is the extreme southern limit of the anadromous form of *O. mykiss*. It was separated from steelhead populations to the north on the basis of a general faunal transition (in the fauna of both freshwater and marine systems) in the vicinity of Point Conception. The genetic differentiation of steelhead populations within the ESU, and from other ESUs in northern California or the Pacific Northwest appears to be great; however the conclusion is based on genetic data from a small number of populations.

Summary of Major Risks and Status Indicators

Risks and limiting factors—The original BRT noted that there has been extensive loss of populations, especially south of Malibu Creek, due to urbanization, dewatering, channelization of creeks, human-made barriers to migration, and the introduction of exotic fish and riparian plants. Many of these southernmost populations may have originally been marginal or intermittent (i.e., exhibiting repeated local extinctions and recolonizations in bad and good years, respectively). No hatchery production exists for the ESU. The relationship between anadromous and resident *O. mykiss* is poorly understood in this region, but likely plays an important role in population dynamics and evolutionary potential of the fish.

Status indicators—Historical data on the ESU were sparse. The historical run size for the ESU was roughly estimated to be at least 32,000–46,000 (estimates for the four systems comprising the Santa Ynez, Ventura, and Santa Clara Rivers and Malibu Creek, which omits the Santa Maria system and points south of Malibu Creek). Recent run sizes for the same four systems were roughly estimated to be less than 500 adults total. No time-series data were found for any populations.

Previous BRT Conclusions

The original BRT concluded that that ESU was in danger of extinction, noting that populations were extirpated from much of their historical range (Busby et al. 1996). There was strong concern about widespread degradation, destruction, and blockage of freshwater habitats, and concern about stocking of rainbow trout. The two major areas of uncertainty were (1) lack of data on run sizes, past and present; and (2) the relationship between resident and anadromous forms of the species in the region. A second BRT convened for an update (NMFS 1997) found that the small amount of new data did not suggest that the situation had improved, and the majority view was that the ESU was still in danger of extinction.

Listing Status

The ESU was listed as endangered in 1997. The original listing defined the ESU as having its southern geographic limits in Malibu Creek. Two small populations were subsequently discovered south of this point, and in 2002 a notice was published in the *Federal Register*, extending the range to include all steelhead found in drainages south to the U.S. border with Mexico.

B.10.2 New Data and Updated Analyses

There are four new significant pieces of information:

1. Four years of adult counts in the Santa Clara River;
2. observed recolonizations of vacant watersheds, notably Topanga Creek in Los Angeles c=County, and San Mateo Creek in Orange County;
3. a comprehensive assessment of the current distribution of *O. mykiss* within the historical range of the ESU (Boughton and Fish MS); and
4. changes in the harvest regulations of the sport fishery.

Items 1, 2, and 4 are described further in the Section B.2.9.3, "New and Updated Analyses"; item 3 is described below.

Current Distribution vs. Historical Distribution

In 2002, an extensive study was made of steelhead occurrence in most of the coastal drainages within the geographic boundaries of the ESU (Boughton and Fish MS). Steelhead were considered to be present in a basin if adult or juvenile *O. mykiss* were observed in any stream reach that had access to the ocean (i.e., no impassable barriers between the ocean and the survey site), in any of the years 2000–2002 (i.e., within one steelhead generation). Of 46 drainages in which steelhead were known to have occurred historically, between 37% and 43% were still occupied by *O. mykiss*. The range in the estimate of occupancy occurs because a number of basins could not be surveyed due to logistical problems, pollution, or lack of permission to survey on private land. Three basins were considered vacant because they were dry, 17 were considered vacant due to impassable barriers below all spawning habitat, and six were considered vacant because a snorkel survey found no evidence of *O. mykiss*. These snorkel surveys consisted of spot checks in likely-looking habitat and did not involve a comprehensive assessment of each basin.

One of the "dry" basins—the San Diego River—may have water in some tributaries—it was difficult to establish that the entire basin below the dam was completely dry. Numerous anecdotal accounts suggest that several of the basins that had complete barriers to anadromy may have landlocked populations of native steelhead/rainbow trout in the upper tributaries. These basins include the San Diego, Otay, San Gabriel, Santa Ana, and San Luis Rey Rivers. Occupancy was also determined for 17 basins with no historical record of steelhead occurrence; none was found to be currently occupied.

Nehlsen et al. (1991) listed the following southern California stocks as extinct: Gaviota Creek, Rincon Creek, Los Angeles River, San Gabriel River, Santa Ana River, San Diego River, San Luis Rey River, San Mateo Creek, Santa Margarita River, Sweetwater River, and Maria Ygnacio River. The distributional study of 2002 determined that steelhead were present in two of these systems, namely Gaviota Creek (Stoecker and CCP 2002) and San Mateo Creek (a recent colonization; see below). Nevertheless, the current distribution of steelhead among the basins of the region appears to be substantially less than what occurred historically. Except for the small population in San Mateo Creek in northern San Diego County, the anadromous form of the species appears to be completely extirpated from all systems between the Santa Monica Mountains and the Mexican border. Additional years of observations, either of presence or absence, would reduce the uncertainty of this conclusion.

Table B.10.1. Estimates from Busby et al. (1996), for run sizes in the major river systems of the Southern California steelhead ESU.

River Basin	Run-Size Estimate	Year	Reference
Santa Ynez	20,000–30,000	Historical	Reavis (1991)
	12,995–25,032	1940s	Shapovalov and Taft (1954)
	20,000	Historical	Titus et al. (MS)
	20,000	1952	CDFG (1982)
Ventura	4,000–6,000	Historical	AFS (1991)
	4,000–6,000	Historical	Hunt et al. (1992)
	4,000–6,000	Historical	Henke (1994)
	4,000–6,000	Historical	Titus et al. (MS)
Matilija Creek	2,000–2,500	Historical	Clanton and Jarvis (1946)
Santa Clara	7,000–9,000	Historical	Moore (1980)
	9,000	Historical	Comstock (1992)
	9,000	Historical	Henke (1994)

Recent Colonization Events

Several colonization events were reported during the interval 1996–2002. Steelhead colonized Topanga Creek in 1998 and San Mateo Creek in 1997 (R. Dagit and T. Hovey, pers. comm.). As of this writing (October 2002), both colonizations persist, although the San Mateo Creek colonization appears to be declining. T. Hovey (CDFG, pers. comm.) used genetic analyses to establish that the colonization in San Mateo Creek was made by two spawning pairs in 1997. In the summer of 2002 a dead mature female was found in the channelized portion of the San Gabriel River in the Los Angeles area (M. Larsen, CDFG, pers. comm.). A single live adult was found trapped and oversummering in a small watered stretch of Arroyo Sequit in the Santa Monica Mountains (K. Pipal and D. Boughton, UCSC and NMFS, pers. comm.). The "run sizes" of these colonization attempts are of the same order as recent "run sizes" in the Santa Clara system—namely, less than five adults per year. Each of the four colonization events reported above occurred in a basin in which the presence of steelhead had been documented historically (Titus et al. MS).

B.10.3 New and Updated Analyses

Two significant analyses exist: (1) A critical review of the historical run sizes cited in the previous status review, and (2) a few new data on run size and population distribution in three of the larger basins.

Review of Historical Run Sizes

Few quantitative data exist on historical run sizes of southern California steelhead. Based on the available information at the time, the previous status review made rough estimates for three of the large river systems (Table B.10.1), and a few of the smaller ones (Busby et al. 1996).

The Santa Ynez—The run size in the Santa Ynez system—probably the largest run historically—was estimated to originally lie between 20,000 and 30,000 spawners (Busby et al. 1996). This estimate was based primarily on four references cited in the status review: Reavis (1991), 20,000–30,000 spawners; Titus et al. (MS), 20,000 spawners; Shapovalov and Taft (1954), 12,995–25,032 spawners; and CDFG (1982), 20,000 spawners. Examination of these references revealed the following: Reavis (1991) asserted a run size of 20,000–30,000, but provided no supporting evidence. Titus et al. (MS) reviewed evidence described by Shapovalov (1944), to be described below. Shapovalov and Taft (1954) did not address run sizes in this geographic region; the citation is probably a mis-citation for Shapovalov (1944). CDFG (1982) makes no reference to salmonid fishes in southern California.

Entrix (1995) argued that the estimate of 20,000–30,000 is too large. They argued that the only direct observations of run size are from Shapovalov (1944), an assertion that appears to be correct. These data are based on a CDFG employee's visual estimate that the 1944 run was "at least as large" as runs in the Eel River (northern California), which the employee had observed in previous years. Estimated run sizes for the Eel River ranged between 12,995 and 25,032 during the years 1939 to 1944 (Shapovalov 1944), and this has thus been reported as the estimated run size of the Santa Ynez. Entrix (1995) observed, however, that the employee who made the comparison was only present at the Eel River during two seasons, 1938–1939 and 1939–1940. The estimates for run sizes in those years were 12,995 and 14,476, respectively, which suggests that a more realistic estimate for the Santa Ynez run of 1944 would be 13,000–14,500. Taking this chain of reasoning to its logical conclusion, the range 13,000–14,500 should be regarded as a minimum run size for the year in question, since the employee used the phrase "at least as large."

It is perhaps useful to place the year 1944 in context, since expert opinion about run size is based solely on observations made in that year. Entrix (1995) report that 1944 occurred toward the end of a wet period, which may have provided especially favorable spawning and rearing conditions for steelhead. Rainfall data from Santa Barbara County historical records give a different picture from Entrix (1995): only two of the preceding eight years (1940 and 1943) were wetter than the 107-year average for the area (M. Capelli, pers. comm.); 1944 was near average; and otherwise, rainfall was below average.

In addition, the year 1944 seems to have occurred toward the end of a period in which extensive rescues of juvenile steelhead were made during low-flow years (Shapovalov 1944, Titus et al. MS). Over the interval 1939–1946, a total of 4.3 million juveniles were rescued from drying portions of the main stem, and usually replanted elsewhere in the system. This averages to about 61,400 juveniles rescued per year. Assuming that rescue operations lowered the mean mortality rate as intended, during the 1939–1946 interval the Santa Ynez population may have increased somewhat (or failed to undergo a decline) due to the rescue operations. A rough estimate of magnitude can be made: Assuming deterministic population growth (as opposed to stochastic), and a survival to spawning of about 1%, the rescues would have increased the run size by about 4% per generation. High environmental stochasticity in survival of the rescued fish and in the overall population growth—which almost certainly was the case—would have reduced the effect size to be much lower than 4%.

There is a counter argument to the argument that the 1944 estimate is too high; namely, that it is too low. The estimate was not made until 24 years after a significant proportion of spawning and rearing habitat had been blocked behind dams. The Santa Ynez system currently has three major dams on the main stem, which block portions of spawning and rearing habitat. The middle dam (Gibraltar), built in 1920, blocked access to 721 km of stream, much of which was widely regarded to be high-quality spawning and rearing habitat (Appendix B.14, Table B.14.1; Titus et al. MS). At that time, no estimates of run size had been made for the Santa Ynez. An upper dam (Juncal) was constructed in 1930 and may have had a negative effect on run size through reduction of flows to the lower main stem. Only the lower dam (Cachuma or Bradbury) was built late enough (1953) to not cause the 1944 estimate to be a biased estimate of historical run size.

Ventura—According to Titus et al. (MS), the Ventura River was estimated to have a run size of 4,000–5,000 adults during a normal water year. This estimate was made in 1946, although it is likely that the estimate is an expert opinion based on numerous years of observation. The system had received numerous plantings of juveniles in the preceding period (27,200 in 1943, 20,800 in 1944, and 45,440 in 1945, as well as 40,000 in 1930, 34,000 in 1931, and 15,000 in 1938). These rescues probably had small effect, for reasons similar to those cited above for the Santa Ynez. As in the Santa Ynez, anecdotal accounts suggest that run sizes declined precipitously during the late 1940s and 1950s, due possibly to both drought and to anthropogenic changes to the river system such as dam construction. Similar considerations apply to the estimate made by Clanton and Jarvis (1946), of 2,000–2,500 adults in the Matilija basin, a major tributary of the Ventura River.

Santa Clara—Moore's (1980) estimate of 9,000 spawners in the Santa Clara basin is an extrapolation of the estimate of Clanton and Jarvis's (1946) estimate for Matilija Creek. Moore assumed similar levels of production per stream mile in the two systems, and noted that at least five times more spawning and rearing habitat exists in the Santa Clara. Moore (1980) regarded his estimate as biased downward because, although it included the major spawning areas (Santa Paula, Sespe, and Piru Creeks), it omitted numerous small side tributaries.

Ed Henke (cited in NMFS 1997) stated that abundance of steelhead in the Southern California ESU was probably about 250,000 adults prior to European settlement of the region. His argument is based on historical methods of research involving interviews of older residents of the area as well as written records. The original analysis producing the cited estimate is part of ongoing research and was not made available for review at the time of this writing (E. Henke, pers. comm.).

In summary, the estimates of historical run sizes for this steelhead ESU are based on very sparse data and long chains of assumptions that are plausible but have not been adequately tested. It seems reasonable to say that the existing estimates are biased upward or downward by some unknown amount. It is certainly clear from the historical record that adult run sizes of the past could be two or three orders of magnitude greater in size than those of recent years, but the long-term mean or variance in run size is not known with any reasonable precision. Assuming that spawning and rearing success are related to rainfall, the variance between years was likely high due to climatic variability in southern California; and variance among decades high due to the Pacific Decadal Oscillation. In addition, long-term climate change in the region likely causes the running mean of run size (whatever it may be) to exhibit drift over time. If one were to be interested in the true potential productivity of these systems, much would be learned by some targeted field studies on the current habitat-productivity relationships for the fish, and by studies of the influence of climate, water management practices, and their interaction. It does not seem likely that further historical research will turn up information useful for making more refined estimates, despite the fact that it is useful for determining where exactly the fish occurred.

Recent Run Sizes of Large River Systems

It seems likely that the larger river systems were originally the mainstay of the ESU. Large river systems that harbored steelhead populations in the past are (from north to south) the Santa Maria, Santa Ynez, Ventura, Santa Clara, Los Angeles, San Gabriel, Santa Ana, and possibly the San Diego. Of these eight systems, the data suggest that steelhead currently occur in only four—the Santa Maria, Santa Ynez, Ventura, and Santa Clara.

The Santa Maria—There do not appear to be any estimates for recent run sizes in the Santa Maria system. Twitchell Dam blocks access to a significant proportion of historical spawning habitat, the Cuyama River, one of the two major branches of the Santa Maria. The other major branch, the Sisquoc River, appears to still have substantial spawning and rearing habitat that is accessible from the ocean; juvenile steelhead have recently been observed in these areas (Cardenas 1996, Kevin Cooper, Los Padres NF, pers. comm.).

The Santa Ynez—Most of the historical spawning habitat is blocked by Cachuma and Gibraltar Dams. However, extensive documentation exists for steelhead/rainbow trout populations in a number of ocean-accessible sites below Cachuma Dam (Table B.10.2). These are Salsipuedes/El Jaro Creeks, Hilton Creek, Alisal Creek, Quiota Creek, San Miguelito Creek, and three reaches in the main stem (Hanson 1996 and Engblom 1997, 1999, 2001). Various life stages of steelhead, including upstream migrants and smolts, have been consistently observed at some of these sites (Table B.10.2), suggesting the occurrence of persistent populations. Run sizes are unknown, but likely small (<100 adults total), implying the populations are not viable over the long term. A third dam, Juncal Dam, occurs above the other two dams in the watershed, and is reported to support a small population of landlocked steelhead that annually enter the reservoirs' tributaries to spawn (M. Capelli, pers. comm.)

The Ventura—There are no estimates of recent run sizes in the Ventura River. Casitas Dam on Coyote Creek and Matilija Dam on Matilija Creek block access to significant portions of the historical spawning habitat. There are recent individual reports of sightings of steelhead in the Ventura River and San Antonio Creek (M Capelli 1997 and C. Zimmerman 2000, 2001), but no quantitative estimates.

The Santa Clara—A few estimates of recent run sizes exist for the Santa Clara system, due to the presence of a fish ladder and counting trap at the Vern Freeman Diversion Dam on the main stem. This diversion dam lies between the ocean and what is widely believed to be one of the largest extant populations of steelhead in the ESU (the Sespe Canyon population). The run size of upstream migrants in each was one adult in 1994 and 1995, two adults in 1996, and no adults in 1997. No data have been collected since that date, and the fish ladder is thought to be dysfunctional.

Harvest Impacts

Since the original status review of Busby et al. (1996), regulations concerning sport fishing have been changed in a way that may potentially reduce extinction risk for the ESU.

Sport harvest of steelhead in the ocean is currently prohibited by the CDFG (CDFG 2002a), and ocean harvest is a rare event (M. Mohr, NMFS, pers. comm.). For freshwaters (CDFG 2002b), summer-fall catch-and-release angling is allowed in Piru Creek below the dam; San Juan Creek (Orange County); San Mateo Creek (one section); Santa Margarita River and tributaries; and Topanga Creek. Year-round catch and release is allowed in the San Gabriel River (below Cogswell Dam); and Sespe Creek and tributaries. All the above are historical steelhead streams and many of the stretches open to fishing are potentially used both by anadromous runs and by resident populations.

Year-round trout fisheries are allowed in Calleguas Creek and tributaries (limit 5); Piru Creek above the dam (limit 2); San Luis Rey River (limit 5); Santa Paula Creek above the falls (limit 5); the Santa Ynez River above Gibraltar Dam (limit 2); Sisquoc River (limit 5); and Sweetwater River (limit 5). With the exception of the Sisquoc River, these take-fisheries appear to be isolated from the ocean by natural or human-made barriers. Except for Calleguas Creek and possibly the Sweetwater, the above drainages are listed as historical steelhead streams by Titus et al. (MS). It is certainly possible, and indeed likely, that some currently harbor native trout with the potential to exhibit anadromy

At catch-and-release streams, all wild steelhead must be released unharmed. There are significant restrictions on gear used for angling. The CDFG monitors angling effort and catch-per-unit-effort in selected basins by way of a "report card" system in which sport anglers self-report their catch, gear used, and so forth, and in selected other basins by way of creel censuses.

Although the closure of many areas, and institution of catch and release elsewhere, is expected to reduce extinction risk for the ESU, this risk reduction cannot be estimated quantitatively from the existing data sets (due to the fact that natural abundance is not being estimated). After the federal listing decisions, NMFS requested that CDFG prepare a Fishery Management and Evaluation Plan (FMEP) for the listed steelhead ESUs in California. This has not yet been done for the Southern California ESU, so the rationale for the set of regulations summarized above is not transparent.

Resident *O. mykiss* Considerations

Resident (nonanadromous) populations of *O. mykiss* were assigned to one of three categories for the purpose of provisionally determining ESU membership (see "Resident Fish" in the introduction for a description of the three categories and default assumptions about ESU membership). The third category consists of resident populations that are separated from anadromous conspecifics by recent human-made barriers such as dams without fish ladders. No default assumption about ESU membership was possible for category 3 populations, so here they are considered case by case according to available information.

As of this writing there are few data on occurrence of resident populations and even fewer on genetic relationships. A provisional survey of the occurrence of category 3 populations in the ESU (see Appendix B.14, Table B.14.1) revealed the following: There are numerous category 3 populations within the original geographic range of the Southern California ESU. All of the larger watersheds originally inhabited by the ESU now have major barriers completely blocking substantial portions of habitat (Table B.14.1; a major barrier is defined as a complete barrier to migration that has greater than 100 sq. mi. of watershed area lying above it). In the watershed of the Santa Maria River, 71% of total stream kilometers are above Twitchell Dam. The Santa Clara watershed has 99% of stream kilometers above Vern Freeman diversion dam. This facility has a fish ladder, but the ladder is currently dysfunctional due to channel migration which has disconnected the ladder intake from the river's thalweg, combined with deficient quantities and configurations of water releases through the facility (M. Whitman, CDFG hydraulic engineer, pers. comm..). The Santa Ynez watershed, which probably originally harbored the strongest run of steelhead in the Southern California ESU, has 58% of its stream kilometers above Cachuma Dam. In each of these cases the historical record has reports of steelhead ascending to and spawning in areas that are now blocked behind the above-mentioned dams (Titus et al. 2003). In the case of the Santa Ynez, adult *O. mykiss* have been observed to make "steelhead-like" runs from the uppermost reservoir (behind Juncal Dam) into the North Fork Juncal and the upper Santa Ynez for at least the past seven years (Louis Andolora, Juncal Dam tender, pers. comm..,).

All the large watersheds farther south have major barriers blocking substantial portions of stream habitat. Consequently, in the set of major watersheds originally inhabited by the ESU, at least 48% of stream kilometers are now behind barriers impassable to anadromous fish (the value is probably somewhat higher due to minor barriers not considered in Table B.14.1). At least 11 of these 15 major watersheds are known to have resident populations above the barriers (Table B.14.1).

We do not know much about the genetic relationships of these resident populations. There is one study of genetic relationships among hatchery stocks, anadromous fish, and resident populations above barriers (Nielsen et al. 1997). The study used selectively neutral genetic markers to assess genetic distances among the various categories of fish (anadromous, residualized, hatchery, etc.), but the results were inconclusive. However, according to the provisional survey described in Table B.14.1, at least 7 of the 11 watersheds with resident populations above major barriers are currently being stocked with hatchery fish. It is not clear whether these stocked fish have successfully interbred with the native fish; whether such interbreeding would have led to significant gene flow between the introduced and native fish; or to what extent the local adaptations of the native fish would have been maintained by selection even if gene flow occurred.

Table B.10.2. Presence of steelhead in the lower Santa Ynez River system.

Tributary	Redds	<6"	>6"	Smolts	Adults	Unspec.	Year (Spring)	Source
Salsipuedes/El Jaro		Y	Y	Y	Y*		1994	Hanson 1996
				Y	Y*		1995	Hanson 1996
	Y	Y	Y	Y	Y*		1996	Hanson 1996, Engblom 1997
	Y	Y	Y	Y	Y*		1997	Engblom 1997
	Y	Y	Y		Y*		1998	Engblom 1999
	Y	Y	Y		Y*		1999	Engblom 1999
					Y*		2000	Engblom 2001
		Y	Y	Y	Y*		2001	Engblom 2001
Hilton Creek		N	N		Y*		1994	Hanson 1996
		Y	Y†	Y	Y*		1995	Hanson 1996
				N	Y*		1996	Hanson 1996, Engblom 1997
	N	Y	Y	N	Y*		1997	Engblom 1997
	Y	Y			Y*		1998	Engblom 1999
					N*		1999	Engblom 1999
		Y	Y		Y*		2001	Engblom 2001
Alisal Creek		Y	Y		Y*		1995	Hanson 1996
Nojoqui Creek		N	N		N*		1994	Hanson 1996
				N	N*		1995	Hanson 1996
				N			1997	Engblom 1997
		N	Y		Y*		1998	Engblom 1999
					N*		1999	Engblom 1999
Quiota Creek (and tributaries)	Y		Y		N*		1995	Hanson 1996
		Y	Y				1994	Hanson 1996
		Y					1998	Engblom 1999
		Y	Y				2001	Engblom 2001
San Miguelito Creek		Y	Y				1996	Hanson 1996
	Y			Y			1997	Engblom 1997
		Y		N	N*		1998	Engblom 1999
	Y			N	N*		1999	Engblom 1999
Mainstem/Hwy 154		Y	Y				1995	Hanson 1996
		Y	Y				1996	Hanson 1996
					Y		1994	Hanson 1996
		Y	Y				1998	Engblom 1999
	Y						1999	Engblom 1999
		Y	Y				2001	Engblom 2001
Mainstem/Refugio		Y	Y				1995	Hanson 1996
		N	Y				1996	Hanson 1996
		Y	Y				1998	Engblom 1999
	Y	N	Y				1999	Engblom 1999
		Y	Y				2001	Engblom 2001
Mainstem/Alisal reach		Y	Y				1995	Hanson 1996
		N	Y				1996	Hanson 1996

	Y	Y	1998	Englom 1999
	Y	Y	1999	Engblom 1999
	Y	Y	2001	Engblom 2001
Mainstem/Cargasachi	N	N	1995	Hanson 1996
	N	N	1996	Hanson 1996

* Caught in upstream migrant trap.